

# Developing a Web Mapping Application for Collaborative Dataset Management

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Innovate! & Penn State



# Travis Bock

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Geospatial Developer, Innovate, Inc.

Contractor for Local, Territorial and Federal Governments and private organizations

Build End-user solutions to collect/manage geospatial data and help answer questions.



# Intro

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GIS should be an integral part to an organization's day to day activities

Better data organization

Increase collaboration

This approach can apply to many different databases

For this application I focused on Geographic Response Planning for the EPA

# Building Blocks

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HTML5

CSS3

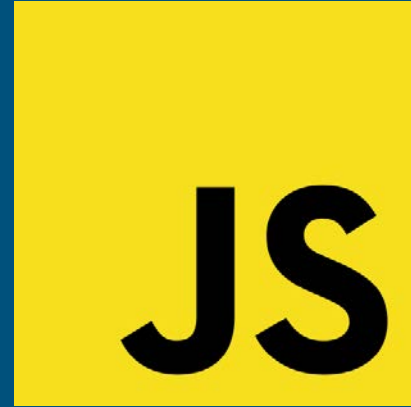
JavaScript

ArcGIS JS API 3.x

AngularJS 1.x

Angular Material 1.x

ArcGIS Server/ Online



**CSS**

**HTML**



# What is a Geographic Response Plan?

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Plan covering loosely defined geographic area

Used for early stage response to oil, chemical or any spill that could cause serious harm to sensitive sites.

Comprised of Sensitive Sites (points), Containment Booms (lines), Incident Action Plans (polygons) and various related tables



# Sensitive Sites with Strategies and Booms

Environmental

Economical

Historical

Cultural

Archeological



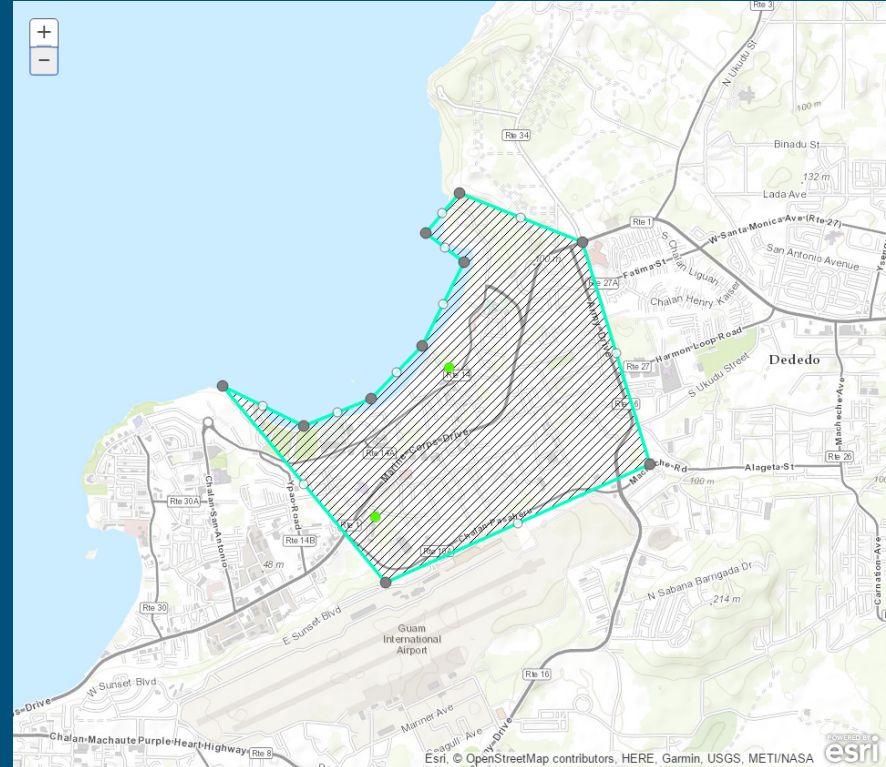
# Incident Action Plan

Early response coordination

Fire, Police and Medical resources

Spill response resources

Local, Regional and National contacts



# Who creates these plans?

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Federal, State, Territory and  
Local Emergency Response

First Responders

Environmental Scientist

Local/Regional Experts

Various subject matter experts





# Current tools

Email

Microsoft Word

ESRI Web AppBuilder

The screenshot shows a web browser window with multiple tabs. The active tab is titled "with Web AppBuilder for ArcGIS". The browser address bar shows "Esri World Geocoder". The main content area displays a map of the Pacific Northwest region, including Seattle, Washington, and parts of Oregon and Idaho. Overlaid on the map is a Microsoft Word document titled "form 202-fillable.docx [Compatibility Mode] - Word". The document content is as follows:

**INCIDENT OBJECTIVES (ICS 202)**

<b>1. Incident Name:</b> Spill	<b>2. Operational Period:</b> Date From: 7/25/2016 Time From: HHMM	Date To: 7/25/2016 Time To: HHMM
<b>3. Objective(s):</b> Save sites		
<b>4. Operational Period Command Emphasis:</b> Protect sites from contaminations		

# Current database

Single flat table

Attributes are repeated

Relationship is 1:7  
instead of 1:Many

Missing lots of  
information

No storage of Incident  
Action Plan in data  
model

Sensitive Site	
- Sector	
- GRP_Map_No	
- Name	
- Other_Name	
- Site_ID	
- PP_Spring	
- PP_Summer	
- PP_Fall	
- PP_Winter	
- ESI_Map	
- ESI_Name	
- NOAA_Chart	
- CHART_Name	
- QUAD_Name	
- Managed_Area	
- General_Location	
- Shoreline_Type	
- Tidal_Range	
- Average_Current	
- Physical_Description	
- Site_Descrip_Comments	
- Seasonal_Concern_Com	
- Habitat	
- Wildlife	
- Threatened_Species	
	- Resources_Comments
	- Cultural_Priority
	- Historic_Priority
	- Socioeconomic_Priority
	- Archaeological_Priority
	- Cultural_Comments
	- SiteSummary_Comments
	- Concerns_Comments
	- Hazards
	- Restrictions
	- Hazards_Comments
	- Contact_Info
	- Site_Strategy_Comments
	- Directions
	- Logistics_Comments
	- Access_Comments
	- Limitations
	- Launching
	- Water_Comments
	- Staging
	- Staging_Comments
	- Communications_Comments
	- Operational_Comments
	- Strategy1_Name
	- Strategy1_Objective
	- Strategy1_Implementation
	- Strategy1_Minimum_Boom
	- Strategy1_Boom_Type
	- Strategy1_Boom_Method
	- Strategy1_Boom_Length
	- Strategy1_Boom_Boat
	- Strategy1_Skiffs_Punts
	- Strategy1_Num_Of_Skimmers
	- Strategy1_Skimmers_Type
	- Strategy2_Name
	- Strategy2_Objective
	- Strategy2_Implementation
	- Strategy2_Minimum_Boom
	- Strategy2_Boom_Type
	- Strategy2_Boom_Method
	- Strategy2_Boom_Length
	- Strategy2_Boom_Boat
	- Strategy2_Skiffs_Punts
	- Strategy2_Num_Of_Skimmers
	- Strategy2_Skimmers_Type
	- Strategy2_Num_Of_Anchors
	- Strategy2_Anchor_Type
	- Strategy2_Num_Of_Staff
	- Strategy3_Name
	- Strategy3_Objective
	- Strategy3_Implementation
	- Strategy3_Minimum_Boom
	- Strategy3_Boom_Type
	- Strategy3_Boom_Method
	- Strategy3_Boom_Length
	- Strategy3_Boom_Boat
	- Strategy3_Skiffs_Punts
	- Strategy3_Num_Of_Skimmers
	- Strategy3_Skimmers_Type
	- Strategy3_Num_Of_Anchors
	- Strategy3_Anchor_Type
	- Strategy3_Num_Of_Staff

## What's wrong with that?

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Spatially enabled in a disconnected manner

Lack of access controls

Not centralized (many version could exist)

Difficult to collaborate

Poor quality data model

## How can we do better?

User requirements gathering

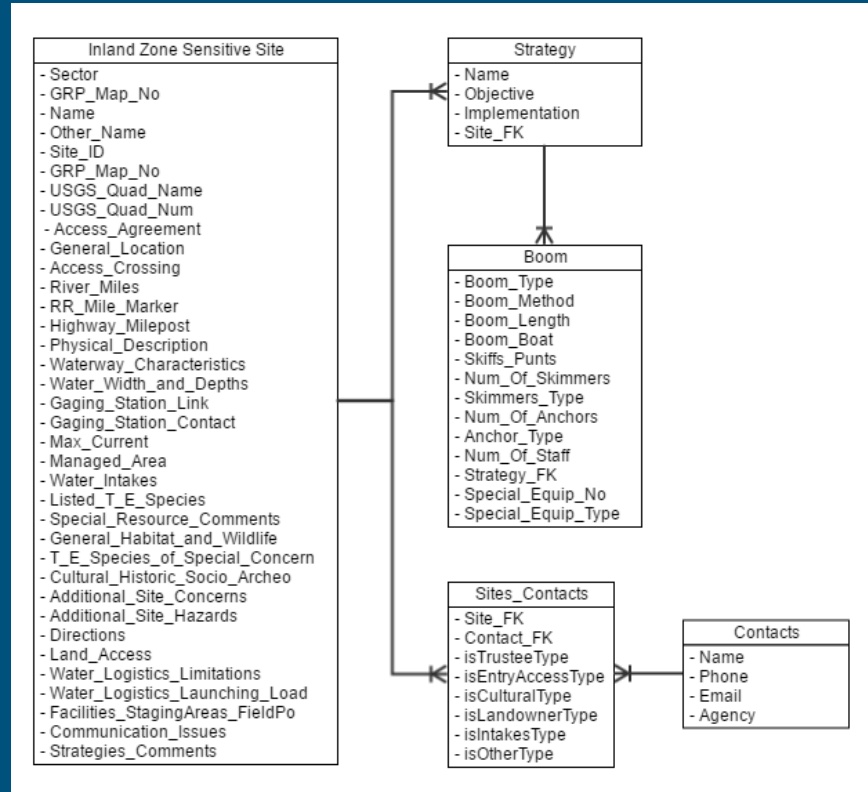
New data model

Create custom user interface

# New Sensitive Site Data Model

Actual 1:Many  
relationships

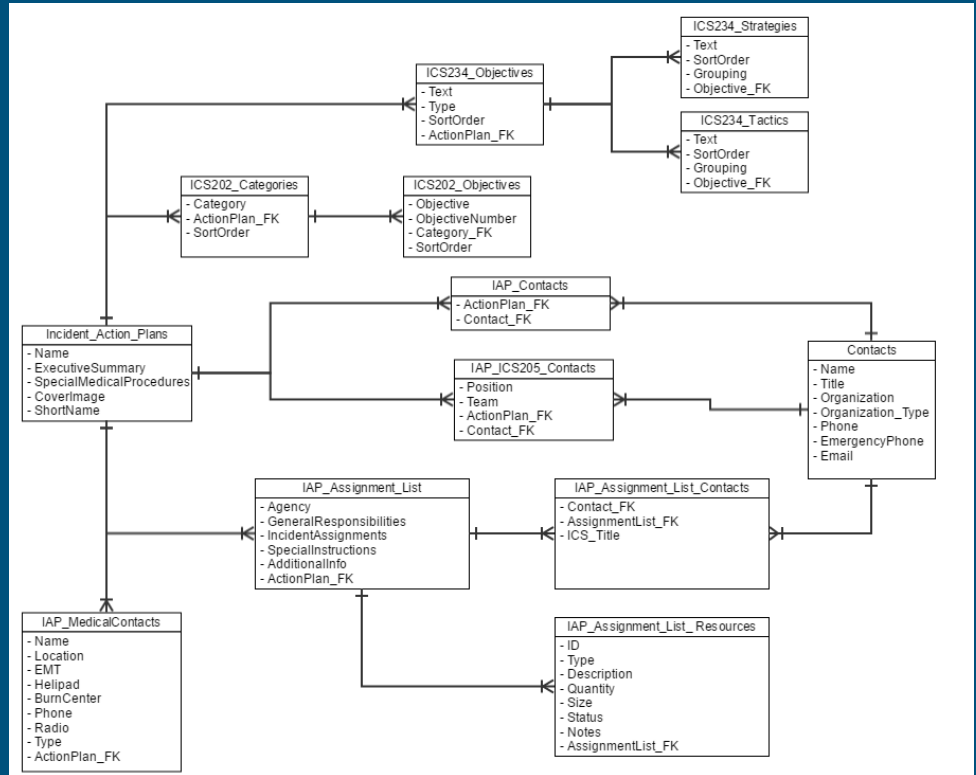
All relevant  
information is  
stored in a single  
place



# New Incident Action Plan Data Model

Provides a single location to store plan information

Can be reproduced for many areas without much effort.

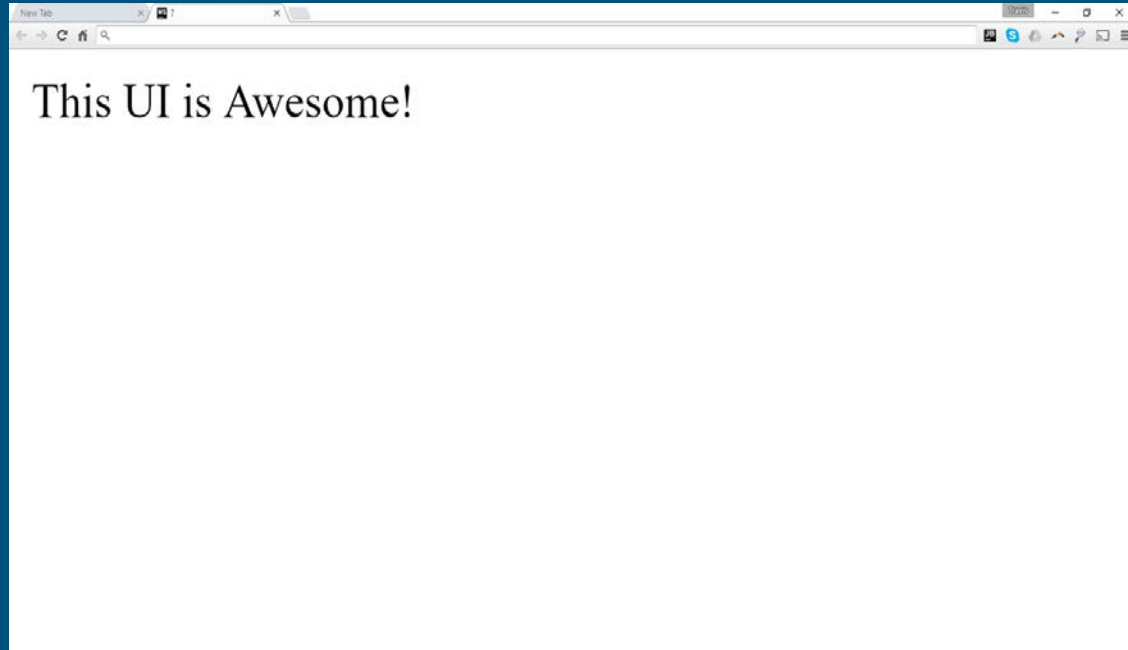


# What will this look like

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Start from scratch?

Use graphic designer?



# Graphic Designers!

User requirements

Data structure

Create static mockup to  
present to end users  
for feedback

Starting point for  
developing UI

The screenshot displays the EPA Geographic Response Plan (GRP) web application interface. The header includes the EPA logo and the text "United States Environmental Protection Agency GEOGRAPHIC RESPONSE PLAN". The user's name, "Travis Beck", is visible in the top right corner. The main navigation bar contains links for "HOME", "SENSITIVE SITES", "GRA APRA HARBOR: MANGROVES", "GENERAL", "RESOURCES AT RISK", "SITE STRATEGIES", "LOGISTICS", and "ATTACHMENTS". The "RESOURCES AT RISK" section is active, showing a satellite map of the site on the left and a data entry form on the right. The form includes sections for "Resources at Risk", "Site Description", "Seasonal and Special Resource Concern", and "Resources of Primary Concern".

**EPA United States Environmental Protection Agency GEOGRAPHIC RESPONSE PLAN**

Travis Beck

HOME → SENSITIVE SITES → GRA APRA HARBOR: MANGROVES

GENERAL RESOURCES AT RISK SITE STRATEGIES LOGISTICS ATTACHMENTS

**Resources at Risk** [SAVE] [EXPORT AS PDF]

**Site Description**

Shoreline Type: Mangroves and salt marsh with coral heads at each end

Tidal Range (ft): +/- 1.5 feet summer months / +/- 2 feet winter months

Average Current (kts): Negligible

Physical Description: This mangrove shoreline is approximately 900 feet wide northern edge. The mangrove area is strongly influenced by seasonal rainfall. During wet winter periods the creek mouth may be open to tidal exchange. For much of the year a natural sand berm fills the creek mouth forming a pond immediately upstream of the xxxxx. This mangrove habitat is the sensitive area of concern where a diverse community of emergent marsh plants such as cattail and bulrush thrive. Numerous species of birds, amphibians, invertebrates, and terrestrial mammals are attracted to this mangrove habitat.

Other Comments: Other site description comments...

**Seasonal and Special Resource Concern**

Comments: Seasonal and special resource concern comments

**Resources of Primary Concern**

Habitat: Mangroves

Wildlife: Manatees, Wading Birds, Juvenile Fish

Threatened and Endangered Species: Manatees, Red Sand Verberna - two listed species of fish are known to occur in this area: the Tidewater goby and Steelhead trout. Consequently any NON-EMERGENCY activity in this creek must be with the concurrence of the Guam EPA wildlife biologist and US Fish and Wildlife Service. During the months of March through September, Guam least tern and Western snowy plover may be present along the beach face. One listed plant, Red sand verberna, may be present on the upper beach sand dunes.

Other Comments: Other resources of primary concern comments

# How to build

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Ajax

Client-side

HTML

CSS

JavaScript

API's

Frameworks





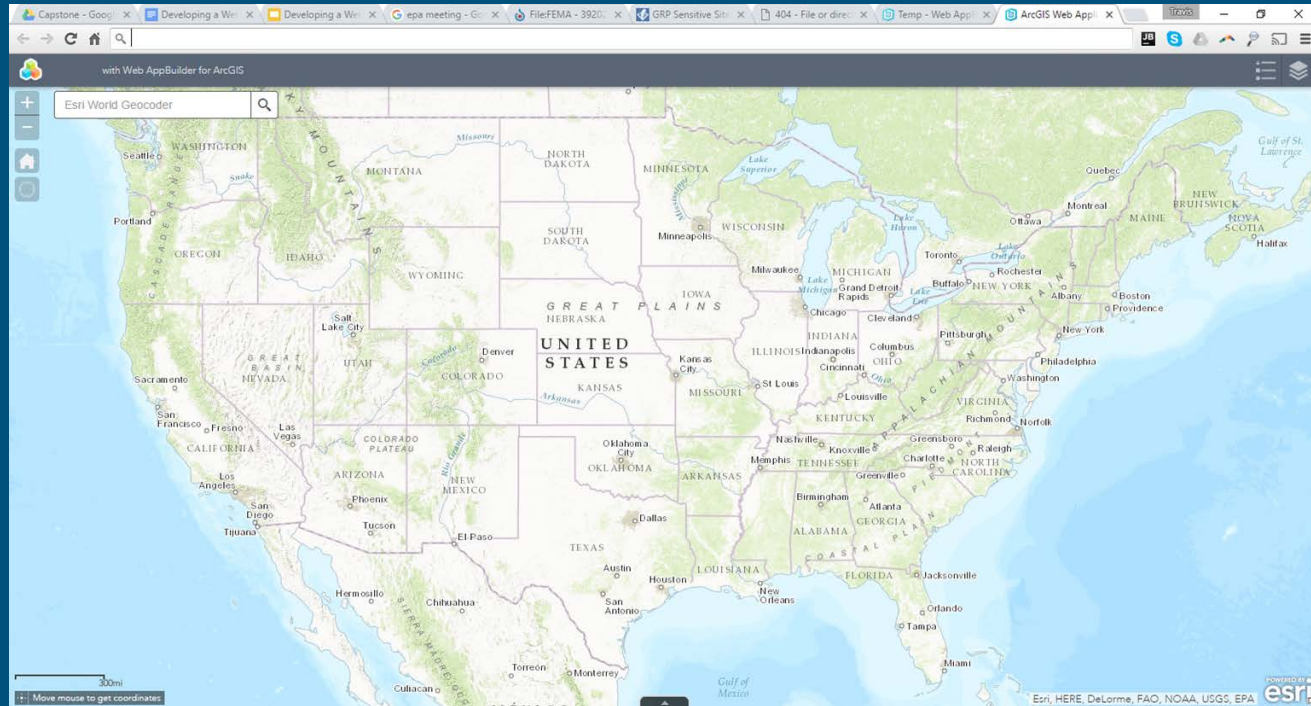
# But what about ESRI Web AppBuilder?

Built using Ajax  
technology

Custom Widgets

Good for  
visualization

Bad for data entry



# User Interface Frameworks

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Faster than starting from scratch

Angular Material

Dojo

Bootstrap

Other

dōjō  
toolkit



# Building Blocks

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HTML5

CSS3

JavaScript

ArcGIS JS API 3.x

AngularJS 1.x

Angular Material 1.x

ArcGIS Server/ Online



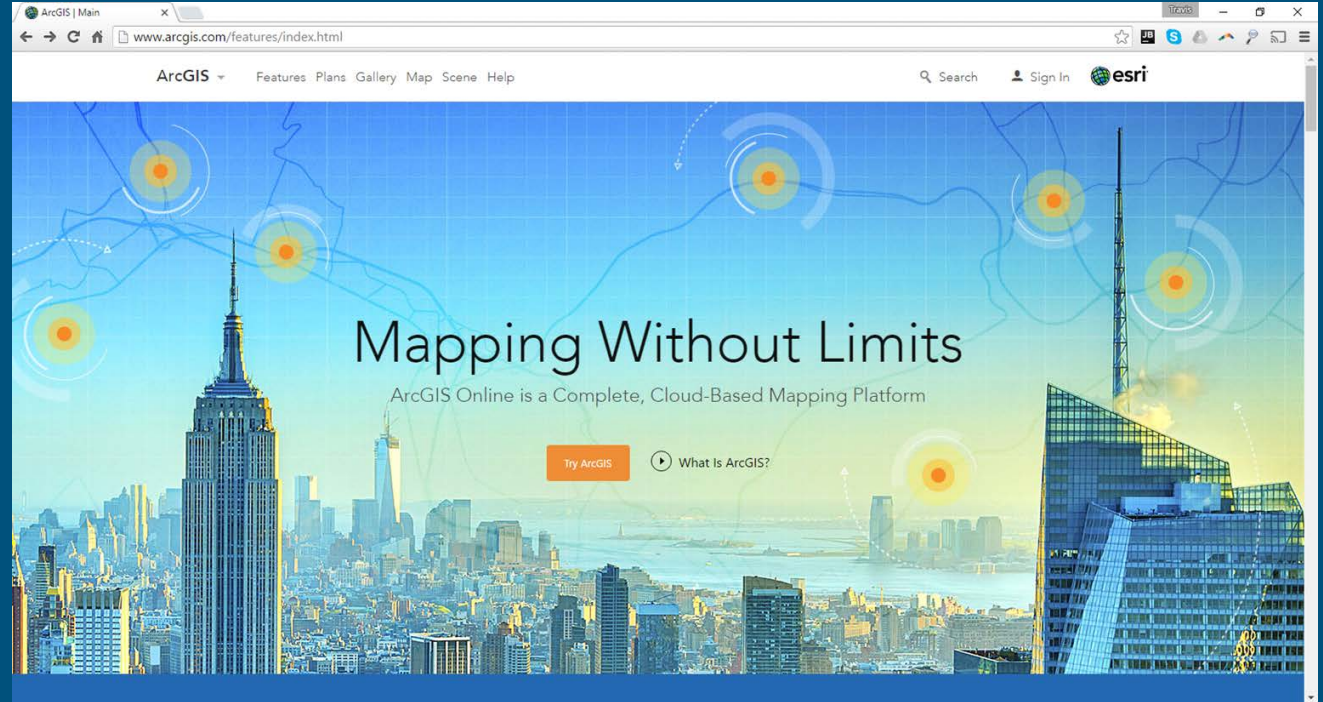
**CSS**

**HTML**



# Software as a Service

ArcGIS Online

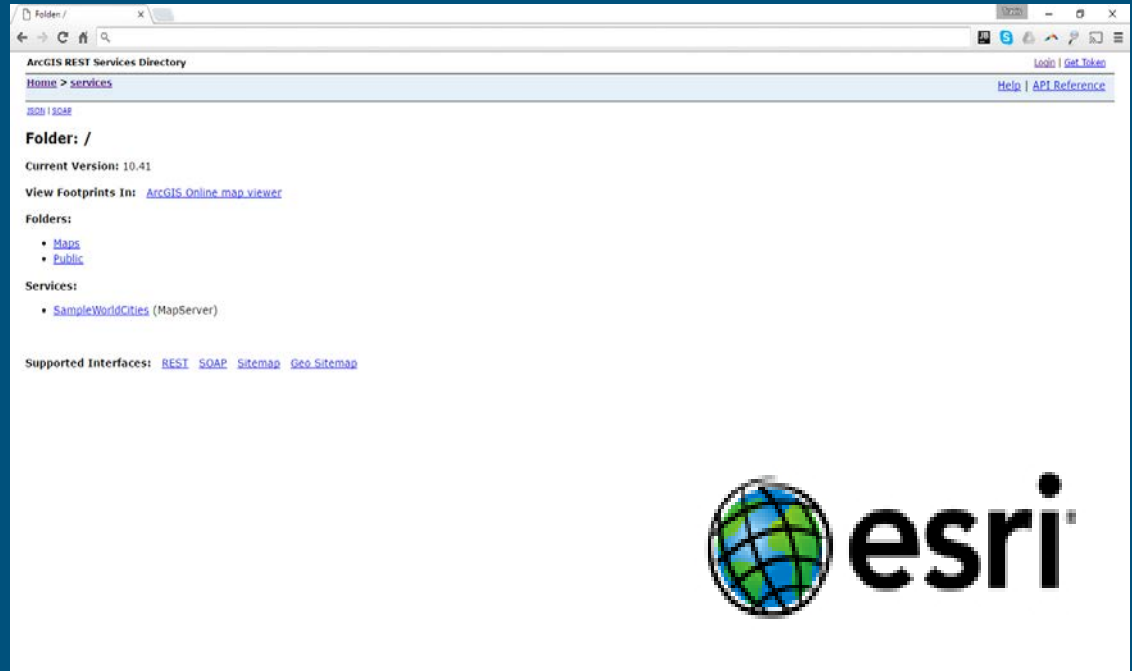


# Still need that server!

ArcGIS Server

Others?

JSON (ESRI JSON  
vs GeoJSON)



The screenshot shows a web browser window displaying the ArcGIS REST Services Directory. The page title is "ArcGIS REST Services Directory" and the current folder is "/". The interface includes navigation links for "Home", "services", "Help", and "API Reference". It also provides "Login" and "Get Token" options. The "Current Version" is listed as 10.41, and a link to "View Footprints In: ArcGIS Online map viewer" is present. Under the "Folders:" section, there are links for "Maps" and "Public". The "Services:" section lists "SampleWorldCities (MapServer)". At the bottom, "Supported Interfaces" are listed as REST, SOAP, Sitemap, and Geo Sitemap. The Esri logo is visible in the bottom right corner of the screenshot.

# Cloud Based ArcGIS Server

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Amazon Web Services

Microsoft Azure



# End Product

GRP App

Secure | <https://r9.ercloud.org/R9WAB/GuamGRPApp/app/#/>

TRAVIS BOCK

GRP Application


Home

CREATE COASTAL SENSITIVE SITE

CREATE INLAND SENSITIVE SITE

CREATE INCIDENT ACTION PLAN

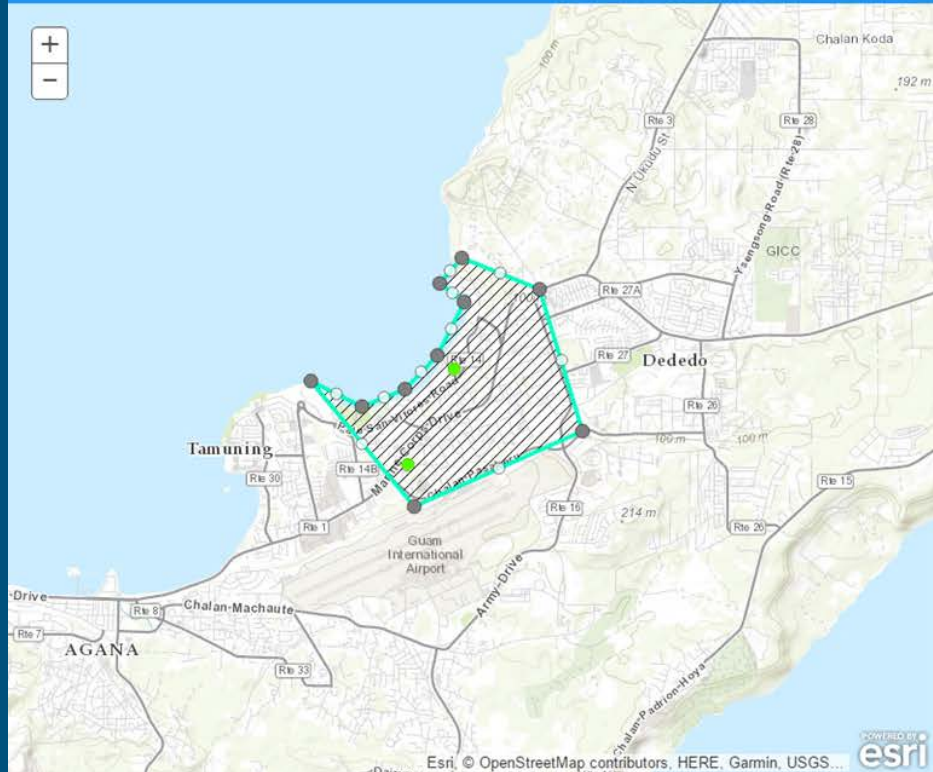
Sensitive Sites/Incident Action Plans



The map displays the island of Guam with various geographical features and labels. Key locations include Yigo (262 m), Dededo (274 m), and Leo Palace. The map shows a cluster of yellow dots along the western coast, a green square highlighting a specific area near Dededo, and several yellow dots in the central and southern regions. The map is overlaid on a light blue background representing the ocean.

Esri, © OpenStreetMap contributors, HERE, Garmin, USGS, NGA

esri



### General

[BACK](#)
[SAVE](#)
[DELETE](#)
[EXPORT PDF](#)

Name:  
Tumon Area Release IAP

Short Name:  
Tumon Incident IAP

Executive Summary:  
TB added

#### Cover Image:





# Factory Pattern with esriLoader.require()

```
angular.module('GRPApp').factory('relatedFeatureFactory',
  function ($q, esriLoader, $mdToast, $filter, $mdDialog, $state, esriAuth) {
    'use strict';
    var relatedFactory = function (feature, foreignKeyField, foreignKey) {
      var deferred = $q.defer(),
          Query,
          Graphic,
          arcgisService;

      esriLoader.require(['esri/tasks/query', 'esri/graphic'],
        function (_Query, _Graphic) {
          Query = _Query;
          Graphic = _Graphic;
          deferred.resolve();
        });
    };
  });
```

## Factory Pattern with esriLoader.require() cont'd

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```
function isLoading() {  
    return deferred.promise;  
}
```

```
get: function (globalId, objectId) {  
    isLoading().then(function () {  
        var query = new Query(),
```

# Using field metadata in template

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```
function initFields(obj) {  
  angular.forEach(obj.layer.fields, function (field) {  
    obj.fields[field.name] = field;  
  });  
}
```

```
<md-input-container>  
  <label>{{coastalSites.site.fields.Site_ID.alias}}:</label>  
  <input type="text" ng-model="coastalSites.site.attributes.Site_ID"  
    maxlength="{{coastalSites.site.fields.Site_ID.length}}">  
</md-input-container>
```

# Conclusion

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Web based spatially enabled tools will increase planning participation and collaboration

Collaboration increases the quality of information in the plan

Always available applications will increase the likelihood of having current information

Web base client side applications backed by cloud based services insures data will always be available.

# Questions?

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