

Southeast Coast Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure 2.3.11

Coastal Shoreline Monitoring Annual Change Analysis— Version 2.0

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Summary

The following standard operating procedure (SOP) outlines the process for analyzing coastal shoreline change. Following the steps and procedures outlined in this SOP will ensure that the same datasets and techniques are used, allowing comparisons to be made within and between parks through time. The topics addressed in this SOP include: (1) equipment and data, (2) initialization steps, (3) loading shorelines, (4) setting default parameters, (5) calculating shoreline distance, (6) shoreline uncertainty, and (7) data output. The USGS Digital Shoreline Analysis System (DSAS; Himmelstoss et al. 2021) is used to analyze the data collected for shoreline monitoring. These procedures are adapted from the *Northeast Coastal and Barrier Network (NCBN) Geomorphological Monitoring Protocol Part I—Ocean Shoreline Position* (Psuty 2010). This SOP assumes the user has at least an intermediate understanding of ArcGIS and familiarity with GPS data.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
May 2023	Abigail Gonzalez	Updated the procedures for transects, baselines, and analysis using the newest version of DSAS (5.0). Included steps on how to clean up the clipped transects and QA/QC of the analysis.	DSAS 5.0 is visually different. The SOP was lacking instruction on how to prepare the data for publishing – like performing QA/QC on the DSAS outputs.	2.0

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Required Equipment/Data List

1. Desktop or laptop computer running ArcGIS 10.7.1 or the newest version.
 - a. Spatial analysis extension.
 - b. DSAS toolbar.
2. Shoreline survey data collected and post processed according to SOP 1.3.22 *Conducting the GPS Shoreline Survey—Version 1.1* (Baron 2023) and 2.3.10 *Post Survey GPS Data Processing—Version 2.0* (Gonzalez and Baron 2023).

Procedure

The purpose of this SOP is to ensure that the same data sets and techniques are used to monitor SECN shoreline change along the coastal parks, allowing comparisons to be made within and between parks over time. The high-tide neap-tide swash line will be mapped according to SOP 1.3.22 (Baron 2023). Once the data are collected, SOP 2.3.10 (Gonzalez and Baron 2023) is used to post-process and prepare the data for analysis. The following steps should be followed to analyze the shoreline data to determine the extent of shoreline change. Annual and seasonal (if collected) shoreline change will be analyzed. Annual change will be monitored from year-to-year and will address season variability when both spring and fall shorelines are collected. The shoreline change analysis will be performed using the United States Geological Survey (USGS) digital shoreline analysis system (DSAS; Thieler et al. 2009), that runs within ArcGIS. An ArcGIS personal geodatabase is used to store the data and is required to run the DSAS routine.

Initialization Steps

To perform the analysis for shoreline change at each park, multiple components need to be created initially, including a personal geodatabase, trendline, baseline, and transects. These files will be used in all future analyses. Below is information pertaining to each component.

Personal Geodatabase

A personal geodatabase is used to house the trendline, baseline, shorelines, and transect feature classes in addition to the tables created during the DSAS analysis. Create a personal geodatabase in ArcCatalog named “PARK_ShorelineChange,” where PARK is the four-letter park code.

Trendline

The information in this section describes how to create a trendline feature class that will be used to adjust the transects in the shoreline change analysis. The trendline represents the general trend of the shoreline and is created by drawing a smoothed line along the length of the beach (Figure 1). Follow these steps to create the trendline feature class:

1. Open ArcCatalog.

2. Select the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
3. Right-click the PARK_ShorelineChange personal geodatabase.
4. Select New.
5. Select Feature Class.
6. Name the new feature class “PARK_Trendline,” where PARK is the four-letter park code.
7. Using the ArcGIS editing tools, edit the trendline feature class, creating a line that represents the general trend of the shoreline.
8. Save edits.
9. Stop editing.
10. Smooth the “PARK_Trendline” using the ArcGIS Smooth Line tool if need be.

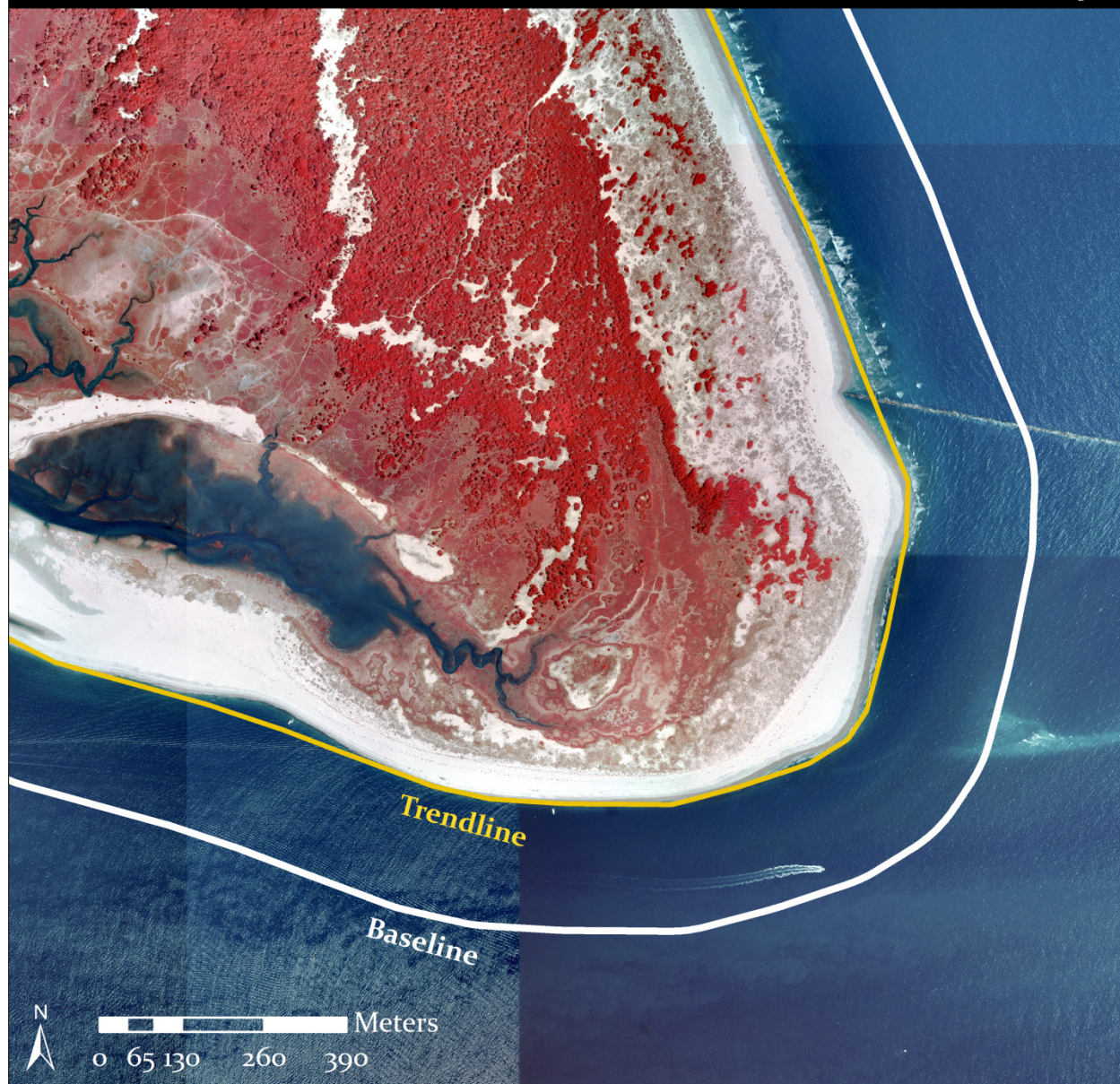


Figure 1. Map displaying the trendline (yellow) and baseline (white) used in the shoreline analysis.

Baseline

The information in this section describes how to create a baseline that will be used in the DSAS shoreline change analysis. The trendline created in the “Create Trendline” section above is used to generate the offshore baseline (Figure 1). The baseline is created by generating a 200-meter (656 feet [ft]) buffer seaward of the trendline using the buffer tool in ArcMap. The baseline is the line from which transects are generated in DSAS. During analysis, the transects intersect the shorelines and are used to calculate change distance. The baseline is created once for each park. If there is a catastrophic

change and the trendline no longer represents the general trend of the shoreline, then the baseline will need to be updated using an updated trendline. The baseline is created and stored in the “PARK_ShorelineChange” personal geodatabase (see Psuty et al. [2010] Appendix A, Database User’s Guide), where PARK is the four-letter park code. The name of the baseline is “PARK_Baseline,” where PARK is the four-letter park code. The general instructions to create a baseline are listed below:

1. Open ArcCatalog.
2. Select the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
3. Right-click the PARK_ShorelineChange personal geodatabase.
4. Select **New**.
5. Select **Feature Class**.
6. Name the new feature class “PARK_Baseline,” where PARK is the four-letter park code, with the following fields (Table 1). Refer to the DSAS Manual for additional information regarding Baseline fields (Himmelstoss et al. 2021).

Table 1. List of fields and field information for the baseline feature class. Refer to the DSAS manual for additional information about the field requirements (Himmelstoss et al. 2021).

Field Name	Data Type and Additional Information
OBJECTID	Object ID, auto-generated
SHAPE	Geometry, auto-generated in geodatabase
SHAPE_Length	Double, auto-generated in geodatabase
ID	Long integer, user-created

7. Create a 200-meter (656 ft) buffer seaward of the PARK_Trendline using the ArcGIS buffer tool.
8. Convert the buffer polygon to line using the ArcGIS polygon to line tool.
9. Edit the new buffer polyline shapefile in ArcGIS by clipping and deleting the lines that are not a seaward representation of the PARK_Trendline.
10. Copy and paste the line seaward of the trendline into the PARK_Baseline feature class.
11. Update PARK_Baseline feature class “ID” field with a number greater than or equal to 1.
12. Save edits.

13. Stop editing.

Transects

Transects are created in DSAS using the PARK_Baseline feature class (where PARK is the four-letter park code), previously generated. The steps below list how to create transects in DSAS and edit the transects using ArcGIS editing tools. The following steps describe how to set the default parameters, create transects, and adjust the transects.

Set Default Parameters

This section describes how to set the default parameters to perform the DSAS shoreline change analysis.

1. Open ArcMap.
2. Add the DSAS toolbar, if not already added.
3. Click **Set Default Parameters**  on the DSAS toolbar.
4. The “Set Default Parameters” window will appear (Figure 2). On the **Baseline Settings** tab (Figure 2) select the following:
 - a. Baseline Layer: **PARK_Baseline**.
 - b. Baseline ID Field: **ID**.
 - c. Toggle **ON** Offshore on the Baseline Placement section.
 - d. On the Baseline Orientation section, select the appropriate location of land relative to baseline orientation. Tip: Turn **ON** the Show Baseline Orientation to help you determine this.

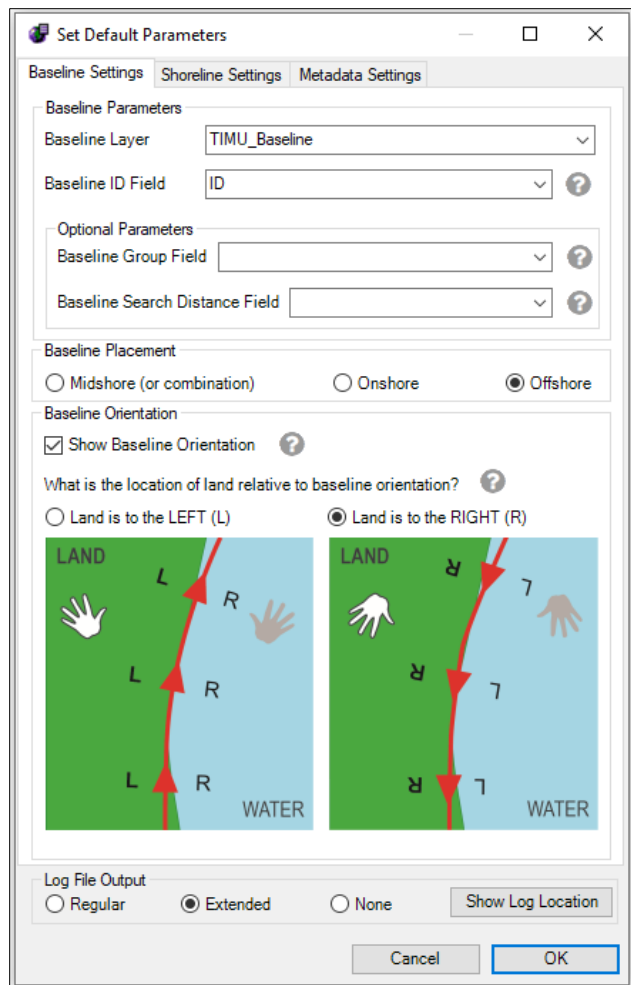


Figure 2. Screen capture of the “Set Default Parameters” window displaying the Cast Transect Settings tab.

5. Click the **Shoreline Settings** tab (Figure 3) and select the following:
 - a. Shoreline Layer: **PARK_Shoreline**.
 - b. Shoreline Date Field: **DATE_**
 - c. Shoreline Uncertainty Field: **UNCERTAINTY**.
 - d. Default Data Uncertainty: **5 ± meters**
 - e. Intersection Parameters: **Seaward Intersection**

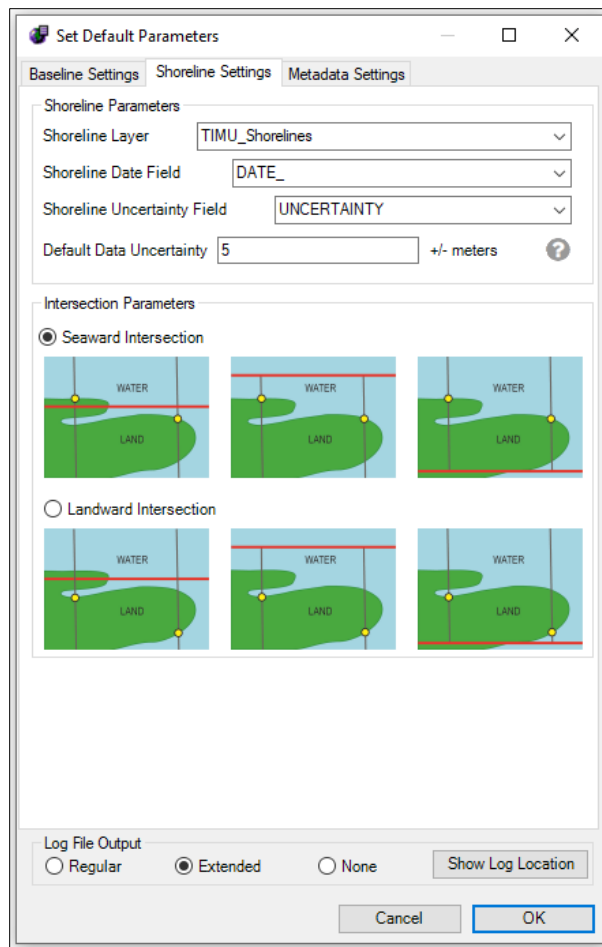


Figure 3. Screen capture of the “Set Default Parameters” window displaying the **Shoreline Calculation Settings** tab.

6. Click the **metadata settings** tab (Figure 4) and select the following:
 - a. General Information Section:
 - i. Originator: **Your name** (person running the analysis).
 - ii. Abstract: “**Shoreline change annual analysis for YYYY to YYYY (for annual change) or MMYYYY to MMYYYY (for seasonal change) at PARK. The annual (or seasonal) shoreline change analysis contains the net shoreline displacement statistic.**” Where YYYY is the four-digit year, MMYYYY is the two-digit month and four-digit year, PARK is the four-letter park code.
 - iii. Purpose: “**Analyze the annual (or seasonal) shoreline change from YYYY to YYYY (or MMYYYY to MMYYYY for seasonal change) at PARK for an annual report.**” Where YYYY is the four-digit year, MMYYYY is the two- digit month and four-digit year, PARK is the four-letter park code.

- b. Data Update and Access Information Section:
 - i. Update Frequency: **Annually**.
 - ii. Progress: **In work**.
 - iii. Constraints on Access: **“Data will be made publicly available through the National Park Service Integrated Resource Management Applications (IRMA) when reports are published.”**
 - c. Contact Information
 - i. Organization: **National Park Service - Southeast Coast Inventory and Monitoring Network**.
 - ii. Person: **Your name** (person running the analysis).
 - iii. Address: **135 Phoenix Road**.
 - iv. City: **Athens**.
 - v. State: **GA**.
 - vi. Phone: **Your phone number**.
 - vii. Email: **Your email**.
7. Log File Output: Toggle **ON** Extended.

Set Default Parameters

Baseline Settings | **Shoreline Settings** | Metadata Settings

General Information

Originator: Abigail Gonzalez

Abstract: Shoreline change annual analysis for 2022 to 2023 at TIMU. The

Purpose: Analyze the annual shoreline change from 2022 to 2023 at TIMU for

Data Update and Access Information

Update Frequency: Annually | Progress: In work

What are Data Current to?: publication date

Constraints on Access: Data will be made publicly available through the National

Contact Information

Organization: National Park Service - South East Coast Inventory and Monitoring

Person: Abigail Gonzalez - Physical Science Technician

Address: 135 Phoenix Rd

City: Athens | State: GA | Zip: 30605

Phone: 904-676-0475 | Email: abigail_gonzalez@nps.gov

Log File Output

☐ Regular ☒ Extended ☐ None

Figure 4. Screen capture of the “Set Data Parameters” window displaying the **Metadata Settings** tab.

8. Click **OK**.

Create Transects

Transects are created using DSAS. The default setting in the previous section are required prior to generating transects. Follow the steps below to create transects.

1. Open ArcMAP.
2. Add the DSAS toolbar if not already added.
3. Set the default parameters as outlined in previous section.

4. Click the **Cast Transects**  button on the DSAS toolbar and select the following criteria in the **Cast Transects** tab (Figure 5):

- a. **Transect Storage Parameters:** Browse to the personal geodatabase location named “PARK_ShorelineChange,” where PARK is the four-letter park code. This is where the transects will be saved.
- b. **Select Existing or Enter New Transect Name:** Type in the transect name using the format: “PARK_Transect_X,” where PARK is the four-letter park code. Once the transect layer has been created, it will be used in future analyses, X is a single digit denoting the transect run. This number will start at “1” and will change only if or when the transect layer needs to be adjusted.
- c. For the Casting Section select the following:

- i. From Baseline: **300**.

Note: This value will depend on the distance (in meters) of the baseline to the farthest shoreline. This value needs to exceed the distance from the baseline to the farthest shoreline for future shoreline movement and analyses. Use the measure tool to determine the needed distance.

- ii. Transect Spacing: **10**.

- iii. Smoothing distance: **50** (default).

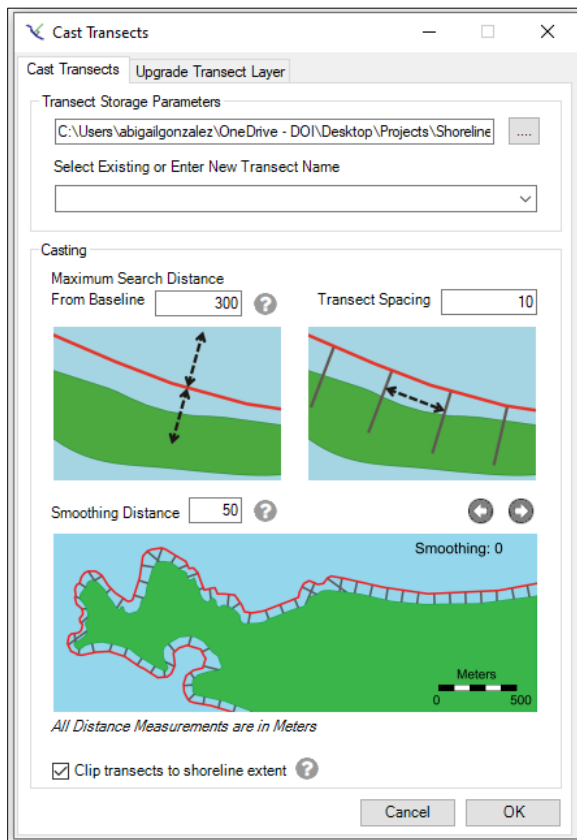


Figure 5. Screen capture of the DSAS “Cast Transects” window.

5. Click **OK** to generate transects.
6. The transects will appear in the map view as shown in Figure 6.

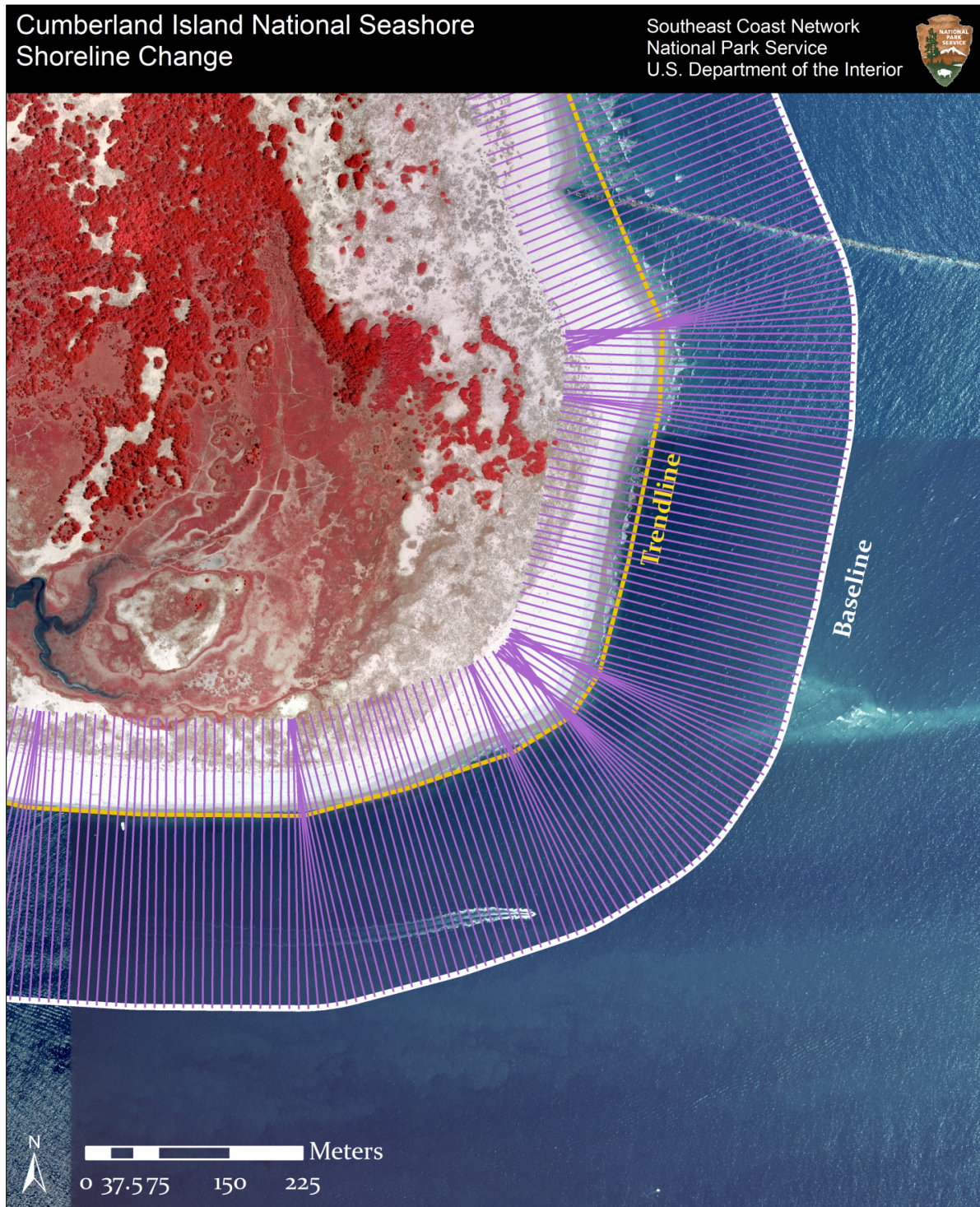


Figure 6. Map of the trendline (yellow), baseline (white), and transects (purple) created at 10-meter (32.8 ft) spacing at the baseline along a curved shoreline. Note: the transects in the map have not been adjusted.

Adjust Transects

The transects should intersect the trendline perpendicularly at approximately 10-meter (32.8 ft) spacing. On straight shorelines transects will not need adjustment; however, on curved shoreline areas, transect adjustment may need to be performed (Figure 7). Using the ArcGIS editing tools, adjust the transects so that they intersect the trendline perpendicularly at approximately a 10-meter (32.8 ft) spacing by adding, deleting, or moving transects.

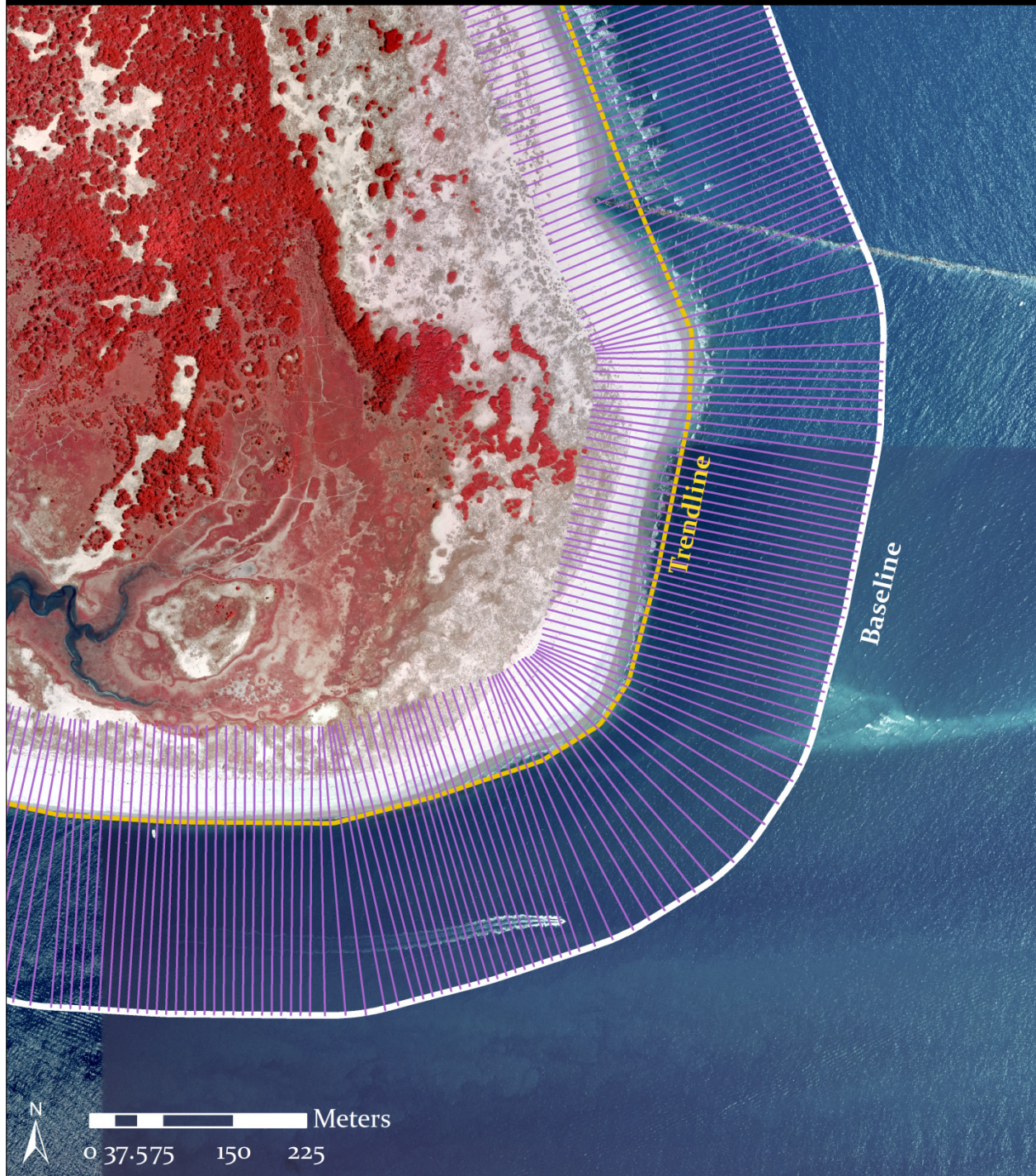


Figure 7. Map of the trendline (yellow), baseline (white), and adjusted transects (purple) created at a 10 meter (32.8 ft) spacing at the trendline along a curved shoreline.

Shoreline

The information in this section describes how to create the shoreline feature class within the personal geodatabase created previously. The shoreline feature class will be used in the DSAS shoreline change analysis and will contain the shoreline surveys that were post processed in the SOP 2.3.10 *Post Survey GPS Data Processing—Version 2.0* (Gonzalez and Baron 2023). Follow the steps below to create the shoreline feature class.

1. Open ArcCatalog.
2. Select the PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code.
3. Right-click PARK_ShorelineChange personal geodatabase, where PARK is the four-letter park code
4. Select **New**.
5. Select **Feature Class**.
6. Name the new feature class “PARK_Shoreline,” where PARK is the four-letter park code, with the fields in Table 2. See the DSAS manual (Himmelstoss et al., 2021) for more information about the shoreline field requirements.

Table 2. List of fields and field information for shoreline feature class. Refer to the DSAS manual for additional information about the field requirements (Himmelstoss et al. 2021).

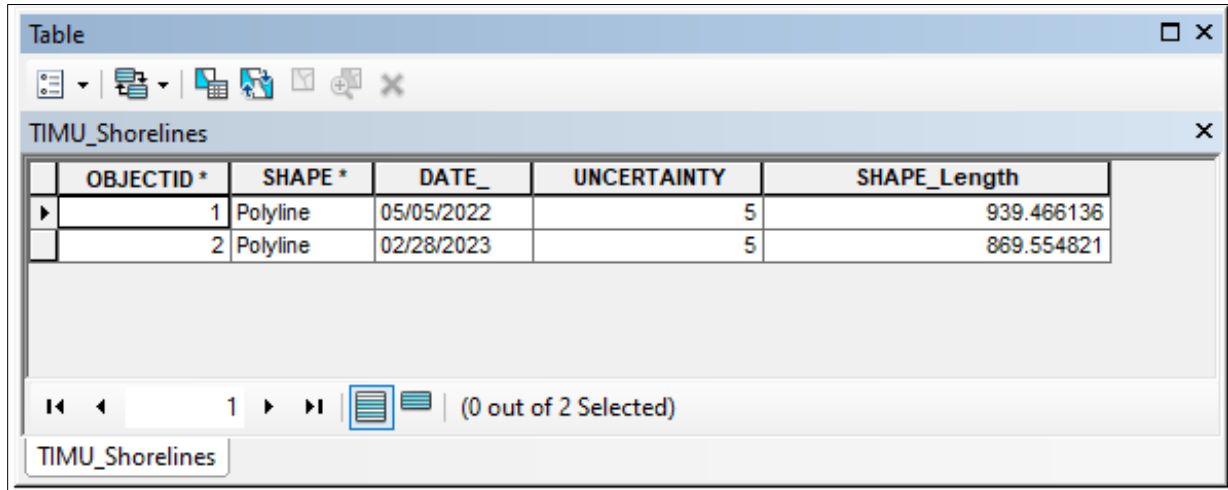
Field Name	Data Type and Additional Information
OBJECTID	Object ID, auto-generated
SHAPE	Geometry, auto-generated in geodatabase
SHAPE_Length	Double, auto-generated in geodatabase
DATE_	Text, Length = 10, user created
UNCERTAINTY	Float, Precision = 2, Scale = 2, user-created

Load Shoreline

The edited shoreline shapefile that was created in SOP 2.3.10 (Gonzalez and Baron 2023) will be loaded into the PARK_ShorelineChange personal geodatabase PARK_Shoreline feature class, where PARK is the four-letter park code. The PARK_Shoreline feature class schema was created when the feature class was created, therefore fields not included in the schema will not be imported. Follow the steps below to load the previously prepared shoreline feature class (or shapefile) using SOP 2.3.10 (Gonzalez and Baron 2023) into the PARK_Shoreline feature class.

1. Open ArcMap.

2. Import the shoreline surveys that will be used for the DSAS analysis.
3. Import the PARK_Shoreline feature class from the PARK_ShorelineChange personal geodatabase.
4. Use the ArcMap Append tool to append the feature classes (or shapefiles) of the two shoreline surveys that will be compared. Make sure to fill out the attribute fields "DATE_" and "UNCERTAINTY" (From Table 2) with the date of the survey and an uncertainty of 5, respectively (Figure 8).



OBJECTID *	SHAPE *	DATE_	UNCERTAINTY	SHAPE_Length
1	Polyline	05/05/2022	5	939.466136
2	Polyline	02/28/2023	5	869.554821

Figure 8. Screen capture of attribute fields "DATE_" and "UNCERTAINTY."

Set Default Parameters

Before performing an analysis in DSAS, the DSAS default parameters must be set. Step through the instruction in the previous section of this document, located at: Initialization Steps > Transects > Set Default Parameters. The previously selected default settings should appear; therefore, it is important to check the default settings each time before running each analysis.

Calculate Shoreline Distance

This section describes how to determine annual and seasonal (if applicable) shoreline change distance between two years or between seasons. These analyses are performed using two shorelines. Seasonal change is calculated by analyzing the spring and fall shorelines collected during the same calendar year. Annual changes are calculated using shorelines, from the same season, that were collected during consecutive years, (e.g., spring 2015 and spring 2016). Use the following steps to calculate the shoreline change distance:

1. Open ArcGIS
2. Open the PARK_Shoreline_Change.mxd, where PARK refers to the four-letter park code
3. If not already loaded, add the PARK_ShorelineChange geodatabase feature classes (PARK_Shoreline, PARK_Transect_#, and PARK_Baseline), where PARK refers to the four-letter park code
4. Add the DSAS toolbar, if not already loaded.
5. Optional: Add the most recent imagery as a background.
6. You will only need three things on the Table of contents on ArcMap (Figure 9); From the PARK_ShorelineChange personal geodatabase, load the following feature classes:
 - a. PARK_Shorelines
 - b. PARK_Trendline
 - c. PARK_Transects_1

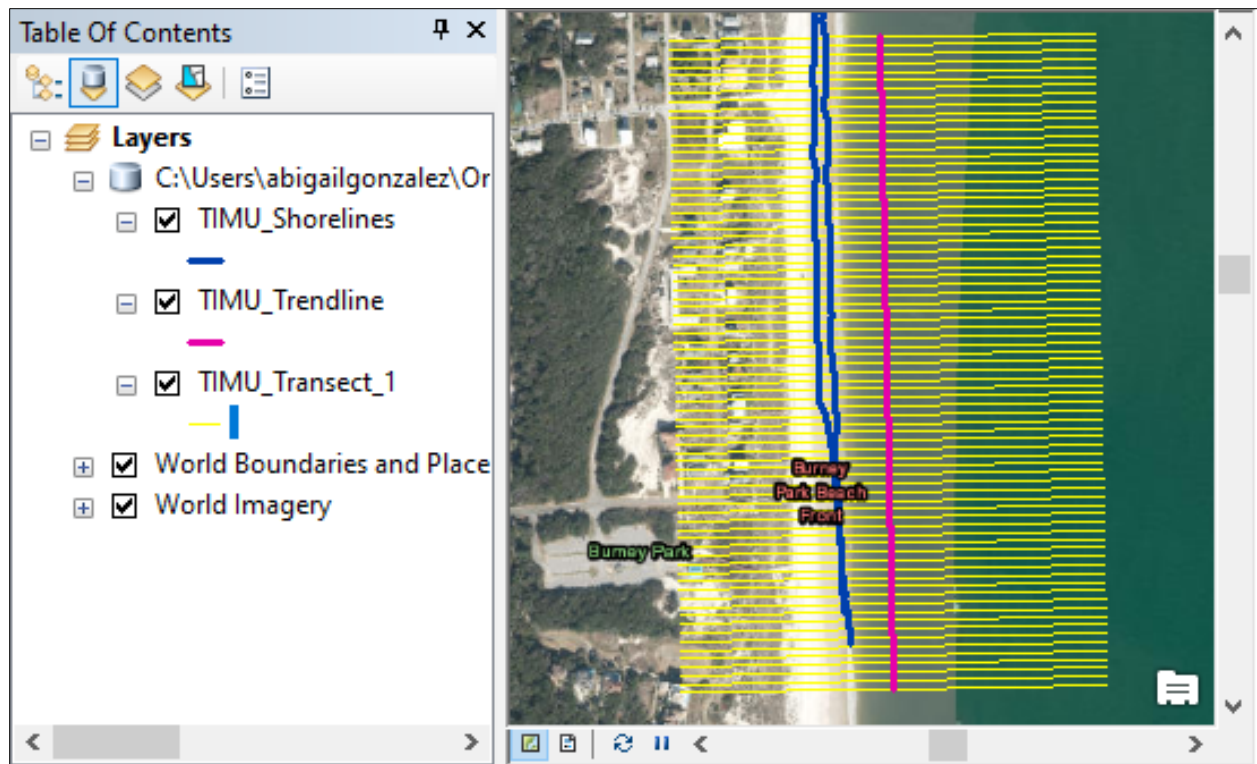


Figure 9. Screen capture of the three feature classes needed for the DSAS analysis displayed on the ArcMap map.

7. Open the PARK_Shoreline feature class attribute table and select the shorelines to be analyzed (Figure 10).

Table					
TIMU_Shorelines					
OBJECTID *	SHAPE *	SHAPE_Length	DATE_	UNCERTAINTY	
1	Polyline	939.466136	05/05/2022	5	
2	Polyline	869.554821	02/28/2023	5	

Figure 10. Screen capture of the PARK_Shorelines feature class attribute table, where PARK is the four-letter park code, with two shorelines selected.

8. In the DSAS toolbar, select the PARK_Transect_# feature class (where PARK is the four-letter park code and # is the run number) previously created and adjusted in the DSAS Transect Layer pull-down menu (Figure 11).

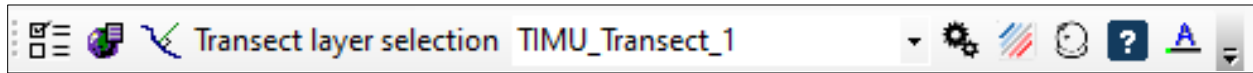


Figure 11. Screen capture of the DSAS tool bar displaying the PARK_Transect_# feature class (where PARK is the four-letter park code and # is the run number) previously created.

9. Click the **Calculate Rates**  button on the DSAS toolbar.
10. The “Calculate Rate” window will appear (Figure 12). For an in-depth description of the various change analysis options, refer to the DSAS manual (Himmelstoss et al., 2021).
 - a. Select the following settings:
 - i. Select NSM: **Net Shoreline Movement**.
 - ii. Toggle **OFF** “Apply shoreline intersection threshold: 0.”
 - iii. Confidence Interval: use default **99.9%**.
 - iv. Toggle **ON** “Display calculation results using color ramp.”
 - v. Toggle **ON** “Create DSAS Summary Report.”
 - vi. Click **Calculate**.

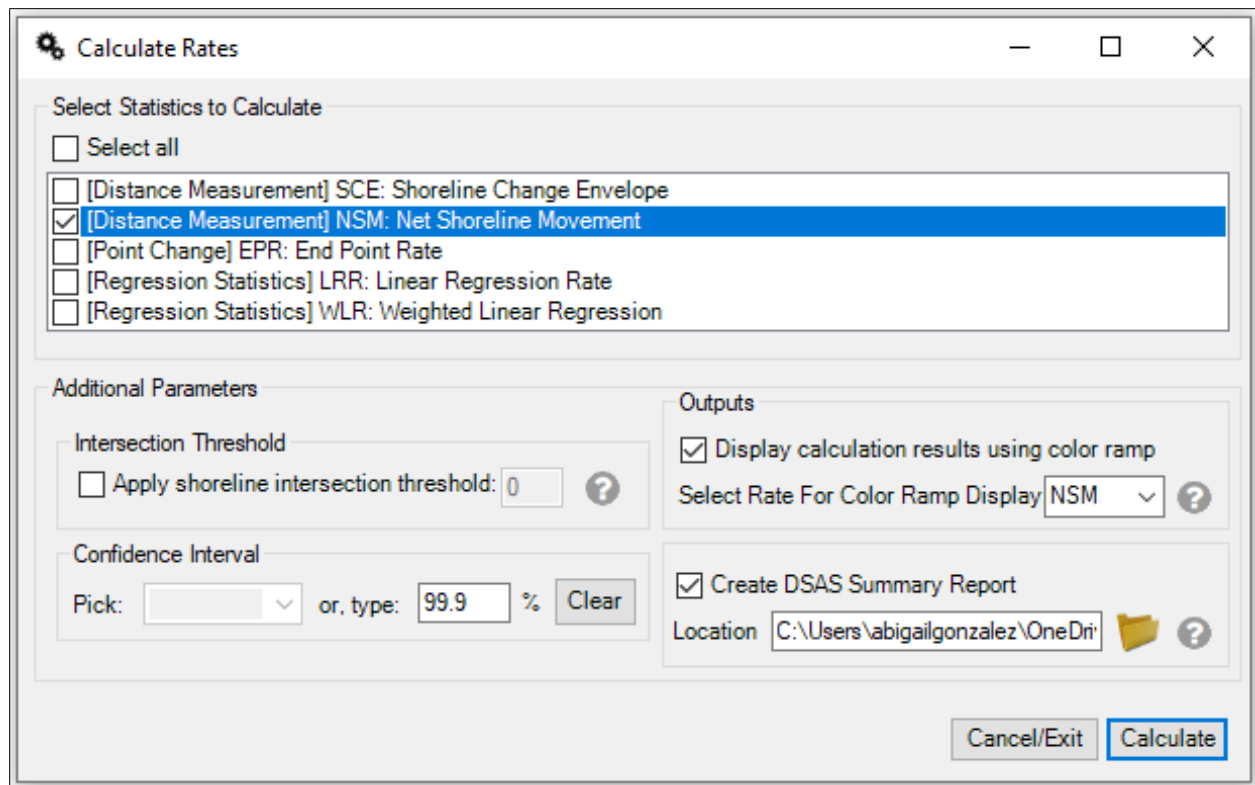


Figure 12. Screen capture of the DSAS “Calculate Rates” window.

- b. Once the calculations have been run, the “Calculate Rates” window will be updated with “Run Complete” at the bottom of the window (Figure 13).

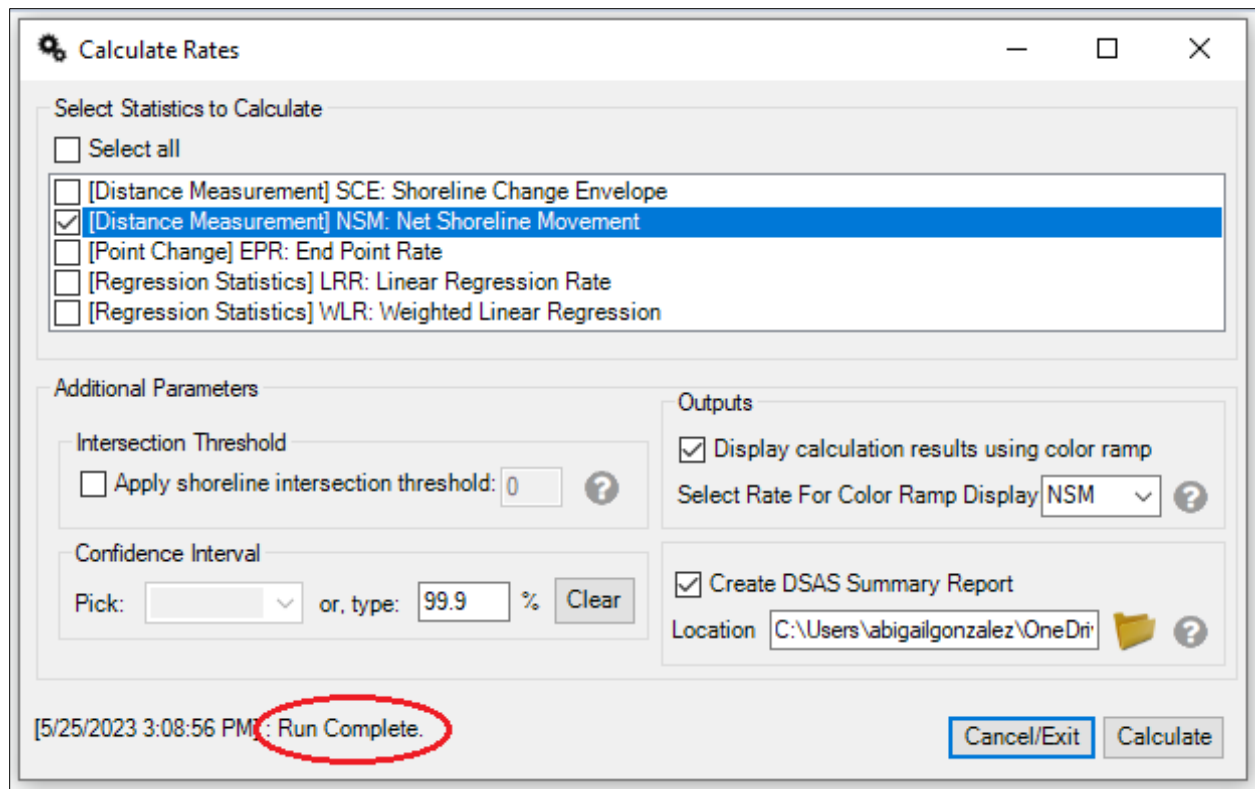


Figure 13. Screen capture of the DSAS “Calculate Change Statistics” window showing that the run is complete.

- c. Click Cancel/Exit.
11. The analyses performed by DSAS are stored in the attribute tables of the generated feature classes of the NSM calculation. Look in the Table of Contents to see the “intersect” and “rates” feature classes generated (Figure 14).
 - a. **Note:** The feature classes that will appear on the map are written in the following format: “PARK_Transect_#_rates_YYYYMMDD_hhmmss,” where PARK is the four-letter park code, YYYY is the year, MM is the month, DD is the day, hh is the hour, mm is the month, and ss is the second the analysis was performed.

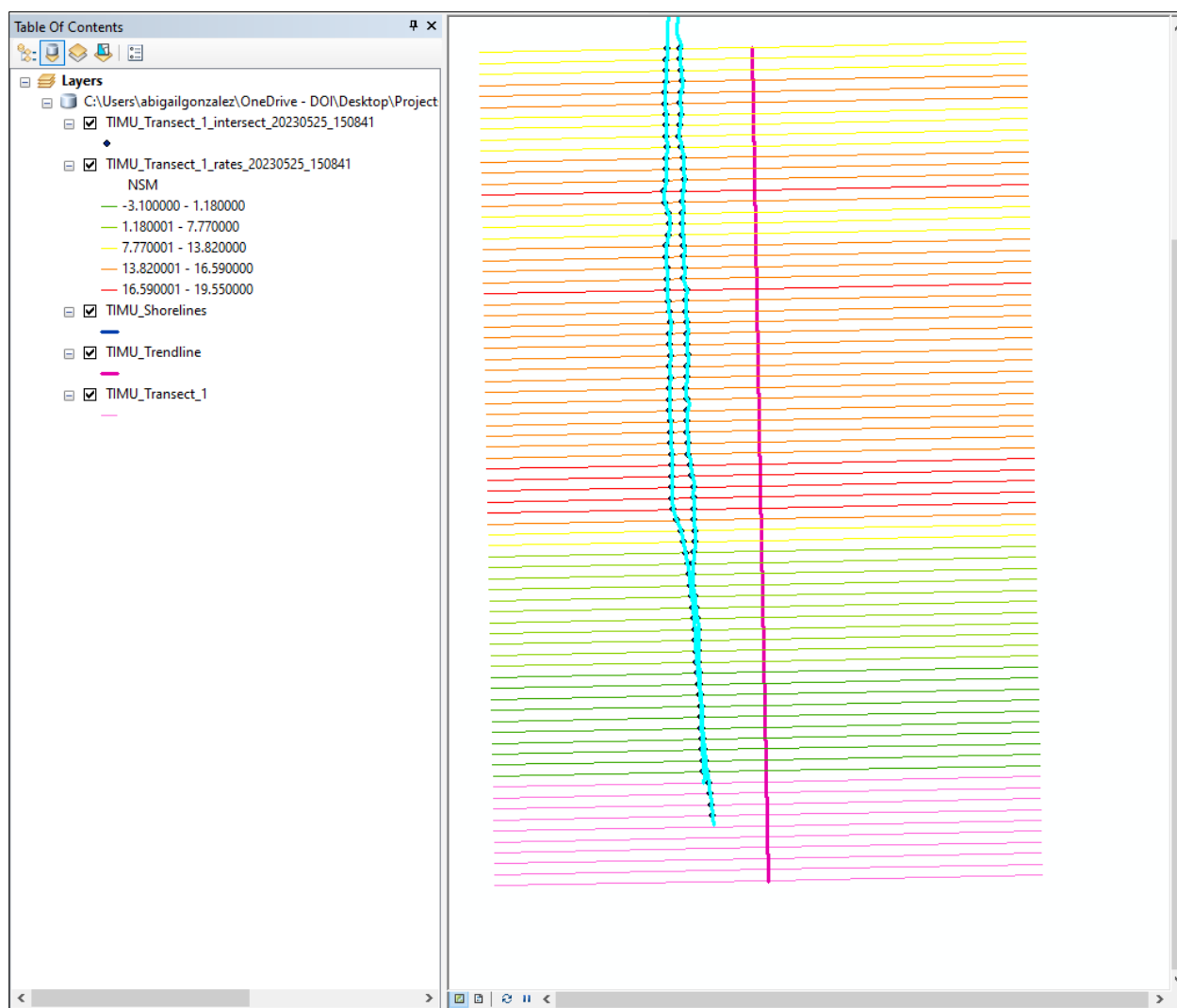


Figure 14. Screen capture of the ArcMap table of contents displaying the two features generated by DSAS.

Shoreline Uncertainty

The uncertainty of the individual shoreline survey is ± 5 meters (16.4 ft). This value is derived from the: (1) GPS accuracy, (2) differential tide position, (3) meteorological effects—wave dimension and run-up, and (4) interpretation of the line (Psuty et al. 2022). The annual comparisons deduced in SOP 2.3.09 *Coastal Shoreline Monitoring Annual Reporting—Version 1.0* (Baron 2018) using two individual shoreline surveys will have an uncertainty of 10 meters (32.8 ft; Psuty et al. 2010). Refer to Psuty et al. 2022 for additional information regarding shoreline survey uncertainty.

Data Output

The shoreline distances calculated in the previous sections by DSAS are stored in the feature classes and attribute tables in the PARK_ShorelineChange personal geodatabase and are used for the analysis. There are two feature classes created with each DSAS run, a “rates” and an “intersect” feature classes. To view these data in ArcGIS and create maps, the tables need to be joined to the

transect layer. The following section describes how to clip the transects to the shoreline envelope (the area of shoreline change) and create a feature class of the clipped transects with the shoreline distance change.

Clip Transects

The steps below describe how to clip the transect layer to the shoreline envelope so that they can be used to create report maps. However, sometimes the unclipped transects might be better visually depending primarily on the scale of the map.

1. In the Transect Layer drop box on the DSAS toolbar, select the PARK_Transect_# feature class (where PARK is the four-letter park code and # is the run number) used in the previous “Calculate Shoreline Distance” section (Figure 15).
2. Click the Data Visualization  button, shown as diagonal lines icon (Figure 15).

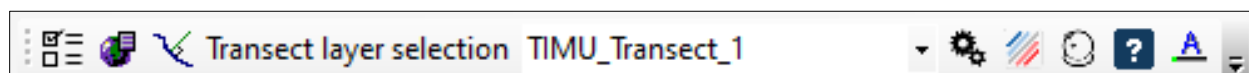


Figure 15. Screen capture of the DSAS toolbar with the PARK_Transect_# feature class (where PARK is the four-letter park code and # is the run number) is listed as the Transect Layer. The Data Visualization button is the button with the diagonal lines icon.

3. The “DSAS Data Visualization” window appears (Figure 16).

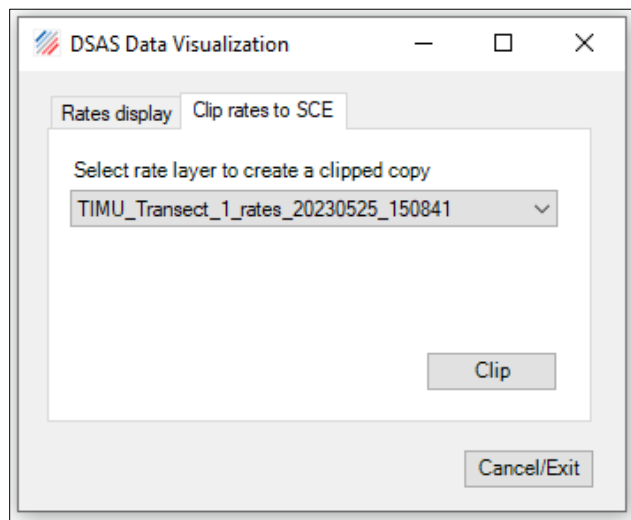


Figure 16. Screen capture of the “DSAS Data Visualization” window.

- a. Select the **Clip rates to SCE** tab.
- b. Select the transect layer to create an SCE clipped copy of: Select the PARK_Transect_# feature class, where PARK is the four-letter park code, that was produced when doing the NSM analysis.

- c. Click **Clip**.
- d. An information window will appear telling you the transect layer has been created and added to the map (Figure 17).

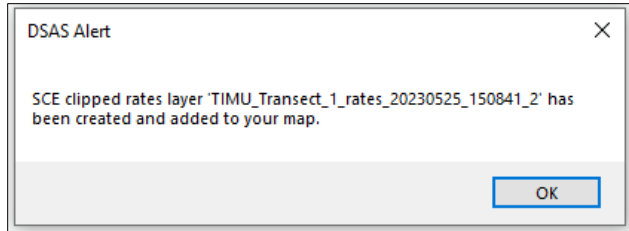


Figure 17. Screen capture of the DSAS information window informing that the transect layer was created and stating it will be added to the map.

- i. Click **OK**.
 - e. Click **Cancel/Exit** in the “Clip to shoreline change envelope” window.
4. The new clipped layer will be created, named “PARK_Transect_#_rates_YYYYMMDD_hhmmss_X,” where X is a single digit denoting the clipped transect layer created (Figure 18). The number will start at “1” and will increase if multiple clipped transects are created for shoreline analysis.

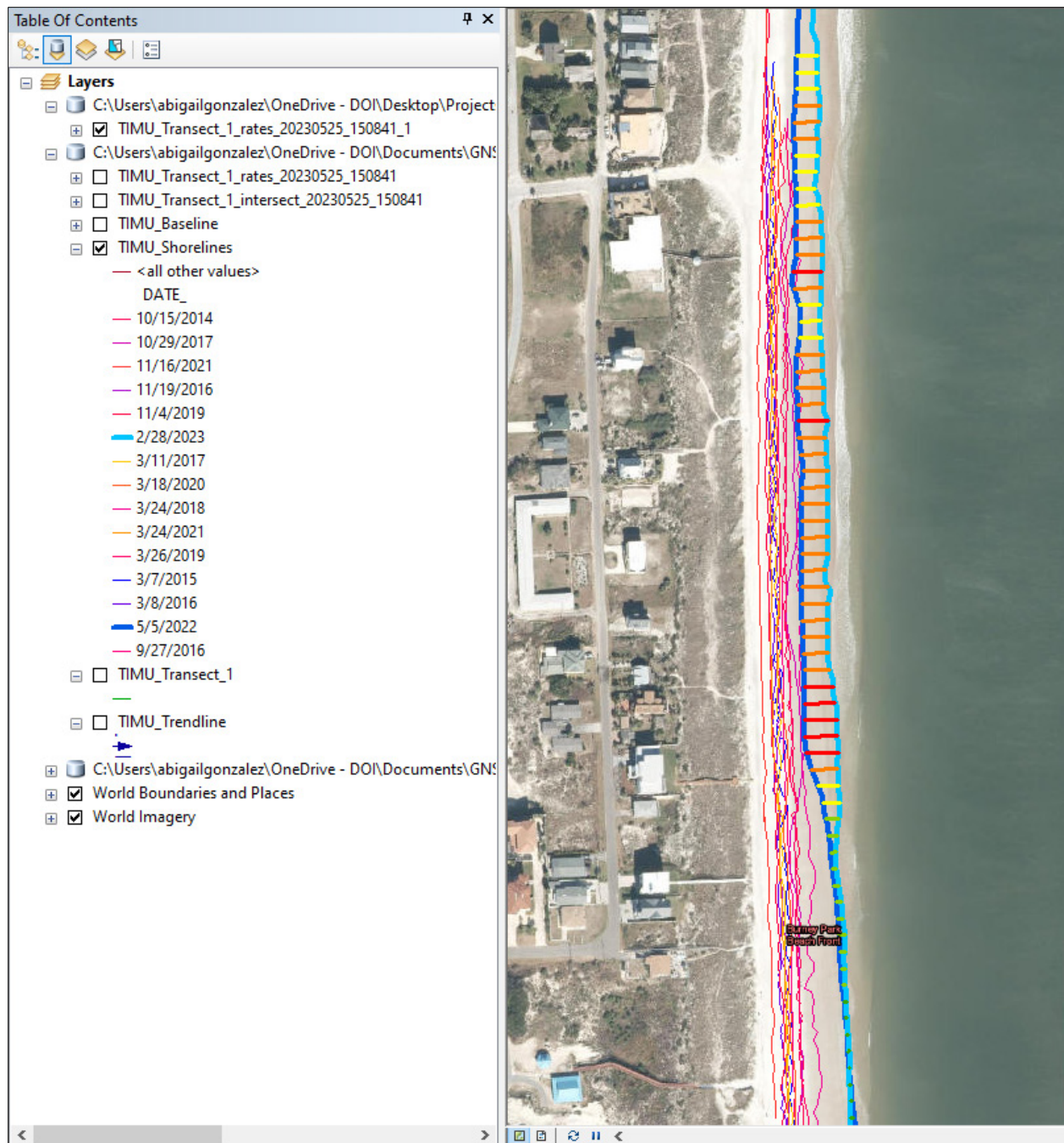


Figure 18. Screen capture of ArcMap displaying the clipped transect layer “PARK_Transect_#_rates_YYYYMMDD_hhmmss_X,” shown in red).

Cleaning up the Data

Before the data can be published or used for any reports, you will need to “clean it up.” Cleaning up the data is part of the QC process and is focused on identifying and removing data processing anomalies. The steps below list how to create a shapefile that will contain the clipped transects previously created and the shoreline change distance previously calculated.

1. Open the attribute table. Of the unclipped transect layer. Delete any rows with <Null> values on the NSM column (Figure 19).
 - a. Do the same with the clipped transects layer.
 - b. **Note:** the transects will have a “<Null>” value when they do not intersect two shorelines.

object identifier *	geometry *	TransectID	BaselineID	GroupID	TransOrder	Azimuth	ShrCount	TCD	SHAPE_Length	NSM
67	Polyline	67	1	<Null>	67	268.9	2	660	500	<Null>
68	Polyline	68	1	<Null>	68	268.9	1	670	500	<Null>
69	Polyline	69	1	<Null>	69	268.9	1	680	500	<Null>
70	Polyline	70	1	<Null>	70	268.9	1	690	500	<Null>
71	Polyline	71	1	<Null>	71	268.9	1	700	500	<Null>

Figure 19. Picture showing NULL values on the NSM column of the attribute table that need to be deleted to clean up the data.

2. If there are transects that overlap or do not accurately represent the net shoreline movement, they should also be deleted or edited using the editing tool. Figure 20 is an example of this.

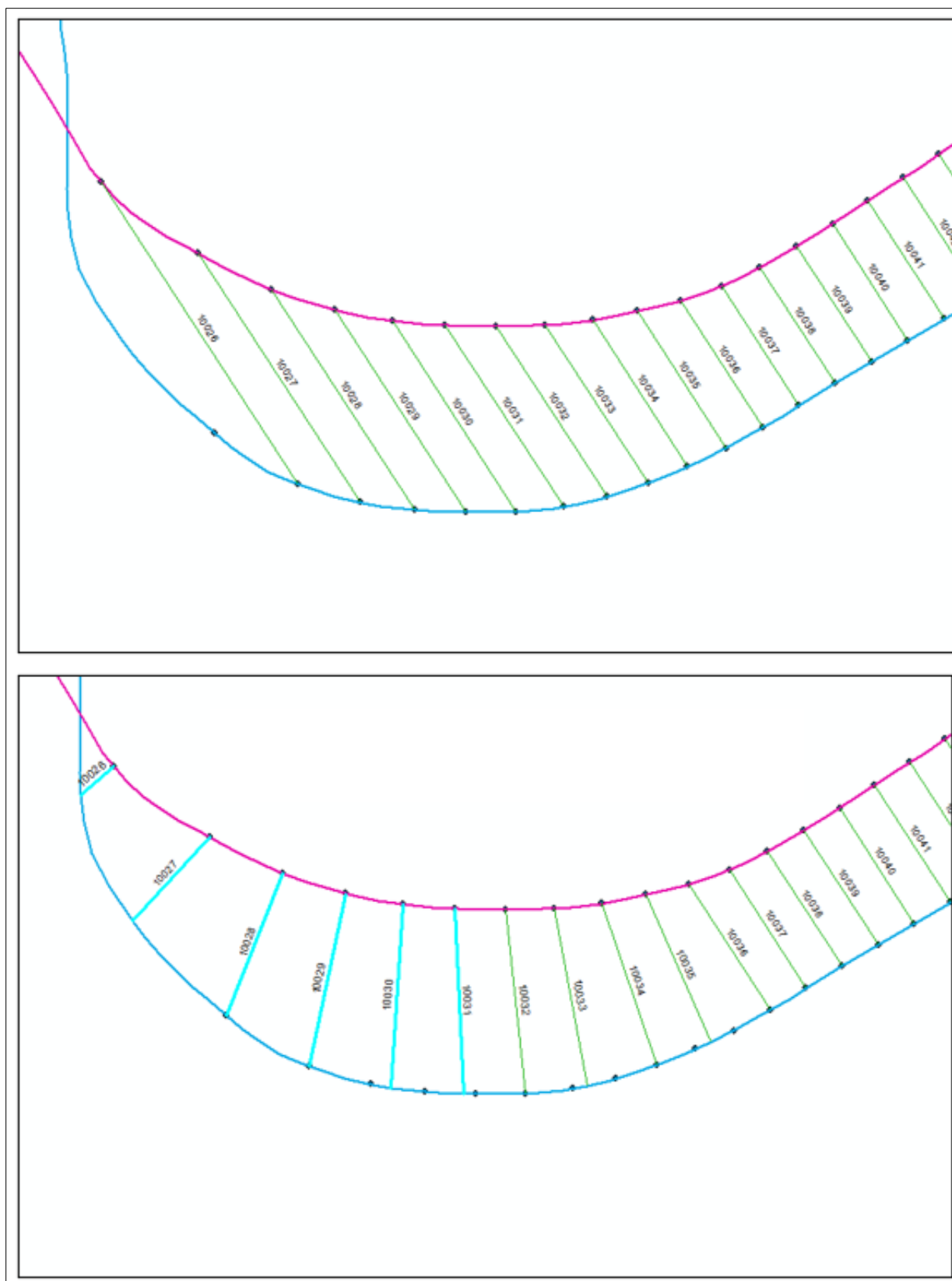


Figure 20. Example of transects edited to accurately fit the shoreline using the editing tool.

Rename The Feature Classes

As previously stated, the feature classes produced by DSAS have the following format:

“PARK_Transect_#_rates_YYYYMMDD_hhmmss,” where PARK is the four-letter park code, YYYY is the year, MM is the month, DD is the day, hh is the hour, mm is the month, and ss is the second the analysis was performed. To better organize the data, you will rename the feature class with the year and season of the data being analyzed. Do this before exporting the feature class into a shapefile or other types of files.

1. Open ArcCatalog.
2. Navigate to the personal geodatabase PARK_ShorelineChange.
3. Rename the 3 feature classes produced by the DSAS analysis using the following format:
 - a. “PARK_Transect_#_XXXXXX_ZZZZZ_rates_YYYYMMDD_hhmmss,” where:
 - i. PARK: Four-letter park code.
 - ii. #: Transect Run number.
 - iii. XXXXX: First letter of the season X (“S” for spring and “F” for fall) followed by the four-digit year for the oldest shoreline analyzed.
 - iv. ZZZZZ: First letter of the season X (“S” for spring and “F” for fall) followed by the four-digit year for the most recent shoreline analyzed.
 - v. YYYY: Year the DSAS run was conducted, MM: Month the run was conducted, DD: Day the run was conducted, hh: Hour the run was conducted, mm: Minute the run was conducted, ss: Second the run was conducted.
 - vi. For example: TIMU_Transect_1__S2022_S2023_rates_20230525_150841.
4. Once you have performed the proper QA/QC and renamed the feature classes, you may export the clipped transect feature class as a shapefile (or export as a feature class into a geodatabase of your choosing). You should perform further analysis, maps, and other statistic calculation using ArcGIS Pro.

Create Metadata

As mentioned in the SOP 2.3.10 *Post Survey GPS Data Processing—Version 2.0* (Gonzalez and Baron 2023), metadata should be created for each shapefile, geodatabase, feature class, and table according to SOP Dataset and Metadata Publication (Wright et al. 2023), currently in preparation.

Literature Cited

- Baron, L. C. 2023. Conducting the GPS Shoreline Survey—Version 1.1. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—1.3.22. Southeast Coast Network, Athens, Georgia. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2301098> (last accessed October 2023).
- Baron, L. C. 2018. Coastal shoreline monitoring annual reporting—Version 1.0. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—2.3.09. Southeast Coast Network, Athens, Georgia. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2253895> (last accessed October 2023).
- Gonzalez, A. and Baron, L. C. 2023. Post survey GPS data processing—Version 2.0. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—2.3.10. Southeast Coast Network, Athens, Georgia. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/2301096> (last accessed October 2023).
- Himmelstoss, E.A., Henderson, R.E., Kratzmann, M.G., and Farris, A.S., 2021, Digital Shoreline Analysis System (DSAS) version 5.1 user guide: U.S. Geological Survey Open-File Report 2021-1179, 110 p. <https://doi.org/10.3133/ofr20211091> (last accessed October 2023).
- Psuty, N. P., M. Duffy, J. F. Pace, D. E. Skidds, and T. M. Silveira. 2010. Northeast Coastal and Barrier Network geomorphological monitoring protocol: part I—ocean shoreline position. Natural Resource Report NPS/NCBN/NRR —2010/185. National Park Service. Fort Collins, Colorado. Available at: <https://irma.nps.gov/DataStore/Reference/Profile/664308> (last accessed October 2023).
- Thieler, E.R., Himmelstoss, E.A., Zichichi, J.L., and Ergul, Ayhan. 2009 Digital Shoreline Analysis System (DSAS) version 4.0—An ArcGIS extension for calculating shoreline change: U.S. Geological Survey Open-File Report 2008-1278. *updated for version 4.3
- Wright W., S. C. Cooper, and A. Gonzalez. 2023. Dataset and Metadata Publication—Version 3.0. Southeast Coast Network Standard Operating Procedure NPS/SECN/SOP—2.1.08. Southeast Coast Network, Athens, Georgia. (In prep).