NEW DATA IMPORTATION CAPABILITIES FOR THE SEDIMENT BUDGET ANALYSIS SYSTEM

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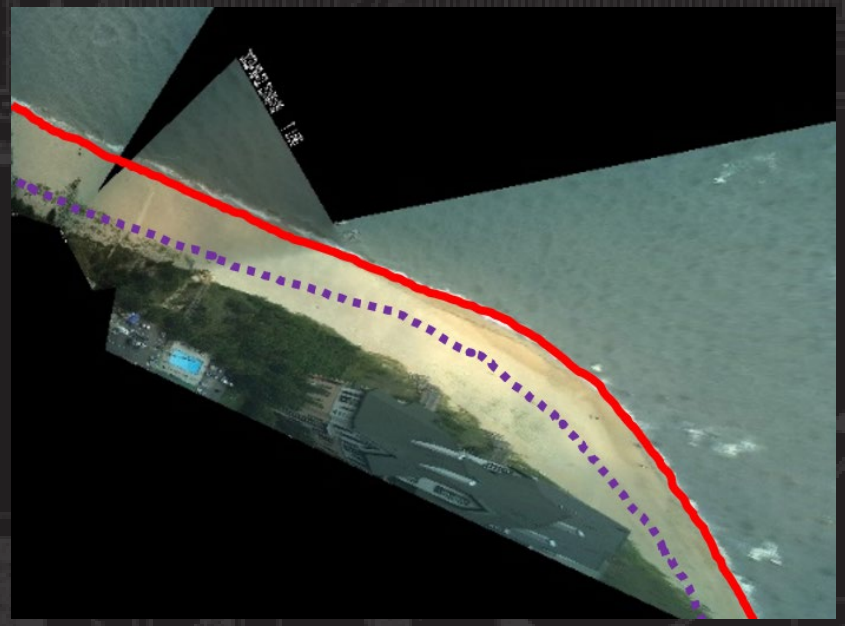
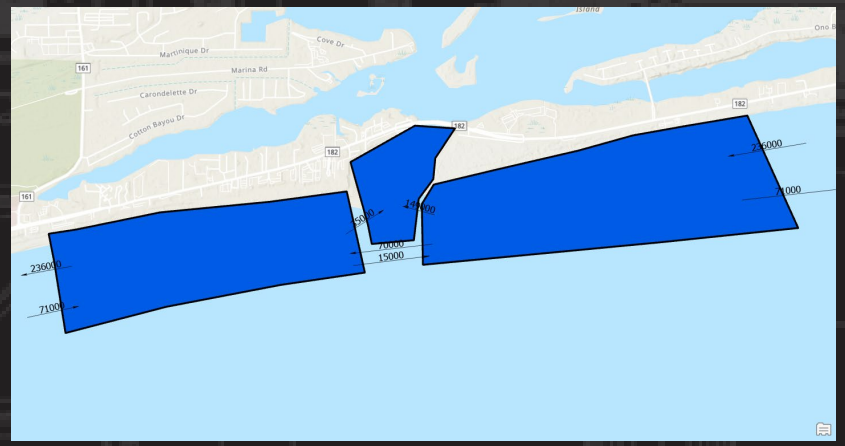
CIRP TD 22 April 2025





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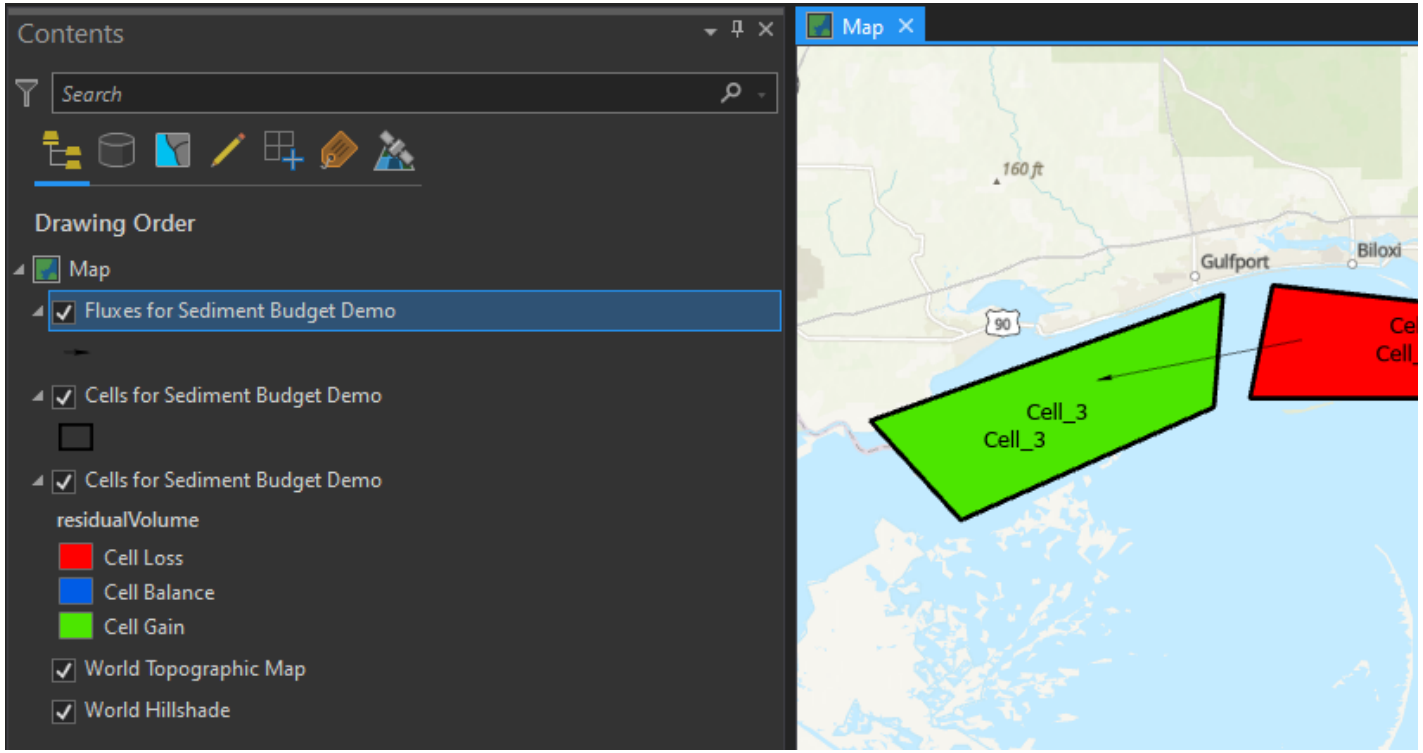
OUTLINE

- Introductions
- Sediment Budgets and the Sediment Budget Equation
- SBAS History
- SBAS 2020 – SBAS 2025



INTRODUCTIONS

FY25 Team

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Charlene Sylvester
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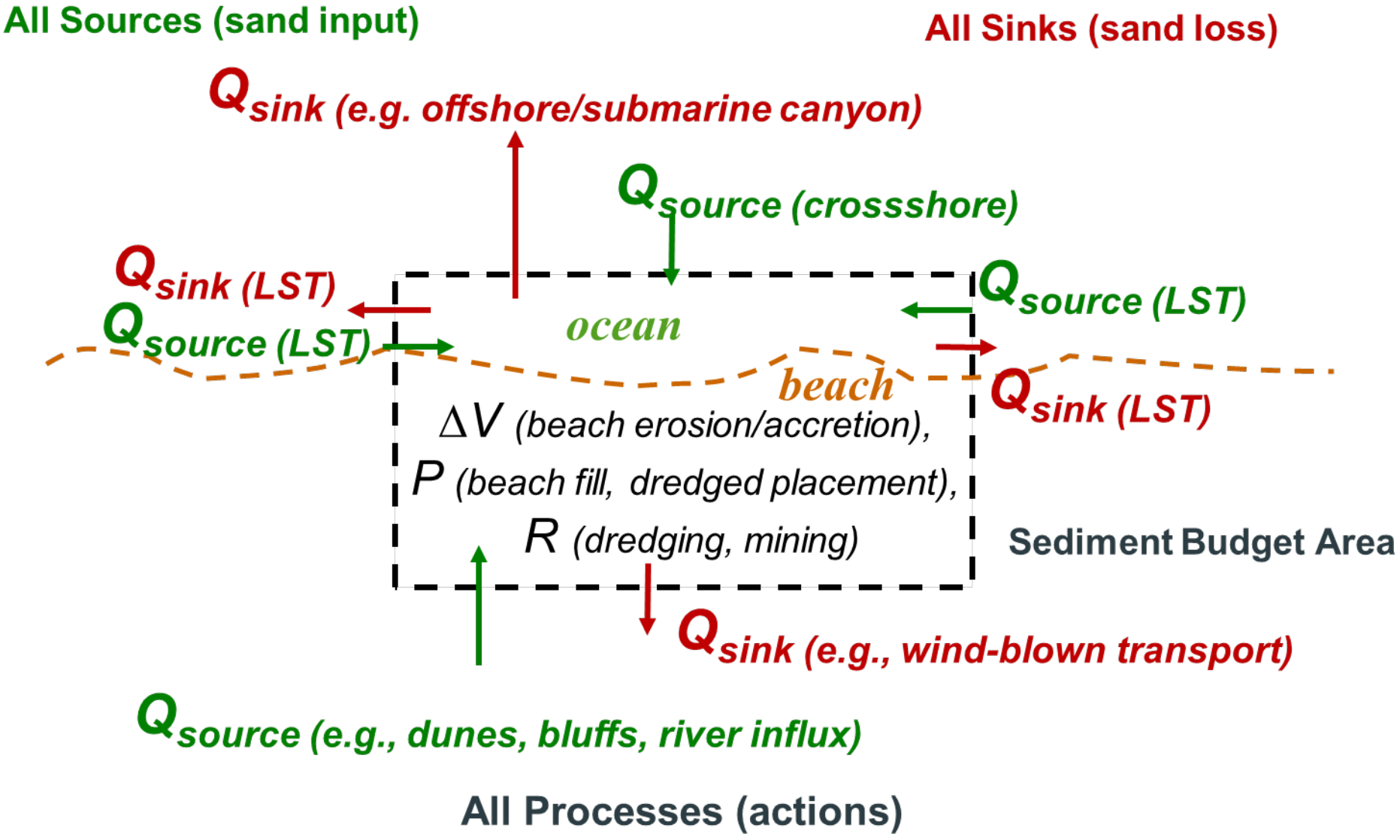
SEDIMENT BUDGETS

- Consists of cells and fluxes
- Account of coastal sediment sources, sinks, and fluxes in the active and nearshore beach
- Conceptual and quantitative model of sediment-transport magnitudes and pathways for various time periods (historic/present/future)
- Provides the framework for understanding complex coastal systems
- Provide ground-truthing for more detailed models
- Tool for communication with clients, sponsors, and partners
- Important for planning/investigating feasibility for projects

SEDIMENT BUDGET EQUATION



SEDIMENT BUDGET EQUATION

DESCRIBING THE EQUATION

Quantifying and finding balance

$$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = Residual$$

Q_{source} = input of sediment into a cell

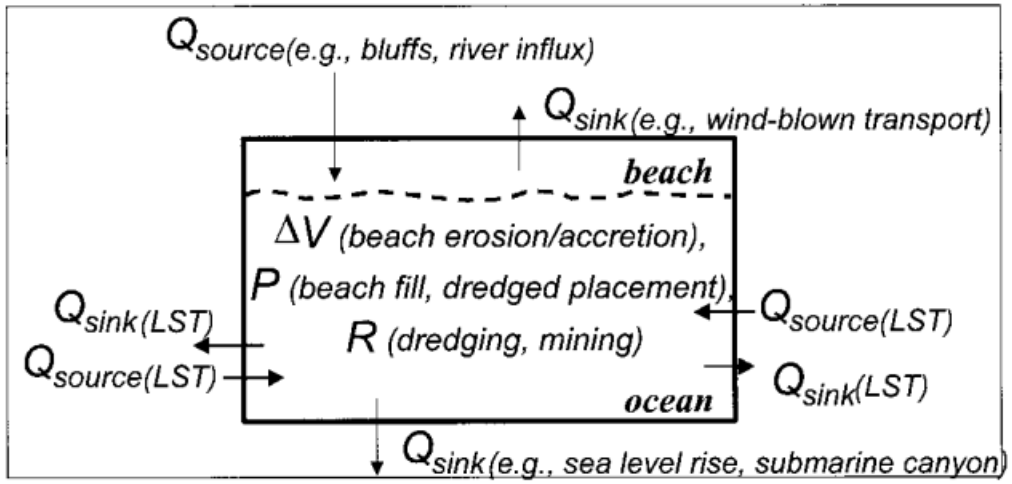
Q_{sink} = loss of sediment from a cell

ΔV = volume change within a cell

P = placement into a cell (e.g., beach fill or dredged material)

R = removal from a cell (e.g., dredging or mining)

$Residual$ = 0 for a balanced cell



SEDIMENT BUDGET TYPES (DATA FIDELITY)

Fast

Accurate

Conceptual

- Building block for more detailed budgets
- Utilize existing data, literature reviews

Interim

- Working budget
- Historical data
- Dredging records
- Shoreline change
- Numerical models

Operational

- Final budget
- May be a series of budgets
- Developed with most available data sets

SEDIMENT BUDGET TYPES (SPATIAL EXTENT)

Size of sediment budgets

Q_{source} = input of sediment into a cell

Q_{sink} = loss of sediment from a cell

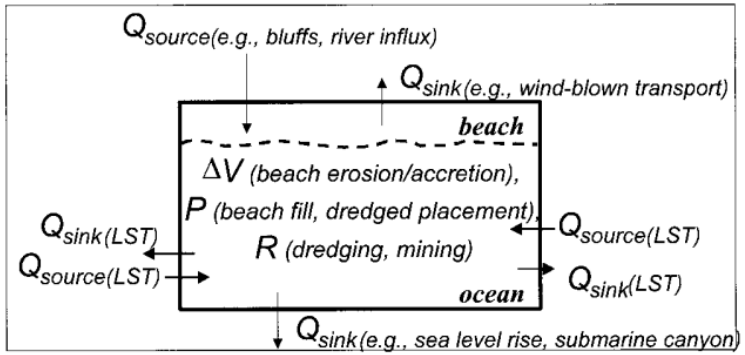
ΔV = volume change within a cell

P = placement into a cell (e.g., beach fill or dredged material)

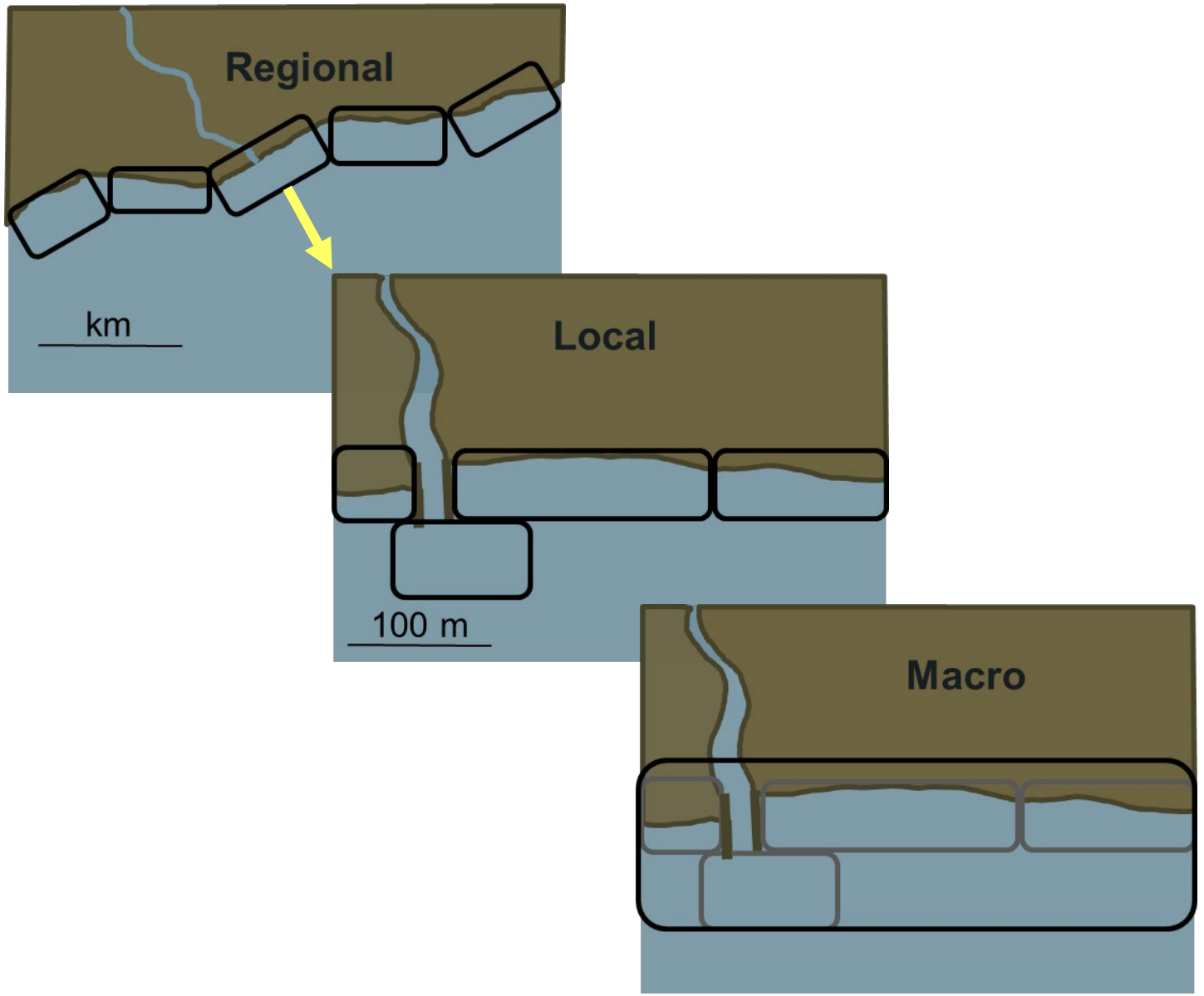
R = removal from a cell (e.g., dredging or mining)

$Residual$ = 0 for a balanced cell

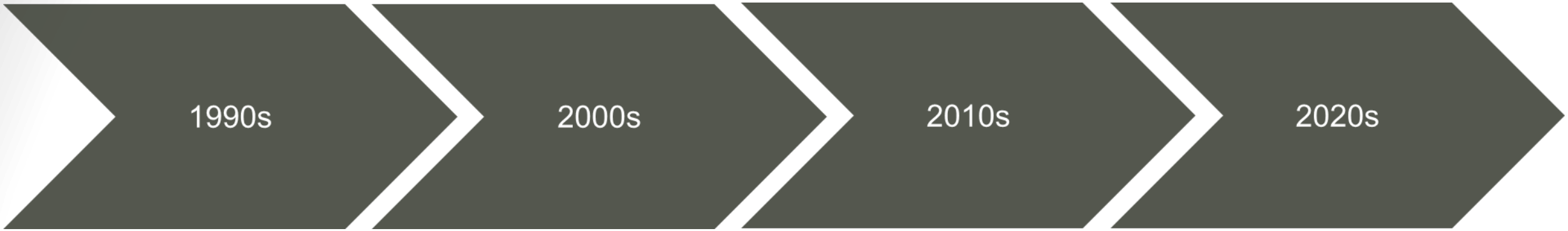
$$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = Residual$$



(Rosati, 2005)



SEDIMENT BUDGET ANALYSIS SYSTEM (HISTORY)



1990s — Sediment Budget Analysis System Creation

- Standalone executable for Windows 95 and 98
- Allowed the user to create and quantify cells and fluxes

2000s — Transition to ArcView

- Incorporation into geospatial software, allowing visualizing and mapping improvements

2010s — Transition to ArcMap

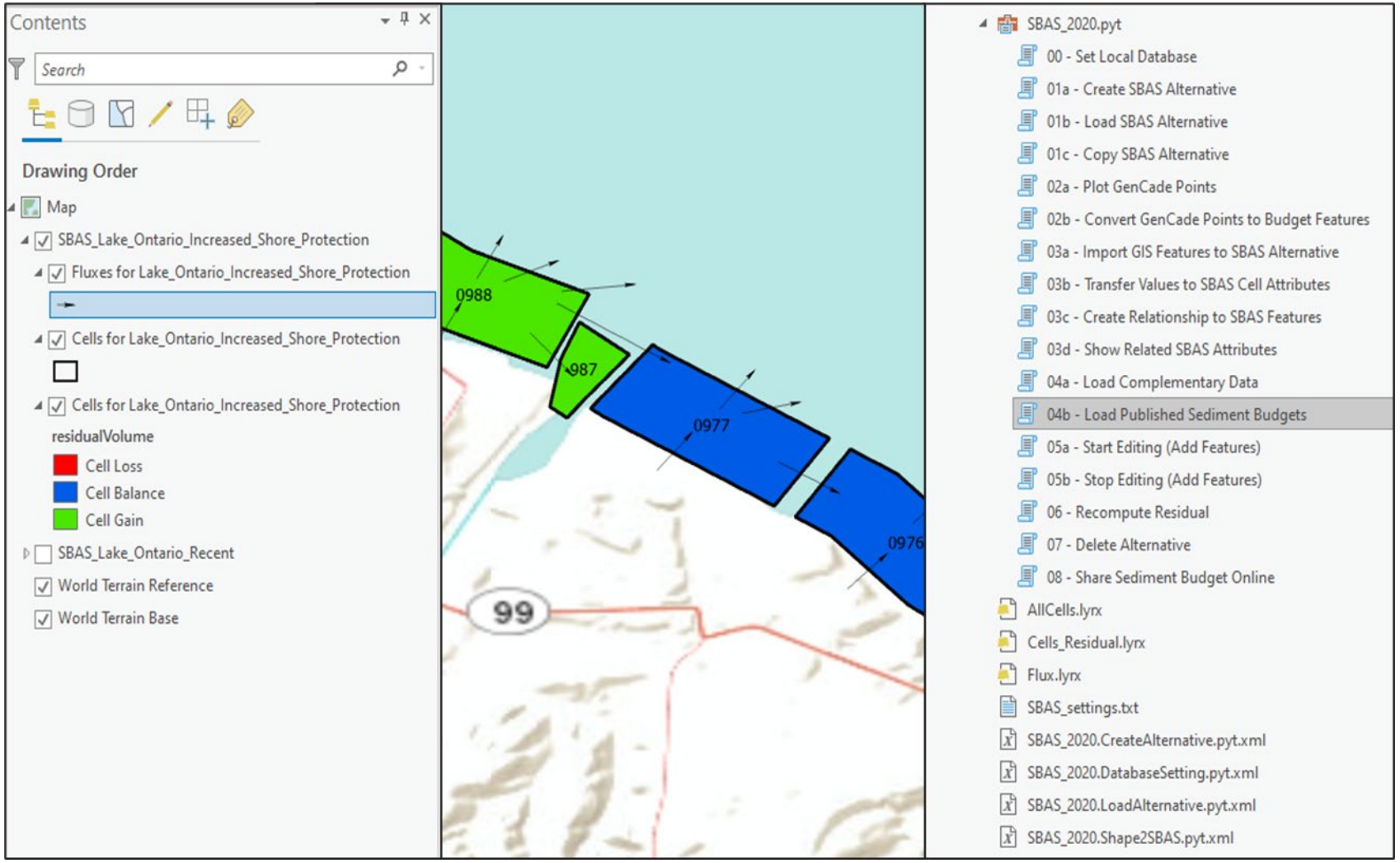
- Create and manage regional sediment budgets

2020s — SBAS 2020

- Upgrade to ArcGIS Pro
- Creation of the SBAS ArcGIS Online (AGOL) Hub

SEDIMENT BUDGET ANALYSIS SYSTEM (2020)

- Create and quantify fluxes and cells
- Import existing datasets and previously created shapefiles
- Import GenCade results (shoreline change/sediment transport rates)
- Publish results on the SBAS Hub



SEDIMENT BUDGET ANALYSIS SYSTEM (2020), ROLLUP

ERDC

SBAS: Sediment Budget Analysis System

Home | Learn More | Contributors | Sediment Budgets Library | Alternative Builder | Wiki

Budget Maps | List of Services | Applications

Master Sediment Budgets

Select Alternative
All

Cell Count
2949

Flux Count
6795

Littoral Cell Details

ID 974149 **Cell Gain**
Cell Name: Cell_1
Residual: **1,300** *Cubic Meters*
Placement: **Unknown** *Cubic Meters*
Removal: **Unknown** *Cubic Meters*
Volume Change: **49,100** *Cubic Meters*
Transport Rate, Source: **139,800** *Cubic Meters/Year*
Transport Rate, Sink: **89,400** *Cubic Meters/Year*

SBAS_AtlanticCoast_Maryland_Assateague_OceanCity | AtlanticCoast_Maryland_Assateague_OceanCity | Metadata

ID 974150 **Cell Gain**
Cell Name: Cell_2
Residual: **0** *Cubic Meters*
Placement: **Unknown** *Cubic Meters*
Removal: **Unknown** *Cubic Meters*
Volume Change: **62,100** *Cubic Meters*
Transport Rate, Source: **62,100** *Cubic Meters/Year*
Transport Rate, Sink: **0** *Cubic Meters/Year*

Flux Details

ID 2185580

43 Budgets Across the Nation*

*Except from Oregon, Washington, Alaska, and California

SBAS 2025 VISION

Problem: Sediment budgets are an important component of any coastal engineering project, and the Sediment Budget Analysis System (SBAS) is a USACE developed toolbox for creating sediment budgets. Depending on the fidelity of the sediment budget, the time required to collect and process data to quantify budgets can be on the timescale of months to years. Except for GenCade, any volume change or sediment transport rates calculated from field measurements, literature values, or other USACE tools must be manually entered into SBAS.

Solution: Add new tools and capabilities to the SBAS, allowing users to quickly and easily import data from commonly used USACE tools, saving time and money.

<u>Statements of Need</u>

SON 1968: “New volume-change tools to improve sediment management”

SON 1969: “Incorporating shoaling rates into sediment budget creation to improve sediment management”

SBAS 2025

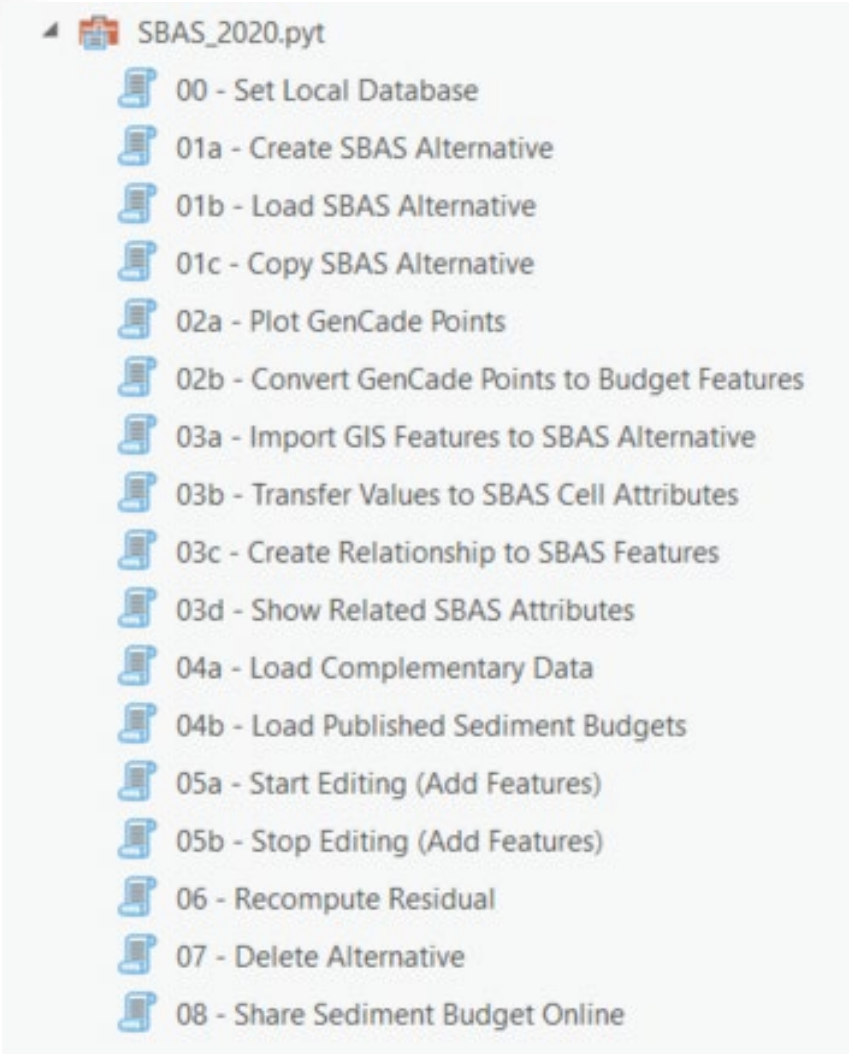
~~Harder~~ Easier
- Data importation

Better
- Sediment budget quality

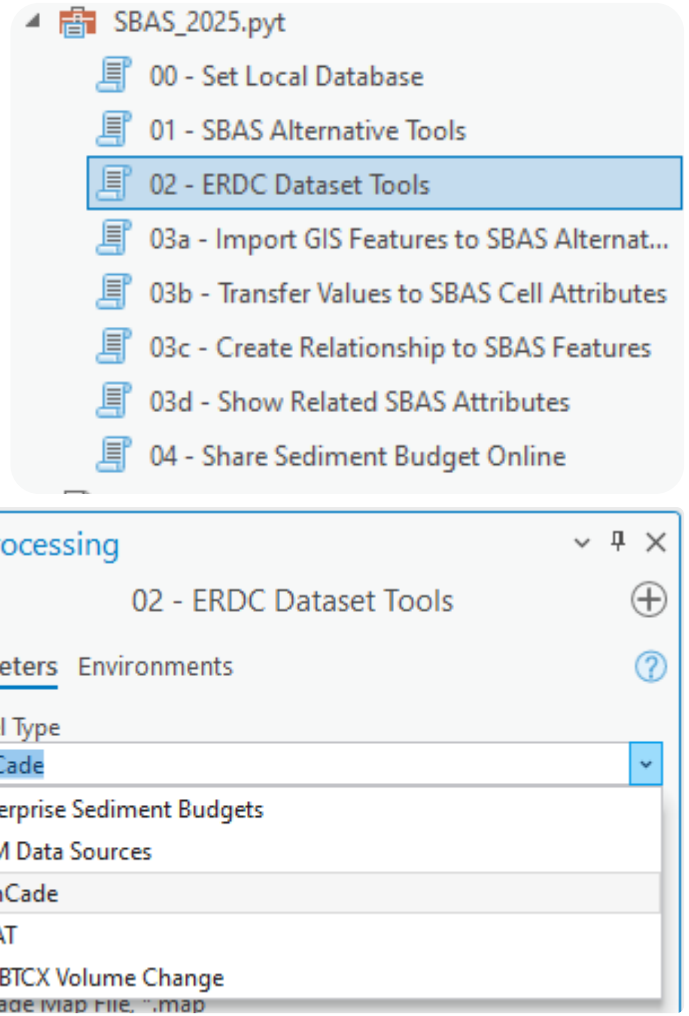
Faster
- Sediment budget creation

Stronger
- Downstream products

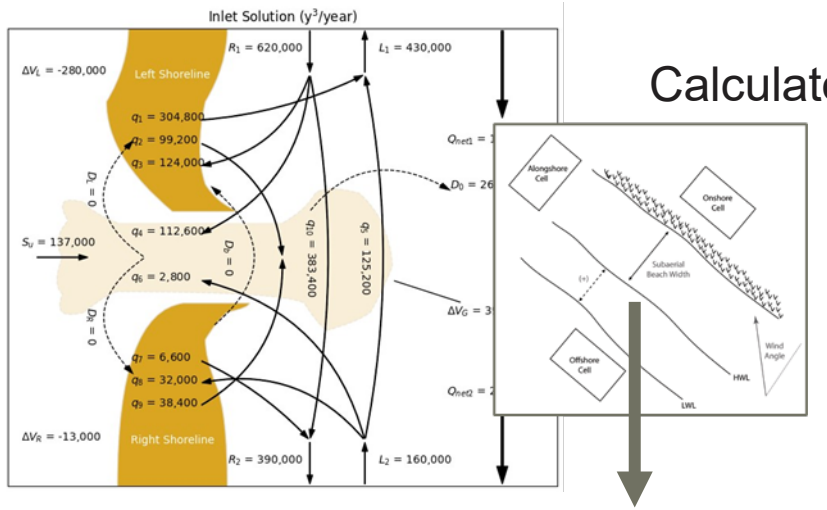
SBAS 2025, STREAMLINED



Streamlined

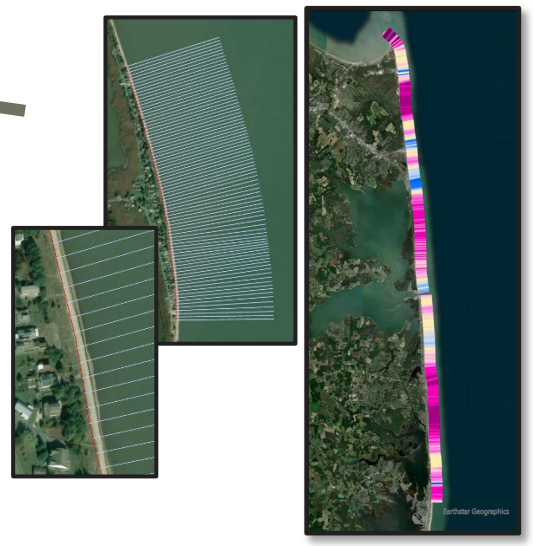


SBAS 2025, INPUTS

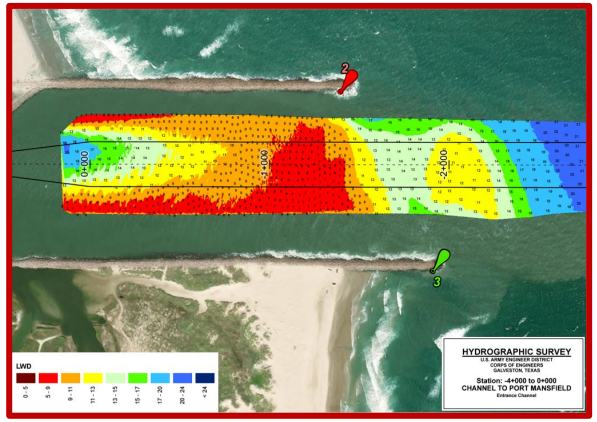


SBAS 2025

JALBTCX Volume Change Toolbox

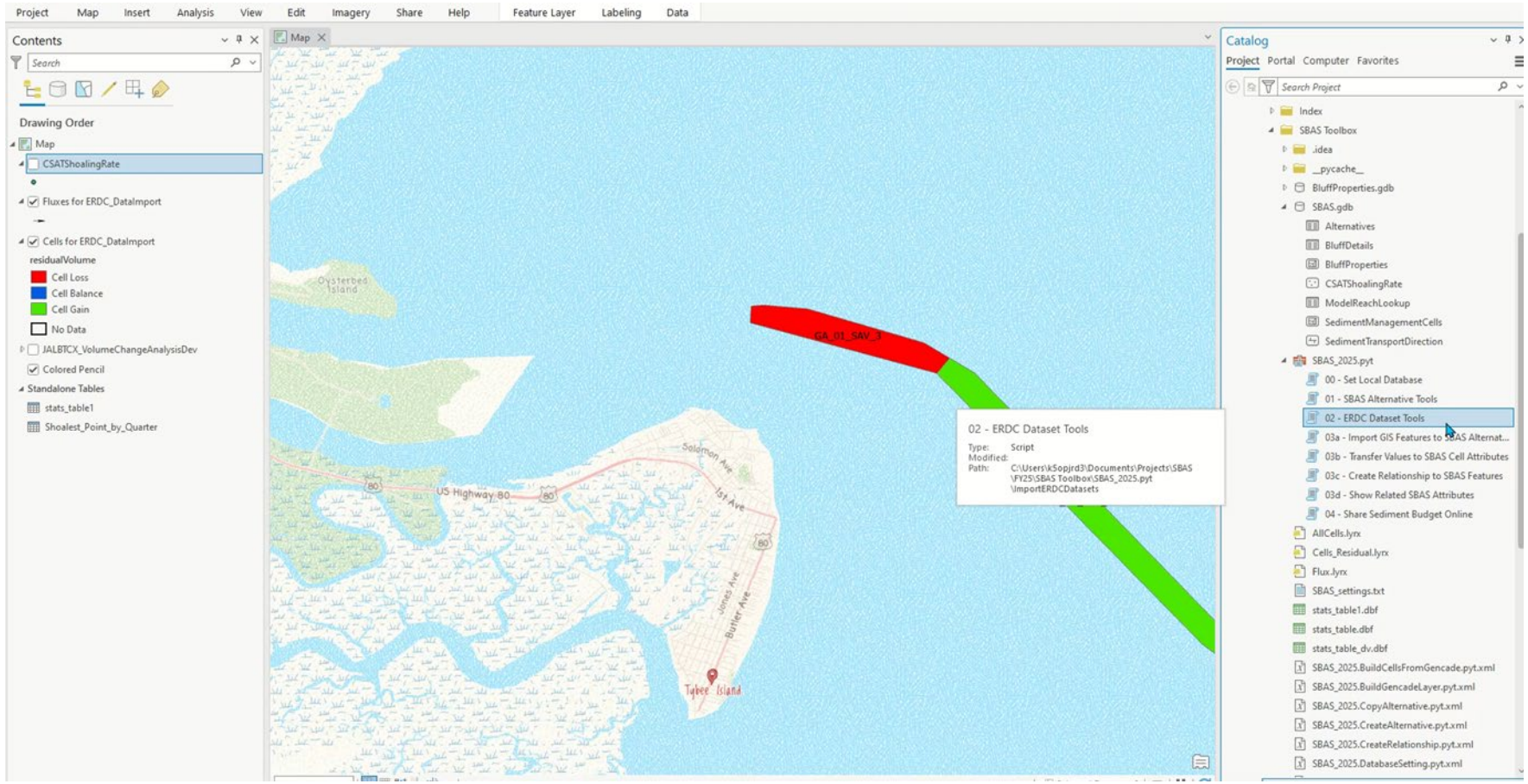


CSAT



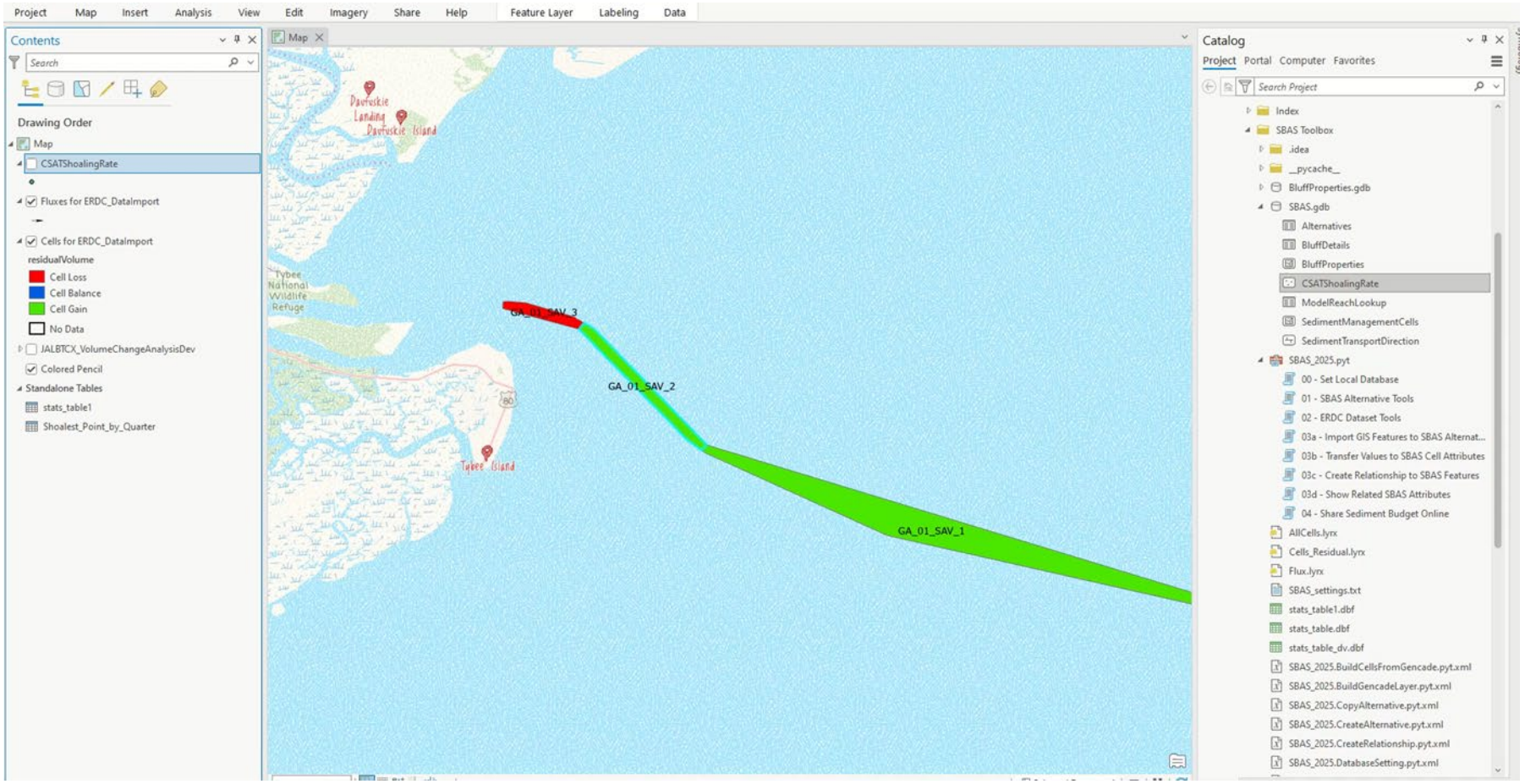
SBAS 2025, OPERATION (PT. 1)

- User selects the location of the local CSAT data
- Converts records to points and loaded into SBAS Database
- Simple boundaries can be computed per reach for littoral cells within inlets
- Delta volume can be computed and used in resuidual calucations
- 78,000 points in ~4 minutes



SBAS 2025, OPERATION (PT. 2)

- User has the option to append to existing littoral cells or consider entire dataset
- If the cell already exists, logic used for identifying the intersecting littoral cell in the same alternative to calculate volume change



SBAS 2025, PROGRESS AND FUTURE

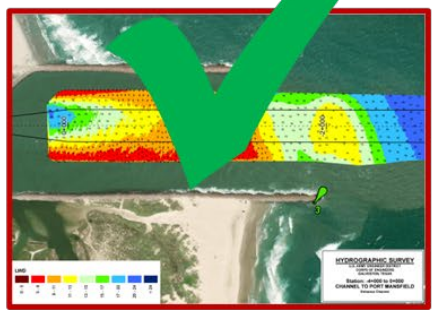
Once completed

- New user guide will be released
- CIRP wiki page will be updated
- Updated tutorial videos will be created
- Training/workshop (CWG 2026?)

In progress!

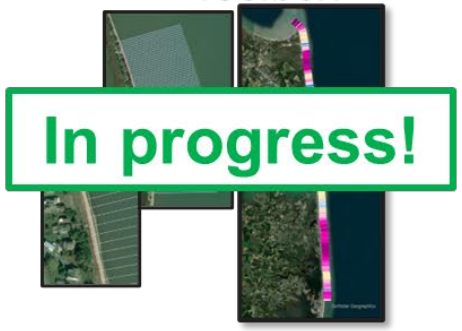
Calculators

CSAT



SBAS 2025

JALBTCX Volume Change Toolbox



In progress!

CONCLUSIONS

- SBAS has historically been used by USACE to develop sediment budgets
- District users have requested new capabilities to import other USACE tools quickly into SBAS
- Efforts currently underway to increase data availability and explore new sediment budget creation methods for
  - Easier data importation
  - Better sediment budget quality
  - Faster sediment budget creation
  - Stronger downstream products

QUESTIONS

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