



## **GIS TRAINING GROUP**

- 📍 Creating a statewide GIS repository for NG9-1-1
- 📍 Providing 9-1-1 GIS stakeholder training at no cost
- 📍 Supplying grants to improve and maintain your 9-1-1 GIS data

# **STATEWIDE NG9-1-1 TRAINING GIS CONCEPTS 2**

DATAMARK

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# OVERVIEW

## ABOUT THIS EXERCISE

The Oklahoma NG9-1-1 Toolkit is a set of tools intended to assist users for preparing their GIS data for NG9-1-1. The Toolkit is meant to be approached like a toolkit in real life; as each user's data is unique so will the approach to NG9-1-1 readiness. Many tools may be executed in different orders if the parameters are met.

**Always consult the ReadMe and/or Toolkit Manual for additional assistance.**

This exercise is a suggested workflow which is fully customizable by each end user. The topics covered in this exercise are centered around the following areas:

- ✓ Section 1: Preparing local data and building a new NG9-1-1 compliant geodatabase
- ✓ Section 2: Pre-validation data preparation, standardization, and populating mandatory values
- ✓ Section 3: Validation and geometry data quality assessments

### HELPFUL LINKS

#### **B1: GIS Standard Concept Course**

<https://www.youtube.com/watch?v=5DkgocdYrWo>

#### **OK GIS Standard, Toolkit Manual, and Toolkit Download**

[http://www.okmaps.onenet.net/address\\_standards.htm](http://www.okmaps.onenet.net/address_standards.htm)

#### **State of Oklahoma Data**

<https://okmaps.org/OGI/search.aspx>

## PREPARING DATA FOR NG9-1-1

The Toolkit can be downloaded from the link posted above in Helpful Links. Unzip the Toolkit but leave it in its native folder structure. This is critical to preserve functionality. Review the readme location and documentation before running the toolkit.

**Scenario:** You are a GIS Analyst who is managing your county's GIS data within a geodatabase. The source geodatabase is called **OK\_SourceData\_Initial.gdb** and includes the following layers:

- Road Centerlines (Centerlines)
- Address Points (SSAP)
- Emergency Service Zones (ESZ)
- Discrepancy Agency Boundary (DISCREPANCYAGENCY\_BOUNDARY)\*
- PSAP Boundary (PSAP\_BOUNDARY)\*

*\*These layers are managed by the State and downloaded from the link posted above in Helpful Links.*

You are going to use the OK NG9-1-1 Toolkit to assess the data and prepare it to meet OK-compliant standards.

## Before You Begin

Before preparing data for NG9-1-1, it is helpful to do an assessment to understand the level of effort required.

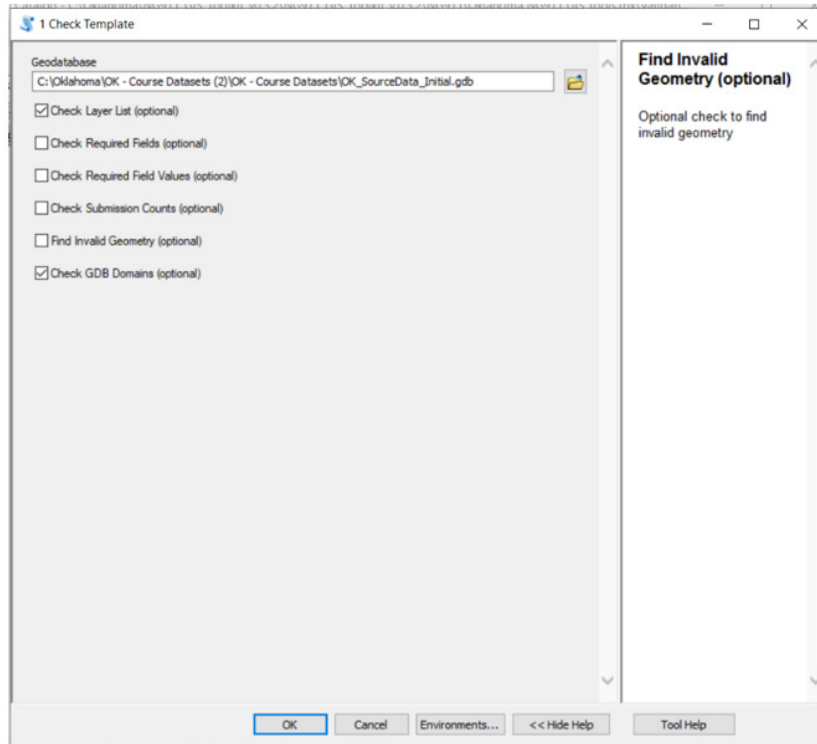
- Assess the data
  - Identify gaps
    - » Missing layers
    - » Missing fields
  - Be mindful of what applications are consuming the data
    - » Legacy fields
- Review the OK Standard
  - Consider if you will adopt the schema or create an ETL process

## Is the GDB Standards-compliant?

The geodatabase requires a specific schema with domains and feature datasets. To determine if our source geodatabase is Standards-compliant, let's run the Check Template within the Validation tools.

- Expand Validation Tools, click Check Template, and input ***OK\_SourceData\_Initial.gdb***.
- Check the boxes for Check Layer List and Check GDB Domains.

Results will be exported into two tables: FieldValuesCheckResults, and TemplateCheckResults. Examine the tables.



# SECTION 1

## PREPARING LOCAL DATA AND BUILDING A NEW NG9-1-1 COMPLIANT GEODATABASE

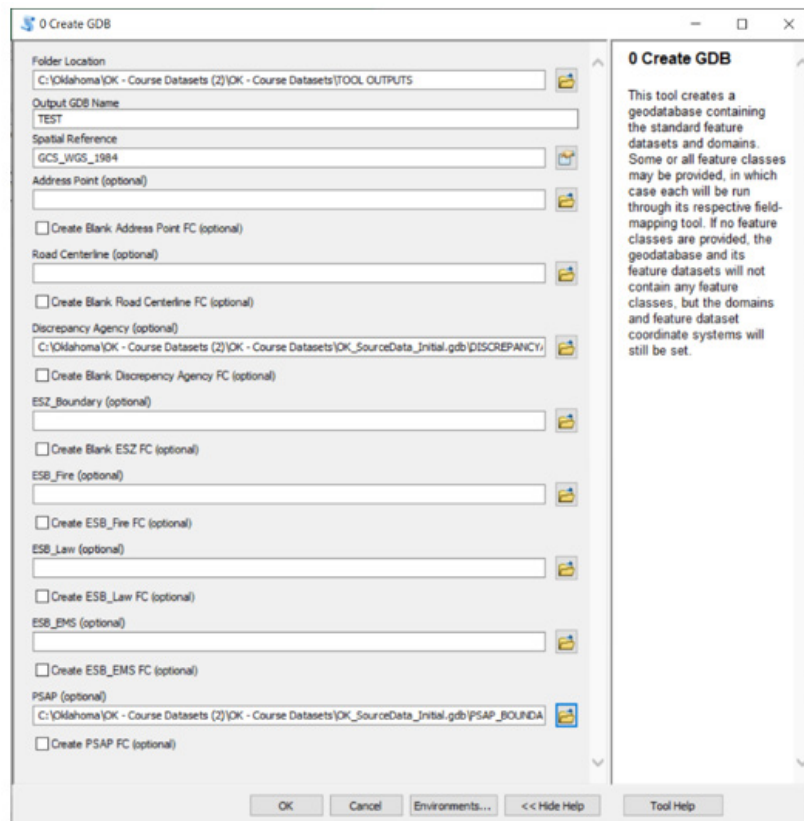
*OK\_SourceData\_Initial.gdb // NG911.gdb*

## CREATE GDB - OK\_SOURCEDATA\_INITIAL.GDB

Create GDB creates a geodatabase with Standards-compliant feature datasets and domains. Create GDB can also create feature classes and bring existing Standards-compliant data into the geodatabase.

In our scenario, we already have several data layers, two of which are already compliant because they were provided by the State.

- Open the **Create GDB Tool**
- Choose the **TOOL OUTPUTS** folder for the new geodatabase
- Name the new geodatabase **NG911** (the Standards-compliant spatial reference is already selected)
- Because we already have an ESZ layer, we will create ESBs using Dissolve ESZ later.
- We can also use the **Create GDB Tool** to import in the parameters boxes for both the PSAP and Discrepancy Agency
- Point to the folder location for PSAP and Discrepancy Agency and select those data sets



- Click **OK** to run

The new geodatabase **NG911.gdb** has been created. Examine the contents.  
**NG911.gdb** is now Standards-compliant.

## FIELD MAPPING

We are going to field map our existing non-compliant data into the Standards-compliant geodatabase **NG911.gdb**. Only the **Centerlines** feature class will be mapped for this portion of the exercise.

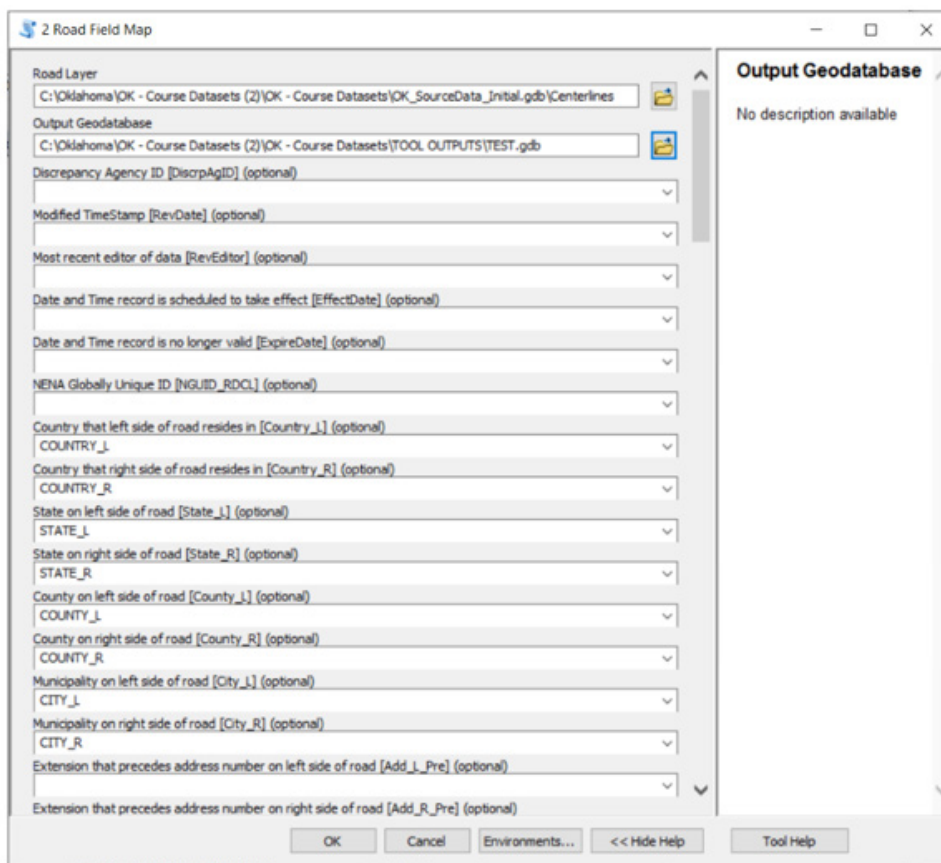
The following layers within **NG911.gdb** are already Standards-compliant because they were downloaded from the State:

- DISCREPANCYAGENCY\_BOUNDARY
- PSAP\_BOUNDARY

Field map Centerlines into **NG911.gdb**:

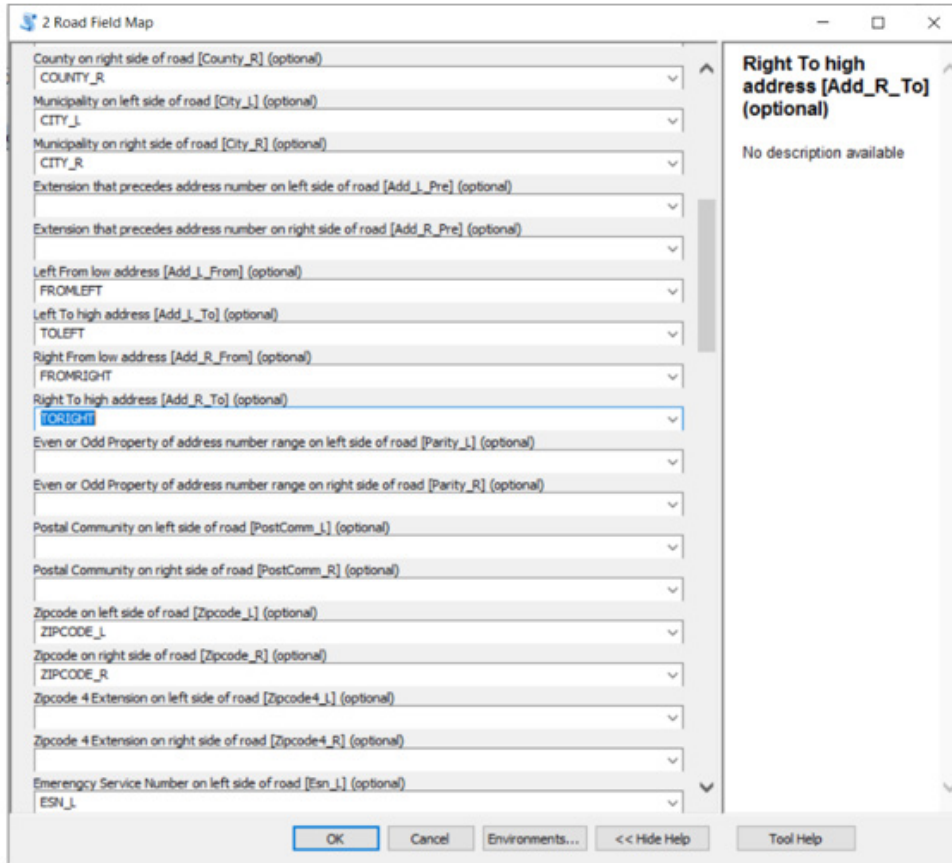
- Open **Road Field Map**
- For **Road Layer**, choose **Centerlines** from **OK\_SourceData\_Initial.gdb** and click **Add**
- Choose **NG911.gdb** for the Output Geodatabase

Note that any source field names that are identical to Standards-compliant fields will be automatically populated. If source data fields are not provided in the field mapping, those fields will be created with Null values.





- Populate the address ranges with the following values:
  - Left From low address [Add\_L\_From]: **FROMLEFT**
  - Left To high address [Add\_L\_To]: **TOLEFT**
  - Right From low address [Add\_R\_From]: **FROMRIGHT**
  - Right To high address [Add\_R\_To]: **TORIGHT**



- Click **OK** to run

**The Standards-compliant ROAD\_CENTERLINE feature class is now field mapped into *NG911.gdb*. Examine the attribute table for ROAD\_CENTERLINE.**

## DISSOLVE ESZ

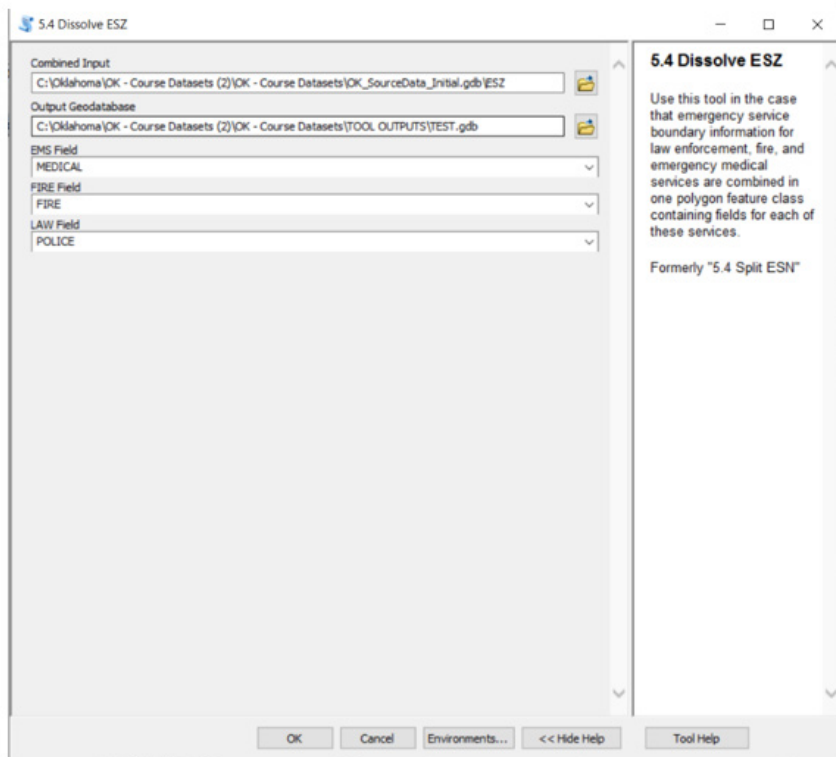
Use Dissolve ESZ\* to dissolve the geometry of the polygon feature class based on individual service types. The tool assumes that all service areas are defined in separate fields within the attribute table. The tool will only work if there are individual fields defining service types.

The source data contains an existing ESZ boundary feature class which includes fields delineating the service type for Fire, Law, and EMS. Use the Dissolve ESZ tool to create individual ESBs based on those service types. The outputs are separate Standards-compliant feature classes for Fire, Law, and EMS ESBs.

### Run Dissolve ESZ before field mapping the source ESZs into the Standards-compliant schema.

Examine the fields within the ESZs. Notice that service types are stored in separate fields.

- In the Toolkit, open **Dissolve ESZ**
- For Combined Input, choose the ESZ feature class from **OK\_SourceData\_Initial.gdb**
- For the Output Geodatabase, choose **NG911.gdb**
- In the drop down for **EMS Field**, choose **MEDICAL**
- In the drop down for **FIRE Field**, choose **FIRE**
- In the drop down for **LAW Field**, choose **POLICE**



- Click **OK** to run

**The Standards-compliant feature class ESBs for Fire, Law, and EMS are created in *NG911.gdb*.**

\*

**If the ESZ data does not define service types in separate fields, choose one of the following options:**

If one or more ESBs exist:

Use the ESB field mapping tools for each service type. If any ESBs are missing, create the missing feature class during Create GDB or run Add Blank FCs.

If service types are in one field:

If the ESZ service types are defined in one field, the user should do a select by service type and export individual feature classes then perform ESB field mapping.

If the service type is unknown:

If the service type within the ESZ layer is unknown, the GIS staff should work with the PSAP authority for assistance defining the ESZ using the information in the attribute table or by geometry.

If the user has no ESZs:

If no ESZs exist, GIS staff should work with the PSAP to define and create them.

## SECTION 2

# PRE-VALIDATION DATA PREPARATION, STANDARDIZATION, AND POPULATING MANDATORY VALUES

*OK\_StandardData\_Initial.gdb*

## POPULATE MANDATORY FIELDS

*OK\_StandardsData\_Initial.gdb* is Standards-compliant and contains all required feature classes and fields. The next step is to populate data within the Mandatory fields.

The Toolkit has several tools which populate some fields in the data. However, some will need to be populated manually. For this exercise, we are only populating fields within two feature classes.

- Open ArcMap and add **ROAD\_CENTERLINES** and **ESB\_FIRE\_BOUNDARY** from *OK\_StandardsData\_Initial.gdb* to the map

### Populate **ESB\_FIRE\_BOUNDARY**:

- Start an editing session and open the attribute table for ESB\_FIRE\_BOUNDARY
- Populate the following fields:
  - Country: **"US"**
  - State: **"OK"**
  - Agency\_ID: **"cog.acog.ok.gov"**
  - Agency: **"ACOG"**
  - DiscrpAglID: **"cog.acog.ok.gov"**
  - NGUID\_FIRE: See **Assign Unique NENA ID** section

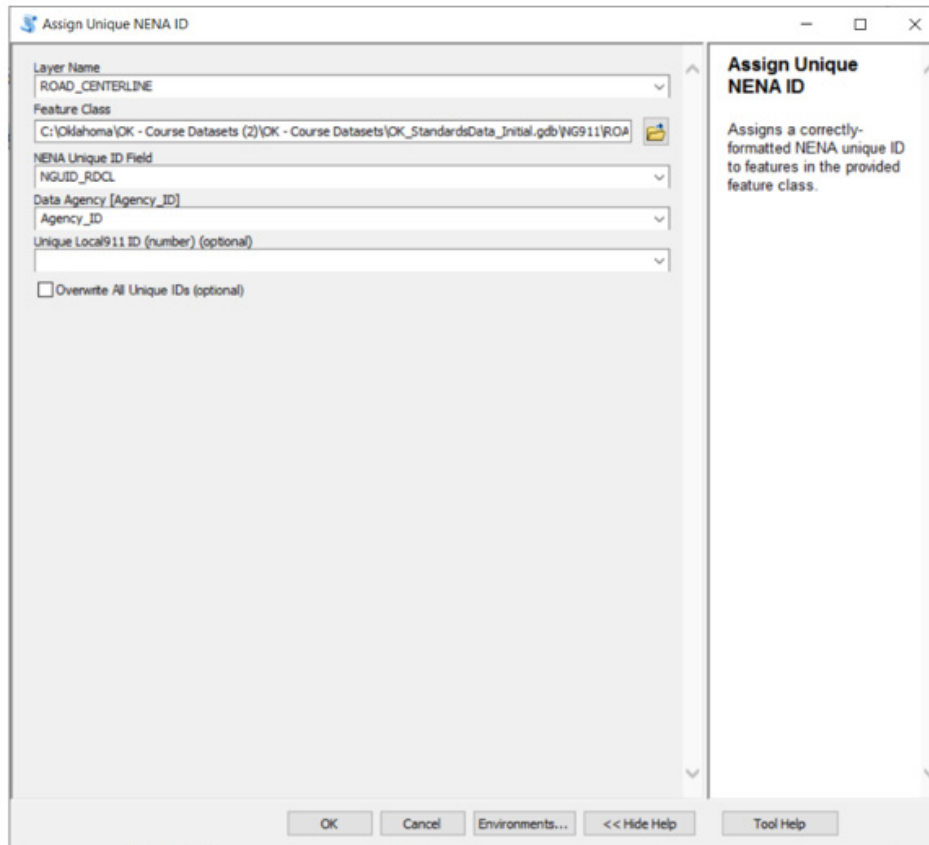
### Populate **ROAD\_CENTERLINE**:

- In the same editing session, open the attribute table for ROAD\_CENTERLINE
- Populate the following fields:
  - Agency\_ID: **"cog.acog.ok.gov"**
  - DiscrpAglID: **"cog.acog.ok.gov"**
  - NGUID\_RDCL: See **Assign Unique NENA ID** section
  - Legacy fields: See **Fix Street Type and Direction** section
    - » LgcyPreDir
    - » LgcyStreet
    - » LgcyType
    - » LgcySufDir

## ASSIGN UNIQUE NENA ID

Every record within every NG9-1-1 data layer requires an NGUID (NENA Globally Unique ID). Use Assign Unique NENA ID within Enhancement Tools to populate this value.

- Open the **Assign Unique NENA ID** tool
- For Layer Name, choose **ROAD\_CENTERLINE**
- For Feature Class, navigate to **OK\_StandardsData\_Initial.gdb** and choose ROAD\_CENTERLINE
- In NENA Unique ID Field, choose **NGUID\_RDCL**
- In Data Agency [Agency\_ID], choose **Agency\_ID**



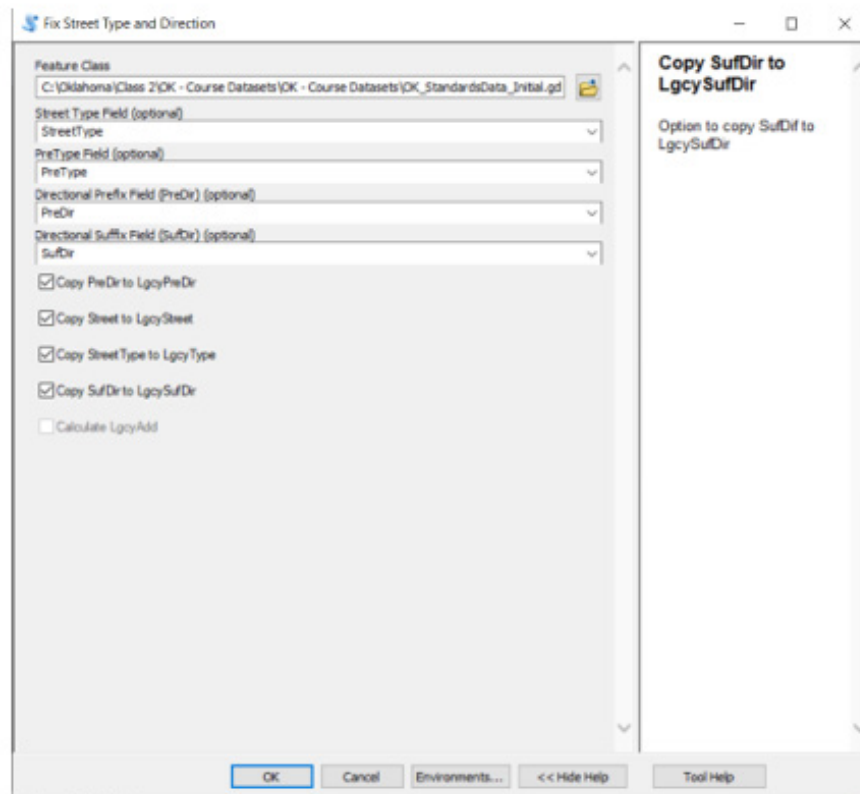
- Click **OK** to run
- Open the attribute table for **ROAD\_CENTERLINE** and verify the **NGUID\_RDCL** field is populated with a unique value
- Run the tool for **ESB\_FIRE\_BOUNDARY**

## FIX STREET TYPE AND DIRECTION

This tool fixes the Street Type and Direction fields to be correctly formatted to current standards. Additionally, the tool has an option to copy the values to legacy fields before adjusting the data to meet the Standard.

The ROAD\_CENTERLINE and ADDRESS\_POINT feature classes contain fields to populate legacy data to continue supporting existing applications. In this exercise, the legacy fields have already been populated for ADDRESS\_POINT, so we will run the tool on ROAD\_CENTERLINE.

- Open and run **Fix Street Type and Direction**
- Choose **ROAD\_CENTERLINE** for Feature Class
- For Street Type Field, select **StreetType**
- For PreType Field, select **PreType**
- For Directional Prefix Field, select **PreDir**
- For Directional Suffix Field, select **SufDir**
- Check the boxes to copy the values to the Legacy fields

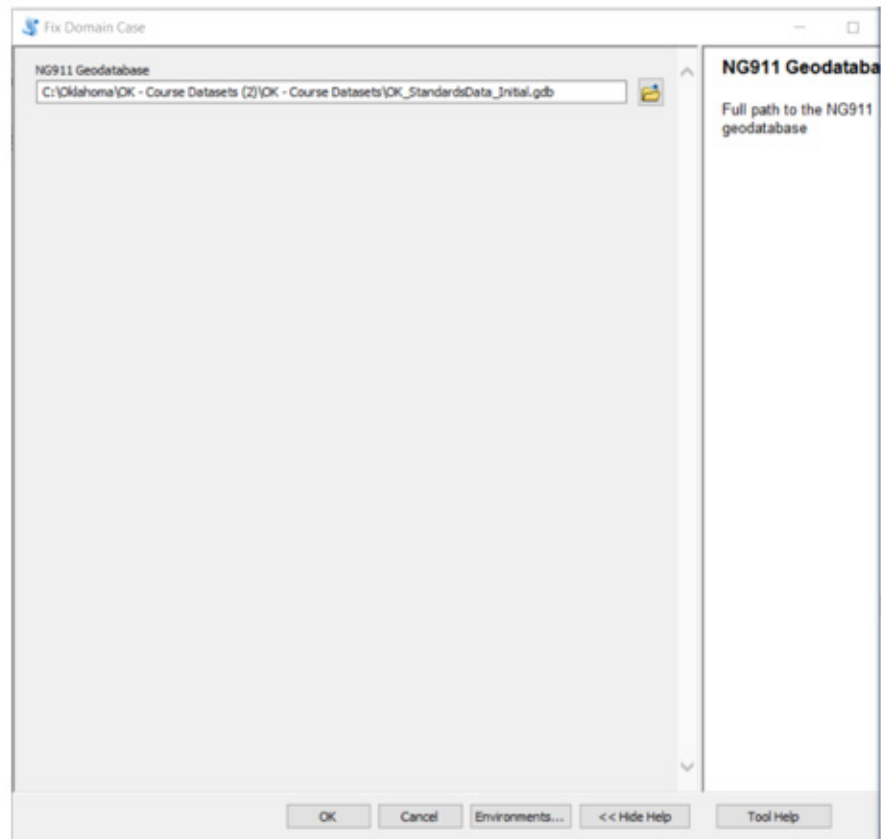


- Click **OK** to run
- Open the attribute table for **ROAD\_CENTERLINE** and verify the Legacy Fields are populated

## FIX DOMAIN CASE

Fix Domain Case adjusts any data with domain values and changes the case to UPPER. This is a good tool to use for QC and standardizing the data.

- Open **Fix Domain Case** and select *OK\_StandardsData\_Initial.gdb*



- Click **OK** to run
- Open the attribute table for ROAD\_CENTERLINE and verify the values in the state and Country fields now have the proper domain values and are UPPER case.

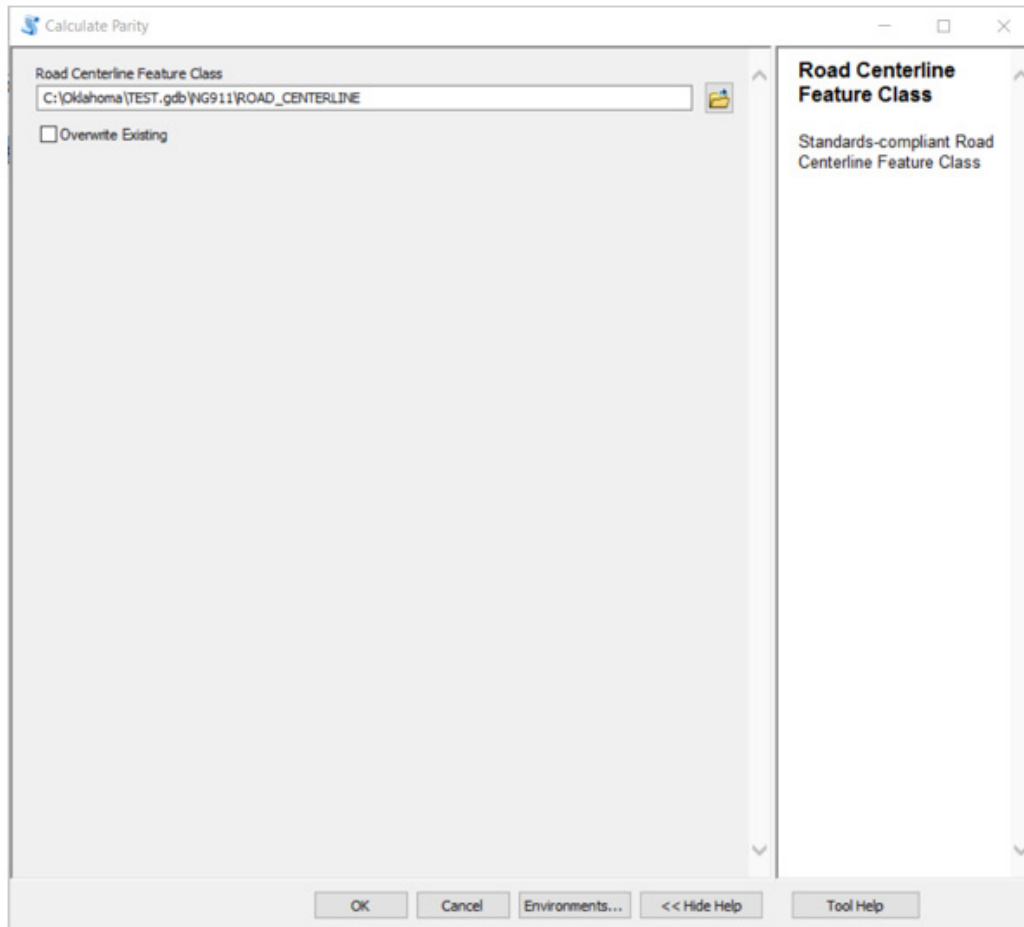


## CALCULATE PARITY

Calculates the Parity\_L and Parity\_R fields within ROAD\_CENTERLINE.

Parity represents the the even or odd property of the address number range on the Left or Right side of the road segment relative to the FROM Node. Appropriate values can be O=Odd; E=Even; B=Both; Z=Address Range 0-0.

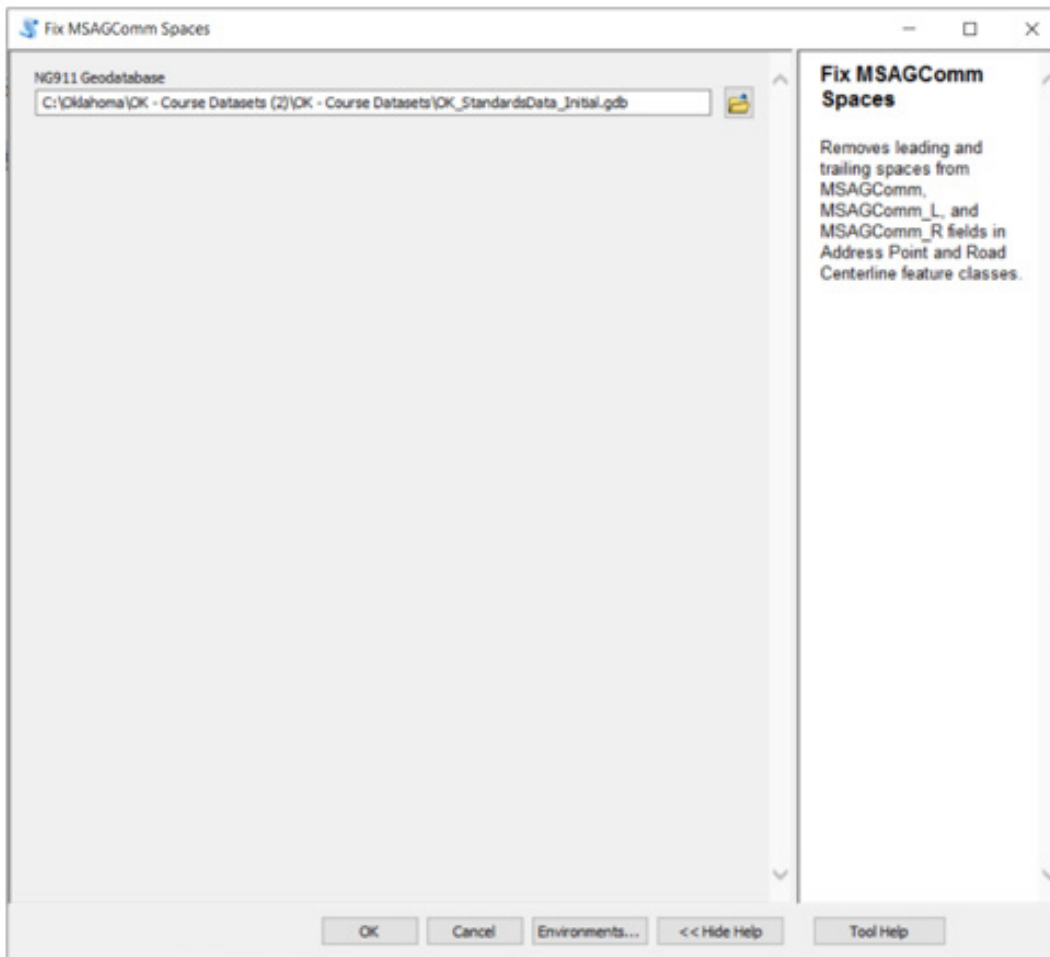
- Open **Calculate Parity** and select **ROAD\_CENTERLINE** in *OK\_StandardsData\_Initial.gdb*



- Click **OK** to run
- Open the attribute table for **ROAD\_CENTERLINE** and confirm **Parity\_L** and **Parity\_R** fields are populated

## FIX MSAGCOMM SPACES

- Open **Fix MSAGComm Spaces**
- Select **OK\_StandardsData\_Initial.gdb**



- Click **OK** to run

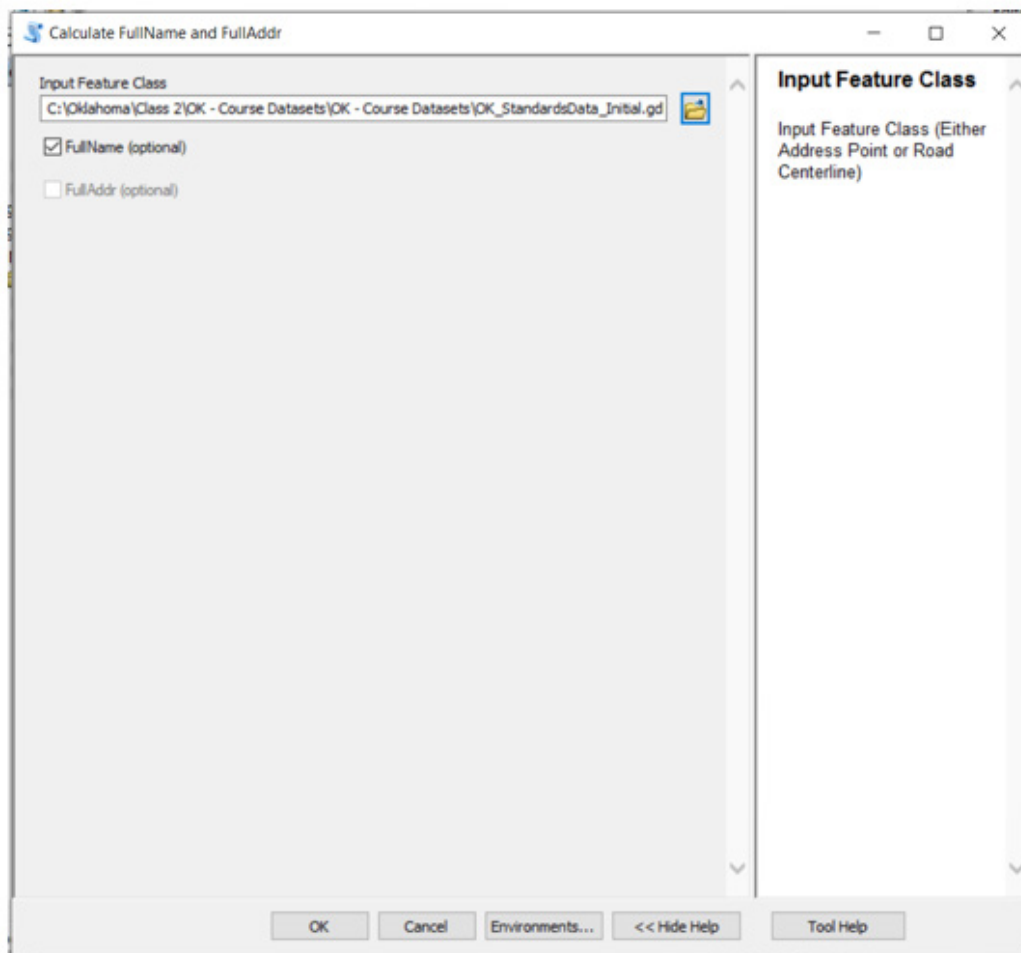
## CALCULATE FULLNAME AND FULLADDR

Calculate FullName and FullAddr uses the following fields within ROAD\_CENTERLINE and ADDRESS\_POINT feature classes to calculate the FullName field within ROAD\_CENTERLINE and ADDRESS\_POINT or FullAddr within ADDRESS\_POINT.

For the FullAddr field, the fields used for the calculation are: *AddPre, Address, AddSuf, PreDir, PreMod, PreType, PreTypeSep, Street, StreetType, SufDir, SufMod, BldgName, BldgUnit.*

For the FullName field, the fields used for the calculation are: *PreDir, PreMod, PreType, PreTypeSep, Street, StreetType, SufDir, SufMod.*

- Open **Calculate FullName and FullAddr**
- For **Input Feature Class**, click the folder icon and select **ROAD\_CENTERLINE** feature class in **OK\_StandardsData\_Initial.gdb**, and then click **Add**



- Click **OK** to run
- The FullName field should now be populated within ROAD\_CENTERLINE

## ADD/VALIDATE NG911 TOPOLOGY

Creates and adds layers and rules to topology. Topology rules included are listed below. Reference the ReadMe for further information.

**Polygon Layer Rules** - All polygon feature classes must individually conform to the rule:

- Must Not Overlap (Area)

**ESB and PSAP Layer Rules** - The ESB\_EMS\_BOUNDARY, ESB\_FIRE\_BOUNDARY, ESB\_LAW\_BOUNDARY, and PSAP\_BOUNDARY must individually conform to the rule:

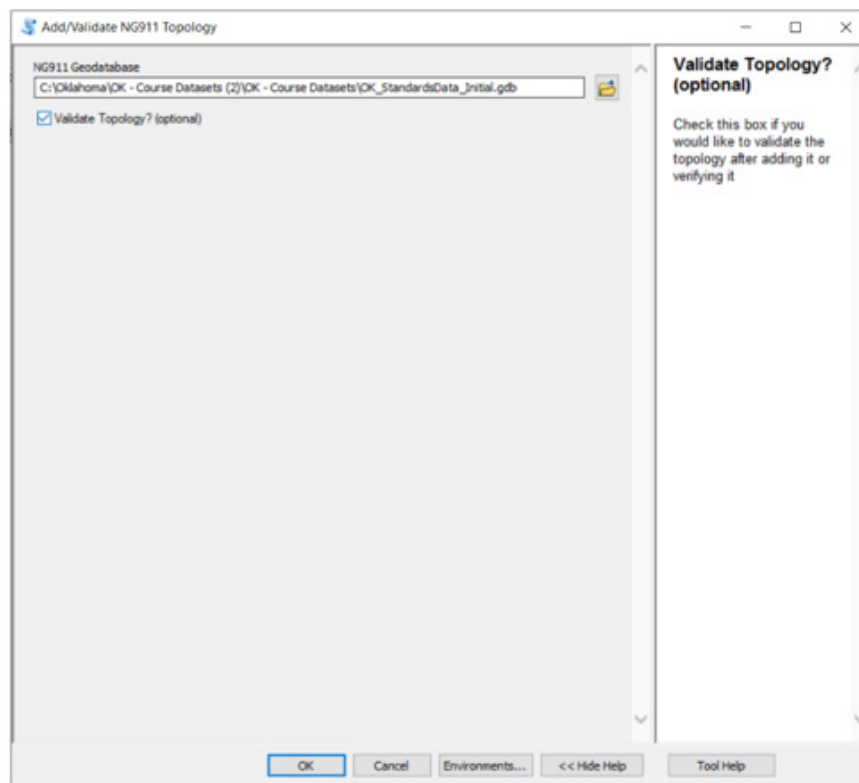
- Must Not Have Gaps (Area)

**ROAD\_CENTERLINE Layer Rules** - The ROAD\_CENTERLINE layer must conform to the following rules:

- Must Not Overlap (Line)
- *Must Not Have Dangles (Line)*
- Must Not Self-Overlap (Line)
- Must Not Self-Intersect (Line)
- Must Be Single Part (Line)

Note: the rule(s) in *italics* may be marked as exceptions on a per-feature basis.

- Open **Add/Validate NG911 Topology**
- Select **OK\_StandardsData\_Initial.gdb**
- Check the box to Validate Topology

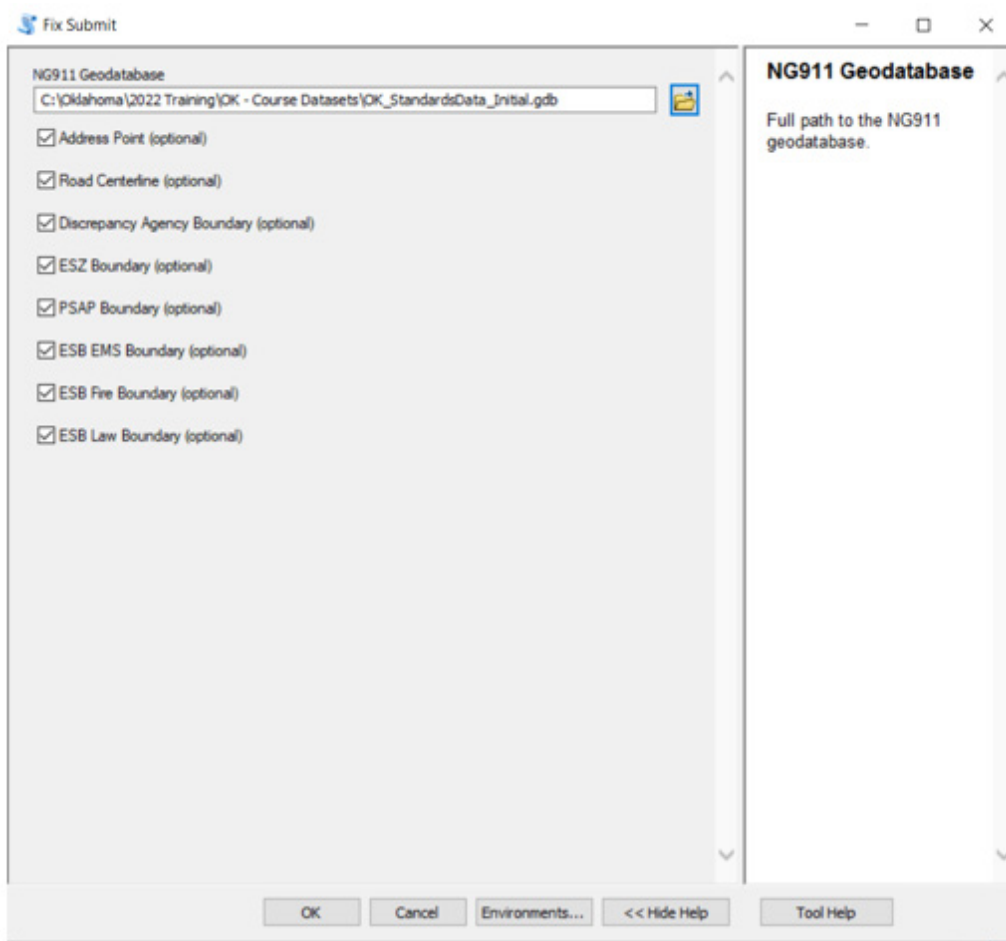


- Click **OK** to run
- Open ArcMap and add the topology and layers into the map
- Review the Instructor examples of marking topology exceptions in ArcMap

## FIX SUBMIT

Required field indicating if a feature is a record for submission.

- Open **Fix Submit** and select *OK\_StandardsData\_Initial.gdb*



- Click **OK** to run
- Open the attribute table for one of the feature classes and verify SUBMIT field is populated

## POPULATE GEOMSAG\_L AND GEOMSAG\_R

These fields are directly correlated to a locality's MSAG and the Submit field. If a record is marked "Y" for submission, the GeoMSAG\_L and GeoMSAG\_R fields should also be marked "Y" for submission.

**CURRENTLY, MSAG and TN Tools do NOT function as intended.**

- Open ArcMap and add ROAD\_CENTERLINE from *OK\_StandardsData\_Initial.gdb*
- For **GeoMSAG\_L** and **GeoMSAG\_R**, field calculate the value "Y"

## SECTION 3

# VALIDATION AND GEOMETRY DATA QUALITY ASSESSMENTS

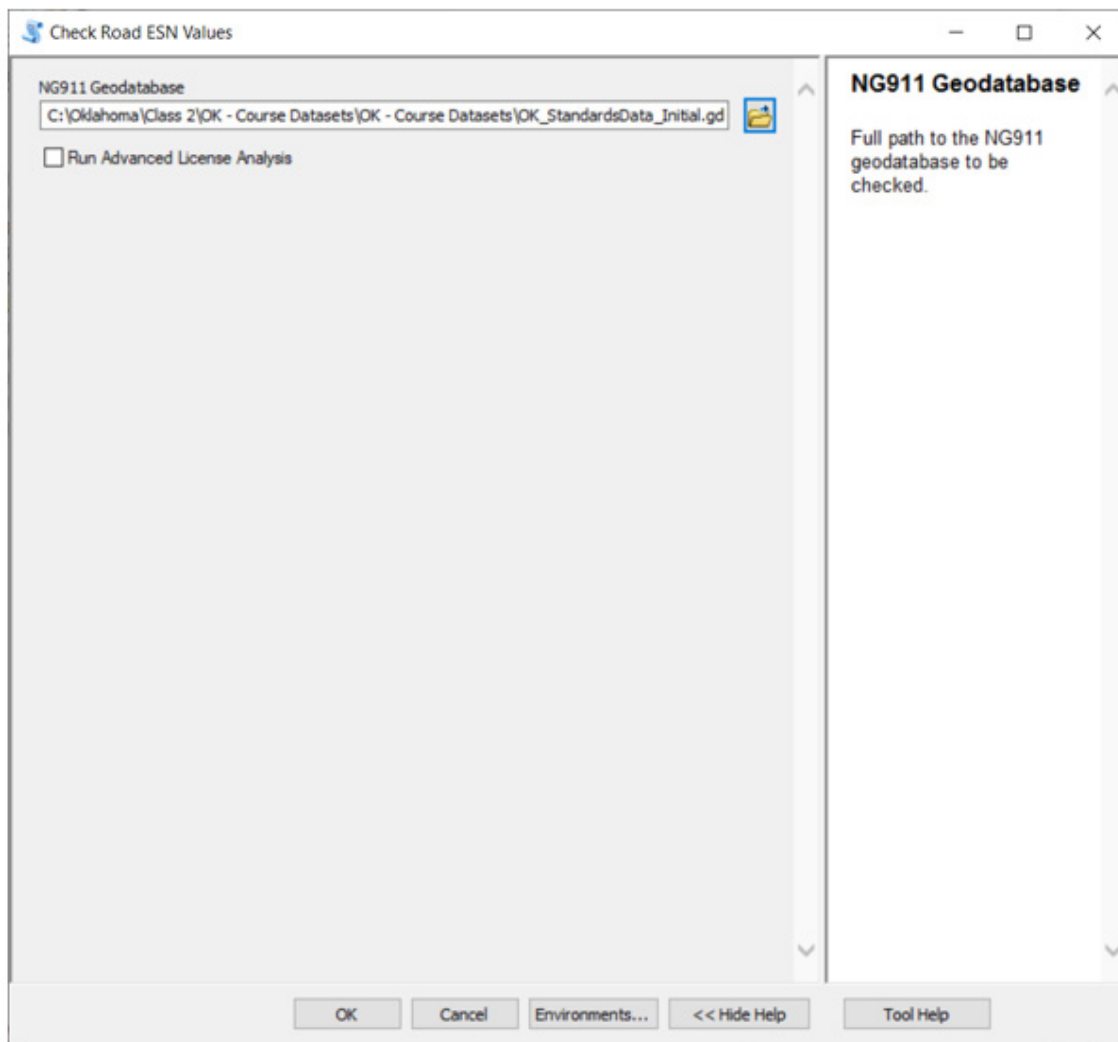
*OK\_StandardsData\_Prepped.gdb*

## CHECK ROAD ESN VALUES

Check Road ESN Values checks the road centerline ESN values against the ESN values of their spatial location.

Ensures the road centerline *Esn\_L* and *Esn\_R* values match the ESN values of the road's spatial location. Results will be reported in *FieldValuesCheckResults*. **This tool only produces Notices, not Errors, and therefore its results will not prevent submission.** ESZ required fields include *NGUID\_ESZ*, *ESN*, and *SUBMIT*. Road Centerline require fields include *NGUID\_RDCL*, *Esn\_L*, *Esn\_R* and *SUBMIT*. There is an option to run an Advanced License Analysis, which is a faster, more through analysis that requires an Advanced License to run.

- Open **Check Road ESN Values** and for NG911 Geodatabase
- Select **OK\_StandardsData\_Prepped.gdb** and click **Add**



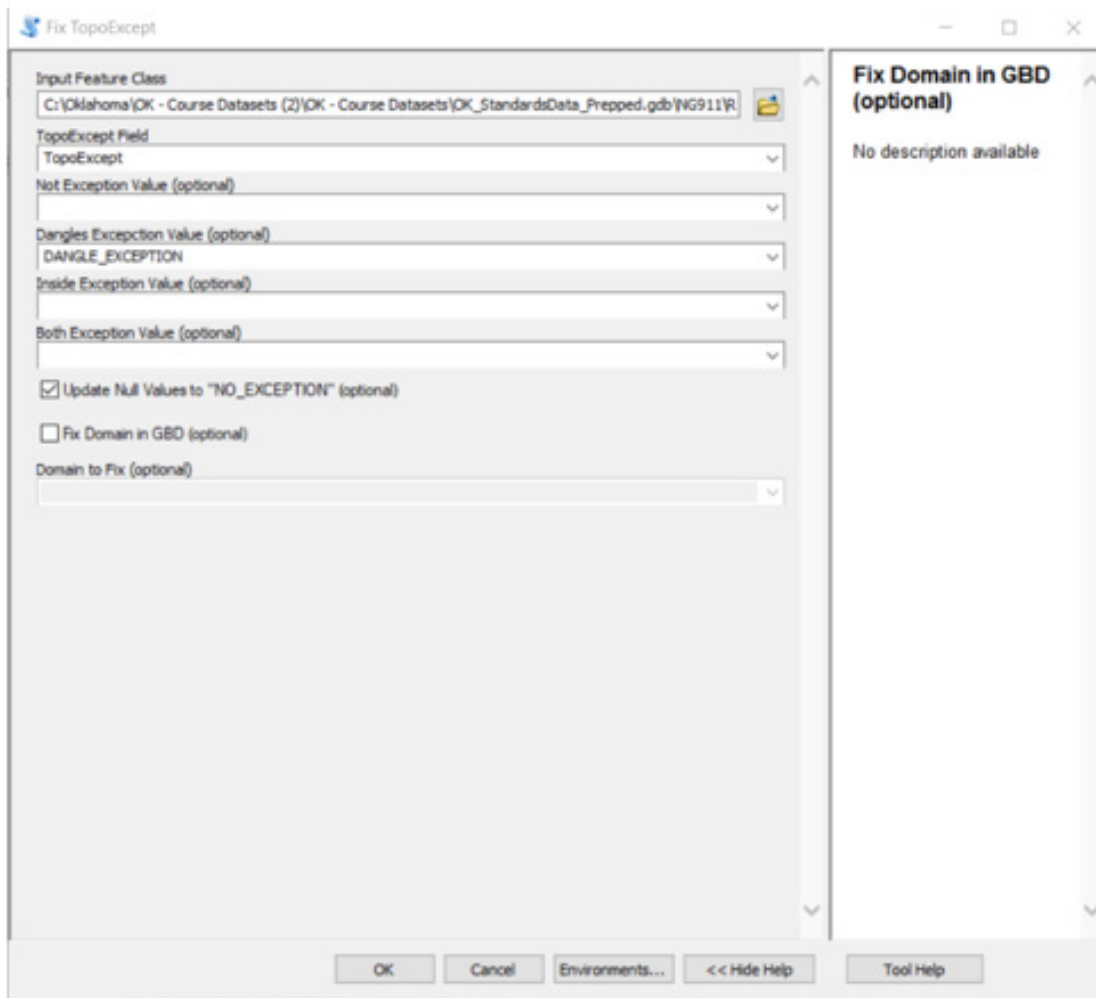
- Click **OK** to run
- Open **FieldValuesCheckResults** to examine the output



## FIX TOPOEXCEPT

TopoExcept is a Mandatory field for the ROAD\_CENTERLINE feature class in the Standard. This tool converts null and blank values to NOT\_EXCEPTION.

- Open **Fix TopoExcept** and for NG911 Geodatabase
- For Input Feature Class, select ROAD\_CENTERLINE from **OK\_StandardsData\_Prepped.gdb**
- For Dangles Exception Value, select DANGLE\_EXCEPTION
- Check the box to update Null values to "NO\_EXCEPTION"



- Click **OK** to run
- Open the attribute table for ROAD\_CENTERLINE to verify the TopoExcept field is populated

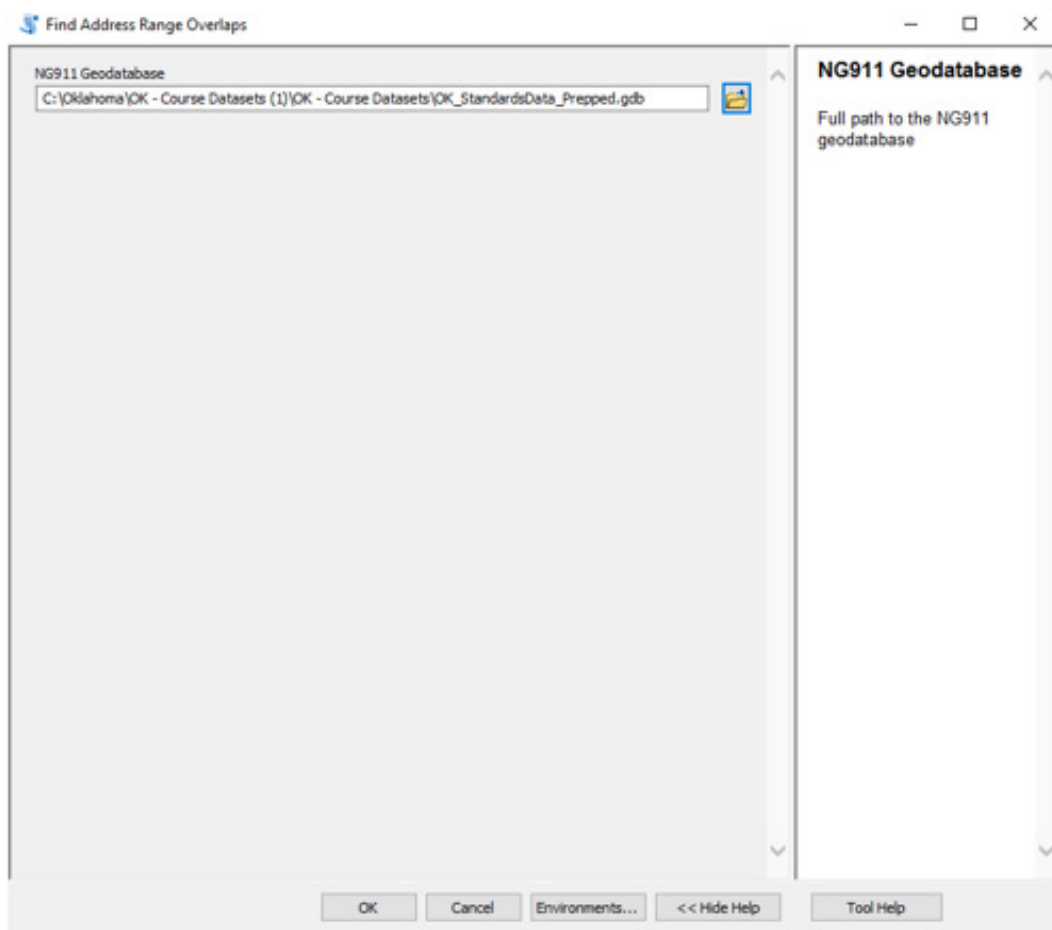
## FIND ADDRESS RANGE OVERLAPS

Find Address Range Overlaps identifies road segments where address ranges overlap.

Results are populated in the *FieldValuesCheckResults* table within a feature class called AddressRange\_Overlap.

**This tool only produces Notices, not Errors, and therefore its results will not prevent submission.**

- Open **Find Address Range Overlaps** and select **OK\_StandardsData\_Prepped.gdb**

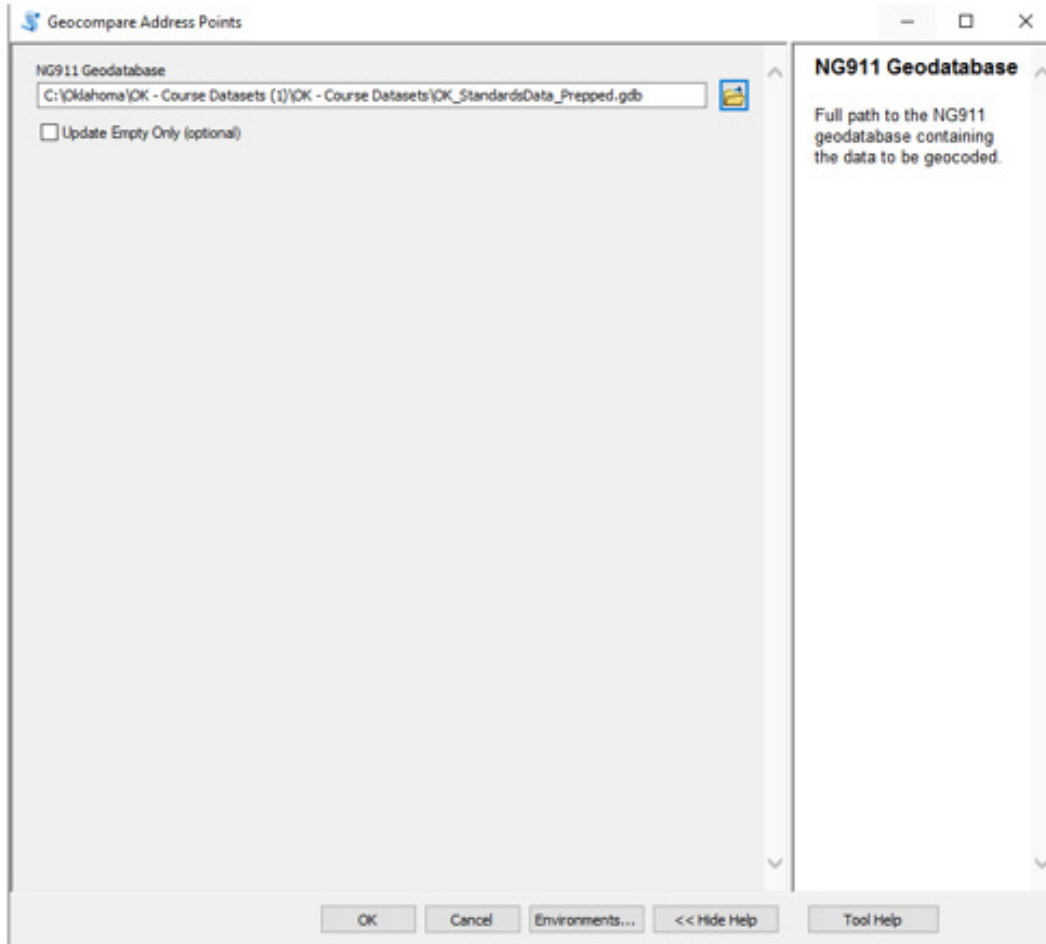


- Click **OK** to run

## GEOCOMPARE

Compares the address points against the road centerline data and calculates RCLMatch and RCLSide fields.

- Open **Geocompare Address Points**
- Select ***OK\_StandardsData\_Prepped.gdb***

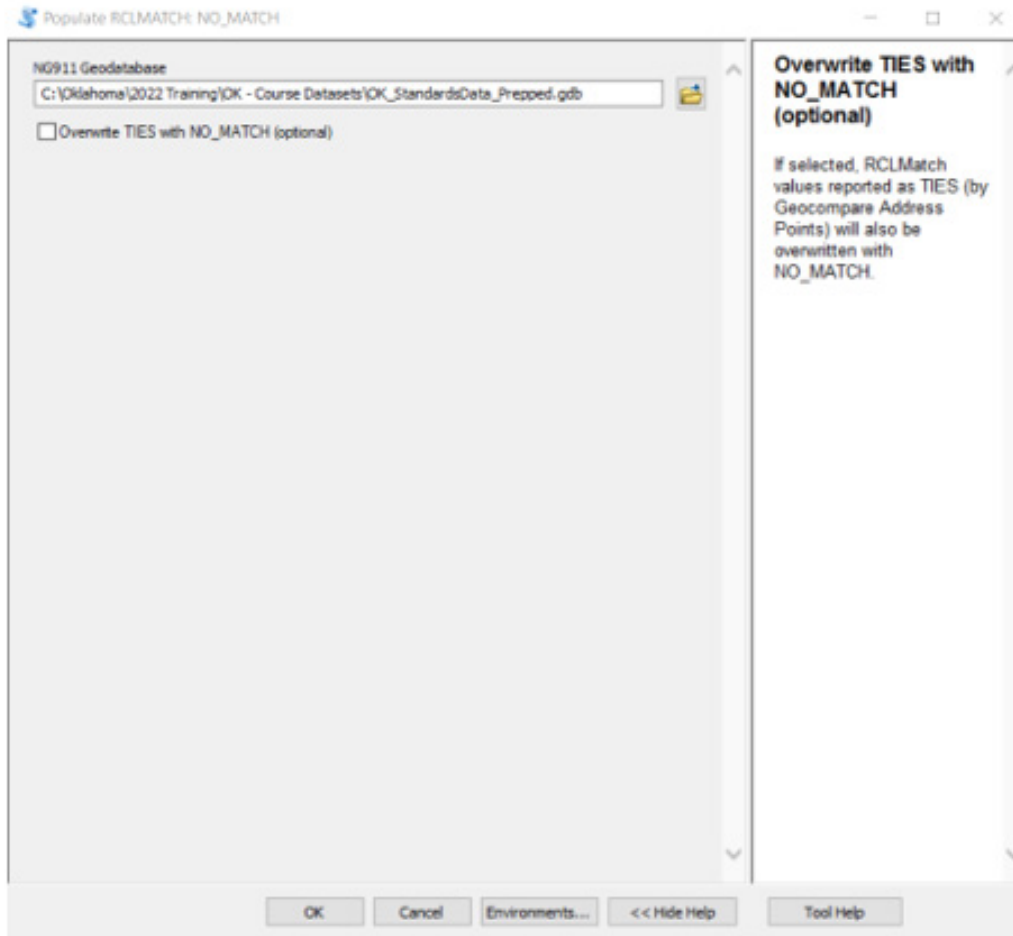


- Click **OK** to run (this may take a few minutes)
- A feature class called AddressPt\_GC\_Results is generated
- Open the attribute table for ADDRESS\_POINT and verify the fields RCLMatch and RCLSide are populated

## POPULATE RCLMATCH: NO\_MATCH

Populates any blank or null RCLMatch features with NO\_MATCH.

- Open **Populate RCLMATCH: NO\_MATCH**
- Select ***OK\_StandardsData\_Prepped.gdb***

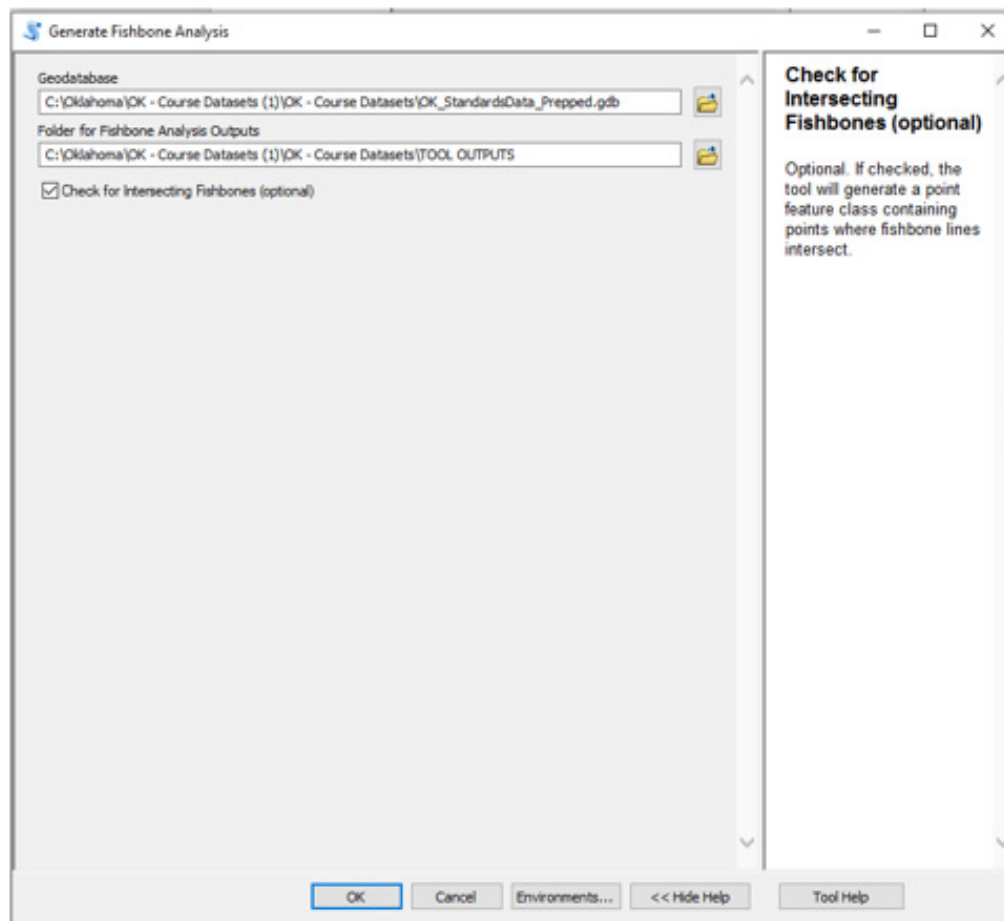


- Click **OK** to run
- Open the attribute table for ADDRESS\_POINT and verify blank values are populated with NO\_MATCH

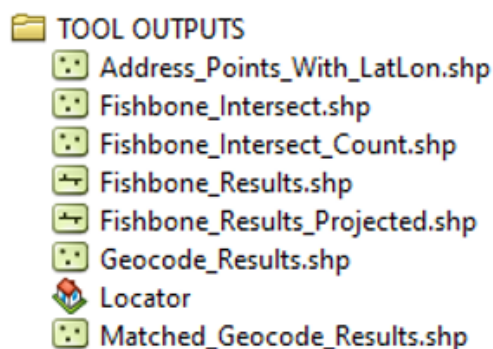
## GENERATE FISHBONE ANALYSIS

Generate Fishbone Analysis is a visual representation of the relationship between address points and road centerlines. Fishbones assist in QA/QC of the data.

- Open **Generate Fishbone Analysis**
- Select **OK\_StandardsData\_Prepped.gdb**
- Select TOOL OUTPUTS for the Folder for Fishbone Analysis Outputs
- Check the box to Check for Intersecting Fishbones



- Click **OK** to run
- Open the TOOL OUTPUTS folder to see the results from the Fishbone Analysis Tool

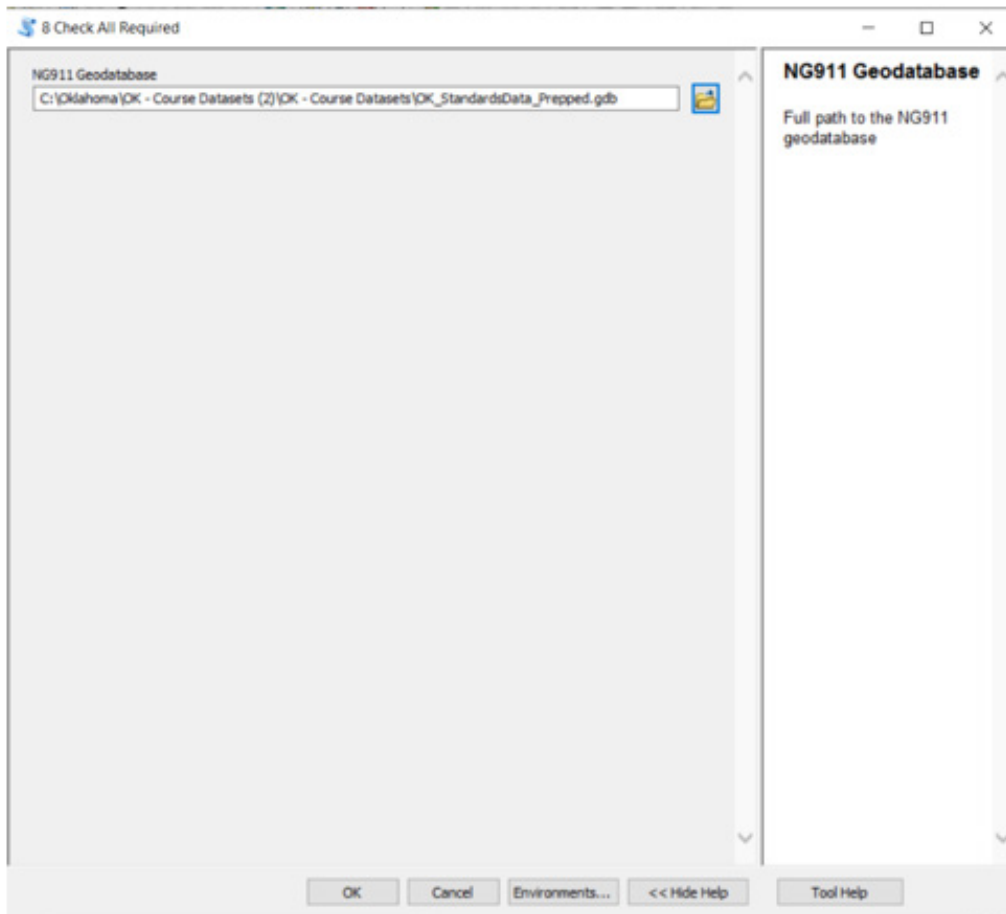


- Open ArcMap and add the Output files:
  - **Address\_Points\_With\_LatLon.shp** - output of ADDRESS\_POINT which exclude null and zero values in lat/long fields.
  - **Geocode\_Results.shp** - endpoint of the fishbone, the attribute table is a combination of ADDRESS\_POINT schema and geocode information
  - **Matched\_Geocode\_Results.shp** - table containing only the matching records
  - **Fishbone\_Results.shp** - Fishbone line drawn between ADDRESS\_POINT and the matched geocode results point
  - **Fishbone\_Intersect** - Marks the location where fishbones intersect
  - **Fishbone\_Intersect\_Count** - Number of fishbones intersecting at a location
  - **Fishbone\_Results\_Projected** - Fishbone results projected into SPCS

## VALIDATE

The data validation tools perform a variety of basic verification checks against the NG911 Data Model template to determine if the data is ready for submission. Validations may be run against individual feature classes or the entire geodatabase. In this exercise, we will be utilizing the Check all Required function.

- Open **Check all Required**
- Select **OK\_StandardsData\_Prepped.gdb**



- Click **OK** to run
- Review the output from the validation check

