



National Park Service

U.S. Department of the Interior



Natural Resource Program Center

Standard Operating Procedure for Calculating the Park Travel Service Area

Population Metric

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Table of Contents

Table of Contents	1
List of Tables	2
Overview	4
Acquire Features	4

Measure Development Summary

Conservation Status

Create File Geodatabase	4
Create Feature Dataset	5
Import Feature Dataset.....	5
Run AddFields Model.....	5
Run SetRoadSpeed Model	6
Create Network Dataset	7
Once created, then accept request to build it.	12
Create Entry Points to Park.....	12
Run CalcServiceArea Model	13
Appendix.....	14
Model Logic and Details.....	14
Hour-Minute Conversions	14

List of Tables

No table of figures entries found.

Revision History

Revision #	Date	Revision Summary	Revised by
0.1	20080915	Initial version	John Gross
0.2	20081013	Additions, edits, name change	Leona Svancara
0.3	20090203	Minor edits	Leona Svancara
0.4	20090414	Updated for C-CAP and PAD-US	Leona Svancara

Measure Development Summary

Conservation Status

0.5	20090518	Minor edits	Allison Lundeby
0.6	20090601	Reformatting	Allison Lundeby
0.7	20090708	Citation formatting	Allison Lundeby

Overview

The travel service area is the area that is within a specified driving time of a park. This SOP provides guidance on how to calculate this area. The following workflow defines the basic steps involved:

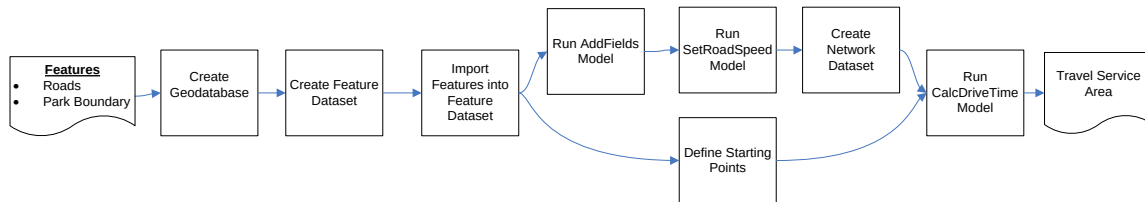


Figure 1. Travel Service Area Calculation Workflow

As much as possible, steps are automated via an ESRI model, although there are a few steps which are not supported and must be done manually.

The Toolbox for calculating the Service Area is titled **ServiceArea.tbx**.

Acquire Features

There are two features necessary for the calculation of the service area – roads and the park boundary.

Road data can be acquired from the NPScape site _____. Alternatively, you can use any road feature as long as it:

- Has defined speeds for each segment
- Has line segments are connected where appropriate. Any gap between roads is considered to be impassible.

The park boundary is used to determine the entry/destination points to the park. Alternatively, any destination point can be used as long as it intersects a road segment.

Create File Geodatabase

Open ArcCatalog and create a file geodatabase (Figure 2).

Measure Development Summary

Conservation Status

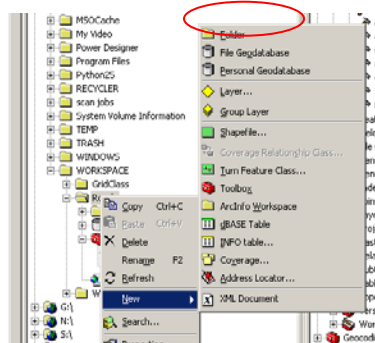


Figure 2. Creating a File Geodatabase in ArcCatalog

Create Feature Dataset

- 1) With ArcCatalog still open, create a FeatureDataset.
- 2) Name the FeatureDataset 'Roads'

Import Feature Dataset

Import the road and boundary features by importing a feature class to the feature dataset

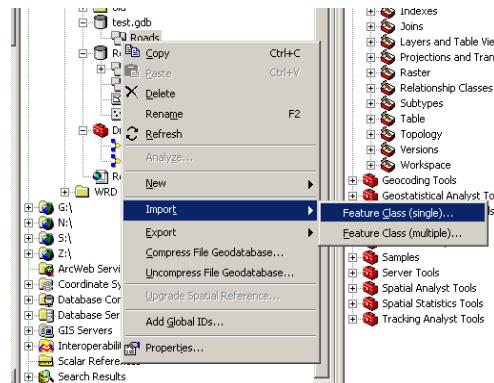


Figure 3. Importing The Roads Shapefile into the Roads Feature Dataset

Run AddFields Model

Once imported, there are three fields necessary for further processing of the roads feature:

- Length_miles (float)
- Speed_mph (float)

Measure Development Summary

Conservation Status

- DriveTime_hrs (float)

If not already present in that feature, they can be automatically added by running the 1_AddFields model in the Toolbox.

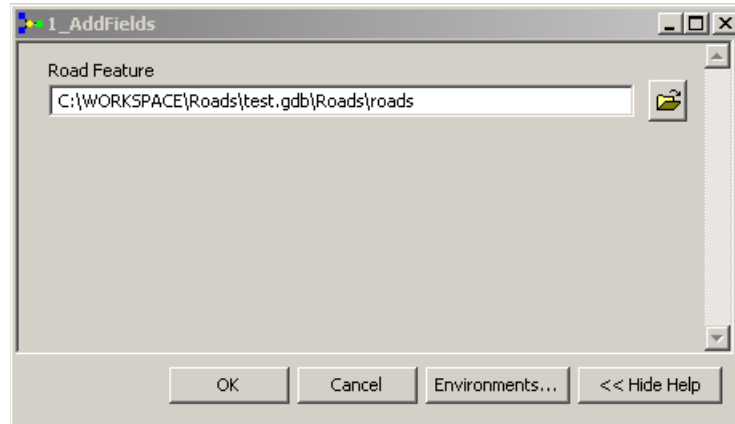
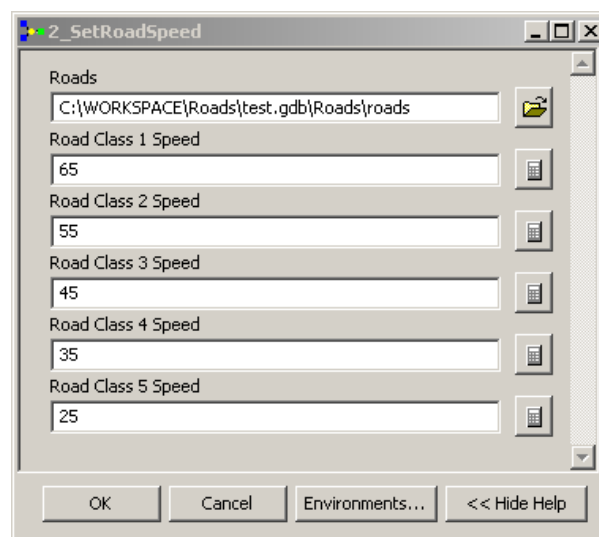


Figure 4. Add Field Model Interface

Run SetRoadSpeed Model

Each road segment of the roads feature class will need to be given a speed in miles per hour. The road data from ESRI doesn't indicate road speed, but has categorized all roads into one of five classes. Class 1 roads correspond to interstates and highways while class 5 roads often are found in neighborhoods.

The 2_SetRoadSpeed model in the associated Toolbox will allow you to specify the speeds for each road. Figure 5 shows the defaults: The following defaults are provided:



Measure Development Summary

Conservation Status

Figure 5. SetRoadSpeed Model Interface

You can use these defaults, select your own, or manually assign speeds to any road segment based on other criteria.

Create Network Dataset

ESRI currently does not provide a tool to create a network dataset, so the wizard must be used in ArcCatalog. Be sure to select the Feature Dataset (and not the Feature Class) to request the creation of a Network Dataset.

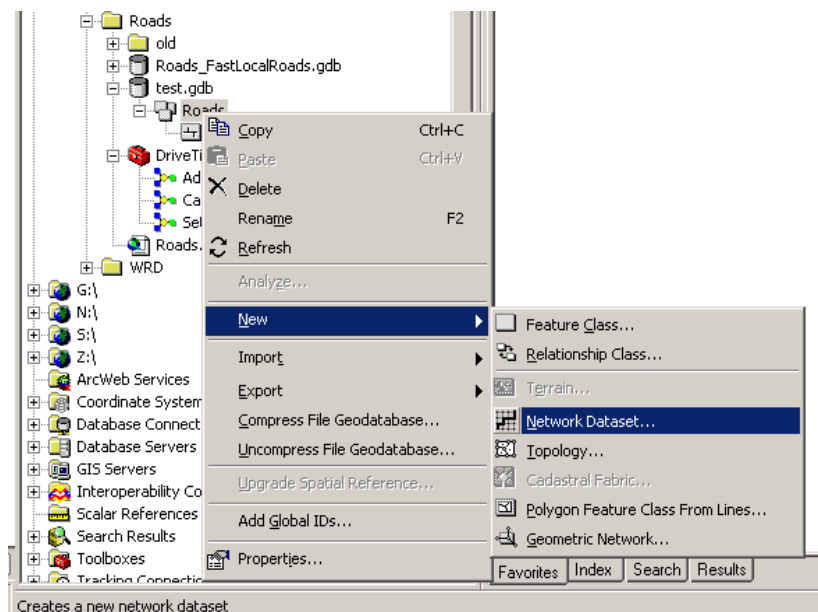
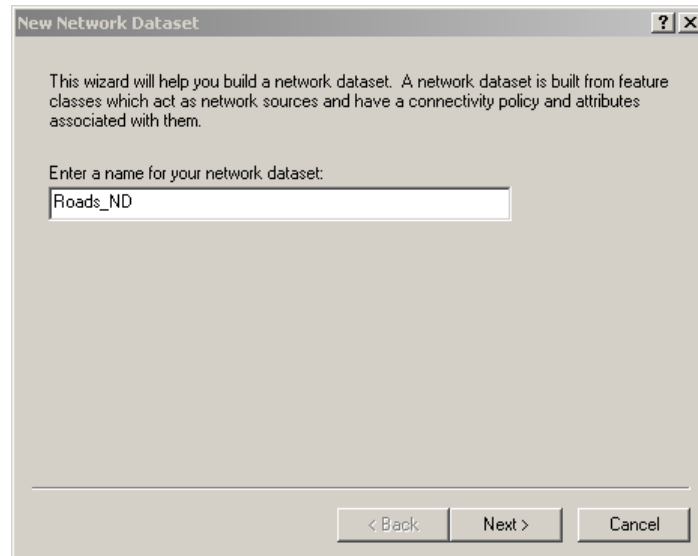


Figure 6. New Network Dataset

The wizard will guide you through the following steps:

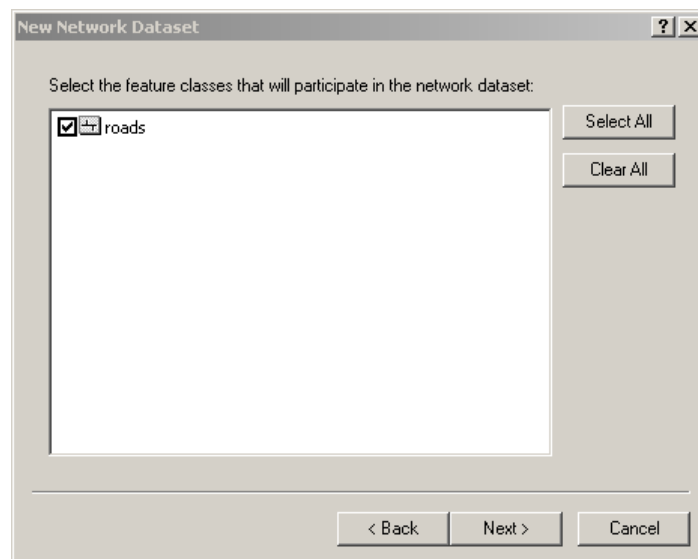
Measure Development Summary

Conservation Status



The dialog box is titled "New Network Dataset" and contains the following text: "This wizard will help you build a network dataset. A network dataset is built from feature classes which act as network sources and have a connectivity policy and attributes associated with them." Below this text is a label "Enter a name for your network dataset:" followed by a text input field containing "Roads_ND". At the bottom right are three buttons: "< Back", "Next >", and "Cancel".

Figure 7. New Network Dataset – Page 1



The dialog box is titled "New Network Dataset" and contains the following text: "Select the feature classes that will participate in the network dataset:". Below this text is a list box containing a single item "roads" with a checked checkbox. To the right of the list box are two buttons: "Select All" and "Clear All". At the bottom right are three buttons: "< Back", "Next >", and "Cancel".

Figure 8. New Network Dataset – Page 2

Measure Development Summary

Conservation Status

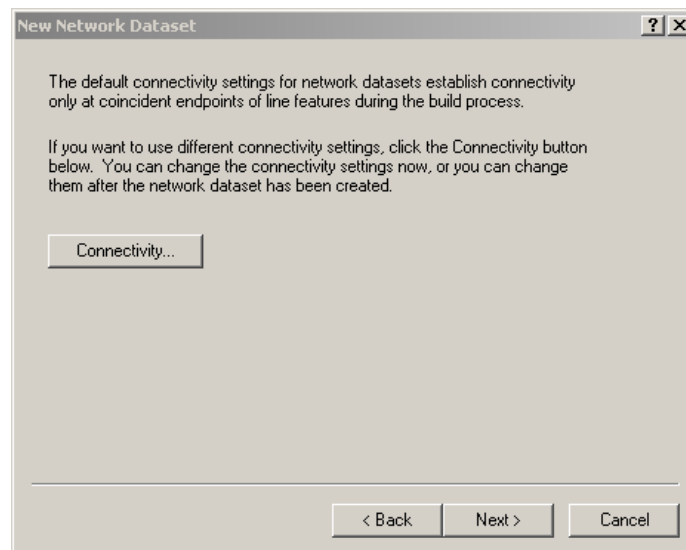


Figure 9. New Network Dataset – Page 3 – Defining Connectivity

Set connectivity and specify "Any Vertex." This rule assumes that any time 2 roads intersect, a driver can switch roads.

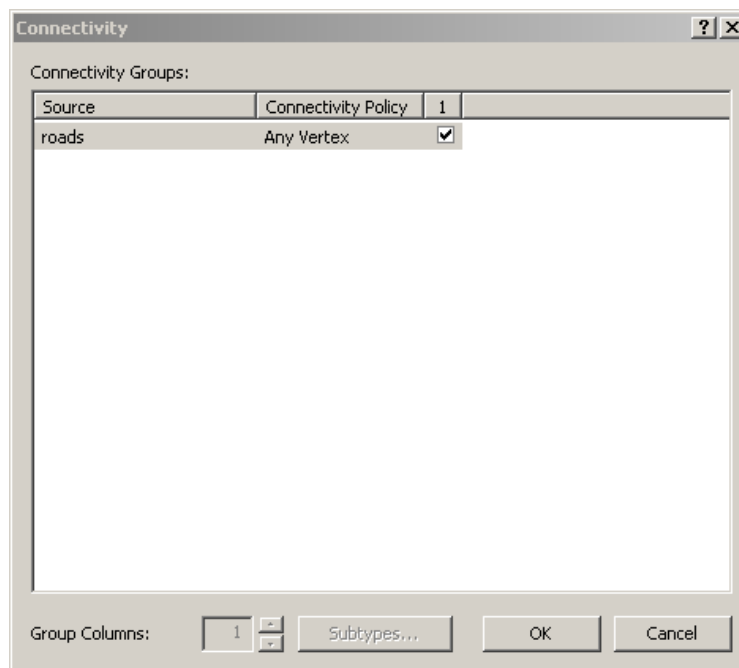
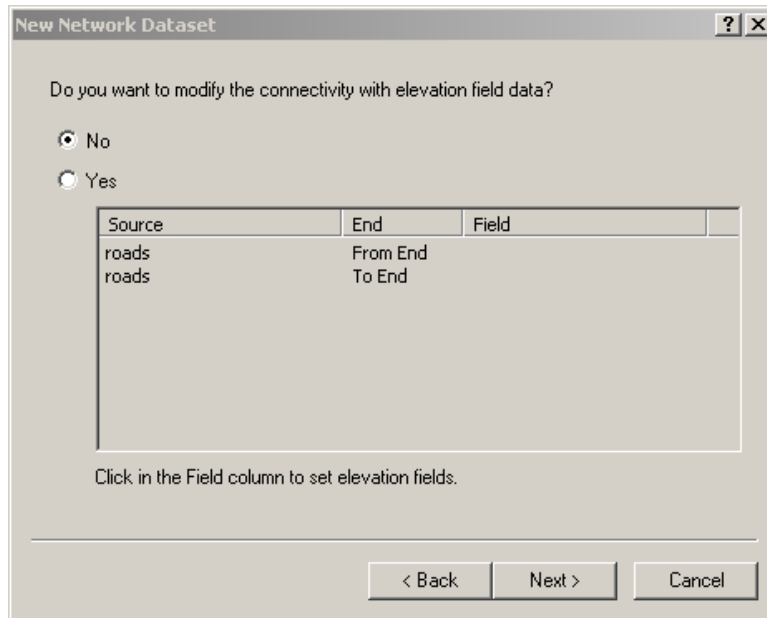


Figure 10. New Network Dataset – Page 3a – Defining Connectivity

Measure Development Summary

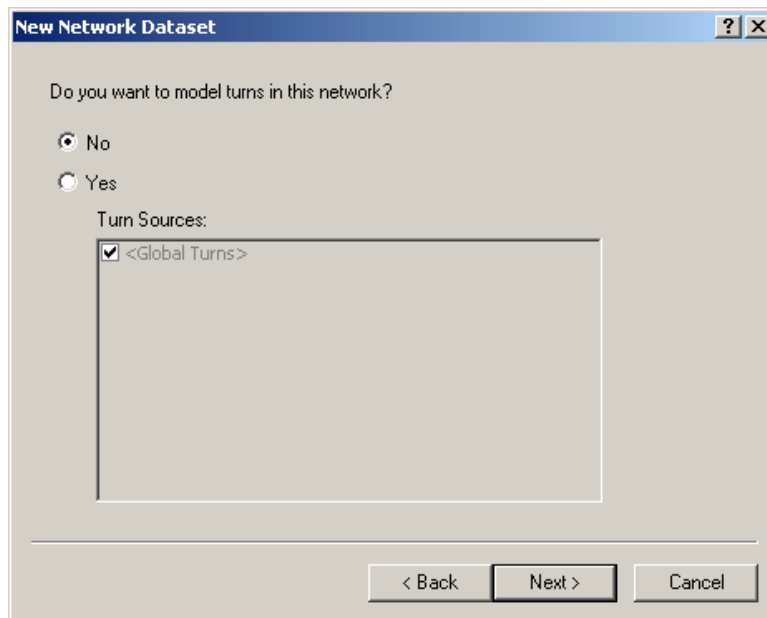
Conservation Status



The dialog box is titled "New Network Dataset". It contains a question: "Do you want to modify the connectivity with elevation field data?". Below the question are two radio buttons: "No" (selected) and "Yes". Below the radio buttons is a table with three columns: "Source", "End", and "Field". The table has two rows: "roads" and "roads". The "End" column has "From End" and "To End" respectively. The "Field" column is empty. Below the table is a text label: "Click in the Field column to set elevation fields." At the bottom are three buttons: "< Back", "Next >", and "Cancel".

Source	End	Field
roads	From End	
roads	To End	

Figure 11. New Network Dataset – Page 4 – Adding Elevation Data



The dialog box is titled "New Network Dataset". It contains a question: "Do you want to model turns in this network?". Below the question are two radio buttons: "No" (selected) and "Yes". Below the radio buttons is a section titled "Turn Sources:". Below "Turn Sources:" is a list box with one item: "<Global Turns>". The list box has a checkmark next to the item. At the bottom are three buttons: "< Back", "Next >", and "Cancel".

Turn Sources:

- ☒ <Global Turns>

Figure 12. New Network Dataset – Page 5 – Modeling Turns

Add the DriveTime_hrs as a cost with a unit of Hours and a data type of float.

Measure Development Summary

Conservation Status

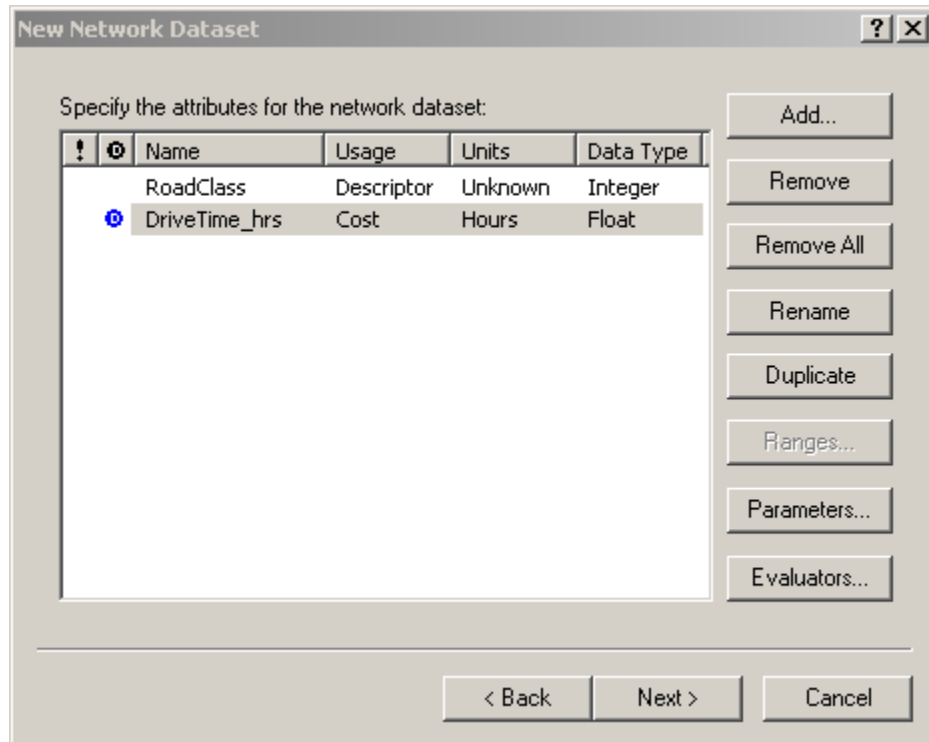


Figure 13. New Network Dataset – Page 6 – Specifying Attributes

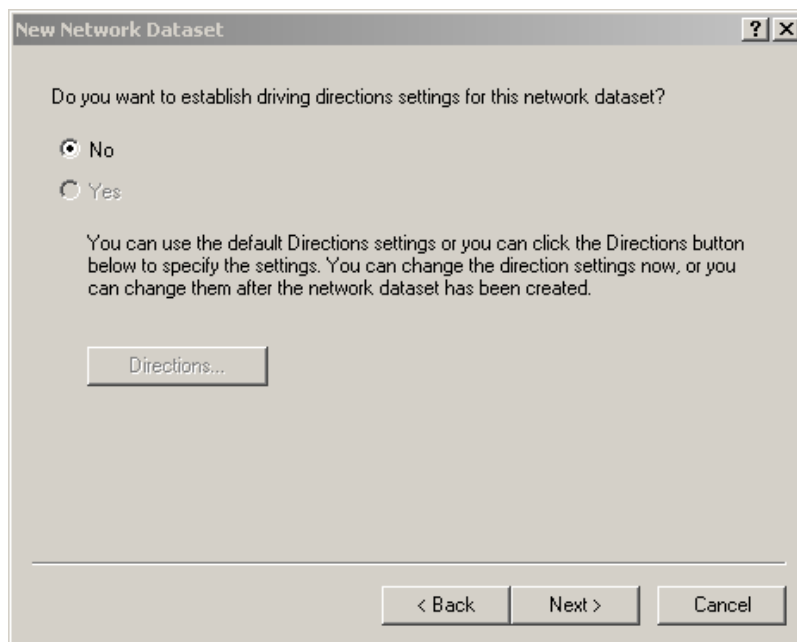


Figure 14. New Network Dataset – Page 7 – Establishing Driving Directions

Measure Development Summary

Conservation Status

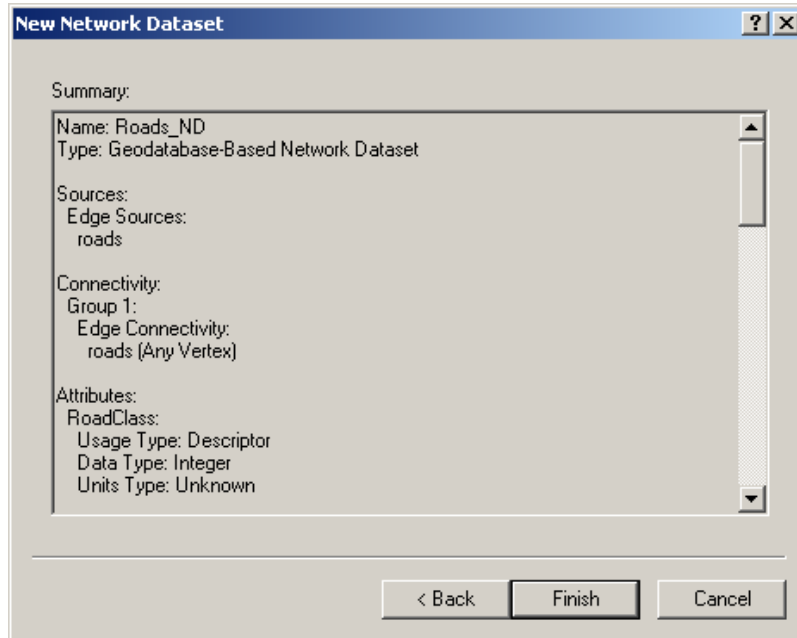


Figure 15. New Network Dataset – Page 8 – Summary and Finish

Once created, then accept request to build it.

Create Entry Points to Park

Entry points to the park must be defined manually or the CreateEntryPoints model will assign all entry points where a road crosses the park boundary. Figure 16 shows that three items must be specified:

Measure Development Summary

Conservation Status

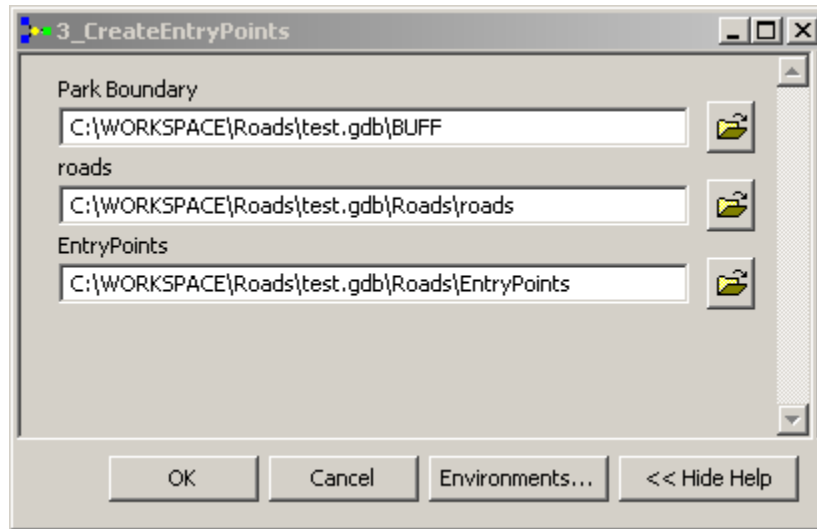


Figure 16. Create Entry Points Model Interface

- Park Boundary – The shapefile or feature class that contains the park boundary
- Roads – The feature class that contains the ESRI roads
- EntryPoints – The shapefile/feature class that will be created.

Run CalcServiceArea Model

Figure 17 presents the interface to the CalcServiceArea Model, which has three items that must be specified:

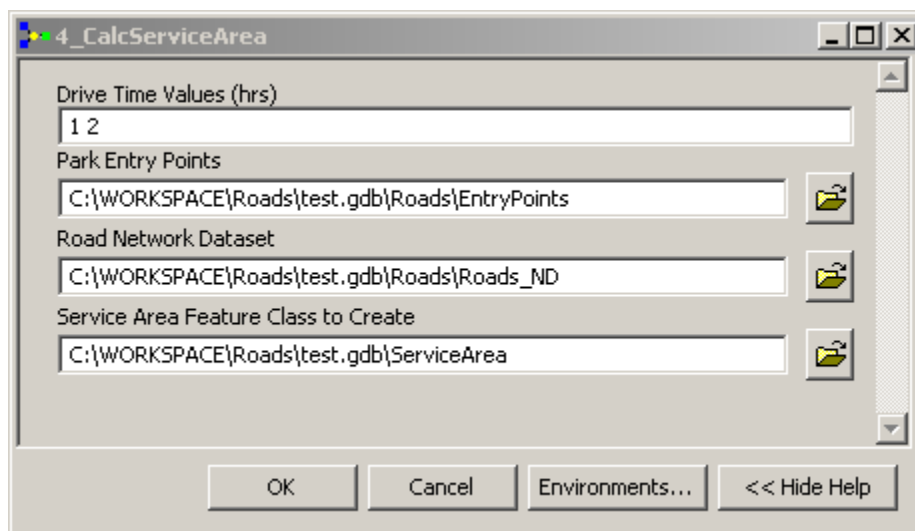


Figure 17. Calculate Service Area Model Interface

- Drive Time Values (hrs) – A polygon will be drawn for each value provided. Values need to be separated by a space.
- Park Entry Points – The name and location of the feature class containing the park entry points (See Section __)
- Road Network Dataset – The name and location of the road network dataset (See Section __).
- Service Area Feature Class to Create – The name and location of the Service Area Feature Class to Create.

Appendix

Model Logic and Details

Hour-Minute Conversions

Minute	Hour
1	0.017
2	0.033
3	0.050
4	0.067
5	0.083
6	0.100
7	0.117
8	0.133
9	0.150
10	0.167

Measure Development Summary

Conservation Status

20	0.333
30	0.500
40	0.667
50	0.833
60	1.000