The ArcGIS™ Coastal Sediment Analyst (CSA)

A Prototype Decision Support Tool for Regional Sediment Management (RSM) Program

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Los Angeles District

Pilot CSA

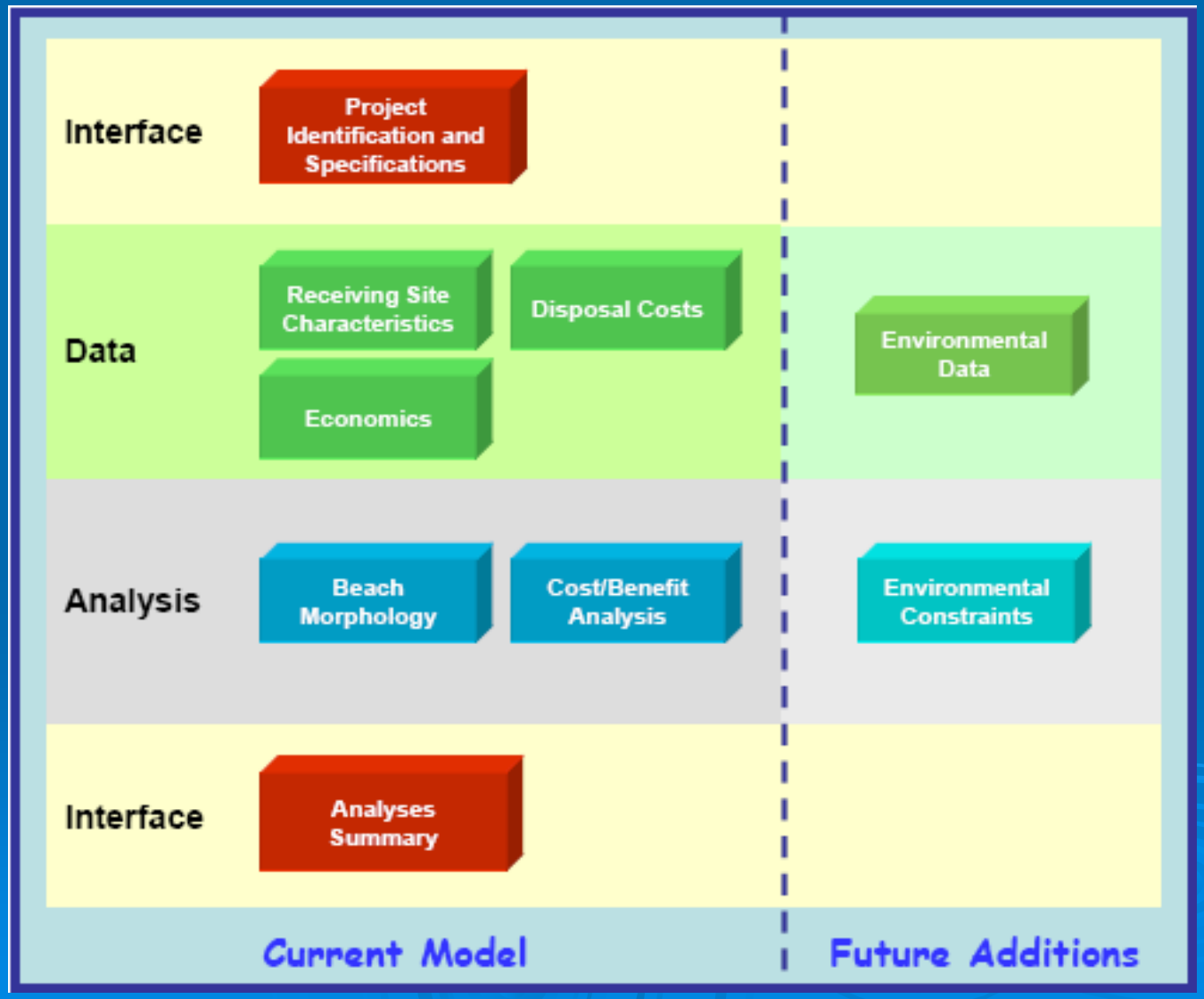
A GIS-based management support tool for decision makers to evaluate future dredging and disposal options along the coast.

Tool looks at recreation benefits and costs of transporting sediment to various locations.

Economic Evaluation

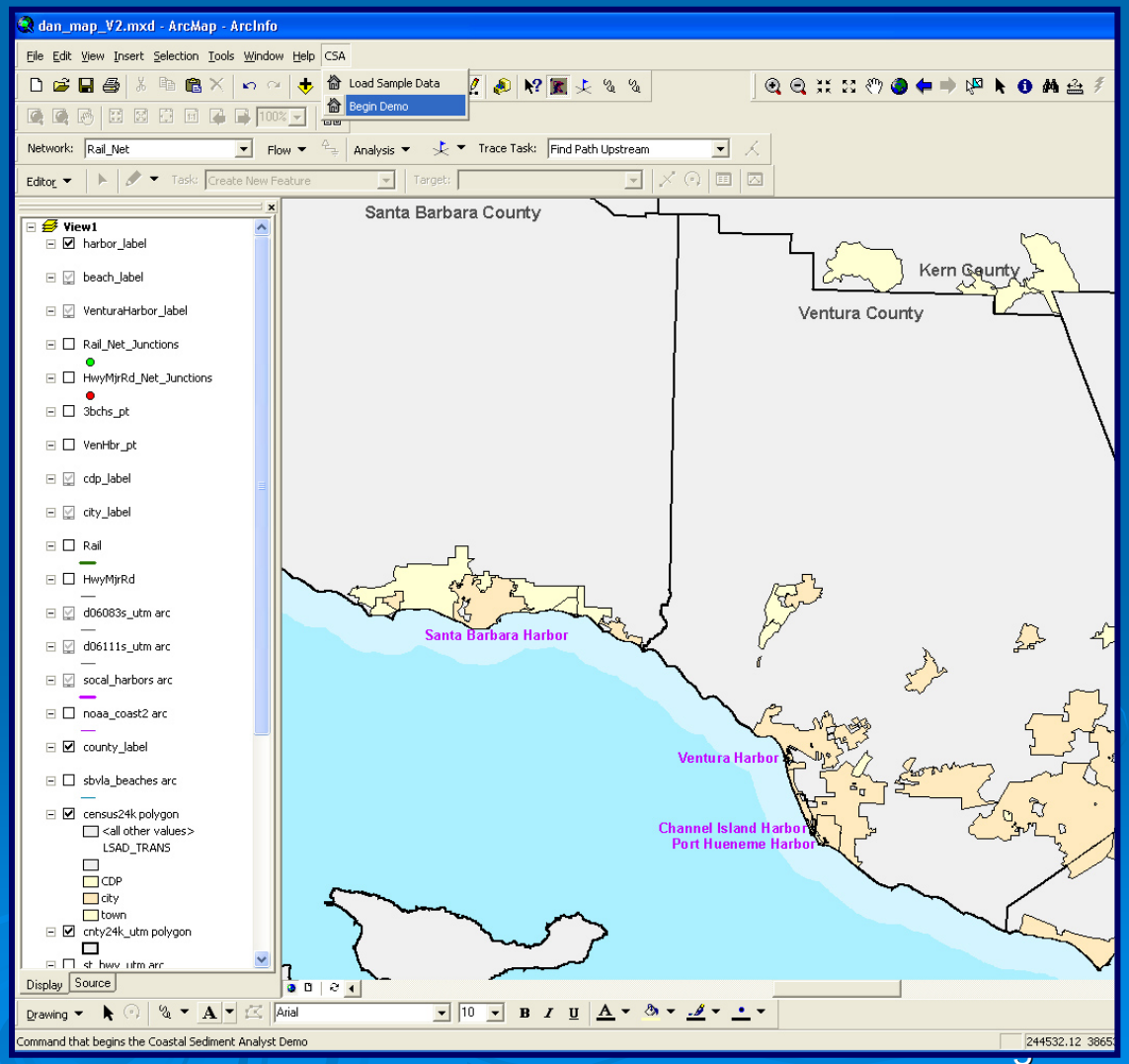
- Benefits of Nourishment are not well understood.
- Created a benefit function for California beaches using:
  - Weather
  - Water quality
  - Beach width and quality
  - Overcrowding
  - Beach facilities and services
  - Availability of substitutes
- Comes up with a daily per person value for the beach as well as calculating the increase in value for a nourishment project.
- Also looks at cost of transporting sediment from a source to a receiver site using different delivery methods.

Pilot CSA

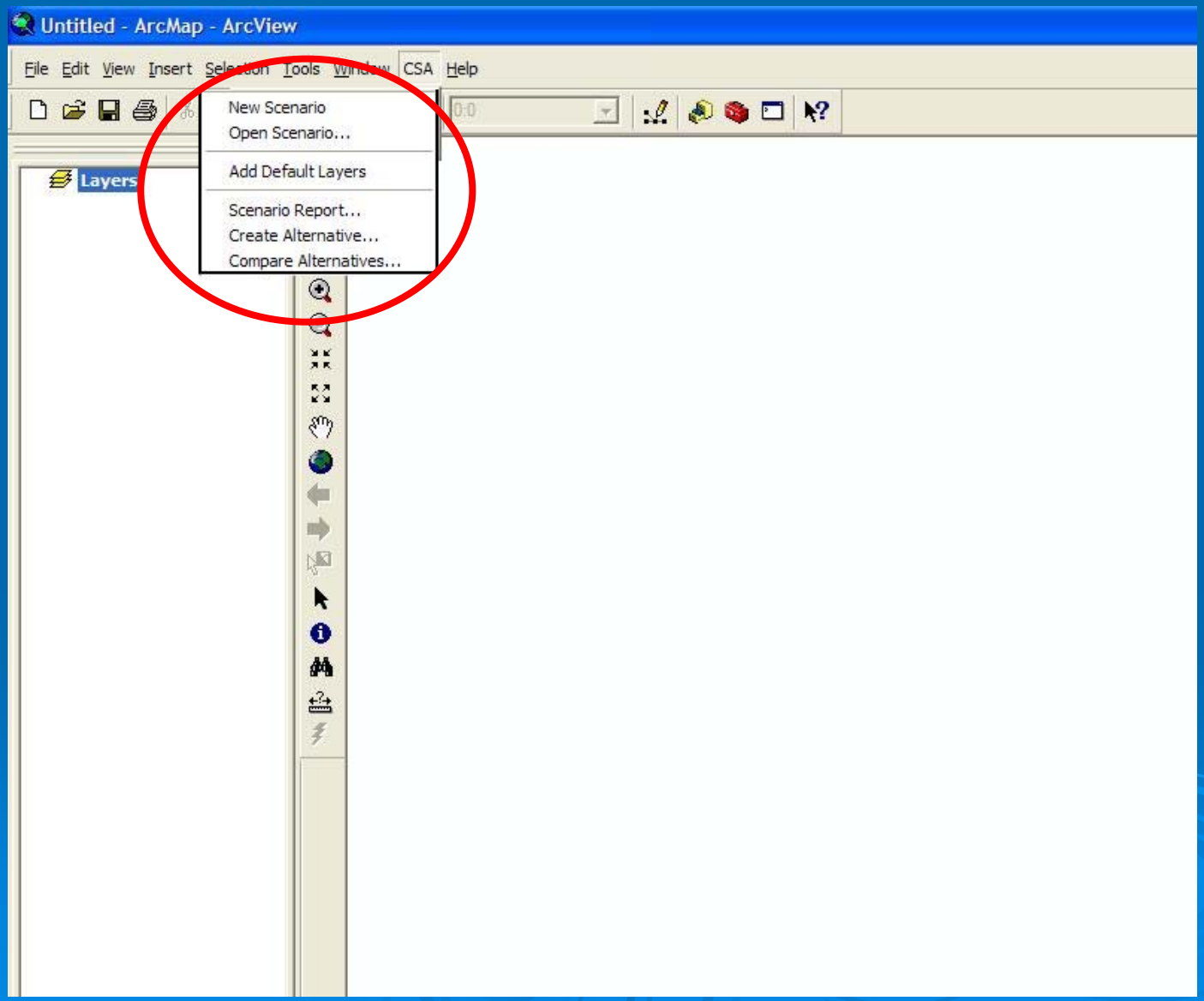

Interface
Project Identification and Specifications
Data
Receiving Site Characteristics
Disposal Costs
Economics
Environmental Data
Analysis
Beach Morphology
Cost/Benefit Analysis
Environmental Constraints
Interface
Analyses Summary
Current Model
Future Additions

Load Geospatial Data

- Geospatial data layers loaded when CSA tool is invoked



Input Scenario



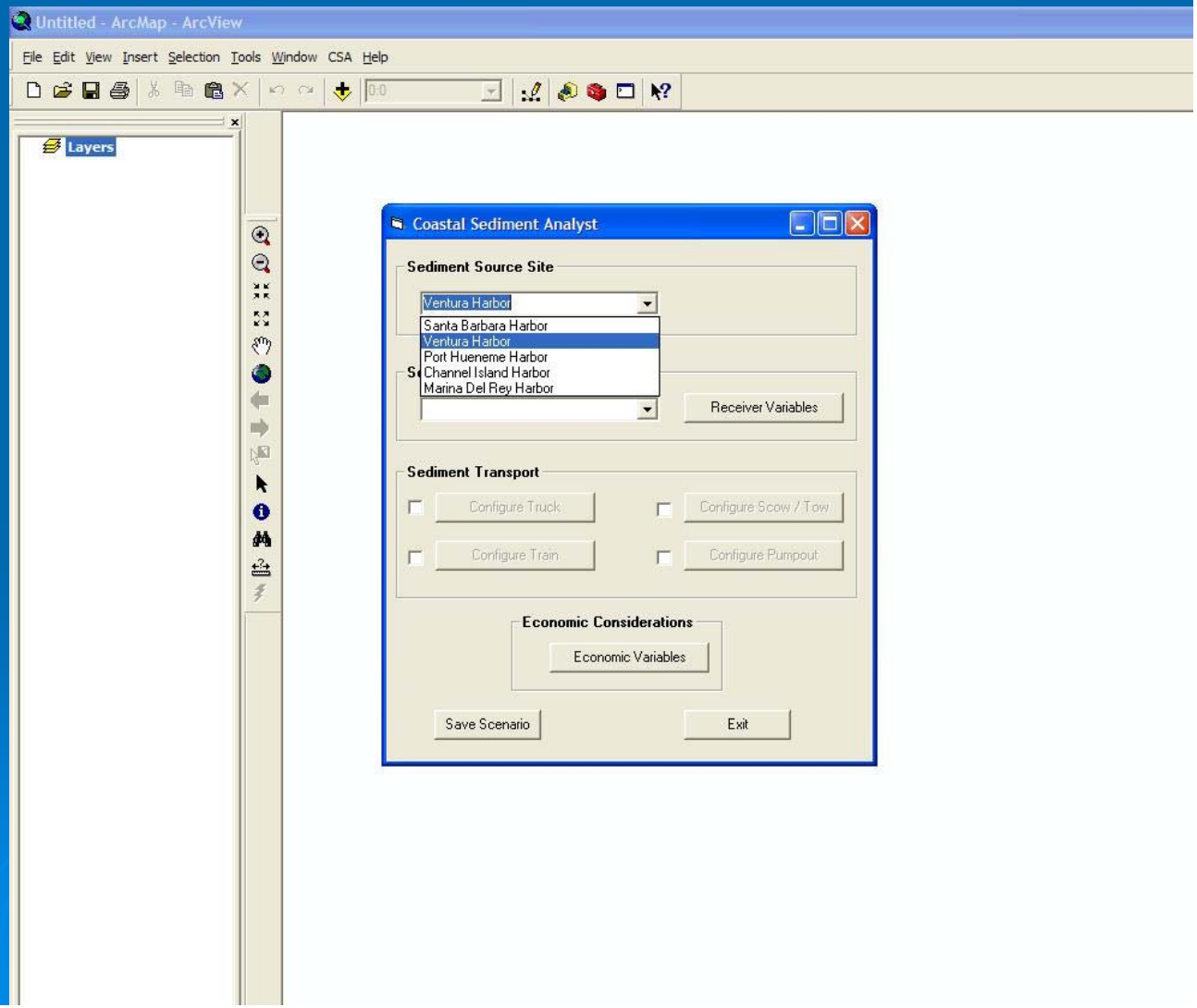
Pilot CSA

The CSA has a graphic interface with the following inputs:

- **Sediment Source**
- Receiver Beach
- Sediment Quantity
- Transportation Mode

Select Sediment Source

- Can select from 4 sources :
  - Ventura Harbor
  - Santa Barbara Harbor
  - Channel Islands Harbor
  - Matilija Dam



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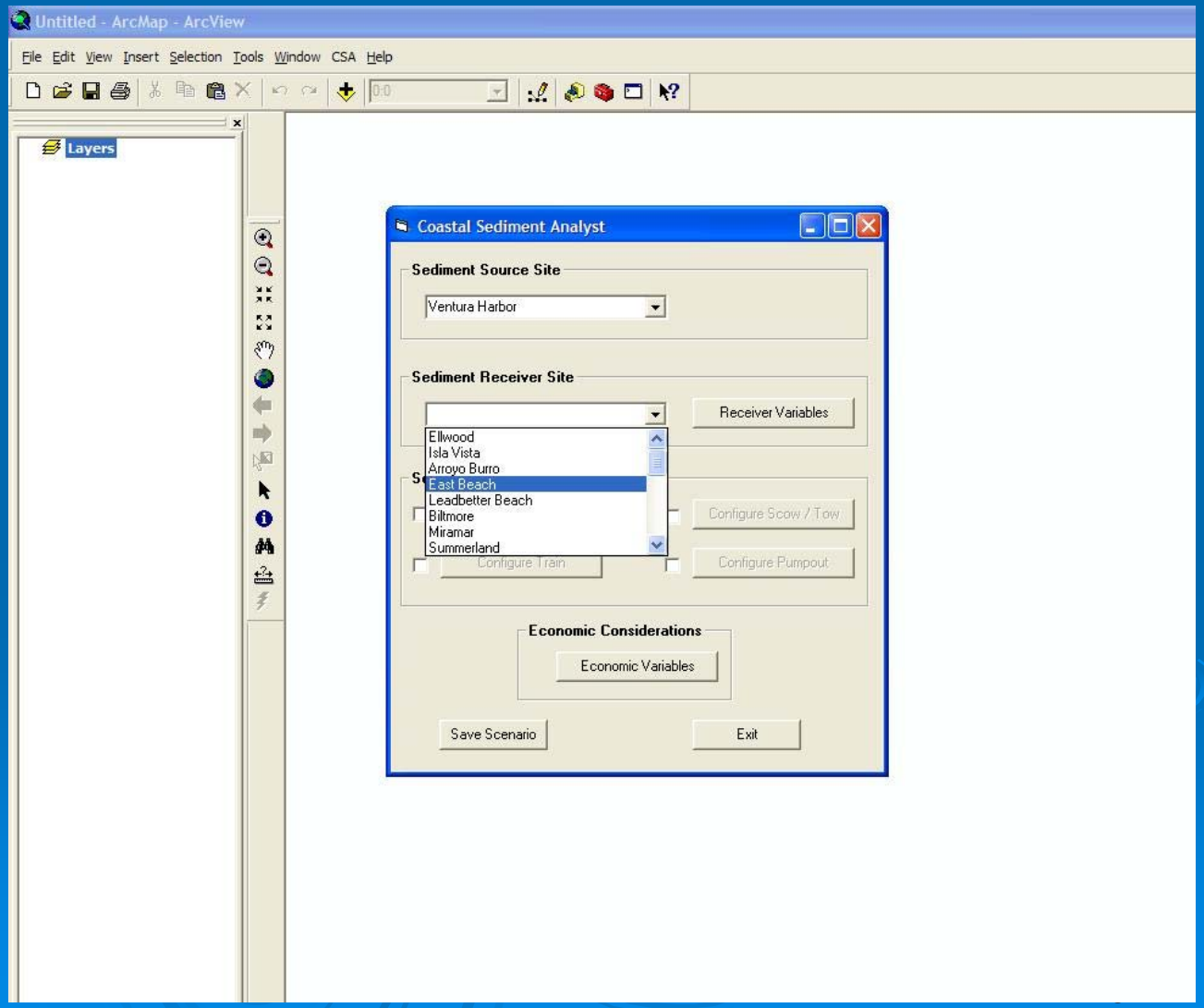
- Sediment Source
- **Receiver Beach**
- Sediment Quantity
- Transportation Mode

Select Receiver Beach

- Can select from 8 locations :
  - El Capitan
  - Goleta
  - Carpinteria
  - La Conchita
  - Oil Piers
  - Rincon
  - Surfer's Point
  - Pierpont
  - Oxnard Shores



Pilot CSA

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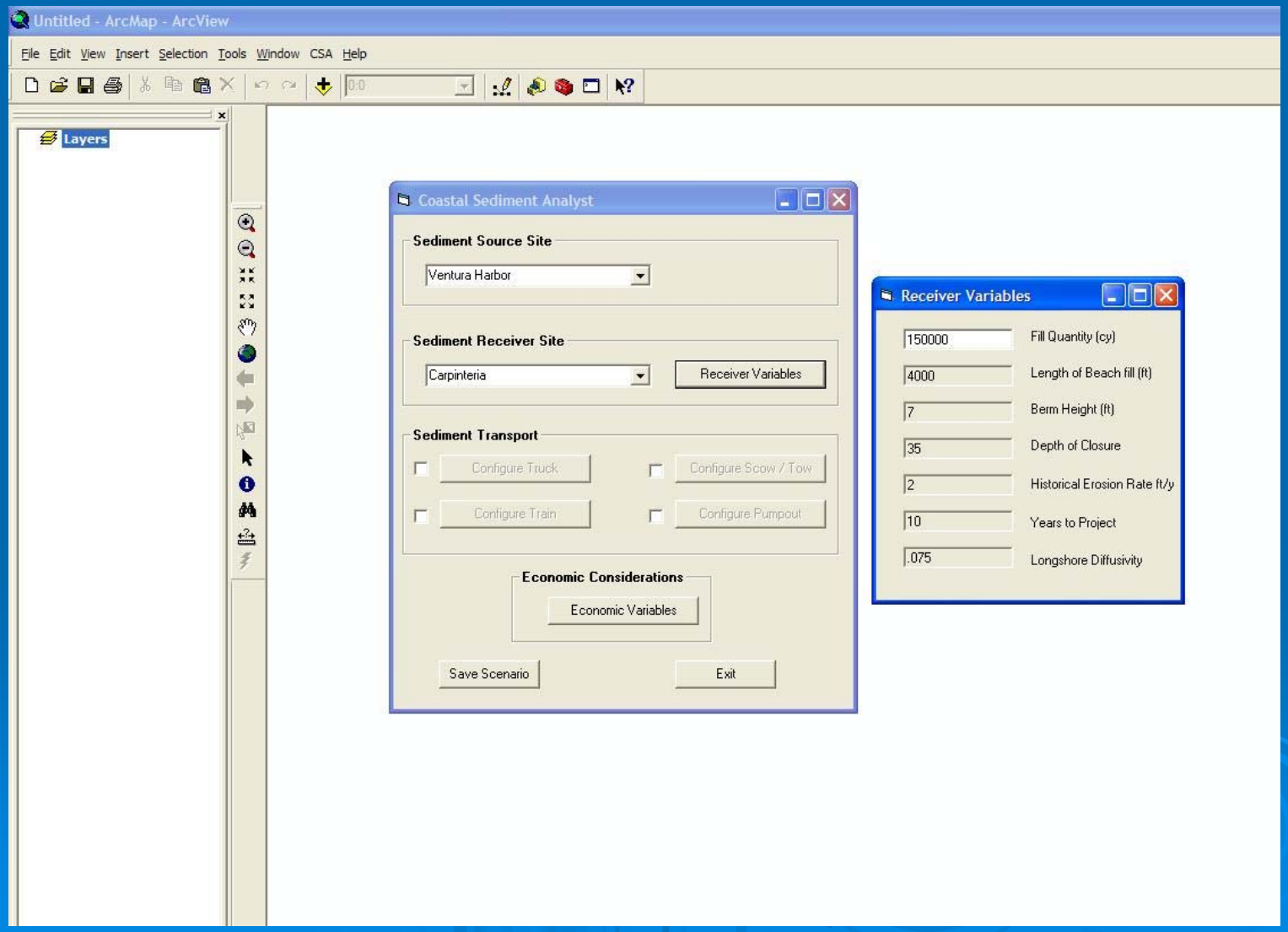
- Sediment Source
- Receiver Beach
- **Sediment Quantity**
- Transportation Mode

Sediment Quantity

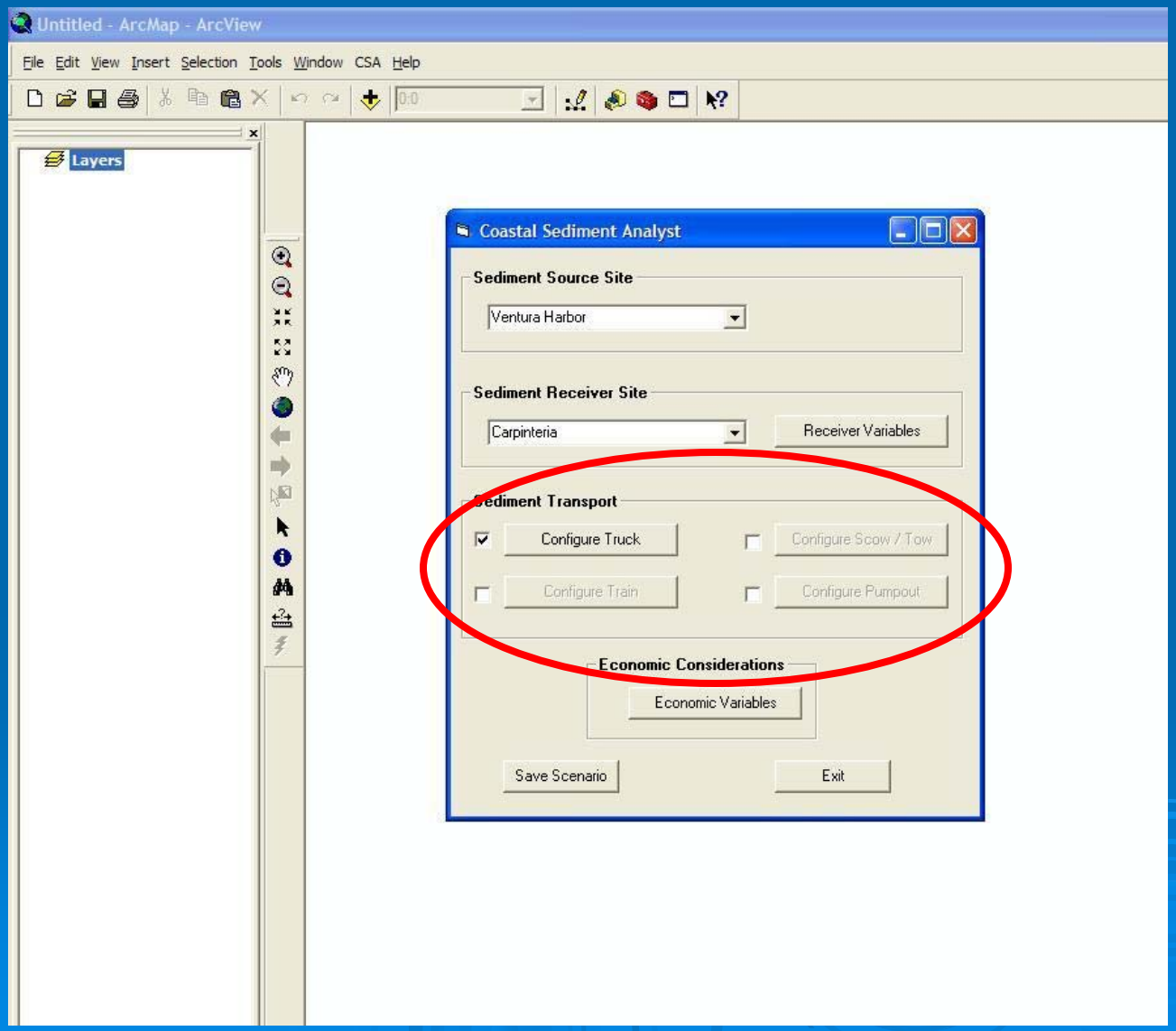


Pilot CSA

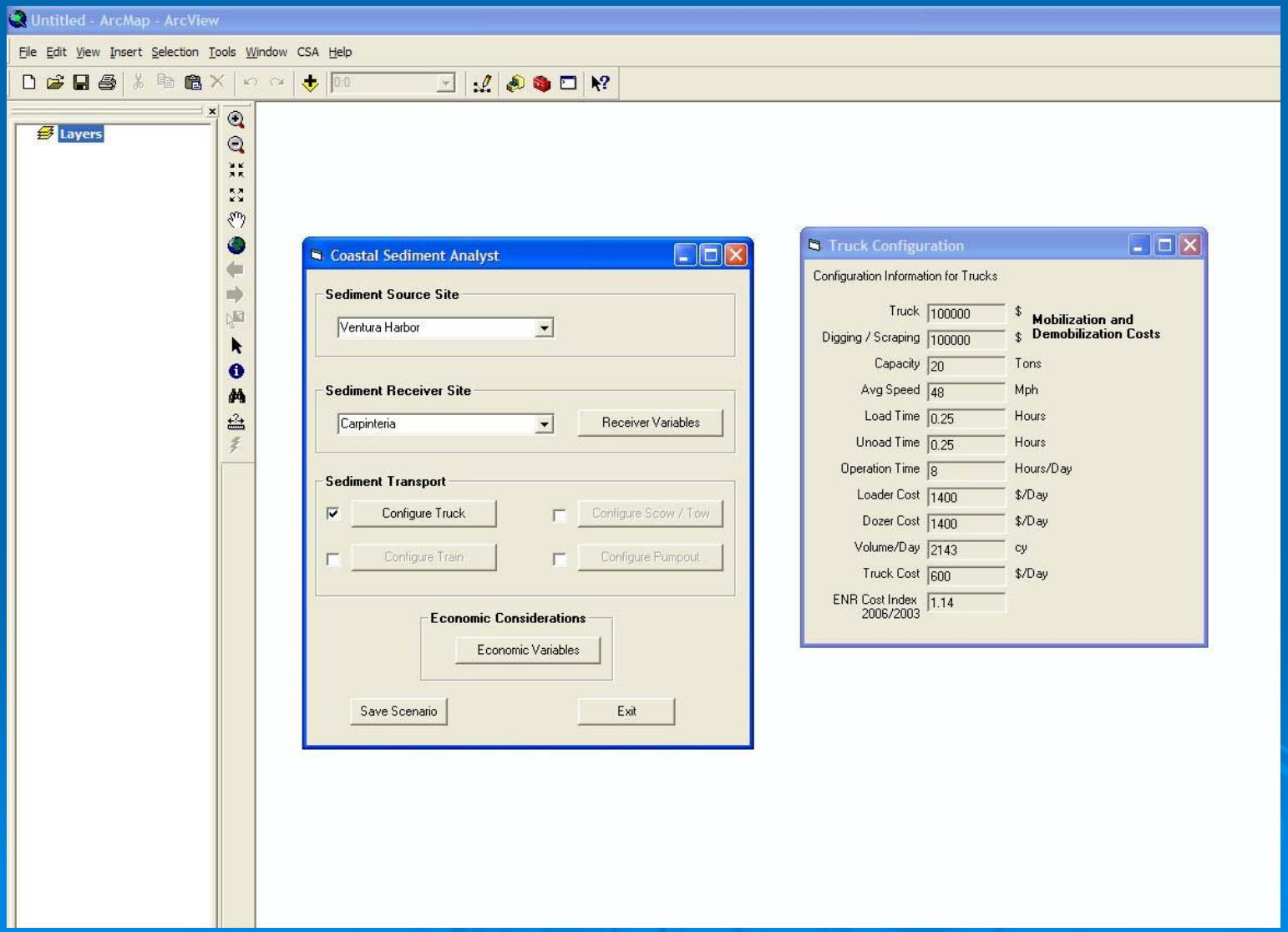
The CSA has a graphic interface will the following inputs:

- Sediment Source
- Receiver Beach
- Sediment Quantity
- **Transportation Mode**

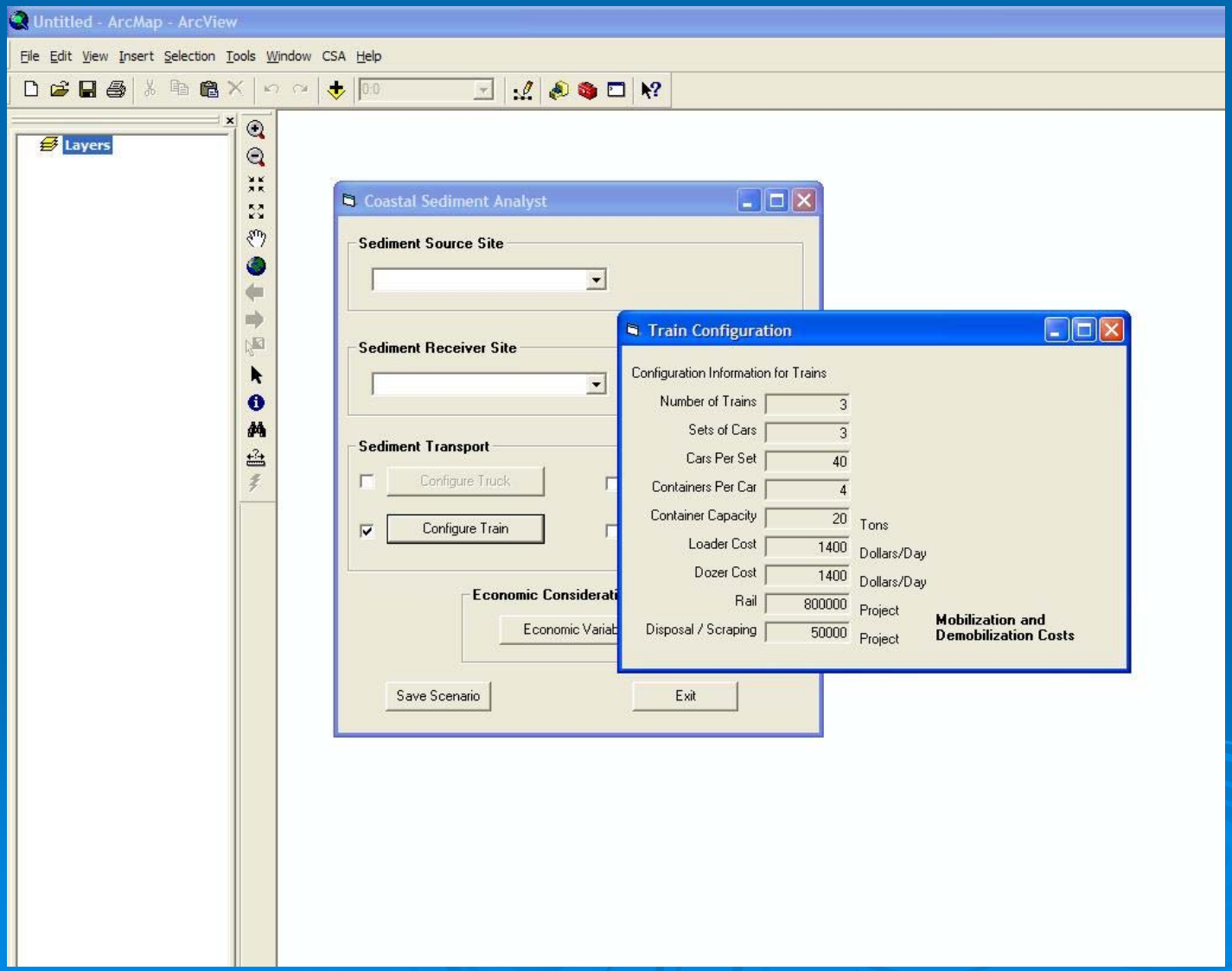
Select Transportation Methods



Trucking


Untitled - ArcMap - ArcView
File Edit View Insert Selection Tools Window CSA Help
Layers
Coastal Sediment Analyst
Sediment Source Site
Ventura Harbor
Sediment Receiver Site
Carpinteria
Receiver Variables
Sediment Transport
Configure Truck
Configure Scow / Tow
Configure Train
Configure Pumpout
Economic Considerations
Economic Variables
Save Scenario
Exit
Truck Configuration
Configuration Information for Trucks
Truck 100000 $
Digging / Scraping 100000 $
Mobilization and Demobilization Costs
Capacity 20 Tons
Avg Speed 48 Mph
Load Time 0.25 Hours
Unoad Time 0.25 Hours
Operation Time 8 Hours/Day
Loader Cost 1400 $/Day
Dozer Cost 1400 $/Day
Volume/Day 2143 cy
Truck Cost 600 $/Day
ENR Cost Index 2006/2003 1.14

Train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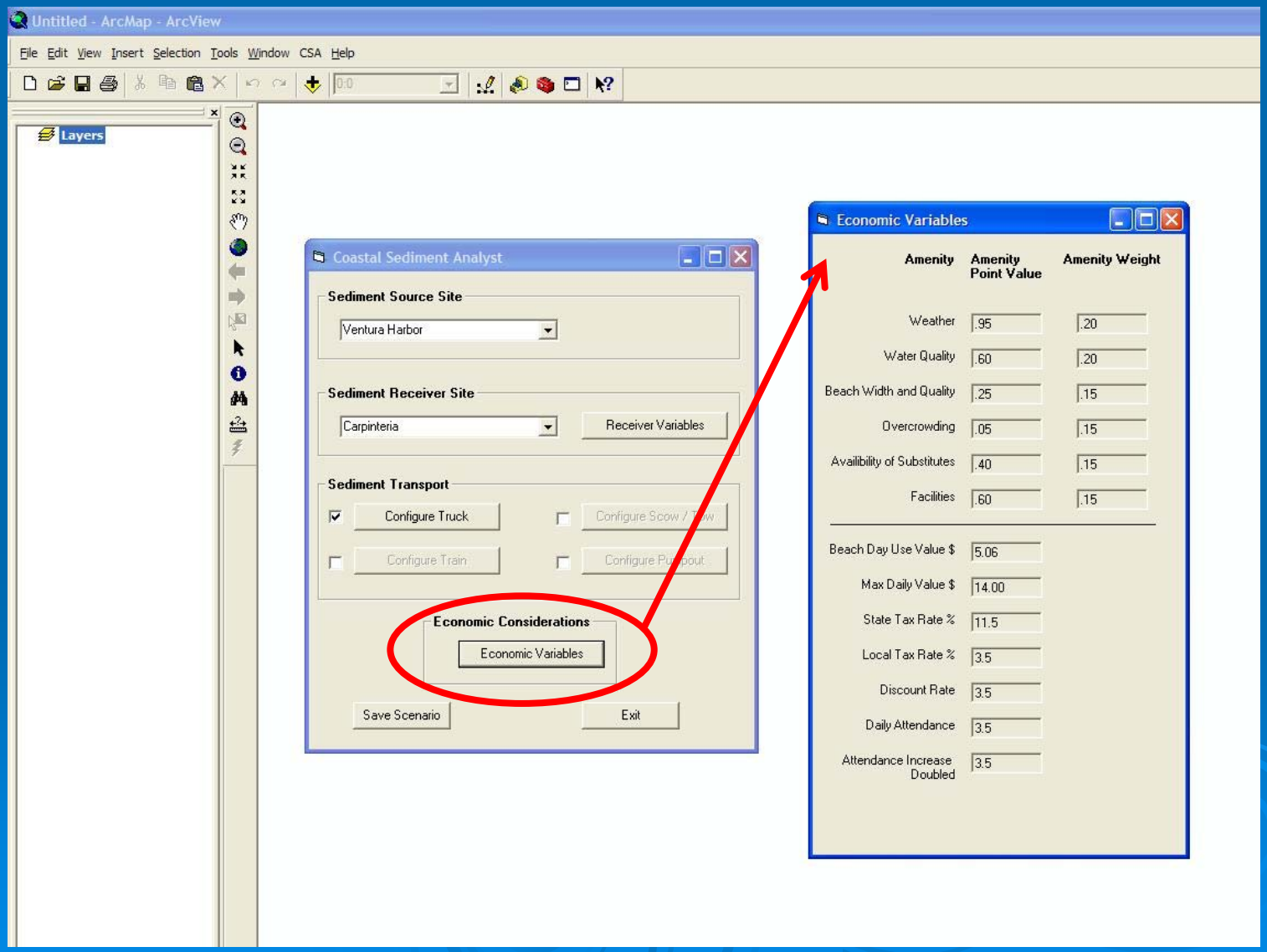
Layers
Coastal Sediment Analyst
Sediment Source Site
Sediment Receiver Site
Sediment Transport
Configure Truck
Configure Train
Economic Considerati
Economic Variab
Save Scenario
Exit
Train Configuration
Configuration Information for Trains
Number of Trains 3
Sets of Cars 3
Cars Per Set 40
Containers Per Car 4
Container Capacity 20 Tons
Loader Cost 1400 Dollars/Day
Dozer Cost 1400 Dollars/Day
Rail 800000 Project
Disposal / Scraping 50000 Project
Mobilization and Demobilization Costs

Economic Benefits

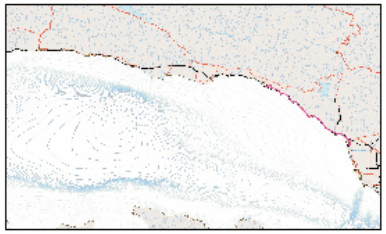


Scenario Report

Scenario ID:
500,000cy to Carpinteria State Beach from Ventura Harbor by Truck

Source and Receiver Locations

Receiver Beach:	Carpinteria State Beach
County:	Santa Barbara
Littoral Cell:	Santa Barbara
Sediment Source:	Ventura Harbor
County:	Santa Barbara
Littoral Cell:	Santa Barbara



Receiver Beach Information

Existing Beach Width[1] (ft):	98
Beach Fill Length (ft):	3,400
Berm Fill Volume (cy):	500,000
Increased Beach Width, Year 0 (ft):	88

[1] *Based on site observation in March 2006.*

Sediment Compatibility

Receiver D50 (mm):	0.195
Source D50 (mm):	0.xxx
Receiver % Fines:	5
Source % Fines:	3

Costs

Source to Receiver (miles):	20.4
Beach Nourishment Costs*:	$8,051,240

** Costs do not include mobilization and demobilization of equipment. These costs are added in once a Scenario is added to an Alternative.*

Benefits

Day Use Value:	$10.72
Attendance (Annual):	1,600,000
Existing Recreational Value:	$114,823,252
Increase in Recreational Value:	$13,032,960

Environmental Considerations

Reefs:	Yes
Kelp Beds:	Yes
Eelgrass/ Surf Grass:	Unk
Grunion:	No
Gull/Tern:	Yes
Shorebirds:	Yes
Diving Birds:	No
Fish:	Yes
Marine Mammals:	Yes
Transit Trips:	35,000

Scenario ID:
500,000cy to Carpinteria State Beach from Ventura Harbor by Truck

Beach Width(ft):	98
Beach Length (ft):	3,400
Berm Height (ft):	10
Depth of Closure (ft):	-35
Historical Erosion Rate (ft/yr):	9
Longshore Diffusivity (sqft/sec):	0.075

Beach Fill Location:	Western Portion
Beach Fill Length (ft):	3,400
Volume (cy):	500,000

Increased Beach Width (ft) from Berm Placement:

Year0	Year1	Year2	Year3	Year4	Year5	Year6	Year7	Year8	Year9	Year10
88	46	35	26	17	8	0	0	0	0	0

Costs

Miles Source to Receiver:	20.4
Dredge Costs (cy):	$4.00
Sorting Costs (cy):	-
Speed of Truck (mph):	30
Truck Capacity (tons):	20
Truck Capacity (cy):	14.3
Trcuk Cost (day):	$680
Loader Costs (day):	$1,600
Dozer Costs (day):	$1,600
Load/Unload Time (hr):	0.5
Targeted Haulage per Day (tons):	6,000
Targeted Haulage per Day (cy):	4,286
Hours of Operation per Day:	8
Truck Trips per Day:	4.4
Number of Trucks (3,000tons/day):	69
Construction Period (days):	117
Beach Nourishment Costs*:	**$8,051,240**

**Costs do not include mobilization and demobilization of equipment. These costs are added in once a Scenario is adedd to an Alternative.*

Benefits

Amenity	*Weighted Value*
Weather:	96.8%
Water Quality:	99.0%
Beach Width & Quality:	92.6%
Overcrowding:	91.4%
Facilities/Services:	96.7%
Availability of Alternatives:	97.6%
Total Index Value:	76.6%

Day Use Value ($):	$10.72
Attendance (annual):	1,600,000
Existing Recreational Value ($):	$18,266,752
Existing Spending in CA ($):	$49,900,000
Existing Local Spending ($):	$39,920,000
Existing Taxes in CA ($):	$5,738,500
Existing Local Taxes ($):	$998,000

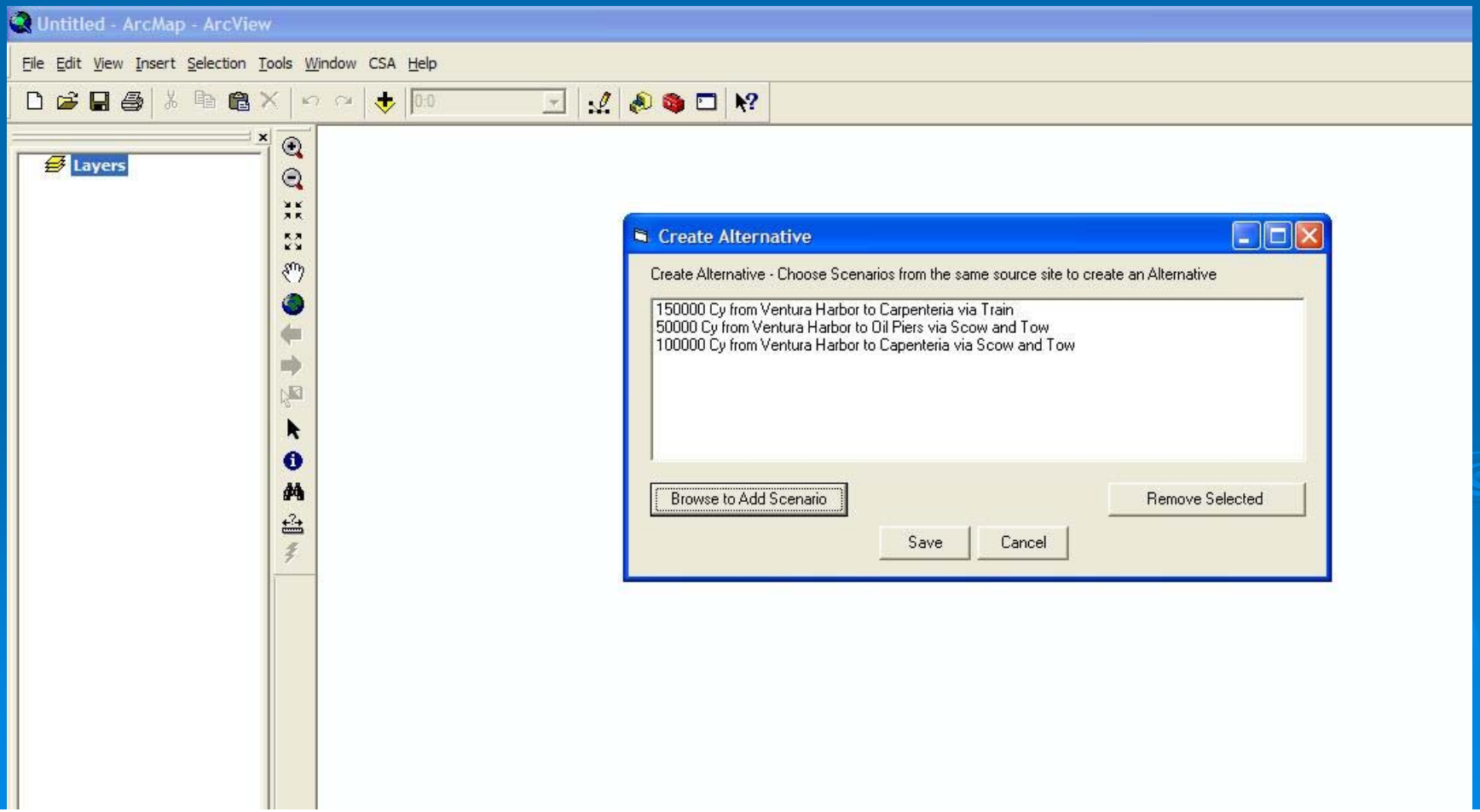
Existing Total Recreational Value $114,823,252

Increased S/L	*Spending*	*S/L Taxes*	*Rec Value*
Year0	$1,660,865	$191,000	$3,214,829
Year1	$826,838	$95,086	$1,971,008
Year2	$599,158	$68,903	$1,463,928
Year3	$423,894	$48,748	$1,058308
Year4	$263,963	$30,356	$674,376
Year5	$118,303	$13,605	$309,793
Year6	$0	$0	$0
Year7	$0	$0	$0
Year8	$0	$0	$0
Year9	$0	$0	$0
Year10	$0	$0	$0
Total	$3,893,021	$447,697	$8,692,242

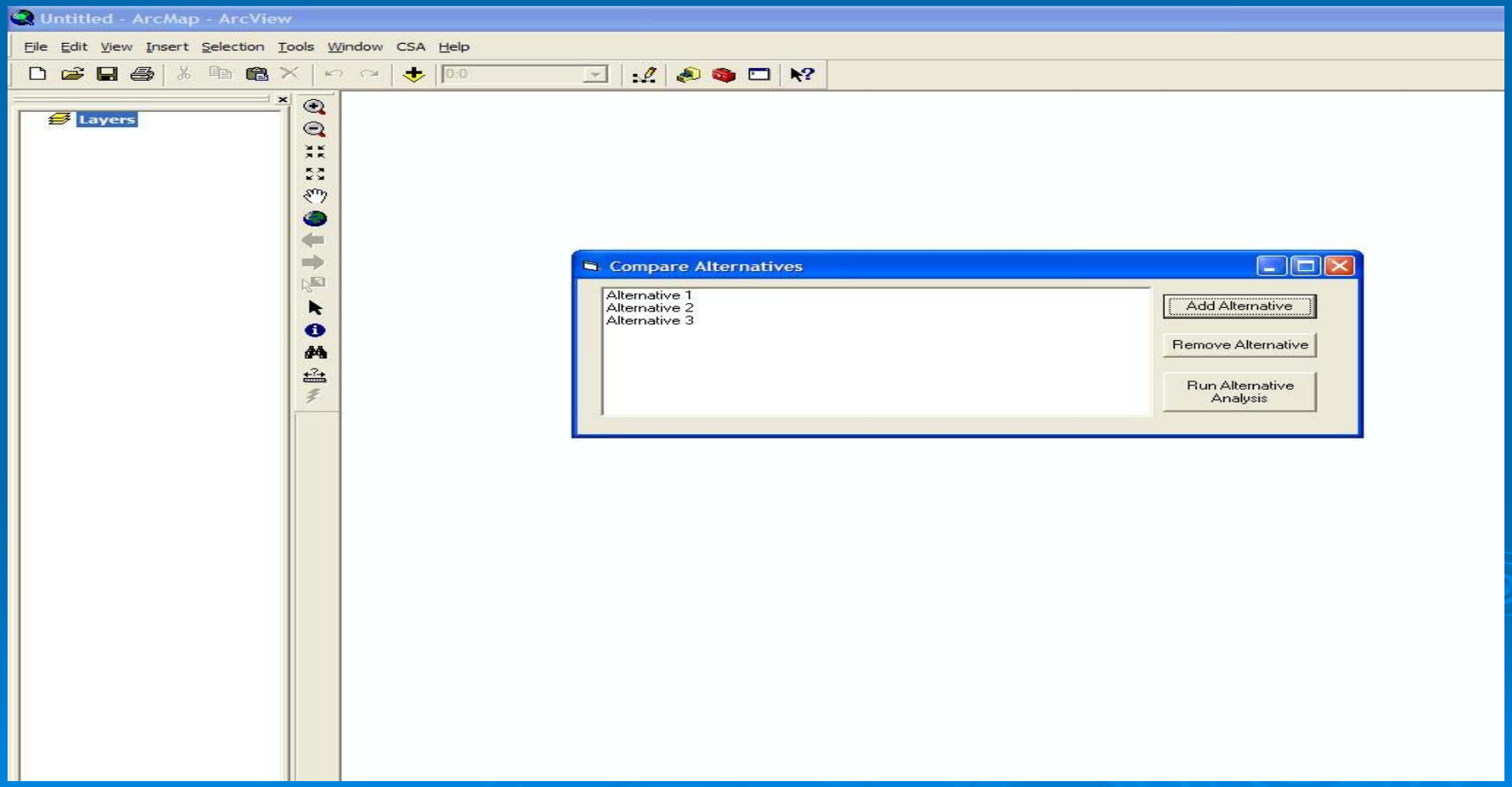
Increase in Recreational Value: $13,032,960

Alternatives

- Combine various scenarios (with the same sediment source) to form alternatives.



Alternative Comparison



Alternative Comparison

Alternative Comparison

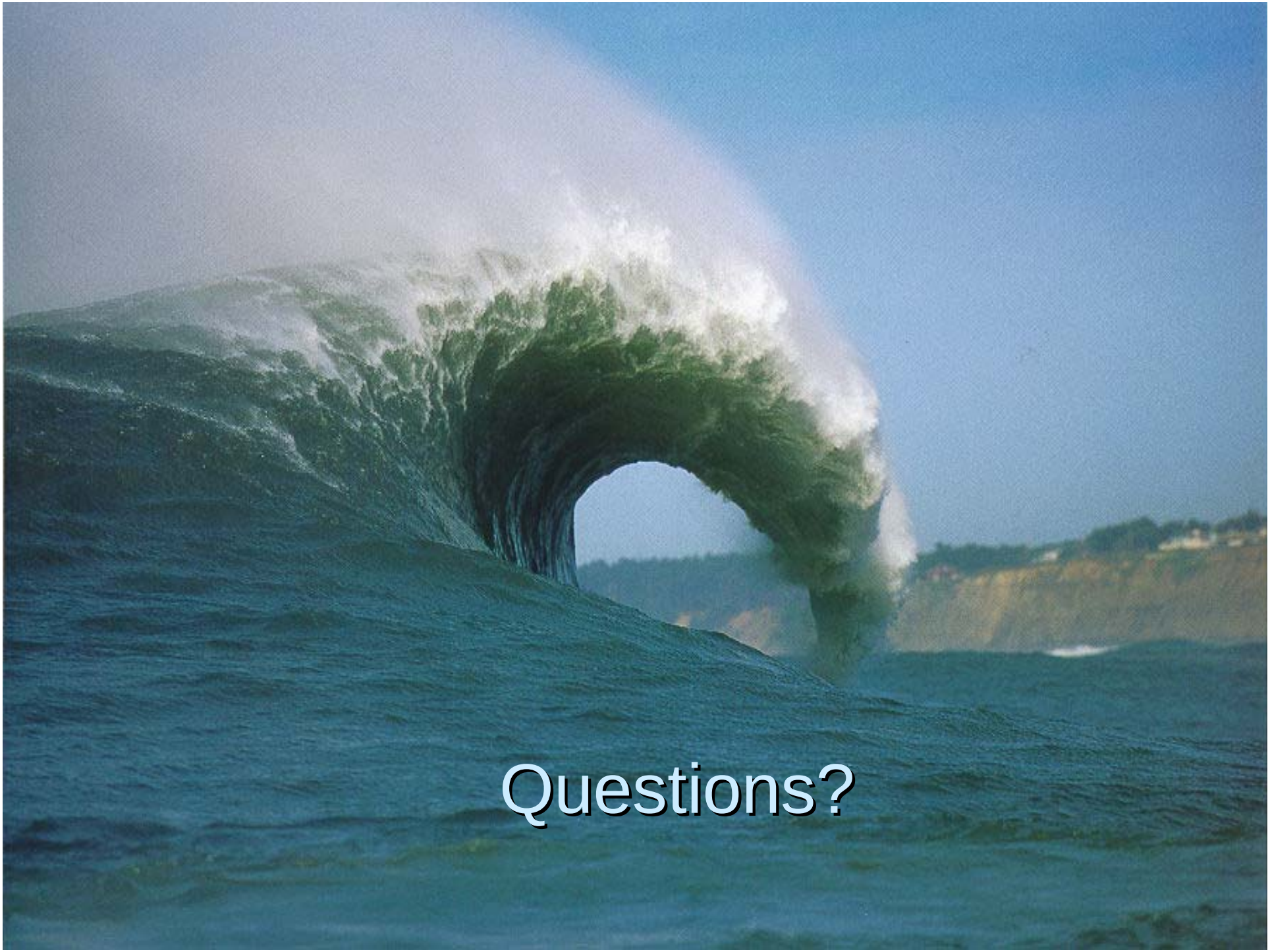
Alternative	Total Costs	Total Benefits	Benefit/Cost Ratio	Environmental Factors
CarpinteriaTruck500	$8,111,240	$13,032,960	1.61	7
CarpinteriaScow500	$3,127,400	$4,884,195	1.56	7
CarpinteriaRail500	$3,480,480	$13,032,960	3.74	7
PierpontPipe500	$2,710,000	$114,914	0.04	2
PierpontScow500	$2,602,200	$114,914	0.04	2
Carp200Oil200Rincon100Scow	$3,766,200	$1,679,368	0.45	15

Improvements

- More defined transportation network for roads, railroad, and barges.
- More realistic transportation costs (rail/truck combo).
- Alternatives combine mob/demob.
- Environmental factors are flagged for each site.
- Scenario summary sheets.
- Easily combine scenarios to make multiple alternatives.

Summary

- Upcoming
  - Users guides
    - How to use tool
    - How to expand tool to other geographic areas
  - Expand geospatial datasets to cover entire CA shoreline
    - Economic data for other beaches
  - Add additional benefits (storm damage reduction?)
- Looking for feedback and/or BETA testers……


Questions?