

**Federal GIS Conference**

February 9–10, 2015 | Washington, DC



# **Spatial Analysis Tools for Site Suitability**

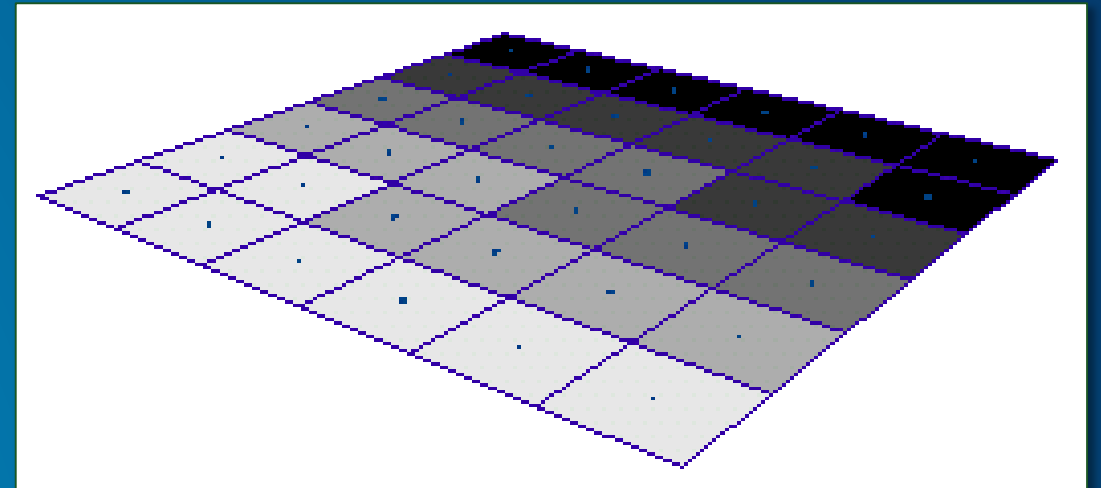
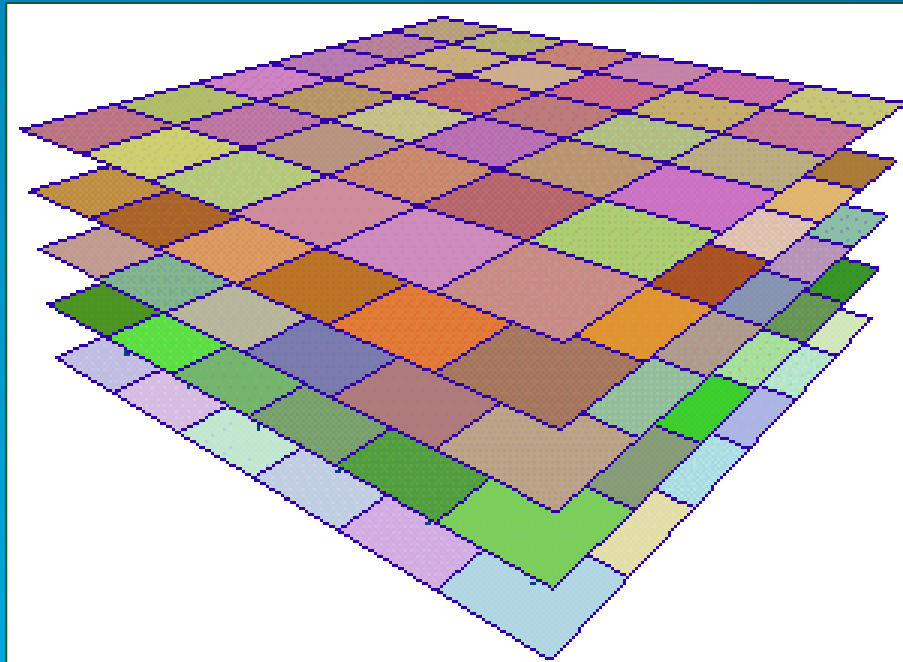
Michael Rink, GISP – Esri

and

Dana Dwyer-Torres – US Air Force,  
ACC Geospatial Information Office Plans & Programs

# Spatial Analysis Tools for Site Suitability

- What is Raster Overlay?



- Elevation
- Aspect
- Slope
- Distance from Roads

Suitable areas based  
on known criteria

# Spatial Analysis Tools for Site Suitability

- What is Binary Overlay Analysis?

Slope

0	1	1
0	1	0
1	1	0

x

Distance

0	0	0
0	1	0
1	1	0

x

Elevation

0	1	0
0	1	0
0	1	0

=

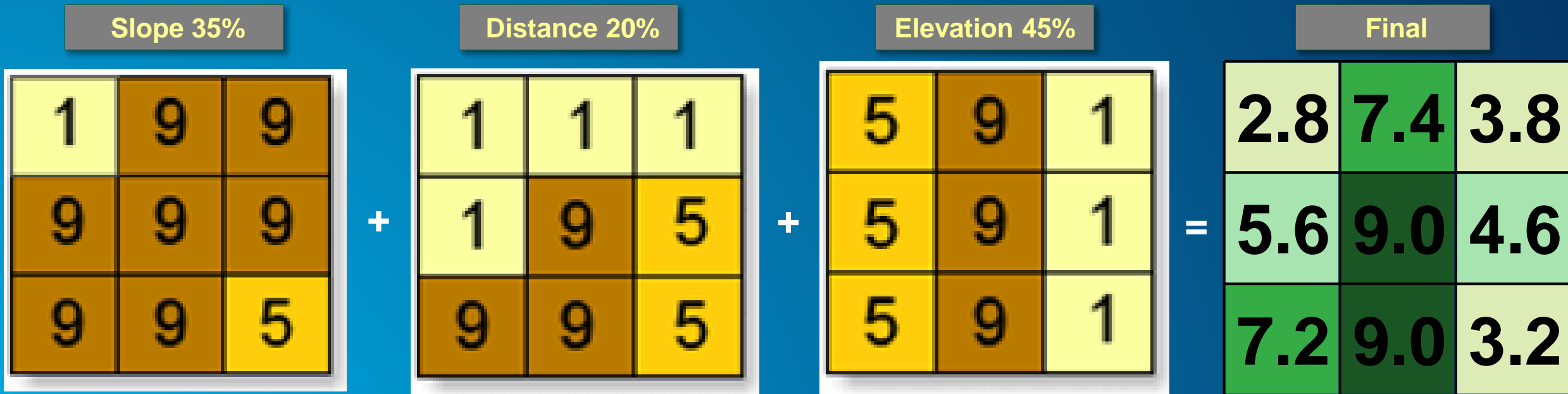
Final

0	0	0
0	1	0
0	1	0

- Cells are either GOOD or NOT GOOD
- Very easy to implement

# Spatial Analysis Tools for Site Suitability

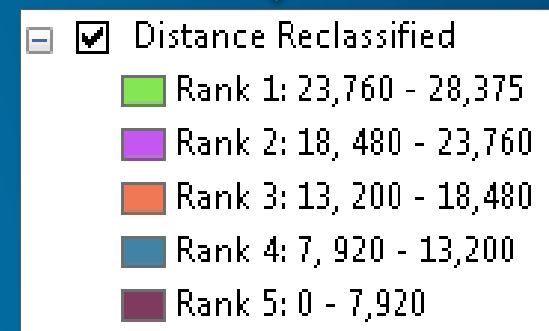
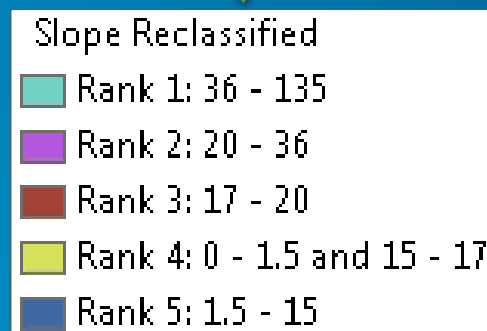
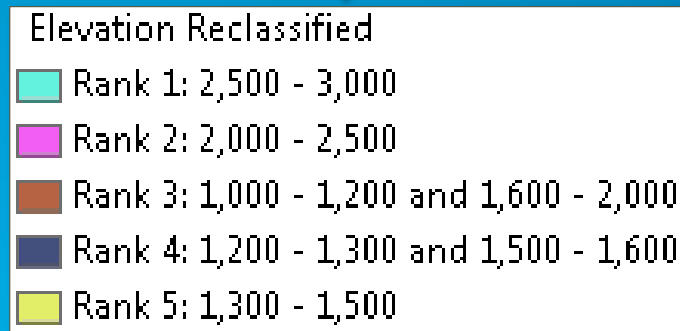
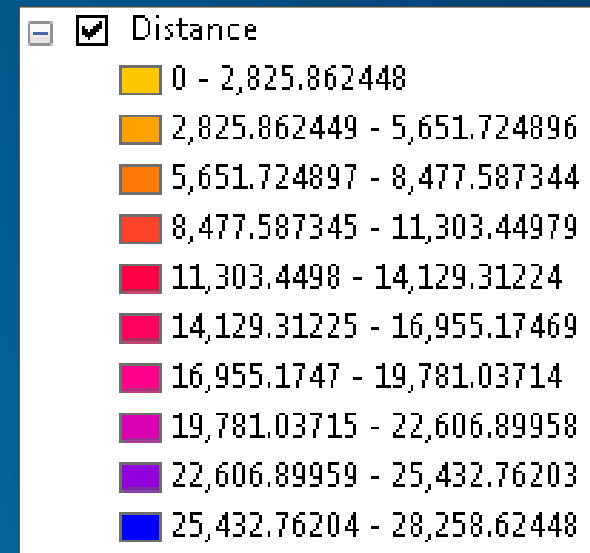
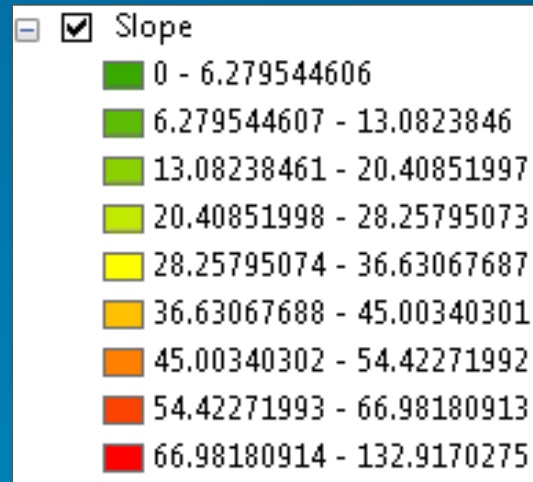
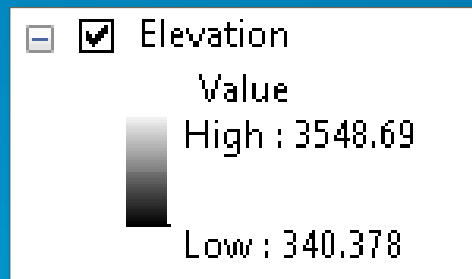
- What is Weighted Overlay Analysis?



- Cell values are ranked onto a common scale
- Layers are weighted (percentage of the final output - must sum to 100%)
- SME decides the rankings and weights
- Document the rankings and weights for the final output layer in metadata

# Spatial Analysis Tools for Site Suitability

- What is Reclassification?



- Rasters with different values and ranges can be combined
- Compares “Apples to Apples”

# Spatial Analysis Tools for Site Suitability

- Why Assign Weights?

Overlay analysis layers for locating Golf Courses	Weights
Slope	35%
Distance from highways	20%
Elevation	45%

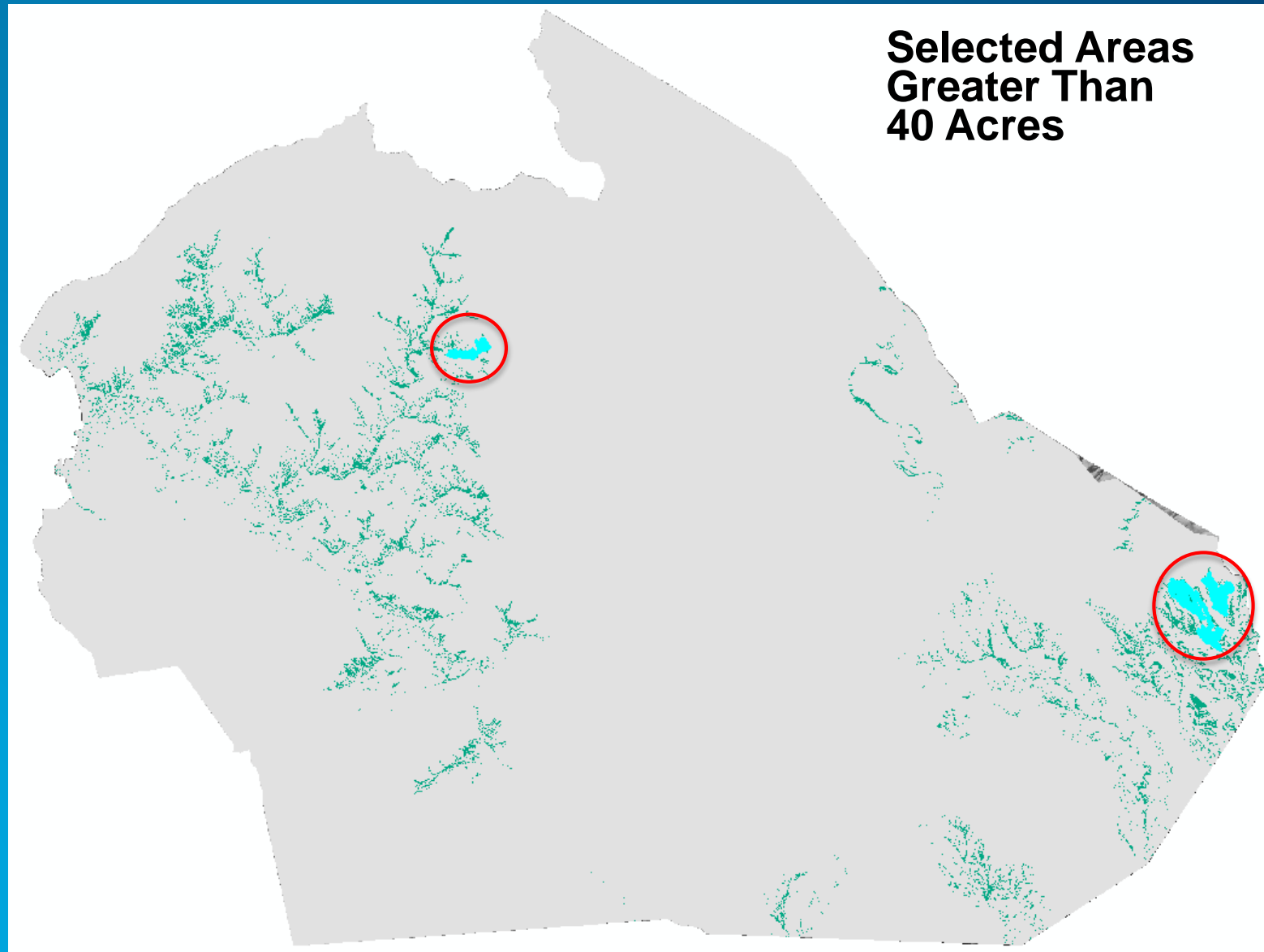
- Percentage indicates the importance of each layer

# Spatial Analysis Tools for Site Suitability

- Site a suitable location for a golf course in Watauga County, NC
- Site Suitability Criteria:
  - Must be below 3000 feet elevation
  - Must be mostly South facing land
  - Must have less than 15 Degrees of Slope
  - Must be within 0.5 miles from any road (2640 feet)
  - Must be at least 40 acres of available land



# Spatial Analysis Tools for Site Suitability



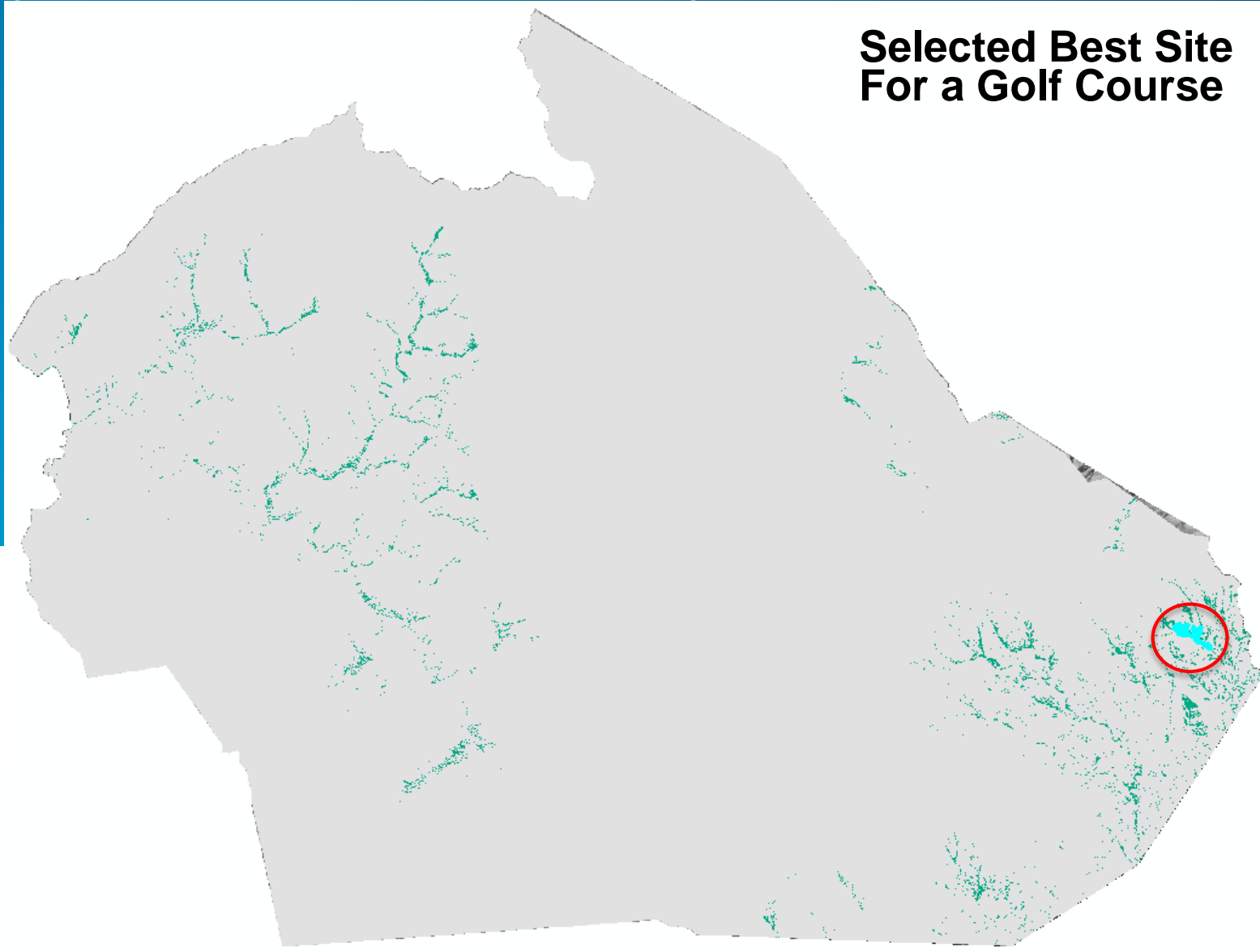
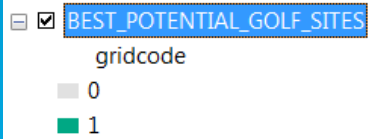


# Demo

Michael Rink, GISP – Esri

# Spatial Analysis Tools for Site Suitability

**Selected Best Site  
For a Golf Course**



# Spatial Analysis Tools for Site Suitability

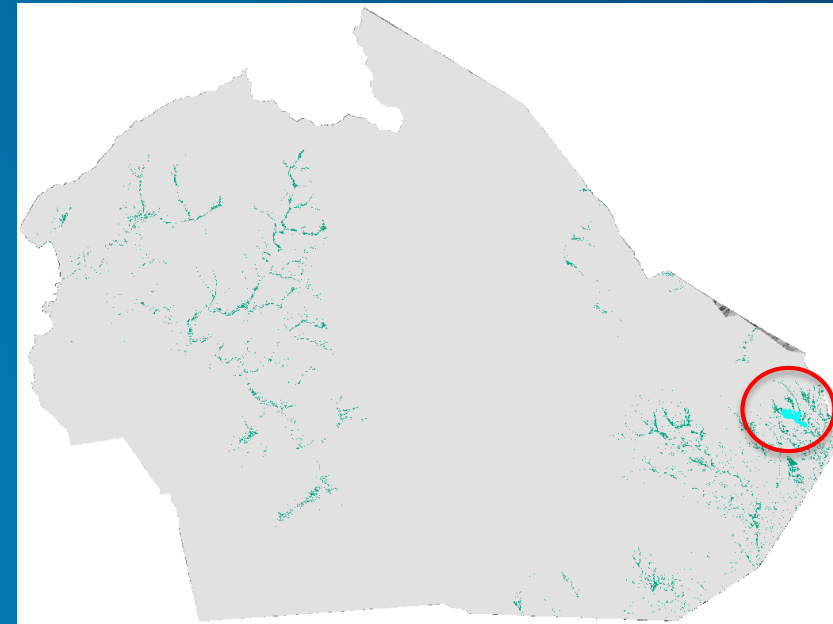
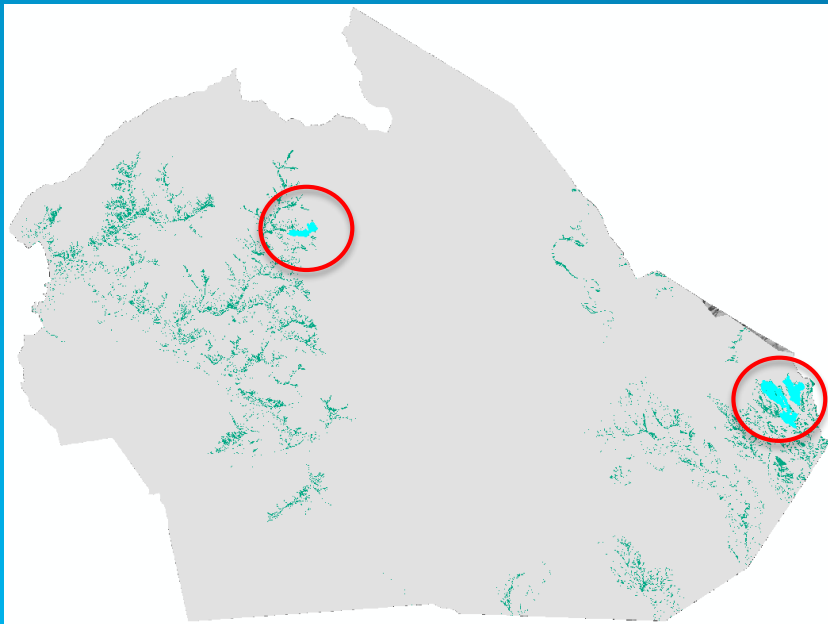
- In Summary

- Binary Overlay Analysis

- Faster and easier method
    - Finds only good/bad sites
    - Does not rank results

- Weighted Overlay Analysis

- More complex
    - Ranks results
    - Ranking is subjective
    - Must be documented



# Spatial Analysis Tools for Site Suitability

# Demo

Dana Torres – US Air Force,  
ACC Geospatial Information Office





# AIR FORCE GEOBASE

INSTALLATION GEOSPATIAL INFORMATION & SERVICES

HQ ACC/A7ZG GIO | 129 Andrews Street, Suite 228, Langley AFB, VA 23665-2769 | DSN: 312.574.4184 | [ACCA7ZGInstall@us.af.mil](mailto:ACCA7ZGInstall@us.af.mil)

Work Management

EASI

ACES Reports

Work Order Reports

GeoBase Resources



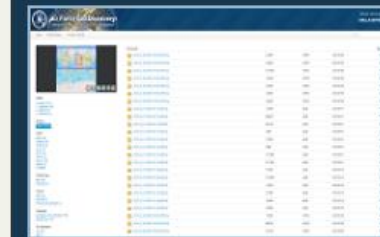
## STANDARD MAP VIEWER

This is the Standard Flex Viewer. No specific datasets are the focus. Includes Utilities.



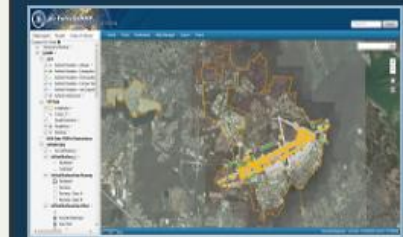
## ADVANCED MAP VIEWER

This is the Advanced Javascript Viewer. No specific datasets are the focus. Utilities are filtered based on assigned Portal roles.



## GEODISCOVERY

Air Force geospatial enabled Enterprise search, discovery, and data management solution. The tool is open and scalable, but with advanced security to role-base access.



## EXAMP

EXAMP is a decision support tool that allows for the management of Airfield obstructions and waivers.



## GEOMETRIX

GeoMetriX - Measure, Analyze, Act  
GeoMetriX takes data from ESRI's Data Reviewer and provides a visualized view of the findings.



## FLOOR PLANS VIEWER

Allows users to view building floor plans.



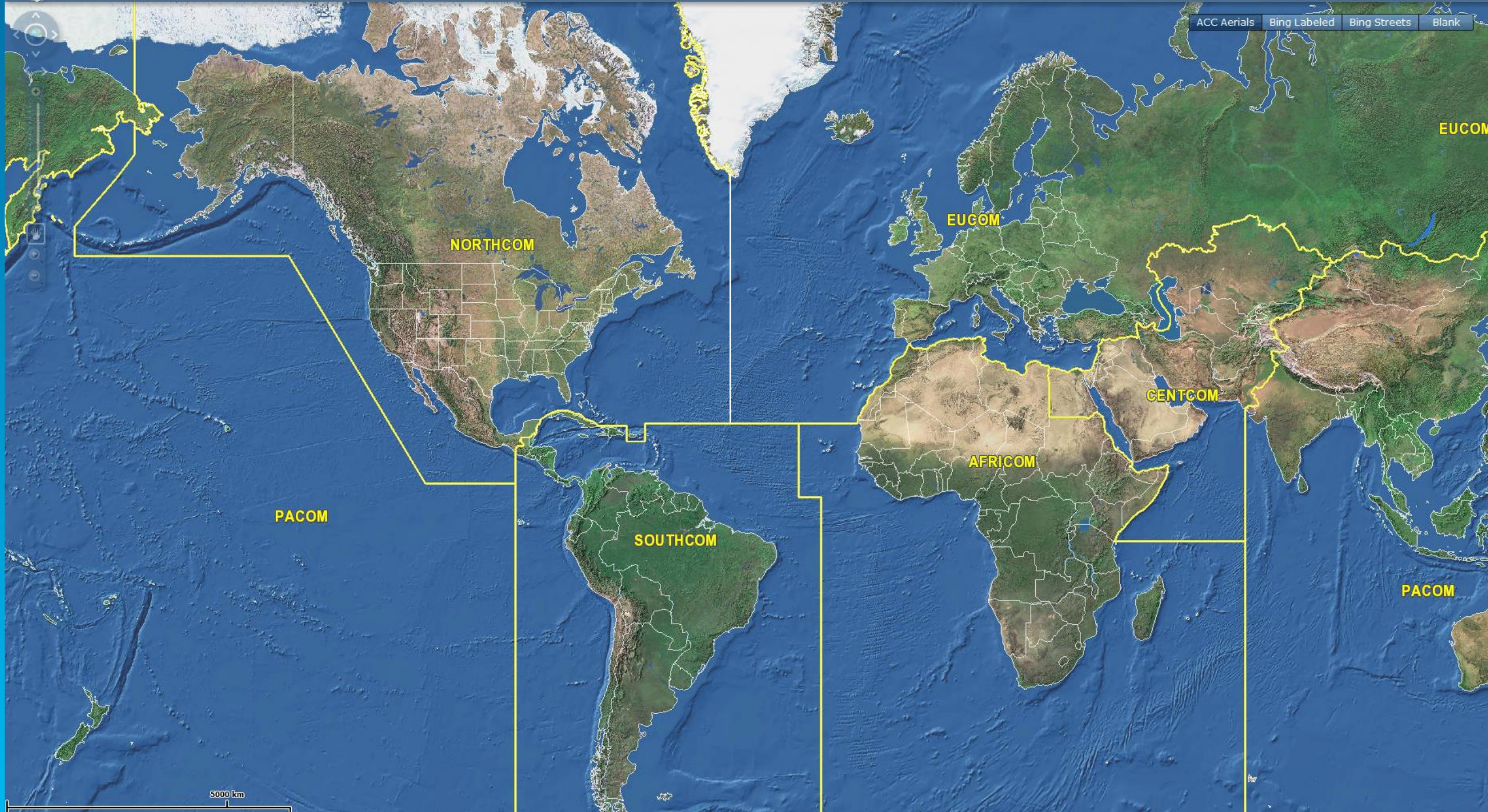
## EMERGENCY RESPONSE TOOL VIEWER

Allows users to monitor emergency events in a read only environment.



## EXPEDITIONARY SITE SELECTION

ESS Tool is for planners and analysts to determine feasibility of a Course of Action (COA) for site selection of force beddown planning.



**NORTHCOM**

**EUCOM**

**EUCOM**

**CENTCOM**

**AFRICOM**

**PACOM**

**SOUTHCOM**

**PACOM**

5000 km



**Langley AFB, Hampton, VA**







# Purpose



**The Expeditionary Site Selection Tool was developed for Planners & Analysts to determine feasibility of a Course of Action (COA) for site selection of force bed down planning.**

# Data Elements



**NGA** NGA AFFIF/DAFIF

Airfield data



**BEARS** BEARS follows guidance from HAF



**MDS** Mission Design Series (MDS)/ aircraft type

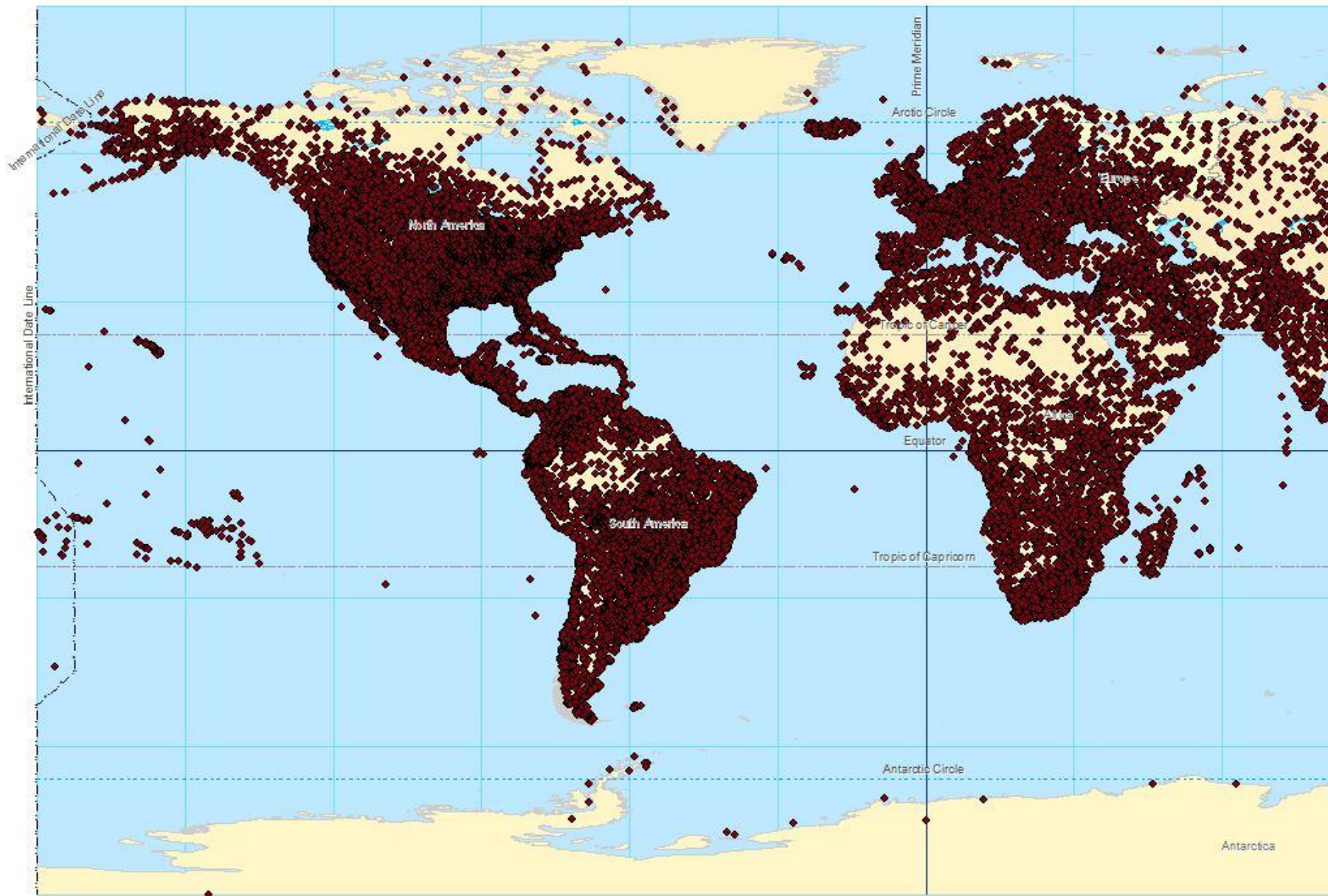


**GDSS** AMC's Global Decision Support System (GDSS)

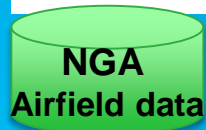


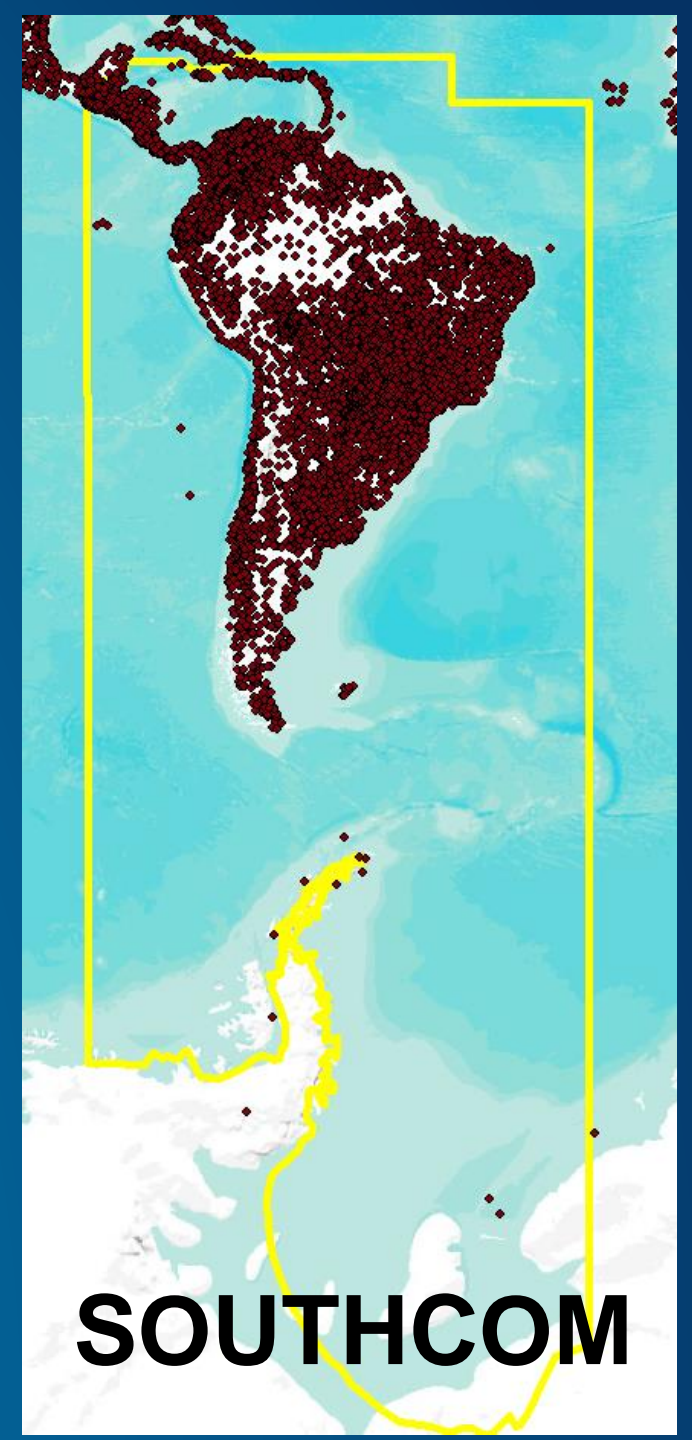
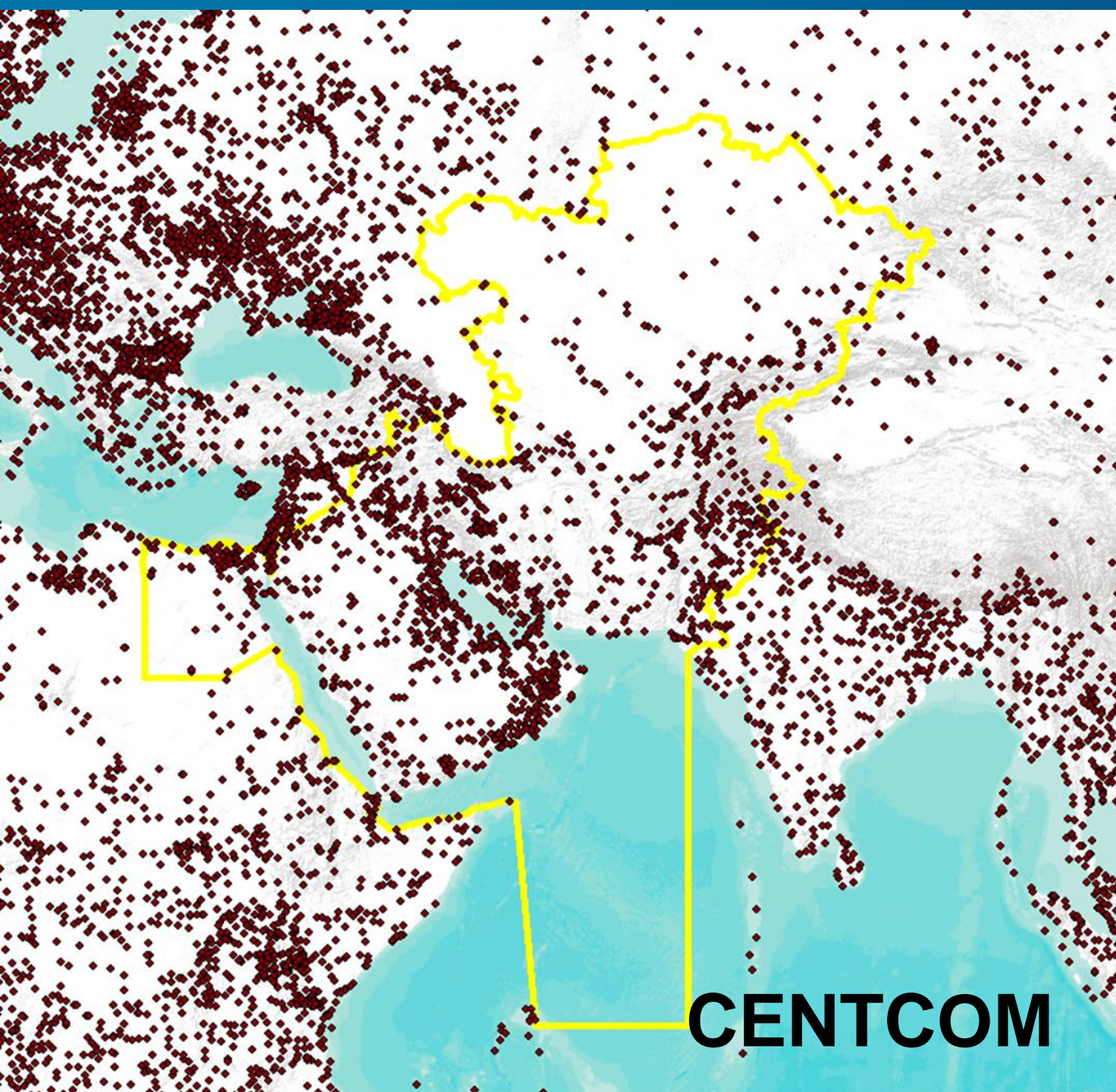
**ACC SDE** Base map/AOR data





Field	Value
OBJECTID	62900
OBJECTID_1	<null>
WAC_INNR	0357-00203
RP_WAC	0357
GEO_ACC	0
COORD_TYPE	0
LAT	38.852083
LONG_	<null>
LCL_HORIZ_	WGE
WGS_LAT	38.852083
WGS_LONG	-77.037722
WGS_DATUM	WGE
GRID_COORD	18SUJ2317502335
GRID_SYS	UTM-WGS-84
SEC_CLASS	U
MOD_DATE	6/22/2007
WAC_INNR_1	<null>
COUNTRY	US
FAA_SITE_I	03001.
PROVINCE	11
OSUFFIX	YF001
ARPT_NAME	RONALD REAGAN WASHINGTON NATL
ALTN_NAME	WASHINGTON NATL
SYMBOL	A
VAR	-10.77332
VAR_DATE	12/23/2010
INFO_CURRE	3/4/2011
FIRST_INFO	8/16/1976
ICAO_RGN	KD
ICAO_CODE	CA
EXS_VALID	
FAA_IDENT	DCA
MAX_DEMO_U	C141



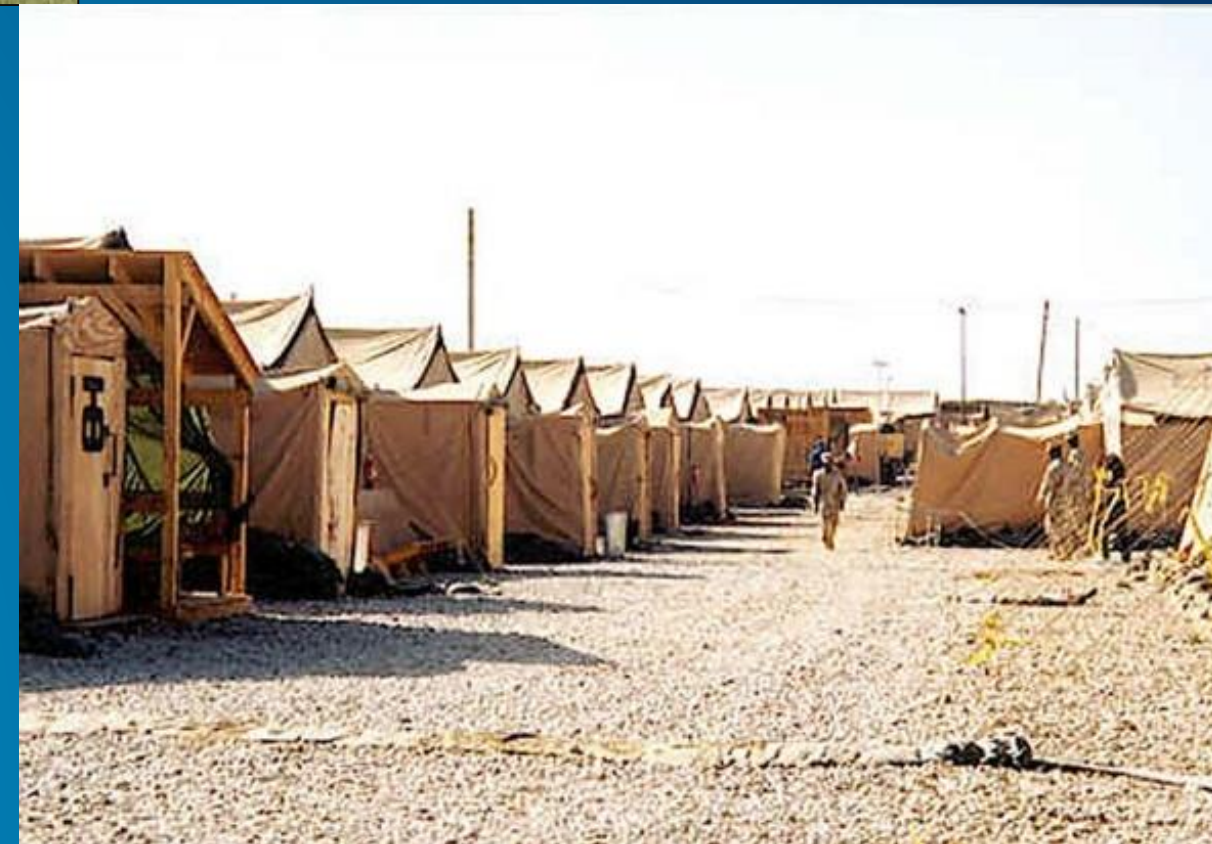




<http://www.southcom.mil/media/pictures/Main/Forms/DispForm.aspx?ID=3818>



<http://www.southcom.mil/media/pictures/Main/Forms/DispForm.aspx?ID=3817>



BEAR

Allows user to answer questions about what is needed to support and operations (i.e. Tents, generators, latrines )



# Air Force ESS:

Expeditionary Site Selection

Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity



Assign

Airfields

Requirements Airfield Search

MDS ?

- A-10
- AC-130H
- AC-130U
- AH-1
- AH-64
- AV-8B
- B-1
- B-2
- B-52
- C-12
- C-130E
- C-130H
- C-130J
- C-141
- C-17
- C-20
- C-21
- C-27
- C-5
- C-9
- CH-47
- CH-53
- CV-22
- E-3
- E-4
- E-8
- EA-6B
- EC-130E
- EC-130H



MDS







# AIR FORCE GEOBASE

INSTALLATION GEOSPATIAL INFORMATION & SERVICES

HQ ACC/A7ZG GIO | 129 Andrews Street, Suite 228, Langley AFB, VA 23665-2769 | DSN: 312.574.4184 | [ACCA7ZGInstall@us.af.mil](mailto:ACCA7ZGInstall@us.af.mil)

Work Management

EASI

ACES Reports

Work Order Reports

GeoBase Resources



## STANDARD MAP VIEWER

This is the Standard Flex Viewer. No specific datasets are the focus. Includes Utilities.



## ADVANCED MAP VIEWER

This is the Advanced Javascript Viewer. No specific datasets are the focus. Utilities are filtered based on assigned Portal roles.



## GEODISCOVERY

Air Force geospatial enabled Enterprise search, discovery, and data management solution. The tool is open and scalable, but with advanced security to role-base access.



## EXAMP

EXAMP is a decision support tool that allows for the management of Airfield obstructions and waivers.



## GEOMETRIX

GeoMetriX - Measure, Analyze, Act  
GeoMetriX takes data from ESRI's Data Reviewer and provides a visualized view of the findings.



## FLOOR PLANS VIEWER

Allows users to view building floor plans.



## EMERGENCY RESPONSE TOOL VIEWER

Allows users to monitor emergency events in a read only environment.



## EXPEDITIONARY SITE SELECTION

ESS Tool is for planners and analysts to determine feasibility of a Course of Action (COA) for site selection of force beddown planning.

ACC SDE



# Air Force ESS:

Expeditionary Site Selection



### Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity

### Airfields

Requirements | Airfield Search | Airfield Details | Settings

MDS ?  Quantity ?  Munitions Profile ?  Priority ?

Unit Identifier ?  C-Day ?  Sortie Profile ?

MDS	Unit	Quantity	Day Available	Munitions	Sortie Profile	Priority



# Air Force ESS:

Expeditionary Site Selection

Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity



Assign

Airfields

Requirements

Airfield Search

Airfield Details

Settings

MDS ?

- A-10
- AC-130H
- AC-130U
- AH-1
- AH-64
- AV-8B
- B-1
- B-2
- B-52
- C-12
- C-130E
- C-130H
- C-130J
- C-141
- C-17
- C-20
- C-21
- C-27
- C-5
- C-9
- CH-47
- CH-53
- CV-22
- E-3
- E-4
- E-8
- EA-6B
- EC-130E
- EC-130H

Unit



Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity
<input checked="" type="checkbox"/>	SQUAD_01	C-130H	4

Assign

Requirements **Airfield Search** Airfield Details Settings

Show Advanced Search Options

Airfield Type ?  Minimum Planning Length ?  Minimum Planning LCN ?  AOR ?

Airfield Name ?  Minimum Planning Width ?  Minimum Planning PCN ?  Country ?

Airfields

Airfield	Country	Runway Length (ft)	Runway Width (ft)	Runway LCN	Runway
----------	---------	--------------------	-------------------	------------	--------

**AOR ?**

- AFRICOM
- CENTCOM
- EUCOM
- NORTHCOM
- PACOM
- SOUTHCOM



# Air Force ESS: Expeditionary Site Selection



### Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity
<input checked="" type="checkbox"/>	SQUAD_01	C-130H	4
<input checked="" type="checkbox"/>	SQUAD_02	F-14	4

Requirements **Airfield Search** Airfield Details Settings

Show Advanced Search Options

Airfield Type ?

Minimum Planning Length ?

Minimum Planning LCN ?

AOR ?

Airfield Name ?

Minimum Planning Width ?

Minimum Planning PCN ?

Country ?

Q Search



Total Airfields: 1000

	Airfield	Country	Runway Length (ft)	Runway Width (ft)	Runway LCN	Runway PCN
<input type="button" value="+"/>	ABERDEEN RGNL	United States	6901	100	56	No Data
<input type="button" value="+"/>	ABILENE RGNL	United States	7198	150	58	No Data
<input type="button" value="+"/>	ABILENE RGNL	United States	7203	150	61	No Data
<input type="button" value="+"/>	ABRAHAM LINCOLN CAPITAL	United States	8001	150	65	No Data
<input type="button" value="+"/>	ADA MUNI	United States	6203	100	62	No Data
<input type="button" value="+"/>	ADDISON	United States	7203	100	54	No Data

Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity
<input type="checkbox"/>	SQUAD_01	C-130E	3

Requirements **Airfield Search** Airfield Details Settings

Show Advanced Search Options

Airfield Type ?

Minimum Planning Length ?

Minimum Planning LCN ?

AOR ?

Airfield Name ?

Minimum Planning Width ?

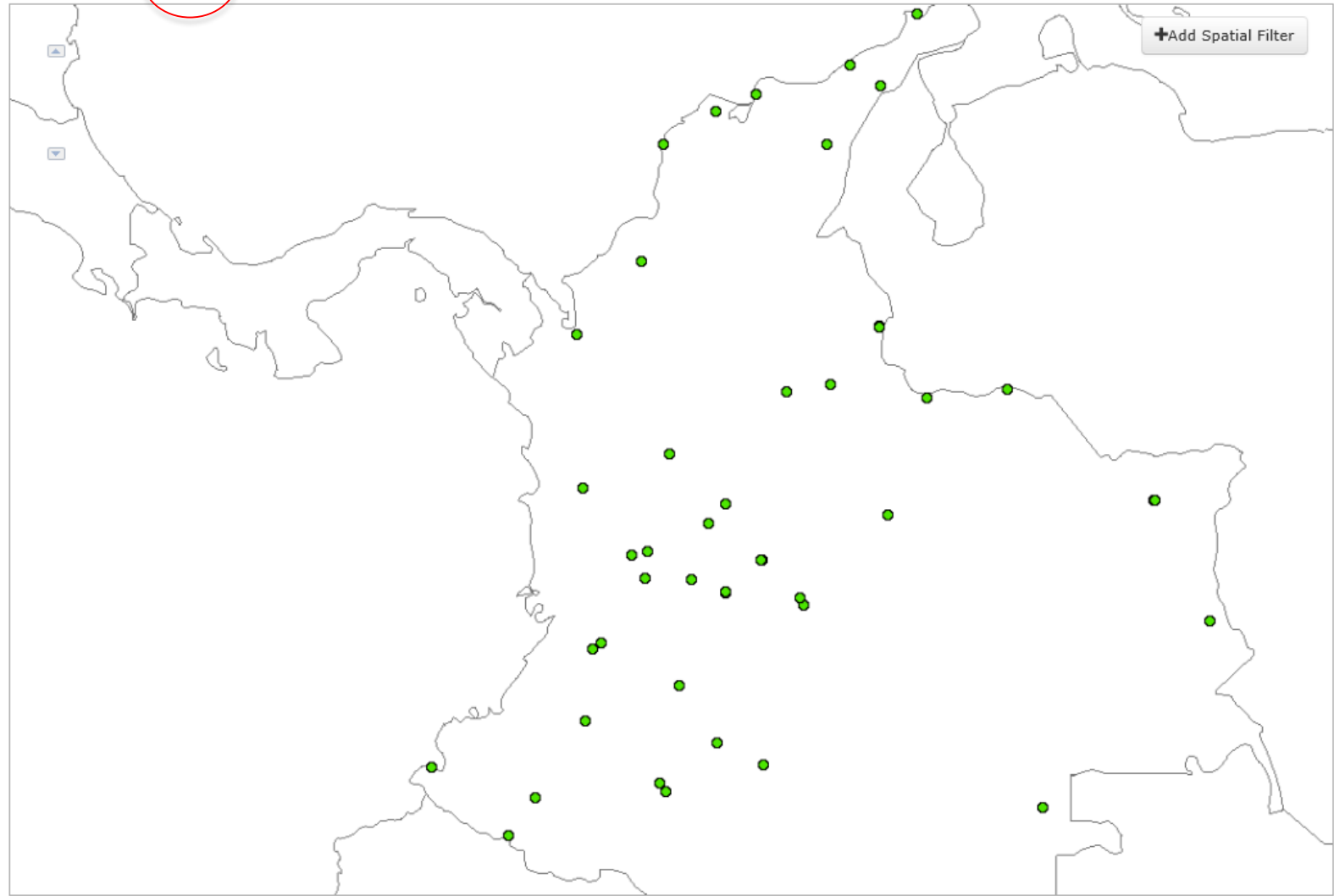
Minimum Planning PCN ?

Country ?

QSearch



Total Airfields: 45





- Flight Rings ▾
  - Unnamed graphic ▾
- Temporary Markup ▾
- ESS detail ▾
  - Buildings ▾
  - Above Ground Storage Tanks ▾
  - Ammunition Storage ▾
- Airfield Surfaces
  - Runway ▾
  - Non-Runway ▾
- Airfields
  - Military
    - 10,000 ft or longer ▾
    - 8,000-9,999 ft ▾
    - 6,000-7,999 ft ▾
    - less than 6,000 ft ▾
  - Military/Civilian
    - 10,000 ft or longer ▾
    - 8,000-9,999 ft ▾
    - 6,000-7,999 ft ▾
    - less than 6,000 ft ▾
  - Unspecified
    - 10,000 ft or longer ▾
    - 8,000-9,999 ft ▾
    - 6,000-7,999 ft ▾
    - less than 6,000 ft ▾
  - Civilian
  - Inconclusive
  - Installation Boundaries ▾
  - Country Boundaries ▾





Requirements Airfield Search Airfield Details Settings

General Map Links Parking Fuel Munitions

**Parking Area ?**  
A3

**OCC\_NR ?**  
2

**Graphic\_NTN ?**  
A3

**Configuration ?**  
Configuration 1

**Aircraft on Apron ?**  
3 C-130E

**Unparked Aircraft ?**  
All Aircraft Parked

Populated Aprons Only

Max Park Tool

**Parking Area ?**  
A3

**OCC\_NR ?**  
2

**Graphic\_NTN ?**  
A3

**Configuration ?**  
Configuration 1

**Aircraft on Apron ?**  
3 C-130E

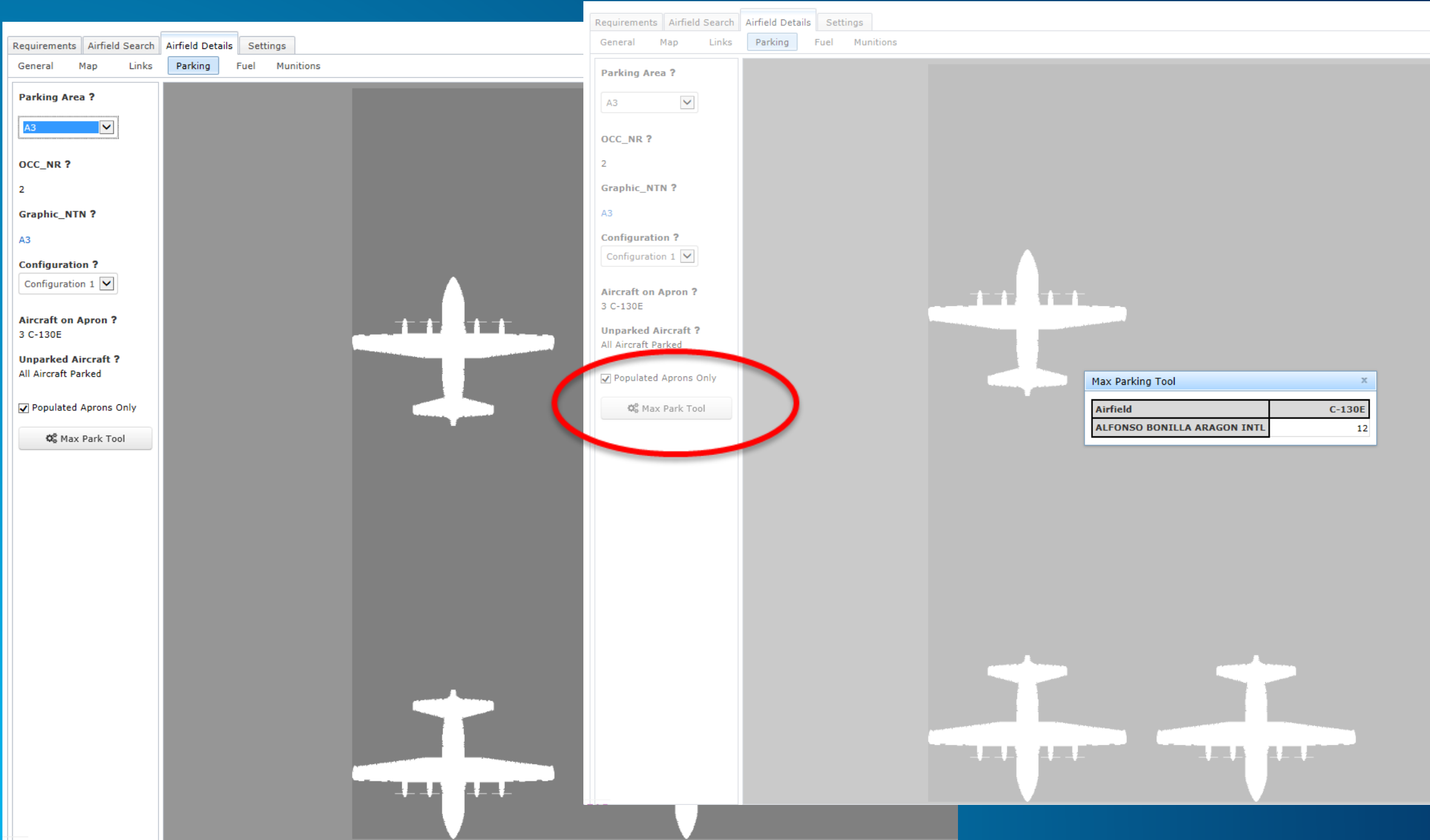
**Unparked Aircraft ?**  
All Aircraft Parked

Populated Aprons Only

Max Park Tool

**Max Parking Tool**

Airfield	C-130E
ALFONSO BONILLA ARAGON INTL	12

The image shows a software interface for managing an airfield simulation. It features a central panel with a grey background and white aircraft icons. On the left and right sides, there are control panels with various settings and data. A red circle highlights a specific button in the right-hand control panel. A small window titled 'Max Parking Tool' is open on the right side, displaying a table with airfield and aircraft information.

Day	Capacity	Starting Inventory	Received	Required	Dispensed	Ending Inventory	Shortfalls	Function	Capability	Method	Color Legend
1	966000	772800	241500								• AAFIF (black)
2	966000	966000	241500								
3	966000	966000	241500								
4	966000	966000	241500								
5	966000	966000	241500								
6	966000	966000	241500								
7	966000	966000	241500								
8	966000	966000	241500								
9	966000	966000	241500								
10	966000	966000	241500								
11	966000	966000	241500								
12	966000	966000	241500								
13	966000	966000	241500								
14	966000	966000	241500								
15	966000	966000	241500								
16	966000	966000	241500								
17	966000	966000	241500								
18	966000	966000	241500								

Inventory	Received	Required	Dispensed	Ending Inventory	Shortfalls
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		
241500	26865	26865	966000		

Function	Capability	Method	Color Legend
Storage	966000		• AAFIF (black)
Inventory	772800		• Rule (blue)
Receives per day	241500		• User (purple)
Dispenses per day	241500		

Add Equipment Add Resupply

**Add Equipment to Base** x

Arrival Day ?	Qty	Equipment Model	Transfer Capability (gal/min)	Storage Capability (gal)	Issuing Capability (gal/min)	Starting Inventory (gal)

Add Quantity ? Select UTC ? Arrival Day ?
 Add Equipment Remove Equipment

- JFALB - POL 210K Fuel Storage Bladder
- JFAXA - POL 08 PAA TFS Fuels-LOX
- JFAXC - POL 01 200K Bulk Storage System
- JFAXE - POL 18 PAA TFS Fuels-LOX
- JFAXG - POL 24 PAA TFS Fuels-LOX
- JFAXJ - POL 48 PAA TFW Fuels-LOX
- JFAXM - POL 72 PAA TFW Fuels-LOX
- JFAXP - POL 01 R-11 Fuel Tank Truck
- JFDEB - POL 01 R09 Fuel TNK TK ACFT
- JFDEG - POL R14 ATHRS Fuel STG ACFT
- JFDEJ - POL R22 Fuel Pump
- JFDEK - POL 01 PMU-27 50GPM Pump SVC
- JFDEL - POL 10K Fuel Storage Bladder
- JFDEM - POL 50K Fuel Storage Bladder
- JFDET - POL 02 PMU-27 Pumps 50GPM
- JFDEU - POL 03 R14 ATHRS STG ACFT SVS
- JFDEV - POL 02 R22 Pumps 800-900 GPM
- JFDEW - POL 01 ABFDS System
- JFDEX - POL 04 ABFDS System
- JFDEY - POL 01 ABFDS DEL SYS-ACE
- JFM74 - TRN WG R-11 800 GL TK TRK

Unassigned MDS Packages

<input type="checkbox"/>	Unit ID	MDS	Quantity

ALFONSO BONILLA ARAGON INTL

Airfields

- ALFONSO BONILLA ARAGON INTL
  - Runways
    - 9843 x 148 x 83
  - Parking

Requirements | Airfield Search | Airfield Details | **Settings**

**General** | Map | Links | Parking | Fuel | Munitions

Name: ALFONSO BONILLA ARAGON INTL      Country: Colombia      Base Type: Civilian  
 GEOLOC: SULU      Latitude: 3.54315      MGRS: 18NUJ4652991737  
 ICAO: SKCL      Longitude: -76.38169166

Runways

Length (ft)	Width (ft)	LCN	PCN
9843	148	83	No Data

Aprons

Structure Type	Length (ft)	Width (ft)	Entry	Door Height	Existence	OCC NR	NTN	OPR Status	Shape	Condition
Operational Apron	1655	805	999	No Data	Confirmed	0	A1	Operational	Irregular	Good
Operational Apron	445	370	999	No Data	Confirmed	1	A2	Operational	Rectangle	Good
Operational Apron	490	490	999	No Data	Confirmed	2	A3	Operational	Rectangle	Good
Alert Apron	450	220	999	No Data	Confirmed	3	A4	Operational	Irregular	Good
Hangar Apron	400	90	90	No Data	Confirmed	4	A5	Operational	Rectangle	Fair
Hangar Apron	400	90	90	No Data	Confirmed	5	A6	Operational	Rectangle	Poor

# Choosing nearby airfields...

Search [Menu] [Globe]

**+ Add Spatial Filter**

Include  airfields within  miles.

Include

Exclude *do not add the buffer*

cancel

Requirements Airfield Search Airfield Details Settings

General MAP LINKS Filtering Fuel Randomize

Map Layers Results Tools Map Manager Print Share

- Right-click
- Uncached graphics
- Temporary Marking
- XY Location
- Viewshed Buffer - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles
- Viewshed - 5 Miles

Decimal Degrees - Lon (X): 83.20888 Lat (Y): 26.90487

# Reporting

- Save scenarios & email
- Export out a Report for Finally decision making



# Contact Info

- Rob Houston

ACC GeoBase Expeditionary  
Combat Support Lead

[Charles.houston.ctr@us.afmil](mailto:Charles.houston.ctr@us.afmil)

757-764-8941

- Dana Torres

ACC GeoBase Plans & Programs

[Dana.dwyer-torres.1.ctr@us.af.mil](mailto:Dana.dwyer-torres.1.ctr@us.af.mil)

757-764-4184

*<https://maps.acc.af.mil>*

# Spatial Analysis Tools for Site Suitability

- Questions and Answers

**Federal GIS Conference**

February 9–10, 2015 | Washington, DC



**Don't forget to complete  
a session evaluation form!**





Understanding our world.