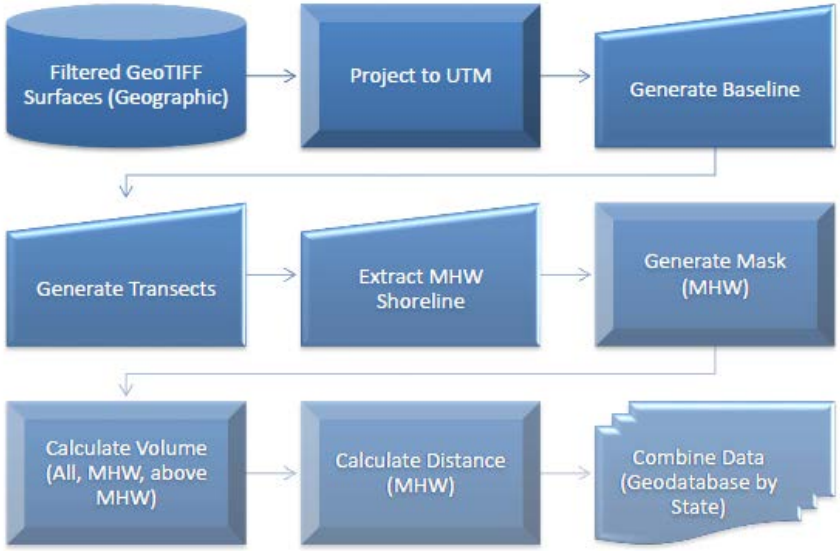
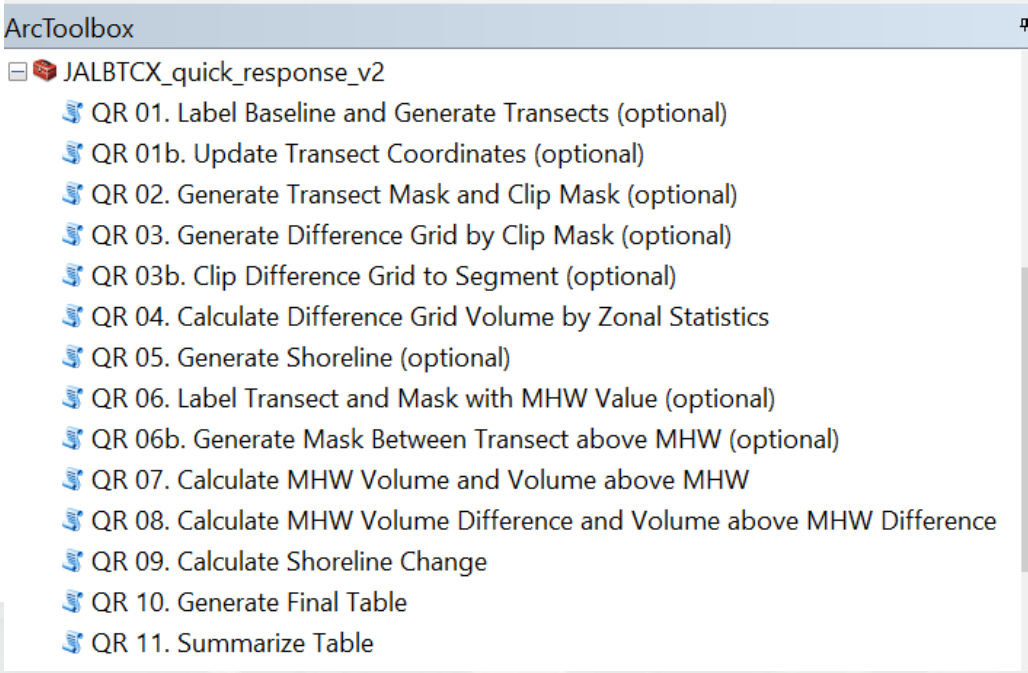
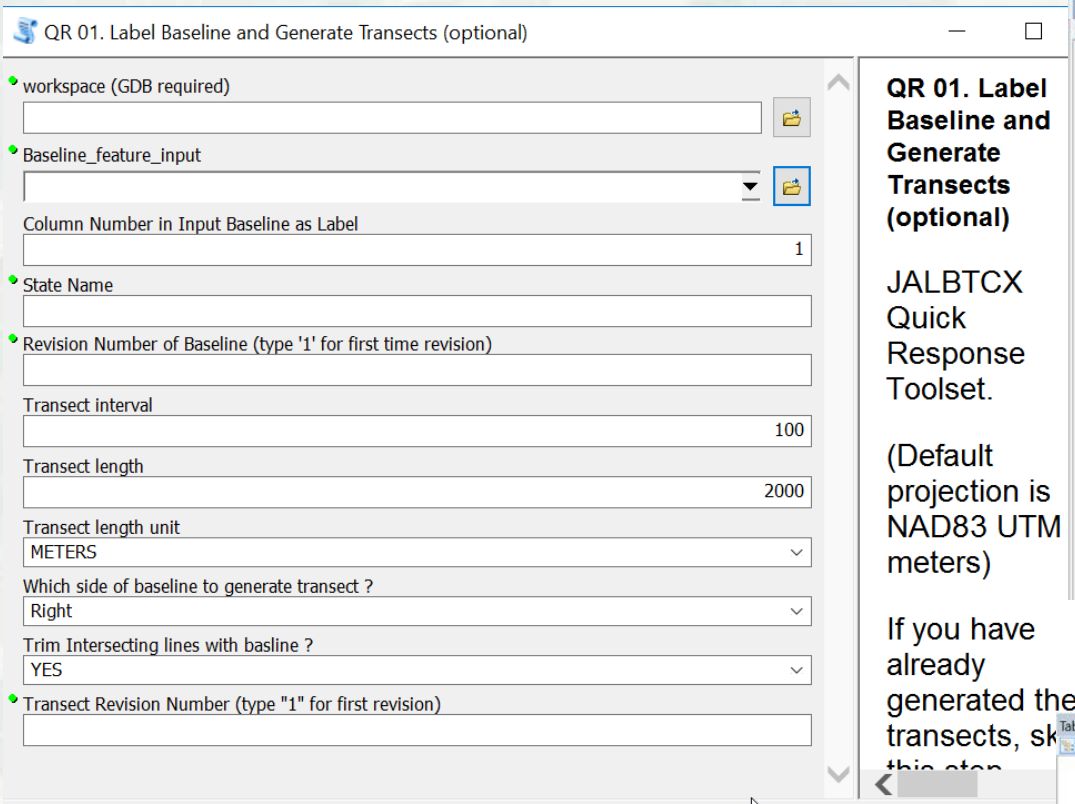
JALBTCX Volume Change Toolbox





Baseline & Transect

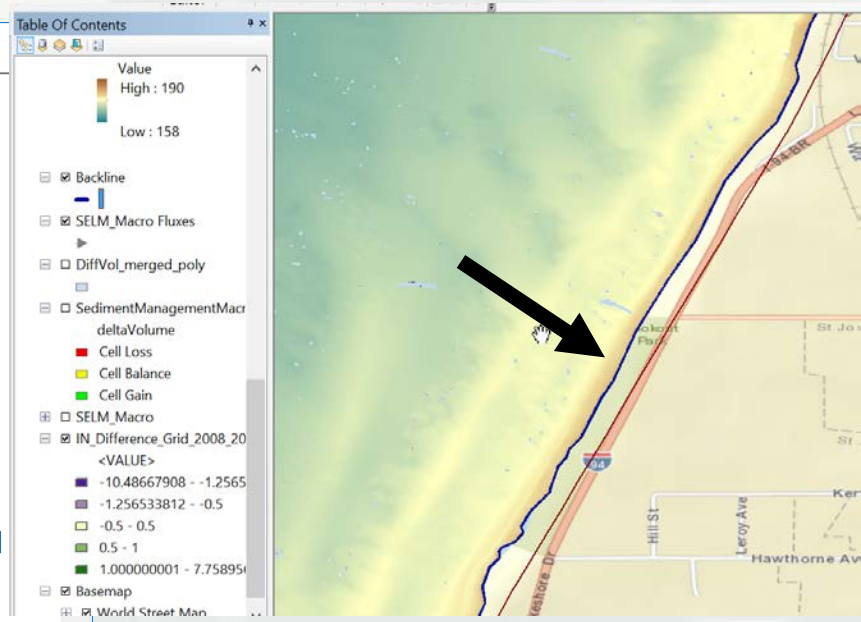


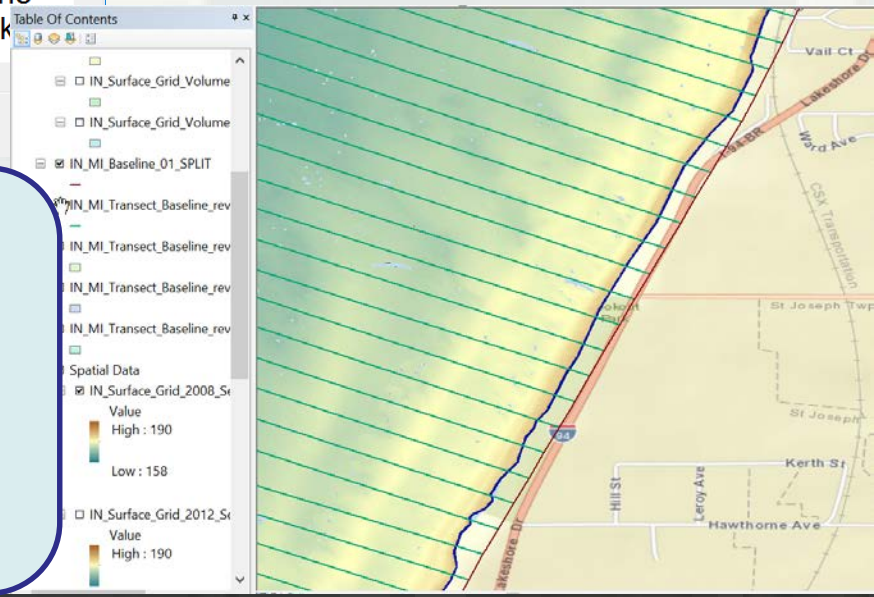
QR 01. Label Baseline and Generate Transects (optional)

JALBTCX Quick Response Toolset.

(Default projection is NAD83 UTM meters)

If you have already generated the transects, sk

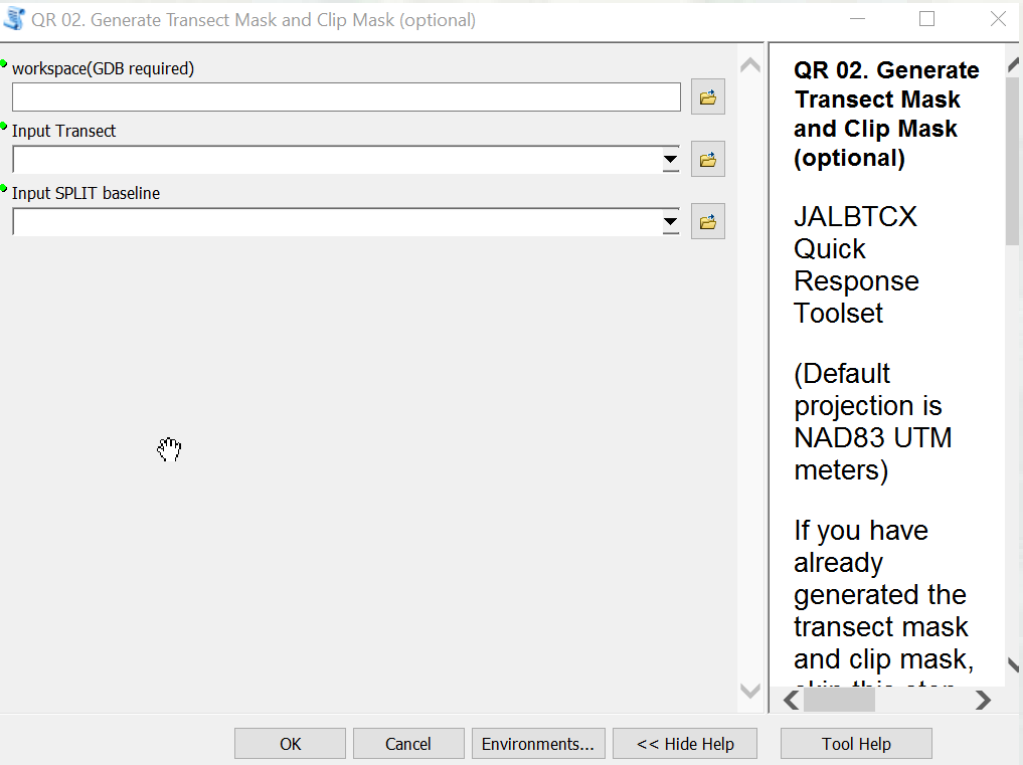




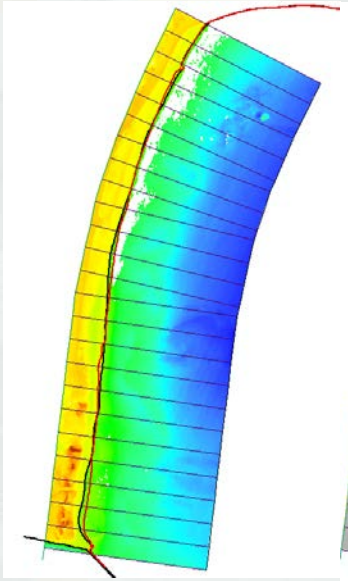
- Baseline – landward limit; used to clip grids for volume calculations
- Split Baseline – cuts baseline at transect interval; can be same as baseline or unique
- Transect – user defined interval (typical 100m)

BUILDING

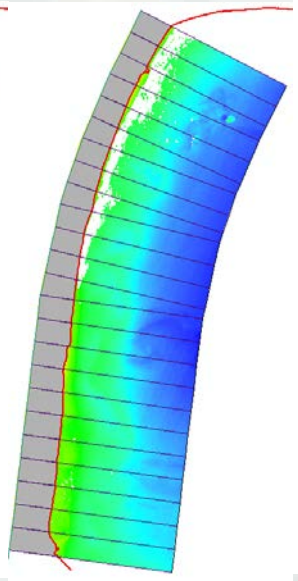
Masks



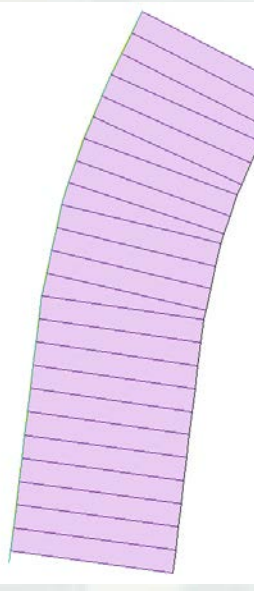
Shorelines

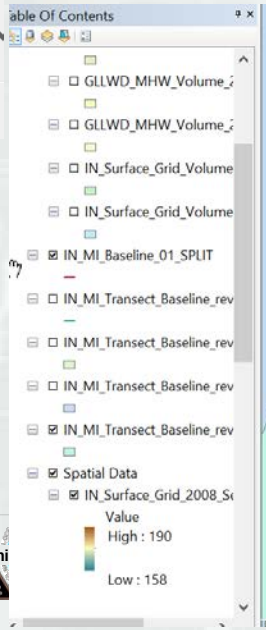


MHW mask

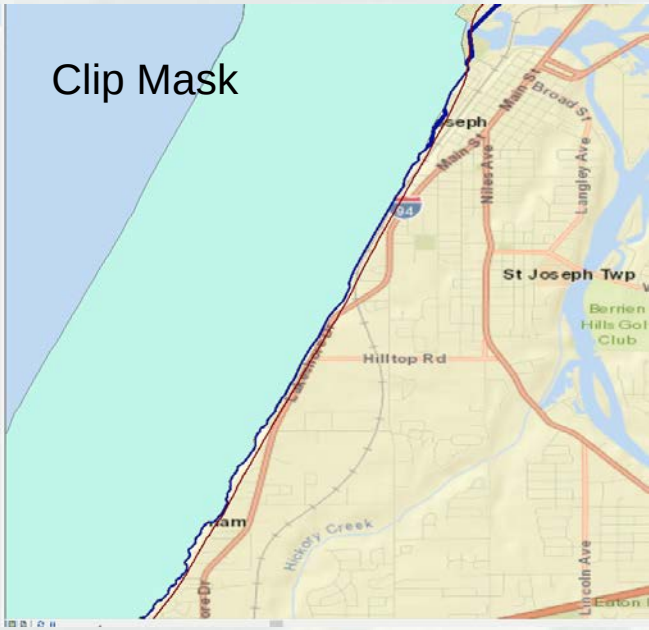


Bin mask





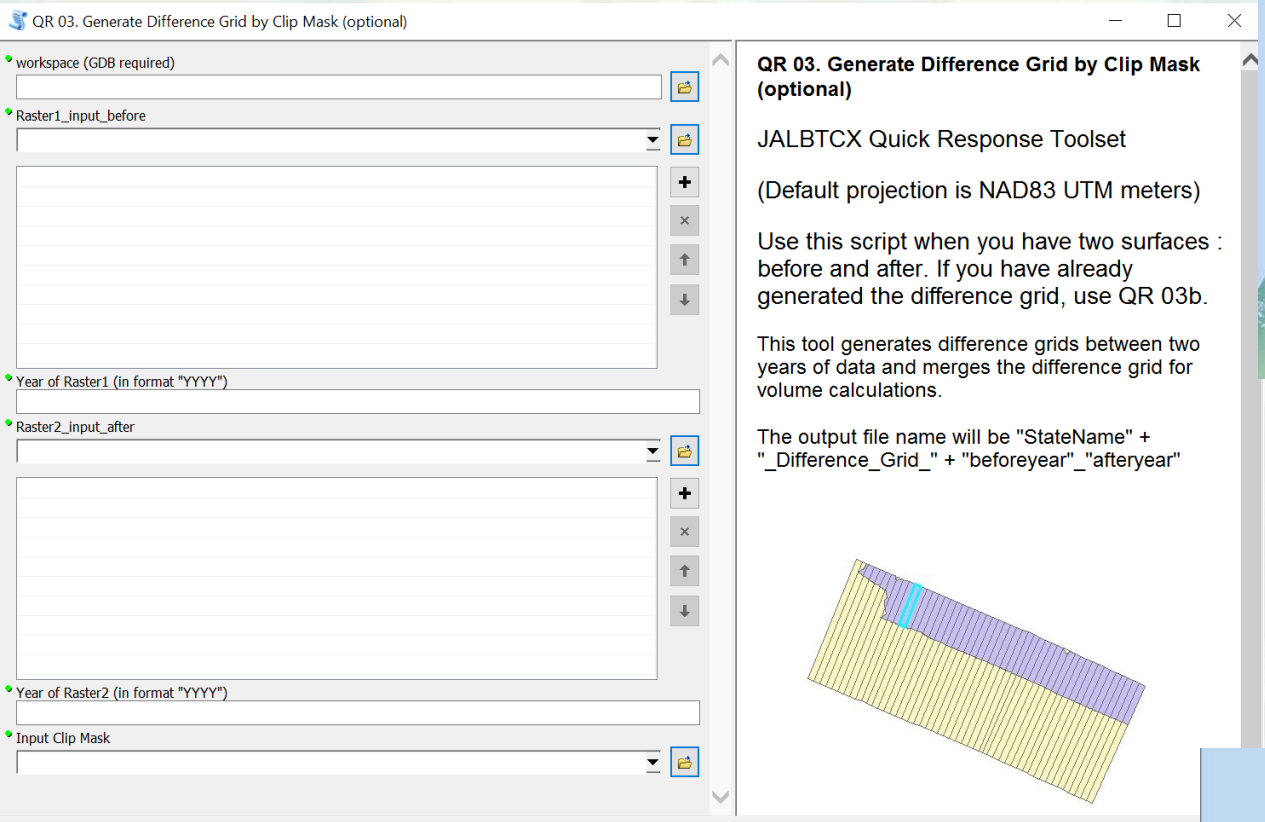
Clip Mask

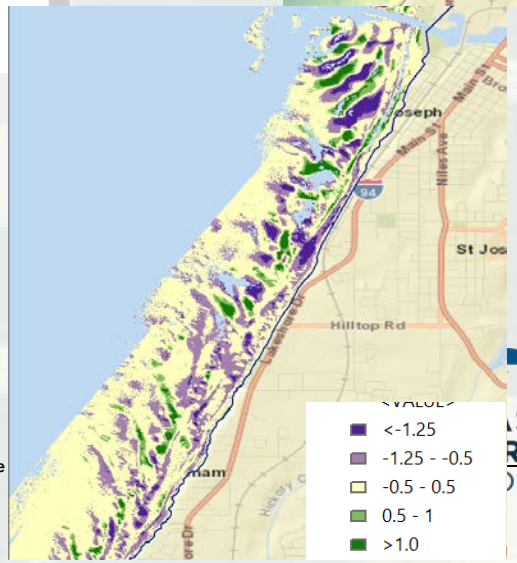


- MHW Mask - Shoreline used to create masks for subaerial
- Bin Mask - transects set R/L boundary for bin
- Clip Mask – dissolved bin masks per segment

BUILDING STRONG®

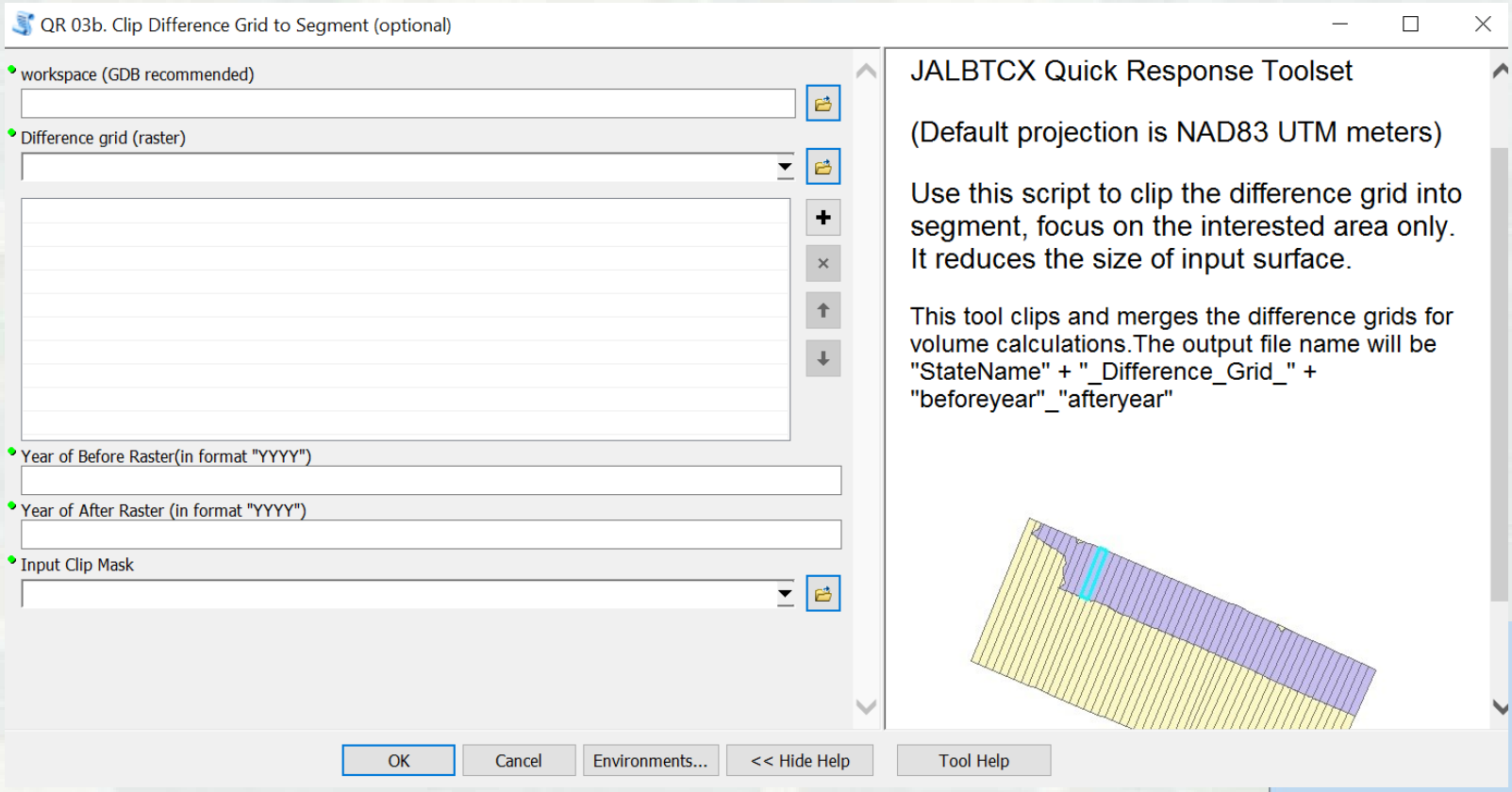
Difference Grid



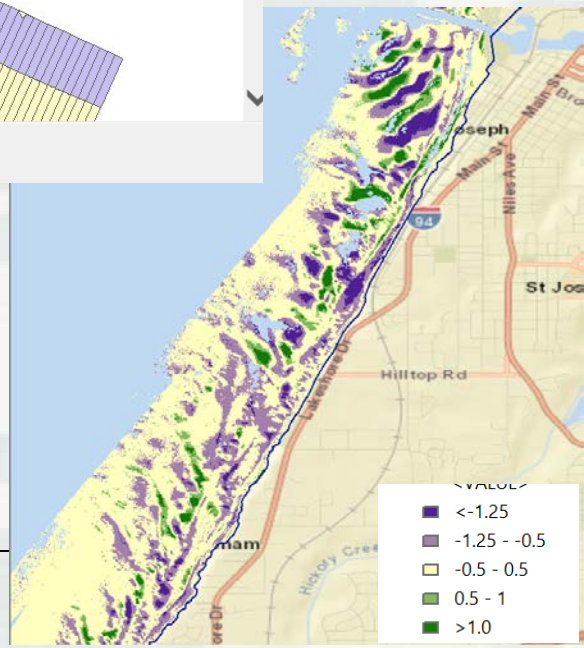


- Difference Grid – two raster datasets (before/after) to create elevation change grid
- Note – if elevation difference grid is created outside the toolbox, run step QR 03b

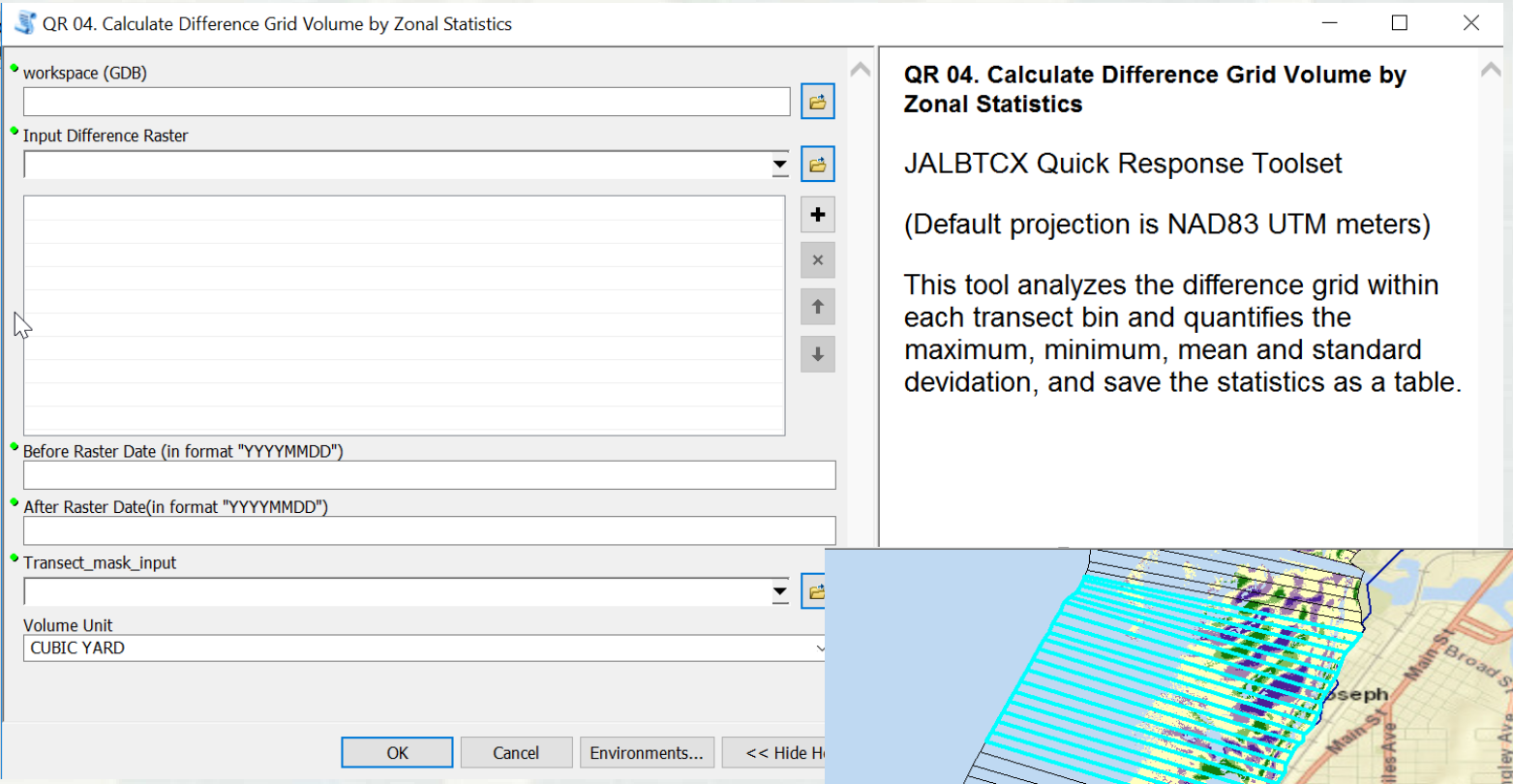
Difference Grid - Alternative

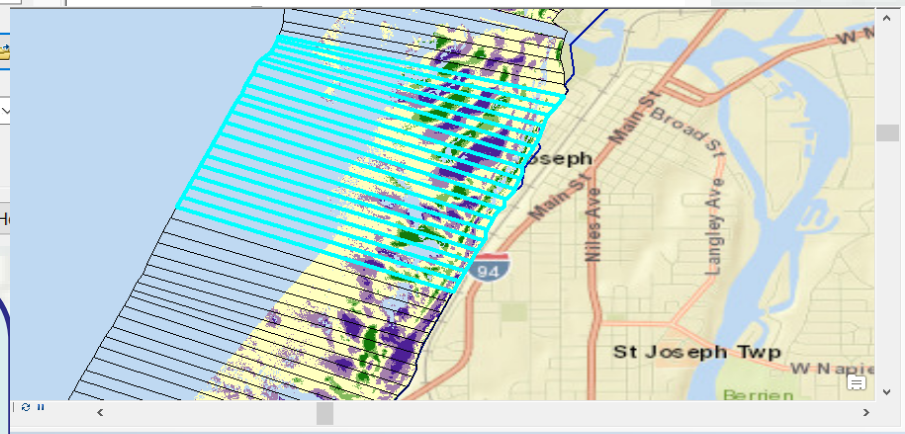


- Difference Grid – elevation difference grid created outside toolbox used as input
- Note – can be used with historical datasets that have been compared



Difference Grid Volume

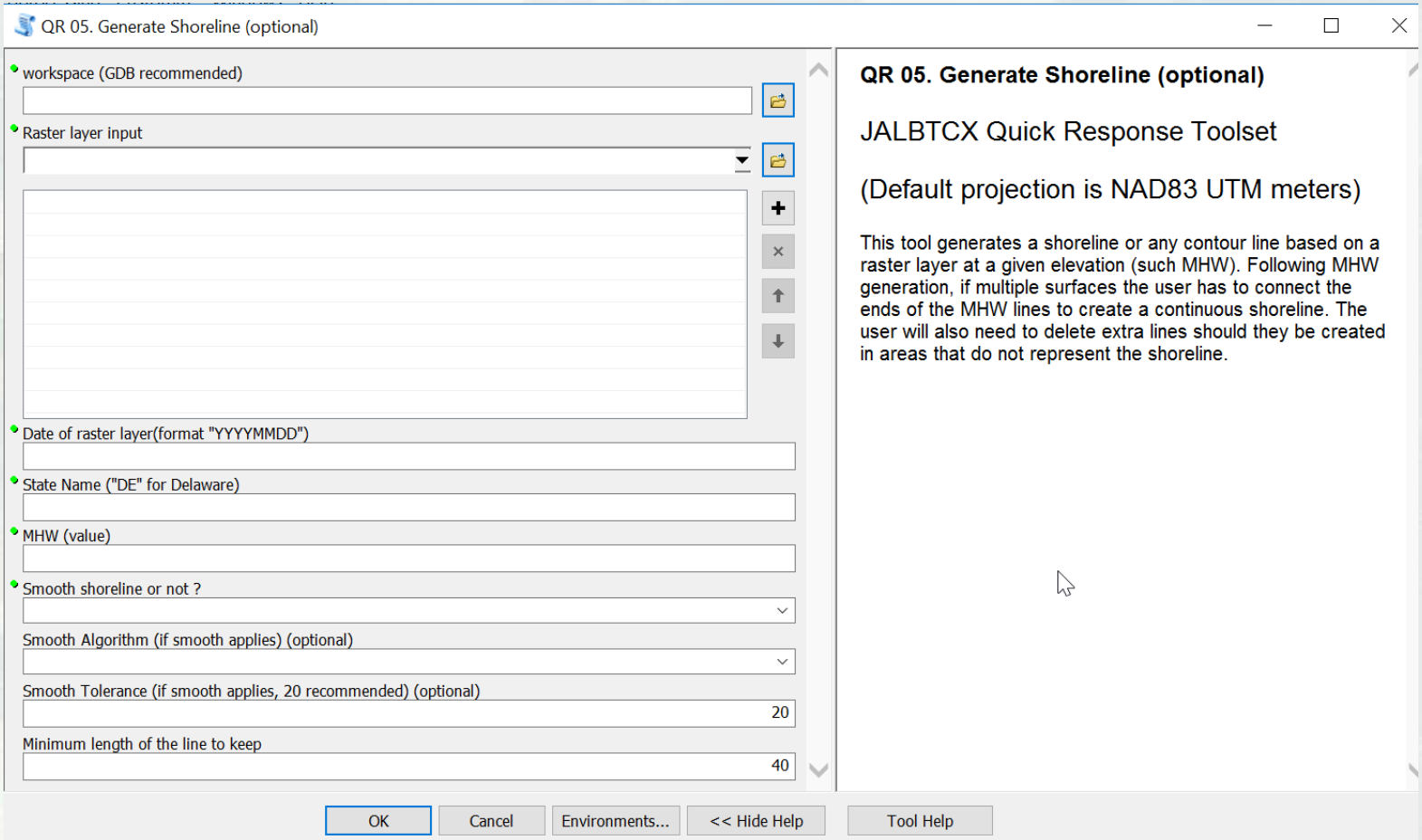




- Difference Grid Volume – total volume change calculated for each individual bin
- dVol – net volume change – input into SBAS
- Note – zonal statistics used for volume calculation

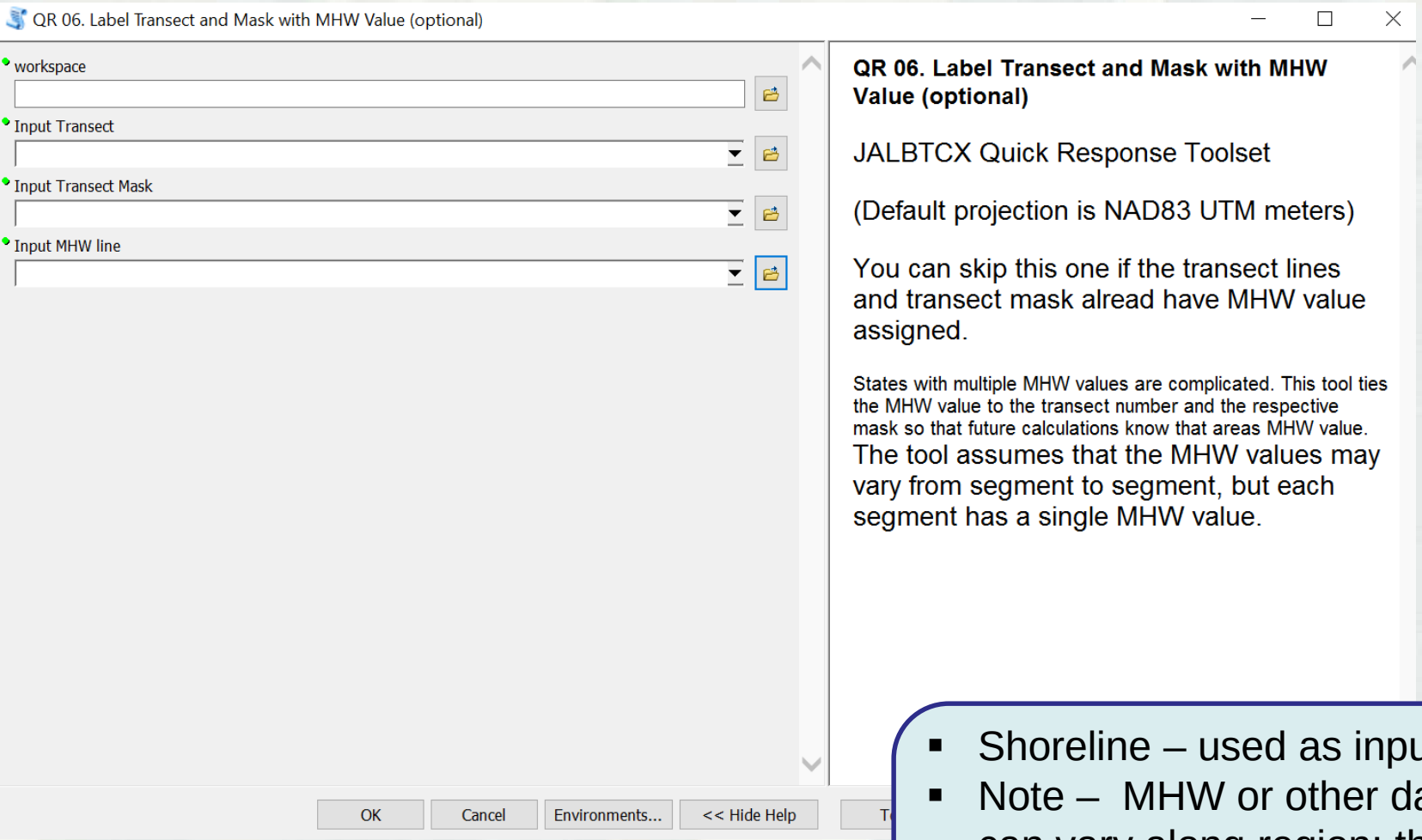
binArea	Start_Date	End_Date	dDensity	dMin	dMax	dMean	STD	dVol	Accretion	Erosion
156008.7	20080901	20120901	-3.6	-3.47	2.05	-0.02	0.76	-1173	19837	-21010
174884.4	20080901	20120901	-56.8	-3.25	1.99	-0.22	1	-18640	21464	-40104
190919.5	20080901	20120901	-59.5	-3.39	2.18	-0.22	1.18	-19513	29962	-49475
182742.3	20080901	20120901	-98.9	-3.69	2.37	-0.34	1.2	-32444	30754	-63198
182079.3	20080901	20120901	-26.5	-2.93	3.13	-0.09	1.08	-8686	38144	-46830
235908.6	20080901	20120901	-82.7	-2.86	3.11	-0.24	1.1	-27140	38234	-65374
244142.3	20080901	20120901	-156	-2.89	3.32	-0.48	0.95	-51188	21531	-72719
223778.9	20080901	20120901	-108.9	-3.69	3.23	-0.38	1	-35726	18500	-54226

Shoreline



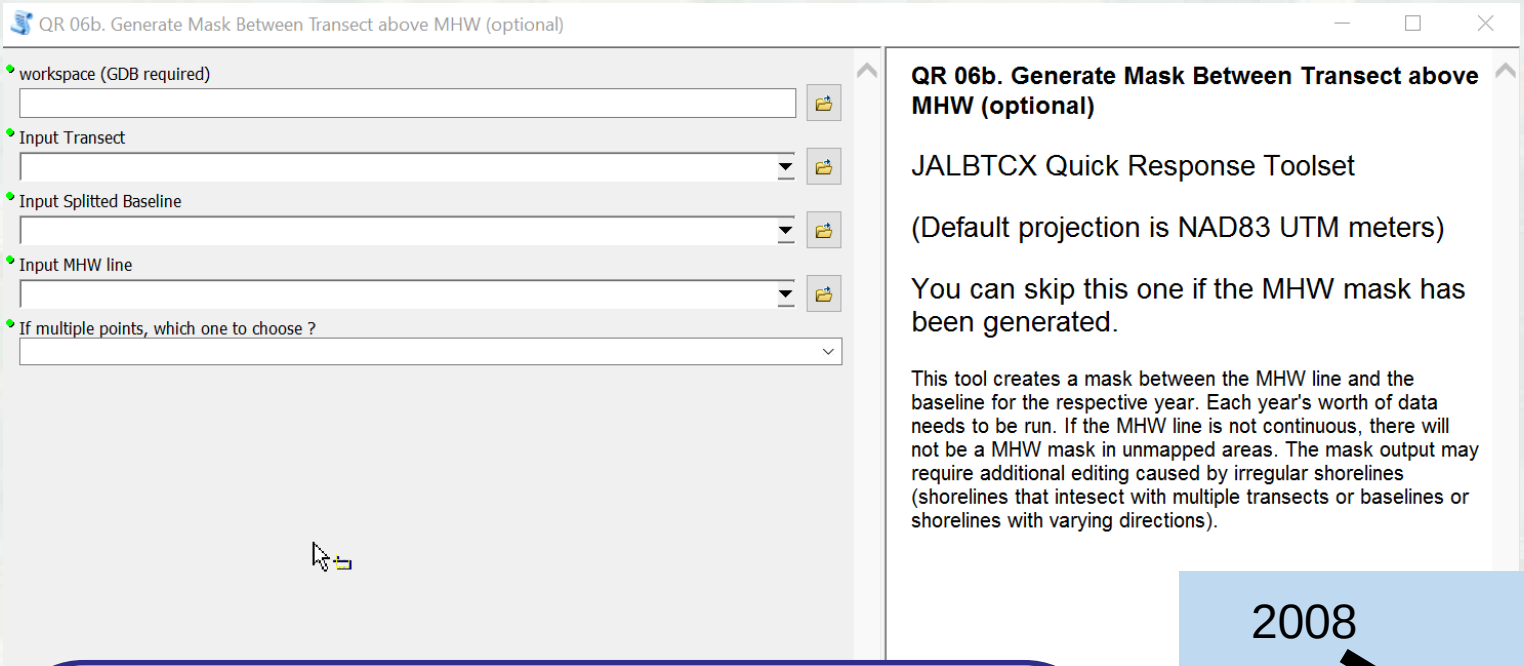
- Shoreline – contour line extracted from lidar grids
- Note – may require manual delineation in areas with data gaps
- Optional step

Transect & Mask – MHW

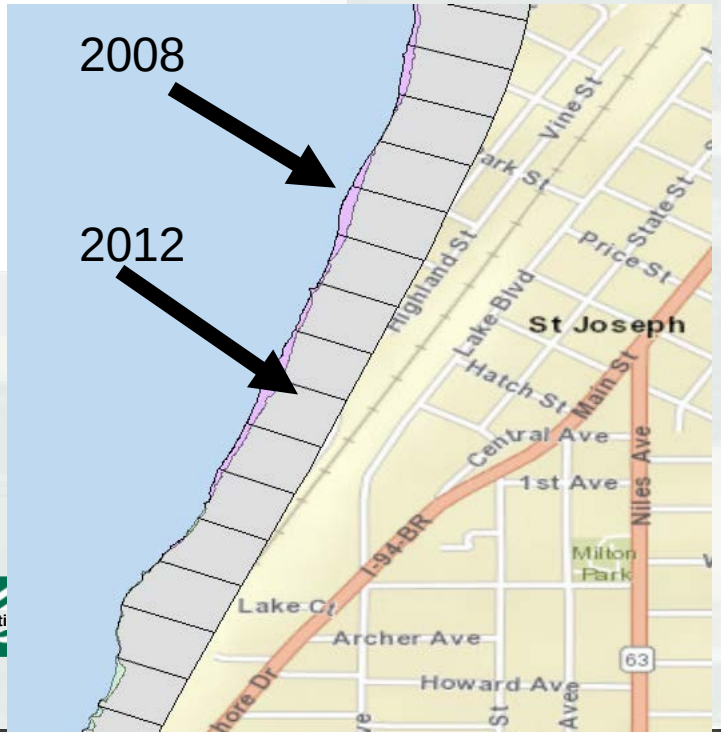


- Shoreline – used as input
- Note – MHW or other datum can vary along region; this step copies values to the transects and masks created in Step 2
- Optional step

MHW Mask



- Shoreline – used as seaward boundary
- Note – areas with discontinuous MHW line/shoreline/contour will not have a mask created for that bin
- Optional step – may choose to skip and run only the above MHW volume calculation (does not require a mask)



MHW Volume

QR 07. Calculate MHW Volume and Volume above MHW

workspace (GDB recommended)

Surface Grid Raster Input

Year of data (in format "YYYY")

MHW_mask_input for MHW Volume (optional)

Transect_mask_input for Volume above MHW (optional)

Volume Unit

CUBIC YARD

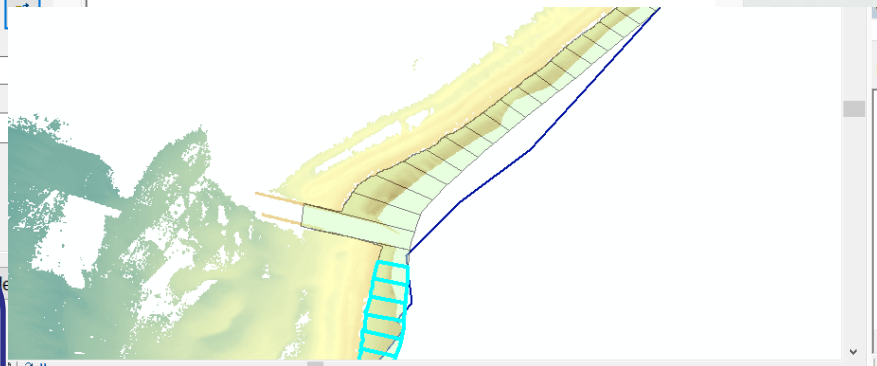
MHW value

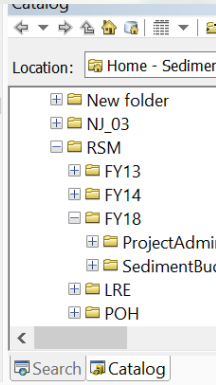
QR 07. Calculate MHW Volume and Volume above MHW

JALBTCX Quick Response Toolset

(Default projection is NAD83 UTM meters)

This tool analyzes the volume of a grid using the mask between transect above MHW and quantifies the maximum, minimum, mean and standard devidation, and save the statistics in a table. This tool needs to be run for each respective year being analyzed.





- Surface Grid – must be run for each year
- Note – if MHW mask was created in Step 6b – option to include in the calculation of volume of sediment for each bin

befBinArea	befDensMHW	MinValue	MaxValue	befMean	STD	befVol	Accretion	Erosion	ElevFloor
16175.3	47.9	0.17	8.29	2.03	1.92	15718	15718	<Null>	17
17377.8	86	0.08	8.85	2.56	1.88	28212	28212	<Null>	17
18236.3	93.2	0.28	5.01	2.37	1.25	30573	30573	<Null>	17
18693.4	142.7	0.31	5.72	2.94	1.72	46816	46816	<Null>	17
18340.3	117	0.23	5.7	2.87	1.59	38382	38382	<Null>	17
16847.3	69.3	0.18	4.94	2.51	1.34	22747	22747	<Null>	17
16749.3	47.6	0.07	6.02	2.5	1.49	15602	15602	<Null>	17
16627.4	52.8	0.21	6.18	2.97	1.93	17323	17323	<Null>	17

MHW Volume Difference

QR 08. Calculate MHW Volume Difference and Volume above MHW Difference

workspace (GDB recommended)

before MHW volume (optional)

after MHW volume (optional)

before volume above MHW (optional)

after volume above MHW (optional)

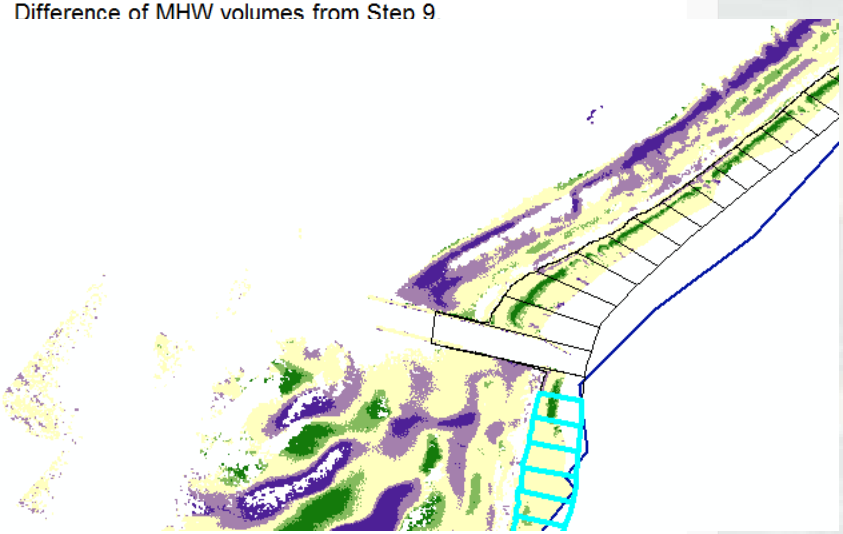
H:\WorkDraft\RSM\SedimentBudgetTraining\Demo_

QR 08. Calculate MHW Volume Difference and Volume above MHW Difference

JALBTCX Quick Response Toolset

(Default projection is NAD83 UTM meters)

Difference of MHW volumes from Step 9



- MHW (before/after) – must be run for each year – Step 7
- Note – if MHW mask was created in Step 6b – option to include in the calculation of volume of sediment for each bin

OK | Cancel | Environments... | << Hide Help | Tool Help

befBinArea	befDensMHW	befMean	befVol	ElevFloor	Shape_Length	Shape_Area	aftBinArea	aftDensMHW	aftMean	aftVol	dMHW_Vol	dDensityMHW
16175.3	47.9	2.03	15718	176	475.988086	13524.643253	16519.5	61.6	2.47	20206	4488	13.
17377.8	86	2.56	28212	176	495.46208	14530.086079	18360.7	93	2.5	30504	2292	
18236.3	93.2	2.37	30573	176	508.826883	15247.867954	19092.4	100.5	2.21	32957	2384	7.
18693.4	142.7	2.94	46816	176	524.398628	15630.033746	20321.6	149.9	2.65	49175	2359	7.
18340.3	117	2.87	38382	176	515.885224	15334.810886	19243	123.9	2.76	40650	2268	6.
16847.3	69.3	2.51	22747	176	491.21389	14086.526879	18346.8	79.1	2.43	25939	3192	9.

Shoreline Change

QR 09. Calculate Shoreline Change

workspace (GDB)

Transect_input_feature_layer

Shoreline_before

Shoreline_after

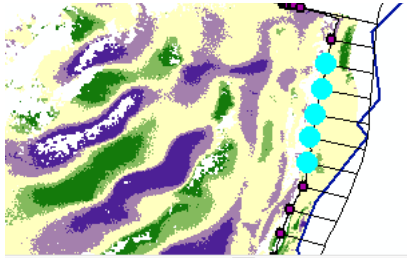
If multiple points, which to choose

QR 09. Calculate Shoreline Change

JALBTCX Quick Response Toolset

(Default projection is NAD83 UTM meters)

This tool calculates the difference from the baseline to the shoreline for two years.

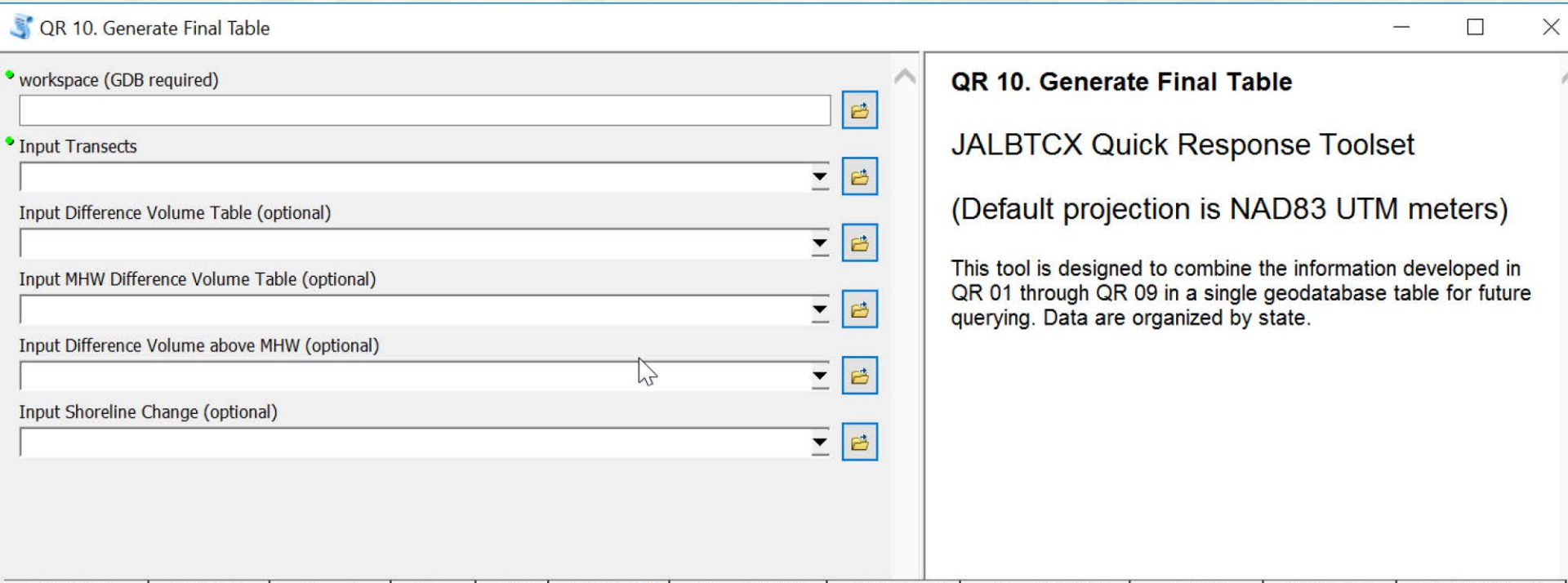


OINT_Y	dMHW	dMHW_Rate	dMHW_Rate_ft
2346.635441	5.179231	1.294808	4.248057
62246.37804	14.058619	3.514655	11.531019
2150.606976	7.559131	1.889783	6.200075
2056.126171	8.642464	2.160616	7.088635
1959.322099	11.343237	2.835809	9.303836

OK | Cancel | Environments | << Hide Help | Tool Help

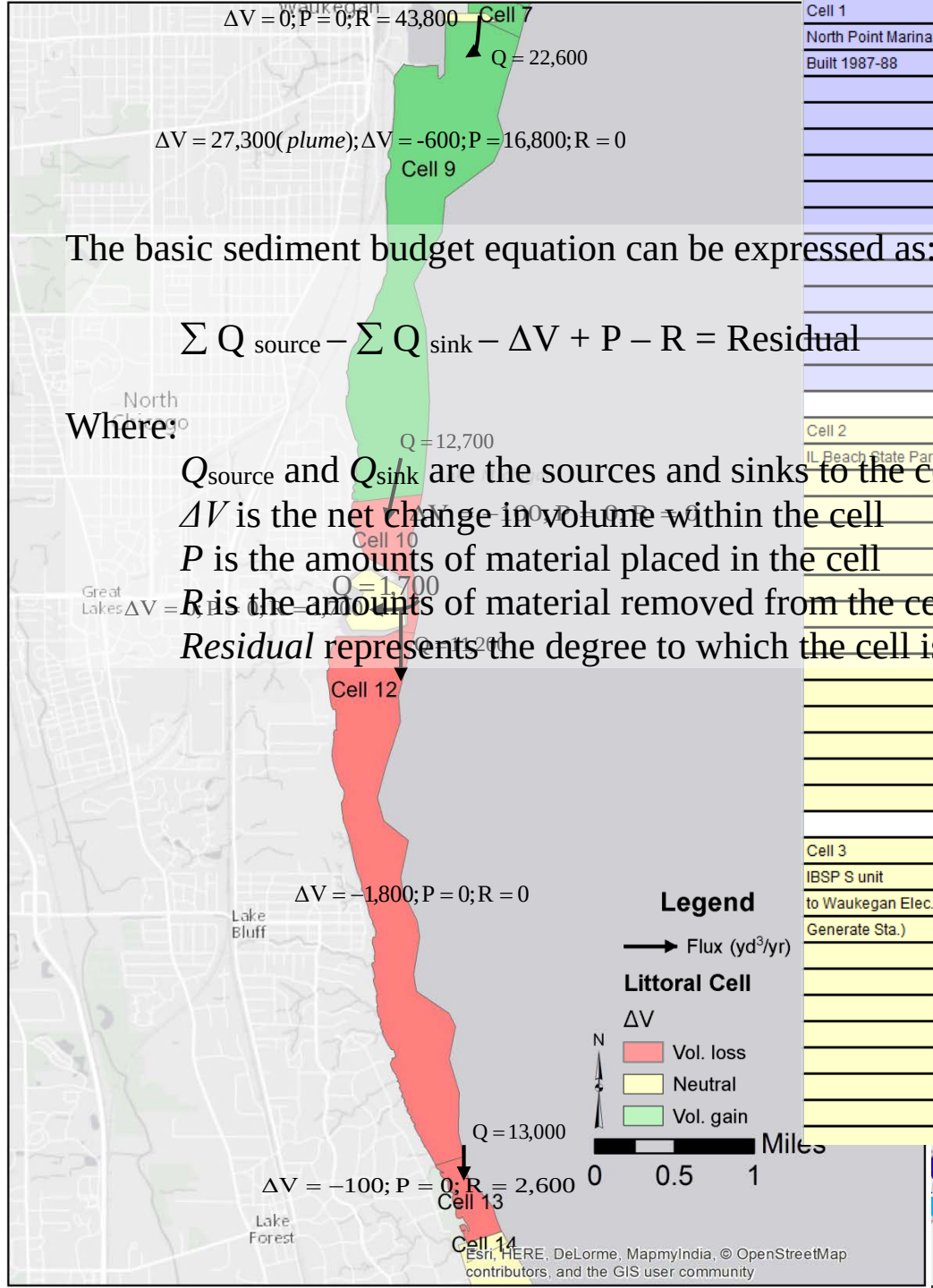
- MHW shoreline (before/after) – must be run for each year –
- Note – other shoreline or lines (bluffs) can be used for the change rates

Lookup Table



Start_Date	End_Date	dDensity	dMean	dVol	dMHW_Vol	dDensityMHW	dMHW_Vol2	dDensityMHW2	dMHW	dMHW_Rate	dMHW_Rate_ft
20080901	20120901	-7.7	-0.32	-2537	-737	-2.3	-724	-2.2	12.374311	3.093578	10.149533
20080901	20120901	9.7	0.14	3183	48	0.1	32	0.1	4.244024	1.061006	3.480991
20080901	20120901	7.8	0.09	2558	1220	3.7	1216	3.7	1.245752	0.311438	1.021778
20080901	20120901	-19.3	-0.16	-6329	-1048	-3.2	-1087	-3.3	0.326217	0.081554	0.267567
20080901	20120901	-63	-0.34	-20662	-3663	-11.2	-3666	-11.2	-15.04843	-3.762107	-12.342872
20080901	20120901	-88	-0.43	-28881	-4703	-14.3	-4745	-14.4	-27.334133	-6.833533	-22.419728
20080901	20120901	-123.8	-0.69	-40614	-5798	-17.6	-5793	-17.7	-34.423458	-8.605865	-28.234464
20080901	20120901	-149.4	-0.85	-49021	-5004	-15.2	-5001	-15.3	-37.682739	-9.420685	-30.907759
20080901	20120901	-166.5	-0.81	-54636	-3326	-10.1	-3356	-10.2	-22.79835	-5.699587	-18.699434
20080901	20120901	-110.8	-0.46	-36350	-2329	-7.1	-2378	-7.2	-11.697398	-2.924349	-9.594322
20080901	20120901	-44.6	-0.19	-14647	28	0	-1	0	-7.259955	-1.814989	-5.954687
20080901	20120901	-43.6	-0.19	-14294	1775	5.4	1791	5.5	-2.242941	-0.560735	-1.839683
20080901	20120901	-83.4	-0.38	-27363	2360	7.1	2359	7.2	-3.024103	-0.756026	-2.480399

OK Cancel Environments... << Hide Help Tool Help



The basic sediment budget equation can be expressed as:

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

Where:

Q_{source} and Q_{sink} are the sources and sinks to the control volume, respectively

ΔV is the net change in volume within the cell

P is the amounts of material placed in the cell

R is the amounts of material removed from the cell (usually dredging)

Residual represents the degree to which the cell is balanced

Cell 1	$Q_{source1}$		
North Point Marina	Q_{sink1}		
Built 1987-88	$Q_{source2}$		
	Q_{sink2}		
	$Q_{source3}$		
	Q_{sink3}		
	$Q_{source-LST1}$	16,000	From north
	$Q_{sink-LST1}$		
	$Q_{source-LST2}$		
	$Q_{sink-LST2}$	20,400	To Cell 2
	Placement	9,400	Sand imported to form feeder beach, Chrzastowski *et al.* 1996, p. 17.
	Removal	9,600	Annual dredge from David Suthard, 8/21/14
	Removal	0	
	DeltaV	-4,600	Compare 1976-2012 bathy
	Residual	0	
Cell 2	$Q_{source1}$		
IL Beach State Park N	Q_{sink1}		
	$Q_{source2}$		
	Q_{sink2}		
	$Q_{source3}$		
	Q_{sink3}		
	$Q_{source-LST1}$	20,400	From north, Cell 1
	$Q_{sink-LST1}$		
	$Q_{source-LST2}$		
	$Q_{sink-LST2}$	188,300	To Cell 3
	Placement	9,600	Bypassed from North Point Marina
	Placement	27,000	Backpassed from Waukegan
	Removal		
	DeltaV	-131,300	Compare 1976-2012 bathy
	Residual	0	
Cell 3	$Q_{source1}$		
IBSP S unit	Q_{sink1}		
to Waukegan Elec.	$Q_{source2}$		
Generate Sta.)	Q_{sink2}		
	$Q_{source3}$		
	Q_{sink3}	52,000	To canal, Cell 4
	$Q_{source-LST1}$	188,300	From Cell 2
	$Q_{sink-LST1}$		
	$Q_{source-LST2}$	0	
	$Q_{sink-LST2}$	167,700	To Canal, Cell 4
	Placement		
	Placement	0	Assume no placement from canal dredging

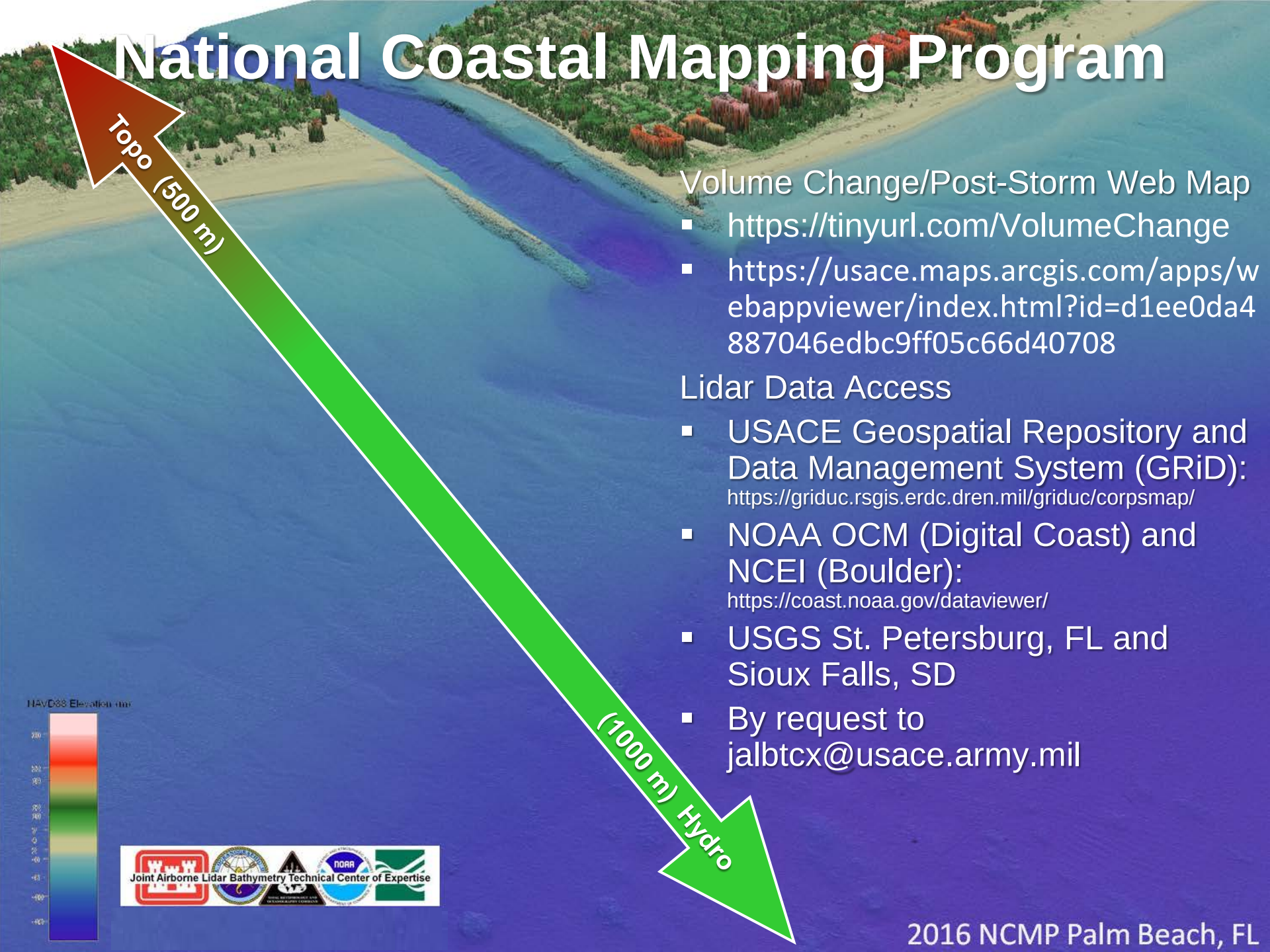
$\sum Q_{source} - \sum Q_{sink} - \Delta V + P - R = Residual$

							Lidar/1976 contour analysis	
PLACEMENT	REMOVAL	SINK	RESIDUAL	CELL_ID	gridcode	VolChange_	DV_v2_CYyr	Q-S (to next cell)
0	0	0	0	Cell WI-1	0	0	0	16000
9400	9600	0	0	Cell 1	-44433	-4,571	-4,571	20,371
36618	0	0	0	Cell 2	-1276312	-131,308	-131,308	188,297
0	0	0	0	Cell 3	200023	20,578	20,578	167,719
0	0	52000	0	Cell 4	0	0	0	115,719
0	0	0	0	Cell 5	0	0	0	115,719
0	0	0	0	Cell 6	303500	31,224	44,187	71,531
0	0	0	0	Cell 7	49529	5,096	5,096	66,436
0	43800	0	0	Cell 8			0	22,636
16800	0	0	0	Cell 9	302000	31,070	27,250	12,185
				Cell 9	-108000	-11,111	-556	12,741
0	0	0	0	Cell 10	-20748	-2,135	-107	12,848
0	0	1668	0	Cell 11	0	0	0	11,180
0	0	0	0	Cell 12	-306068	-35,425	-1,771	12,951
0	2630	0	0	Cell 13	-26147	-2,690	-135	10,456
2630	0	0	0	Cell 14	-7751	-797	0	13,086
0	0	0	0	Cell 15	0	0	0	13,086
0	0	0	0	Cell 16	0	0	0	13,086
12800	12800	0	0	Cell 17	0	0	0	13,086
0	0	0	13000	Cell 18	0	0	0	13,086

Web Map

- Lauren Dunkin
- Coastal and Hydraulics Laboratory

National Coastal Mapping Program



Volume Change/Post-Storm Web Map

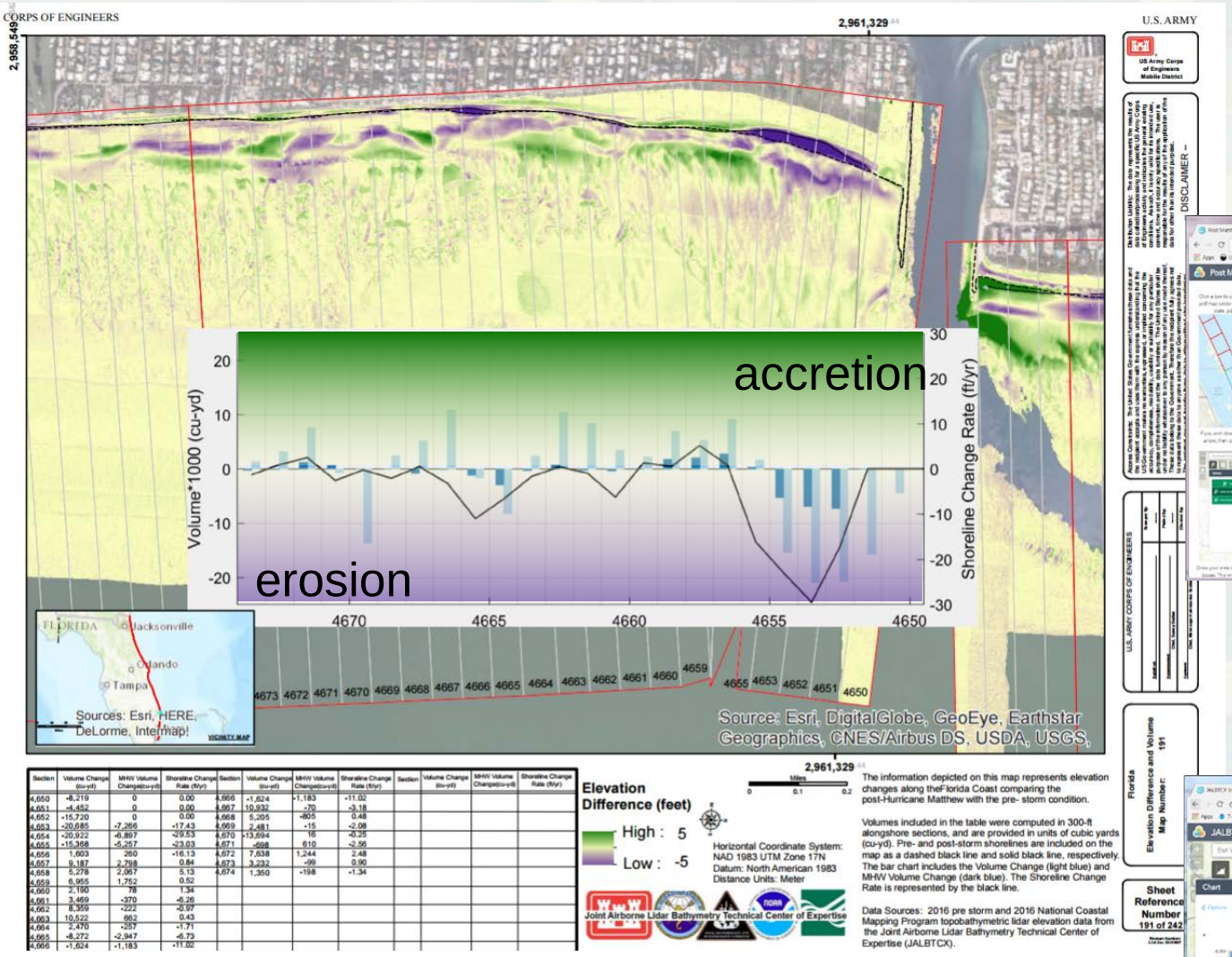
- https://tinyurl.com/VolumeChange
- https://usace.maps.arcgis.com/apps/webappviewer/index.html?id=d1ee0da4887046edbc9ff05c66d40708

Lidar Data Access

- USACE Geospatial Repository and Data Management System (GRiD): https://griduc.rsgis.erdc.dren.mil/griduc/corpsmap/
- NOAA OCM (Digital Coast) and NCEI (Boulder): https://coast.noaa.gov/dataviewer/
- USGS St. Petersburg, FL and Sioux Falls, SD
- By request to jalbtcx@usace.army.mil

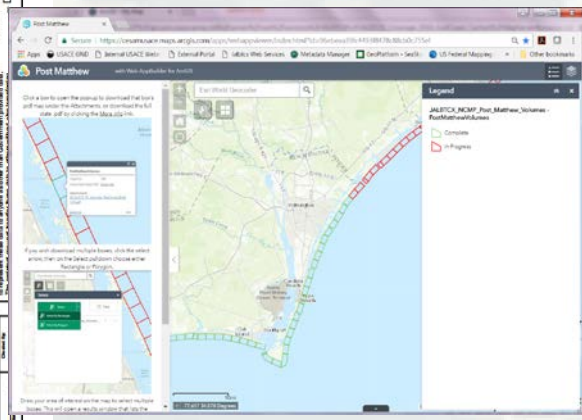
2016 NCMP Palm Beach, FL

Volume and shoreline change

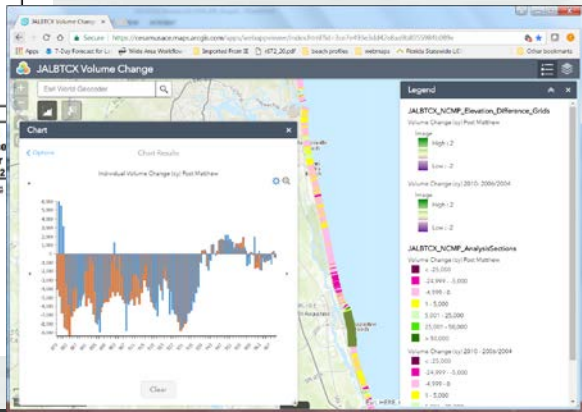


Delivered by:

- AMRDEC
- Web viewer



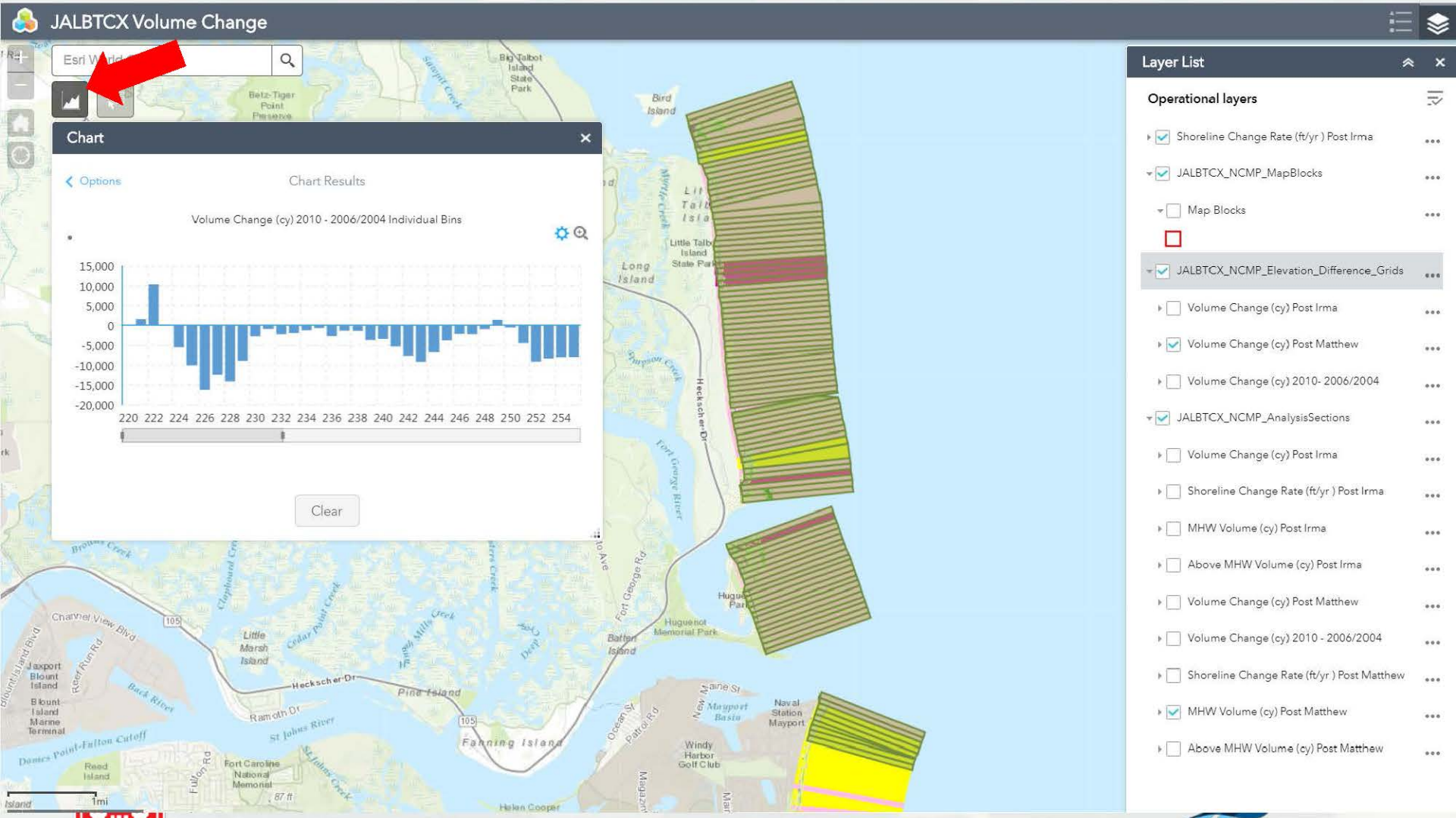
- Interactive web map



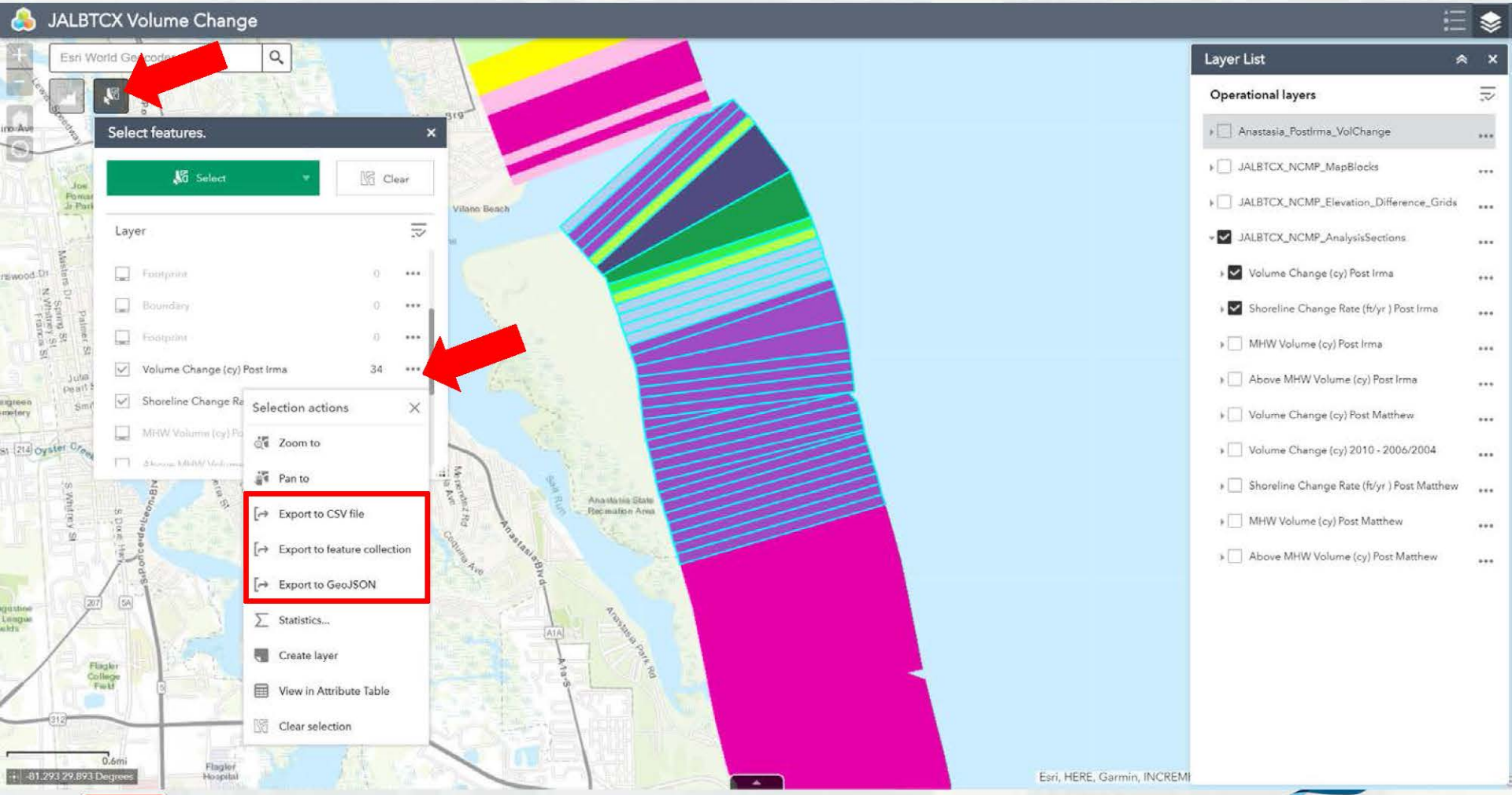
https://tinyurl.com/VolumeChange

https://usace.maps.arcgis.com/apps/webappviewer/index.html?id=d1ee0da4887046edbc9ff05c66d40708

Web Map - Volume and Shoreline Change

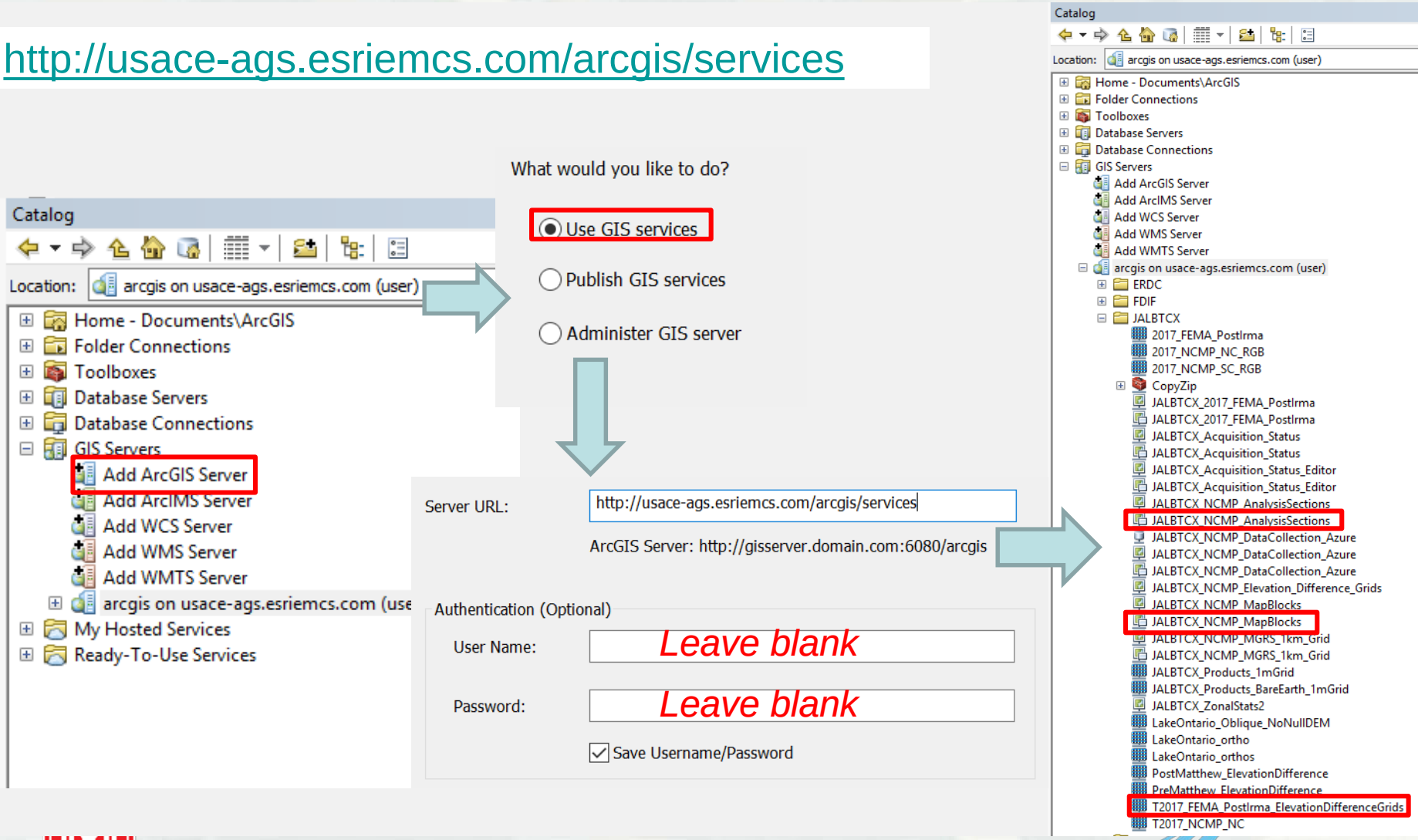


Web Map - Volume and Shoreline Change

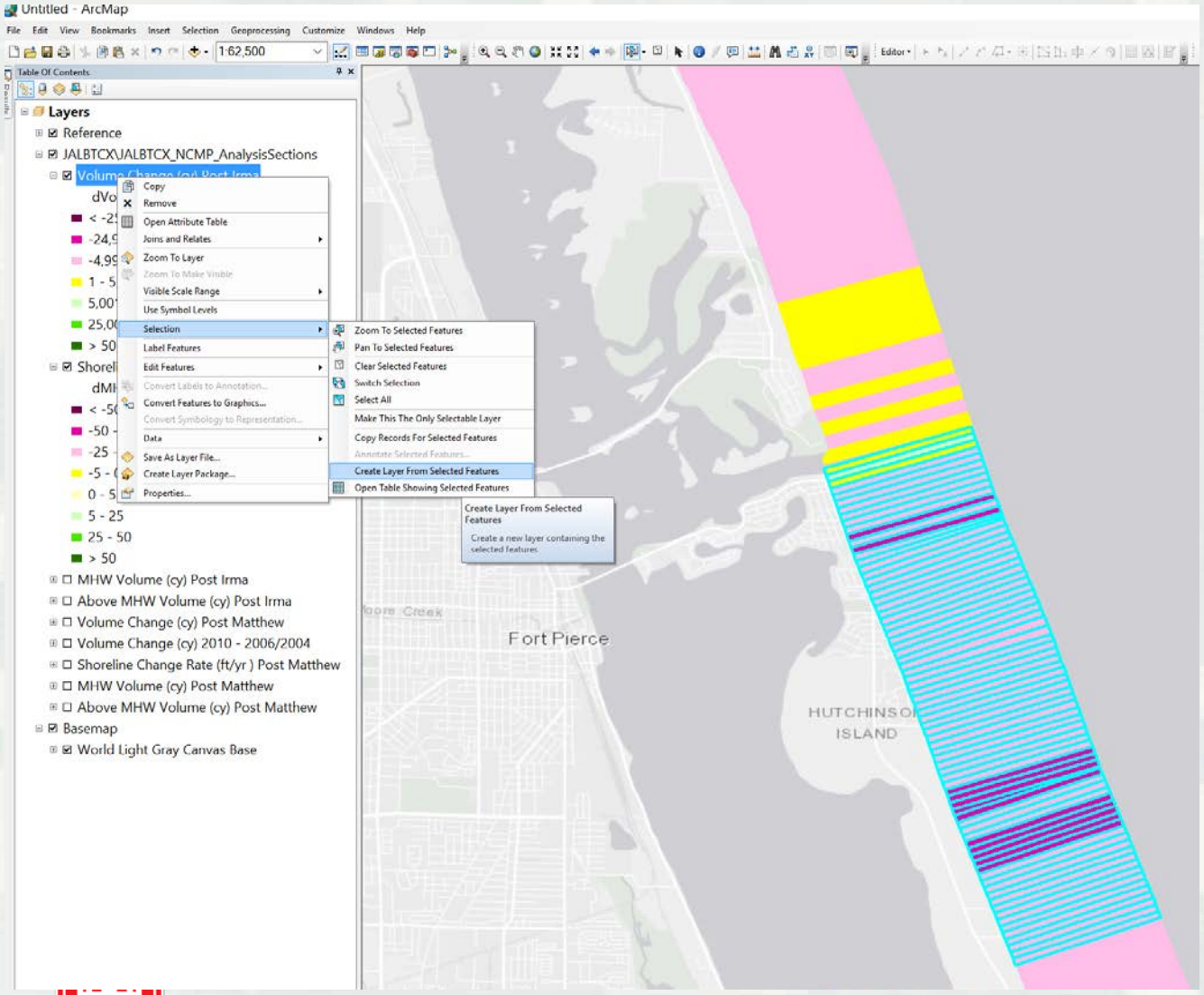


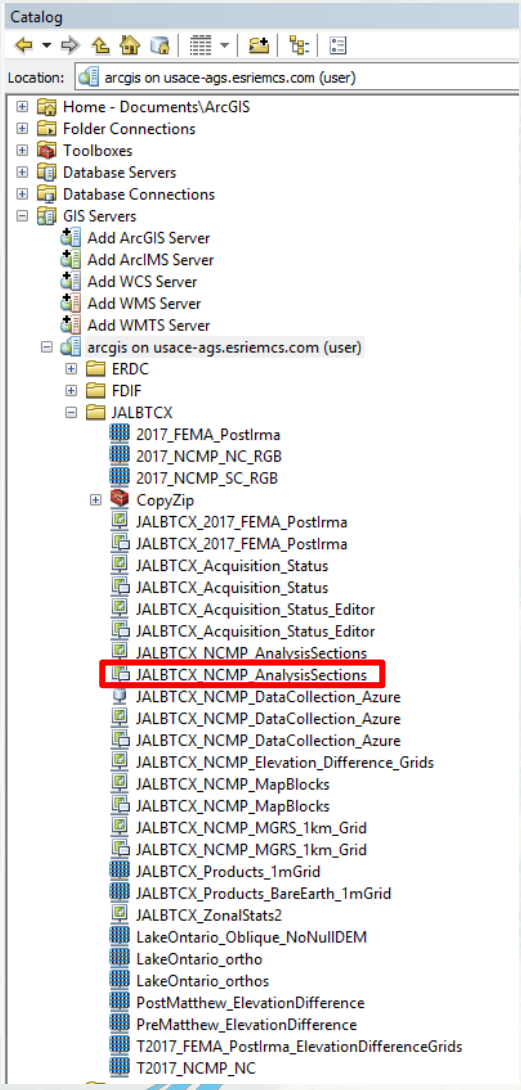
Accessing through ArcGIS server

http://usace-ags.esriemcs.com/arcgis/services



Accessing through ArcGIS server





Web Map - Geomorphic Metrics

Dune Crest

Beach Width