

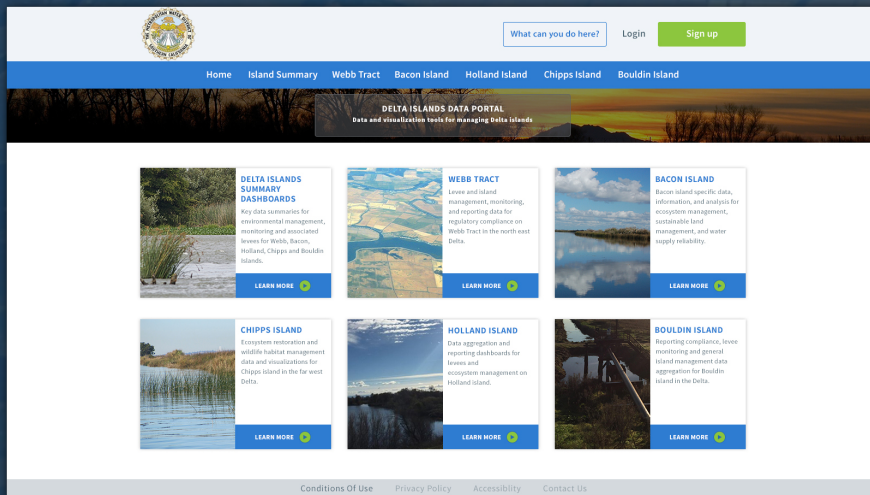
MWD Delta Island Management Platform

Presented by: Amye Osti
34 North



Proposal

- ✓ Develop a comprehensive data aggregation and management platform for Delta islands and levees
- ✓ Develop platform to support and automate regulatory compliance and reporting for island management
- ✓ Develop cyber infrastructure to support portions of California WaterFix
- ✓ Provide State with a platform and data reporting for demonstrating objectives for attaining the state's co-equal goals
- ✓ Facilitate collaboration between land owners, consultants, reclamation districts



Value of Island Management Platform

Management, monitoring and reporting topics include:

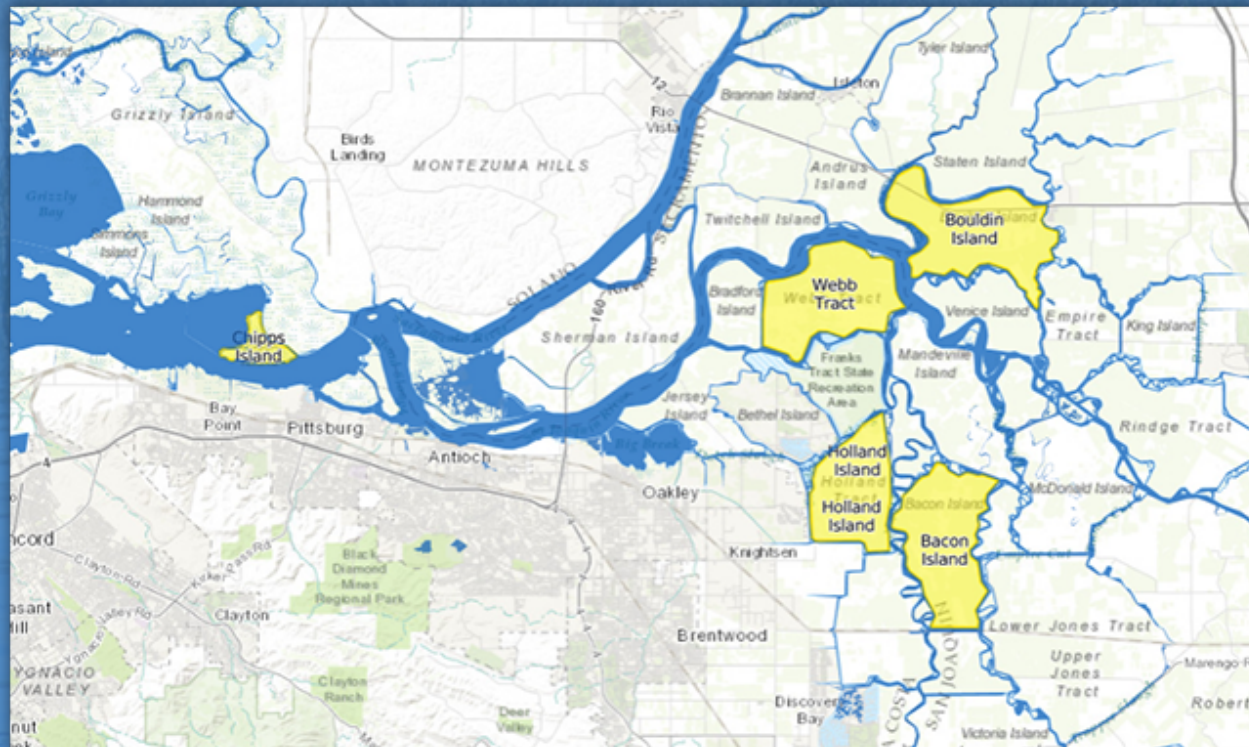
- ✓ Centralization of general island management data activity
- ✓ Management of Key Water Supply Reliability: Levee Management and Maintenance, Emergency Freshwater, Salinity Management
- ✓ Emergency Management Planning
- ✓ Habitat Restoration and Monitoring: Tidal Wetlands, Food Production, Flyways
- ✓ Monitoring Migration Pathways of Important Species: Salmon and Delta Smelt
- ✓ Regulatory Compliance and Reporting: Diversions (SB88), Water Quality
- ✓ Conservation
- ✓ Reducing Carbon Emissions
- ✓ Improve Air Quality
- ✓ California Water Fix

General Island Management

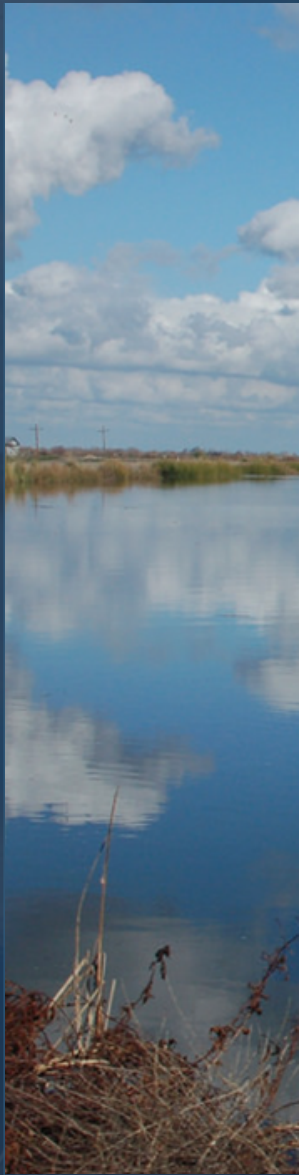
- ✓ Island Orientation
- ✓ Levee Monitoring
- ✓ Diversions and discharges to and from islands
- ✓ Flood protection
- ✓ Wildlife Habitat
- ✓ Water Supply and Quality
- ✓ Emergency Management and Planning

Island Background

- ✓ Bacon and Bouldin Island on proposed Delta Tunnels route
- ✓ Holland Island and Webb Tract help inhibit the inland migration of salinity
- ✓ Chipps Island could provide wildlife habitat with tidal wetland restoration
- ✓ All of the islands contain numerous points of diversion and discharge
- ✓ 4 of 5 islands purchased by MWD, excluding Chipps Island, are primarily used for agricultural purpose



Bacon Island



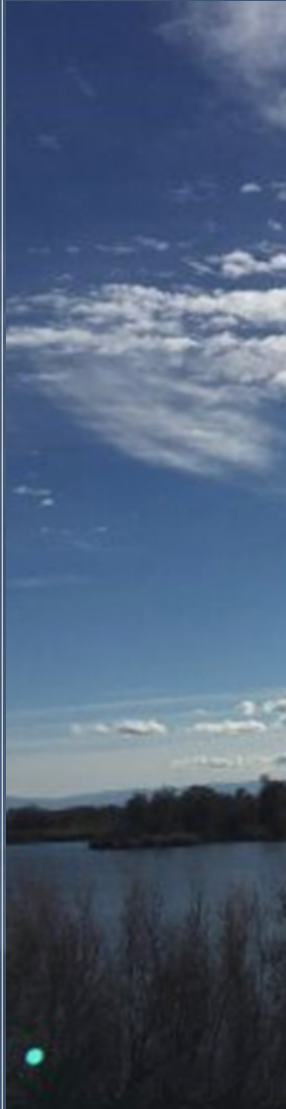
Area	5,400 acres
County	San Joaquin
Reclamation District	2028
Reclamation District	#5-22.15, San Joaquin Valley
Groundwater Basin Priority	Medium
Surrounding Hydrology	Old River borders the western edge; Middle River borders the eastern edge; Connection Slough borders the northern edge connecting the water between Old and Middle Rivers.
Land Use Types	Field Crops (Including: Sunflowers, Corn (field and sweet), and Grain sorghum); Grain and Hay Crops; Idle (land not cropped the current or previous crop season, but cropped within the past three years); Barren and Wasteland; Native Vegetation; Water Surface; Semiagricultural and incidental to agriculture (farmsteads); Truck, nursery, and berry crops (including: Potatoes, melons, squash and cucumbers, asparagus); Industrial (fruit and vegetable canneries and food processing and storage and distribution)
Noteable features	Delta Tunnels proposed route crosses over Bacon Island. Mokelumne Aqueduct pipeline lies to the south of Bacon Island

Bouldin Island



Area	5,900 acres
County	San Joaquin
Reclamation District	756
Reclamation District	#5-22.10, San Joaquin Valley
Groundwater Basin Priority	High
Surrounding Hydrology	Bouldin Island is bordered by the Mokelumne River to the northwest and the San Joaquin river to the southwest, the rivers converge at the southwest tip of the island. To the north is the South Mokelumne River, east is Little Potato Slough, and the southern edge is bordered by Potato Slough.
Land Use Types	Grain and Hay Crops; Field Crops - Corn (field & sweet); Riparian Vegetation - Marsh lands, tules and sedges; Native Vegetation; Water Surface; Semiagricultural and Incidental to Agriculture; Residential
Noteable features	Delta Tunnels proposed route crosses over Bacon Island.

Holland Island

	Area	4,250 acres
	County	Contra Costa
	Reclamation District	2025
	Reclamation District	#5-22.15, San Joaquin Valley
	Groundwater Basin Priority	Medium
	Surrounding Hydrology	Holland Island is bordered by Sand Mound Slough to the north and west. Rock slough borders the southern edge and the eastern edge is bordered by Old River on the southern half and Sheep Slough on the northern half.
	Land Use Types	Field Crops - Safflower and Corn (field & sweet); Grain and Hay Crops; Idle (Land not cropped the current or previous crop season, but cropped within the past three years); Riparian Vegetation (marsh lands, tules and sedges); Native Vegetation; Water Surface; Pasture (Mixed pasture); Urban; Commercial
	Noteable features	A portion of this island is not owned by MWD.

Webb Tract



Area	5,500 acres
County	Contra Costa
Reclamation District	2026
Reclamation District	#5-22.15, San Joaquin Valley
Groundwater Basin Priority	Medium
Surrounding Hydrology	The north and east edges of Webb Tract are bordered by the San Joaquin River, western edge is Fisherman's Cut, southern is bordered by False River, and the southeast corner is bordered by Old River.
Land Use Types	Field Crops - Safflower and Corn (field & sweet); Grain and Hay Crops; Idle (Land not cropped the current or previous crop season, but cropped within the past three years); Riparian Vegetation (marsh lands, tules and sedges); Native Vegetation; Water Surface; Pasture (Mixed pasture); Urban; Commercial

Chipps Island

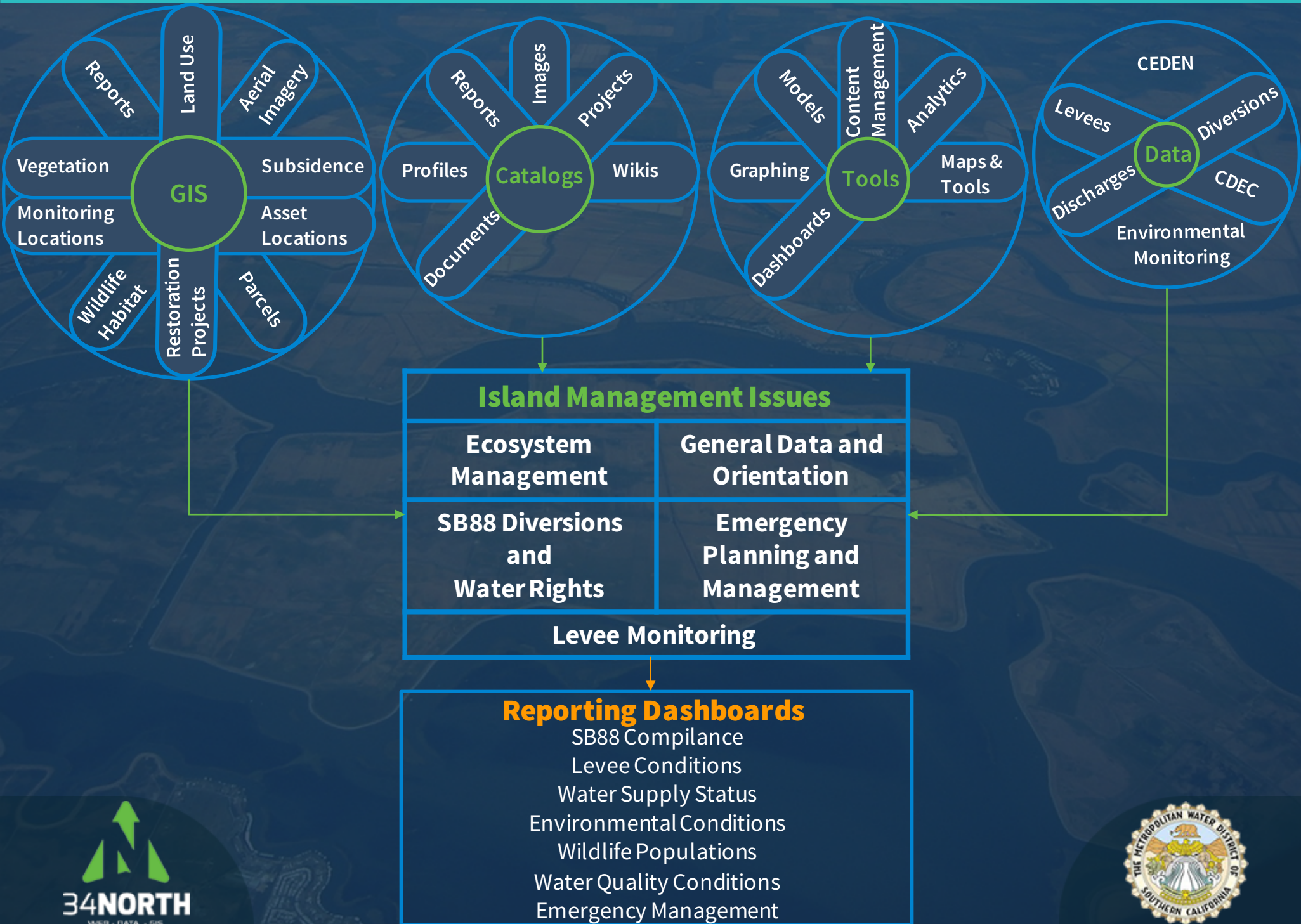


Area	900 acres
County	Solano
Reclamation District	n/a
Reclamation District	#2-3, Suisun-Fairfield valley
Groundwater Basin Priority	Very Low
Surrounding Hydrology	Chipps Island is located in the west Delta and is within the Suisun Marsh legal boundary. Immediately to the northwest of the island is Honker Bay and to the south the water is considered to be part of Suisun Bay. The eastern edge of the island is bordered by Spoonbill Creek.
Land Use Types	Native Riparian Vegetation; Water Surface
Noteable features	Chipps Island is waterfowl habitat and was acquired with the intent of restoring tidal wetlands.

General Data – Island Orientation

Datasets		
*Land Use	*Vegetation	*Levees
Diversion Locations	LiDAR	NAIP
Parcels	Restoration Projects	Weather Forecasts
*Geology and Soils	Subsidence	*Critical Habitats
Asset Locations	*Flood Zones	*Wetlands
*Hydrology features	*SWP and CVP	Discharges
Monitoring Locations	Emergency Resources	*Fault Lines
* = Data already acquired by 34 North		

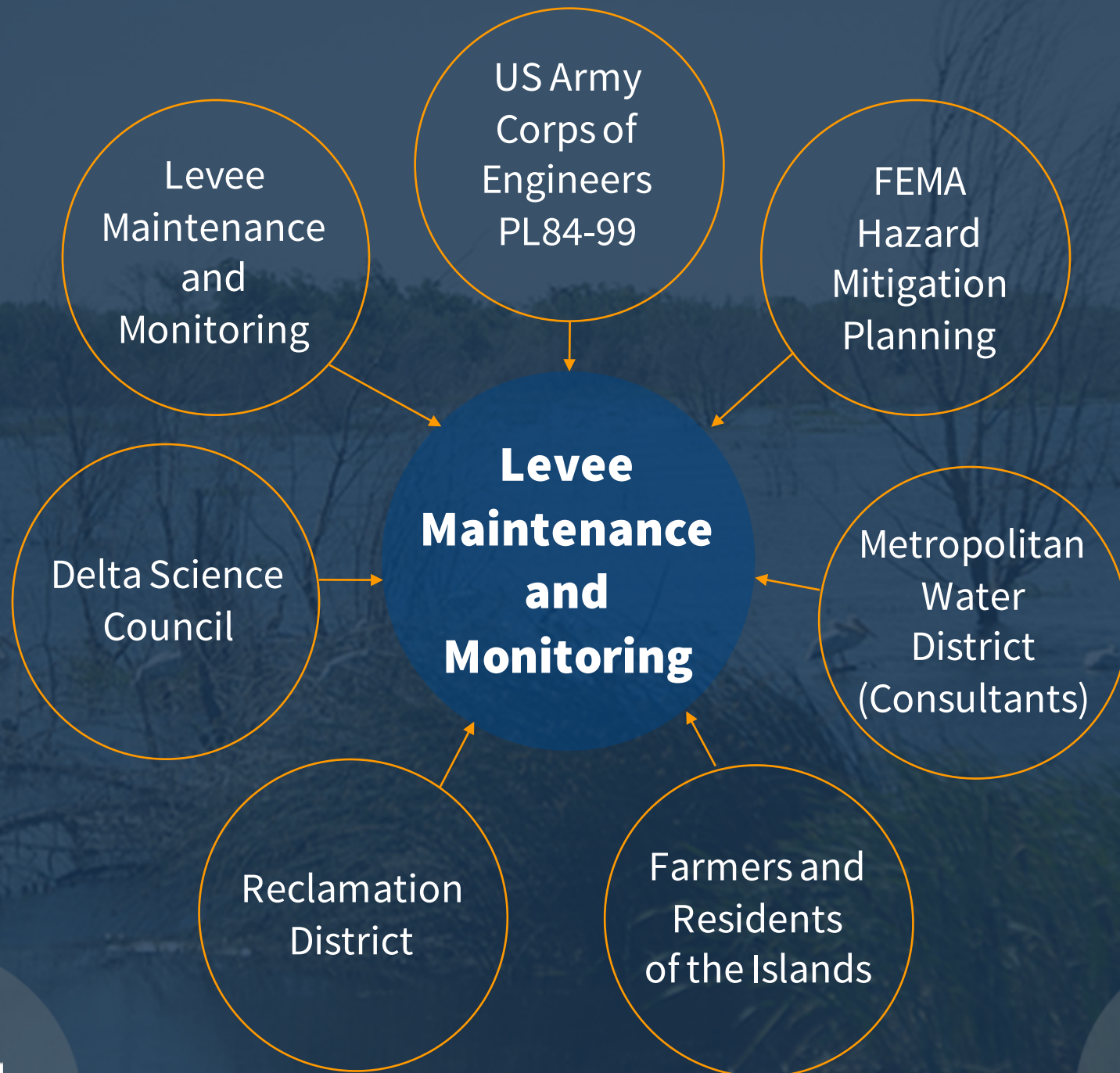
Data Flow Diagram



Levee Management and Maintenance

- ✓ Levees are integral to maintaining freshwater supplies in California
- ✓ Levee function is a factor in flood management and planning
- ✓ Levees are subject to regulations and standards for asset and flood protection
- ✓ Maintenance is the responsibility of Reclamation District
- ✓ FEMA HMP
- ✓ USACE PL 84-99

Levee Management Stakeholders



Levee Monitoring

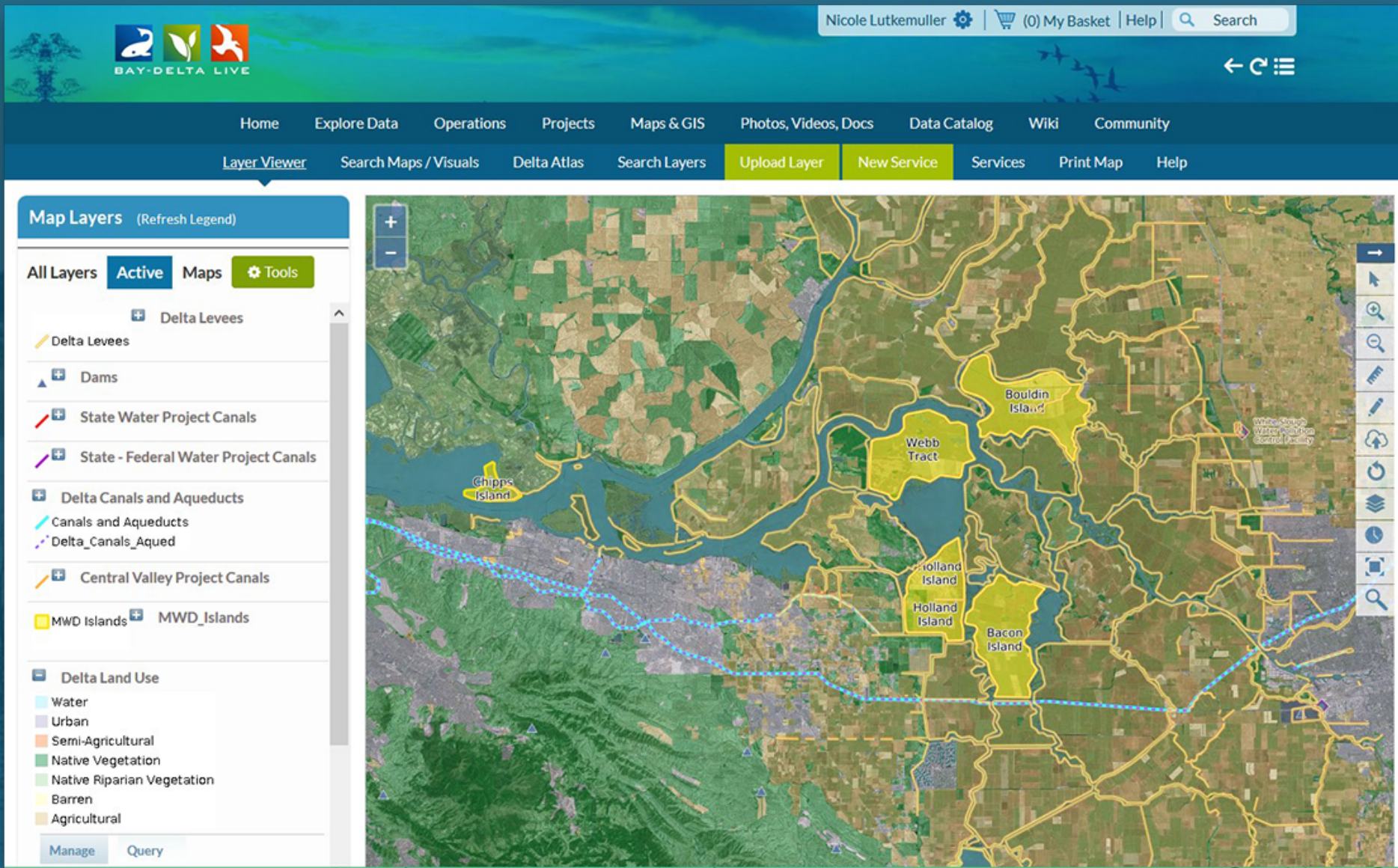
Key requirements for levee monitoring:

- ✓ Daily, weekly and monthly visual inspections
- ✓ Profile surveys with CORS GPS
- ✓ Piezometer and inclinometer readings
- ✓ Terrestrial 3-D scanning
- ✓ Aerial LiDAR and photogrammetry
- ✓ GIS analyses

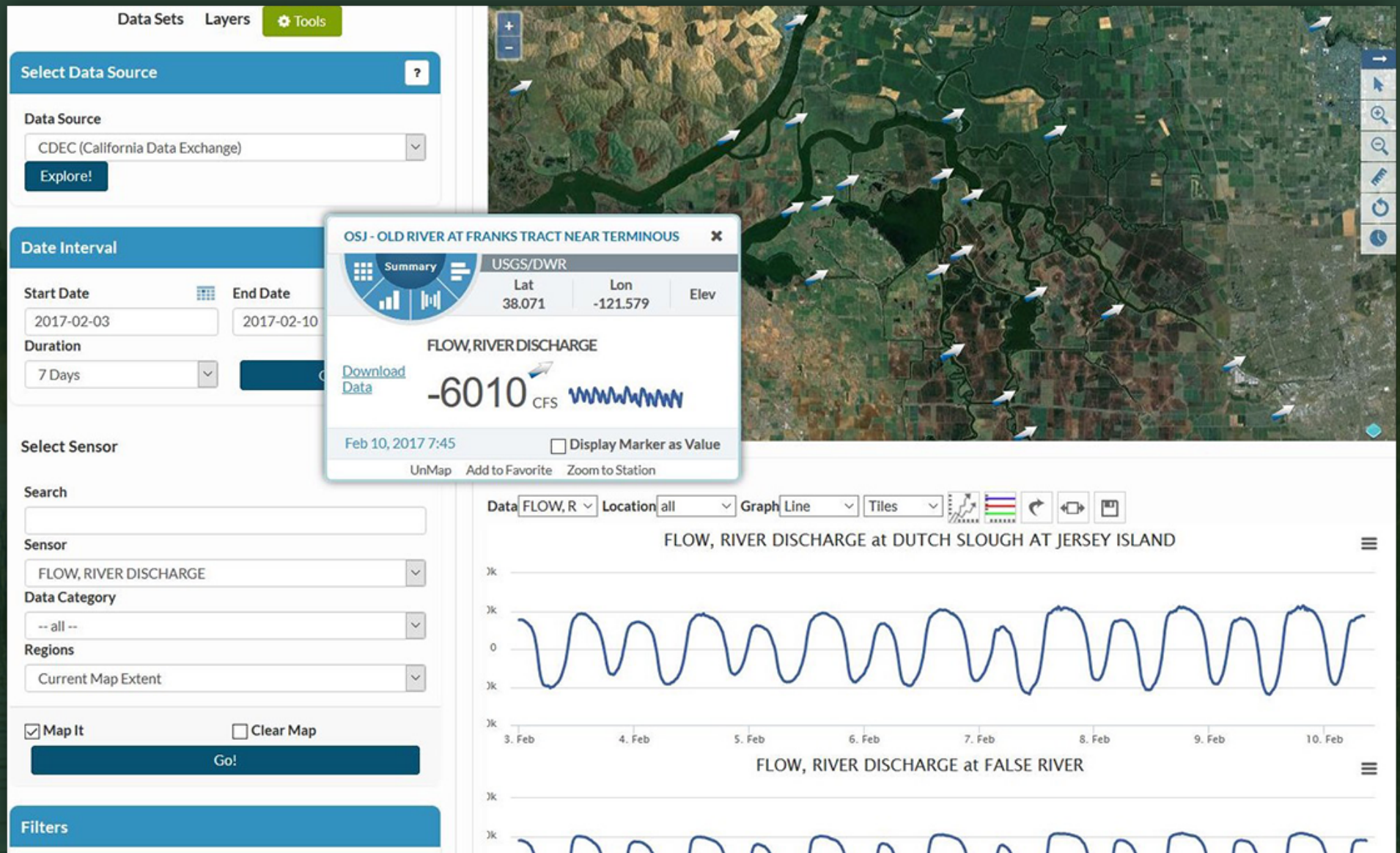
Levee Data Use Cases

Plan Element	Dataset	Source	OpenNRM Application
Daily Visual Inspections	Images, Reports, Documents	Farmer, Leasee, Reclamation District, DWR, Army Corps	Catalog, Projects, Fillable Form, Compliance and Reporting Dashboard
Profile and Cross-sections Surveys	plan drawings	MWD	Catalog, Projects, Documents, Web Map, 3-D model
Piezometers	Images, Reports, Excel	Farmer, Leasee, Reclamation District, DWR	Catalog, Projects, Fillable Form, Compliance and Reporting Dashboard, Data Analytics
Inclinometers	Images, Reports, Excel	Farmer, Leasee, Reclamation District, DWR	Catalog, Projects, Fillable Form, Compliance and Reporting Dashboard, Data Analytics
Survey Monuments and GPSCORS	GIS, Documents, Reports	Consultant?	Web Map, Catalog, Projects, Compliance and Reporting Dashboard, Data Analytics
Terrestrial 3D Scanning	Point Cloud Data, GIS, Imagery, Documents	MWD, Consultant	Web Map, Catalog, Projects, Compliance and Reporting Dashboard, Data Analytics, 3-D Models
Aerial LiDAR, Photogrammetry	Raster Imagery, GIS	DWR, MWD, Consultant	Web Map, Catalog, Projects, Compliance and Reporting Dashboard, Data Analytics, 3-D Models
Acres of Agricultural Land	GIS, Reports, Documents	DWR, Local jurisdiction, Land Owner	Web Map, Catalog, Projects, Compliance and Reporting Dashboard, Data Analytics,

Levees, Aqueducts, and Islands Data



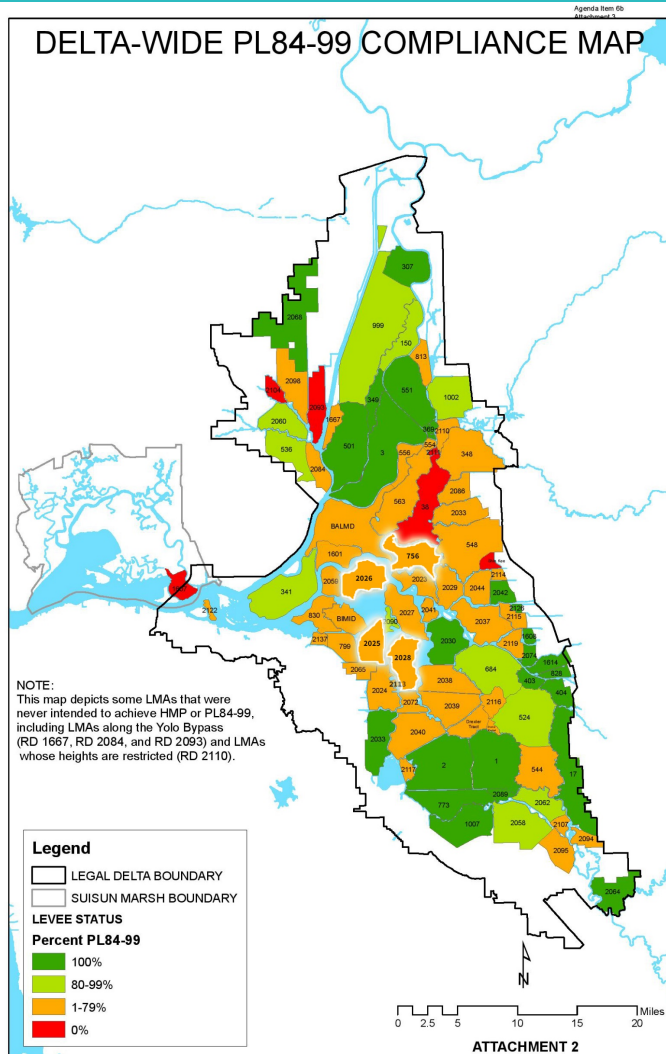
Real Time Levee Monitoring Data



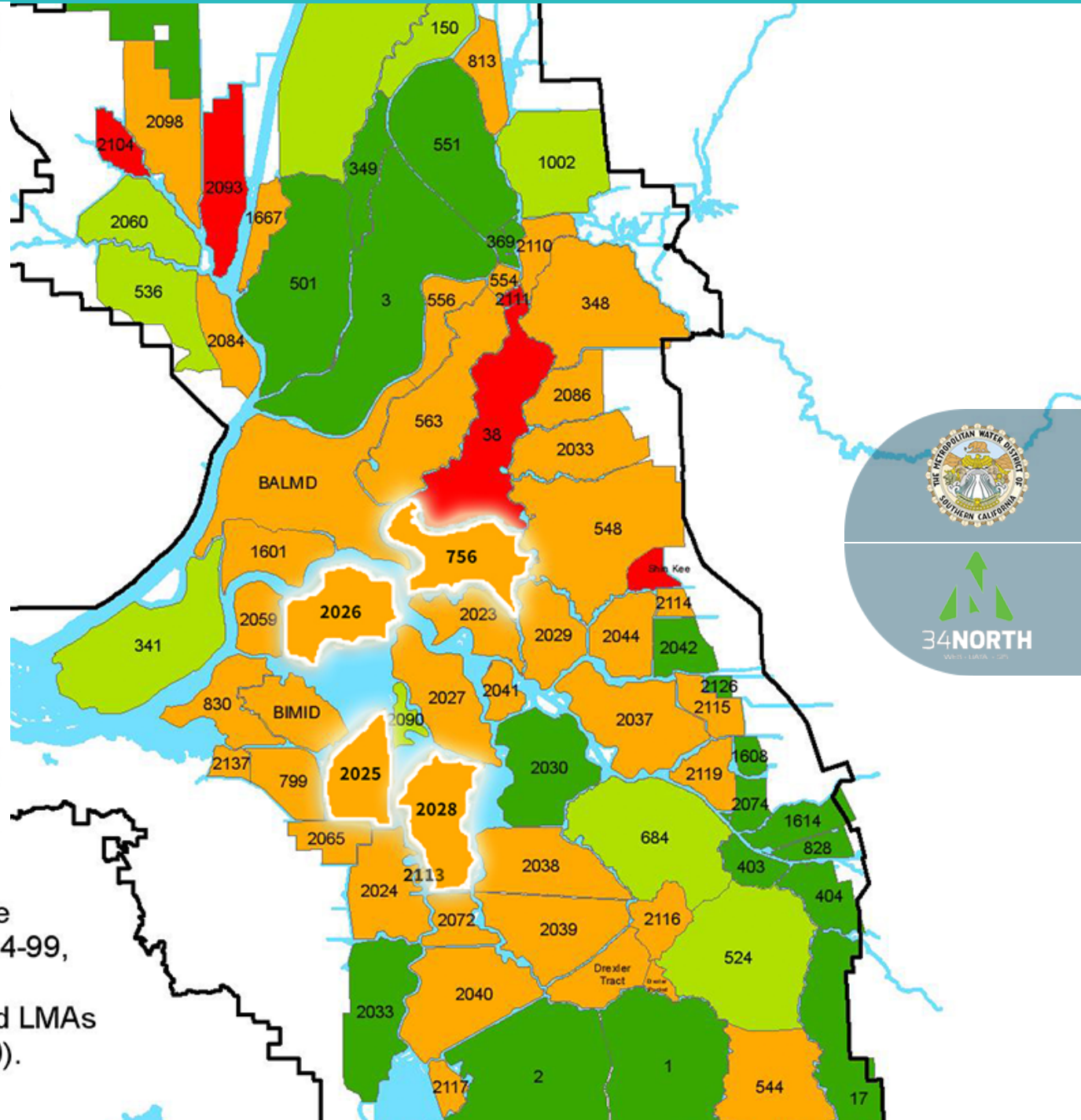
USACE PL 84-99 Compliance

- ✓ **Levee Safety Program** – provides eligibility for federal rehab assistance to levees if maintained to standards
- ✓ **Under program: “eligible damage” restored to pre-event condition:**
 - At no cost to federal system owners
 - At 20% of cost to non-federal system owners
- ✓ **Regularly inspected by USACE**
- ✓ **Surveyed parameters include:**
 - Stability (Piezometers, Inclinometers)
 - Subsidence (LiDAR, Profile and Cross-section Surveys, 3D scanning)
 - Cracking (Daily visual inspections, 3D scanning, Photogrammetry)
 - Vegetation growth (Daily visual inspections, LiDAR)
 - Erosion (Daily visual inspections)
 - Settlement and depressions (Daily visual inspections, LiDAR, Profile and Cross-section Surveys, 3D scanning)
 - Animal control (Daily visual inspections)
 - Rip-rap condition (Daily visual inspections)
 - Elevation changes (LiDAR, Profile and Cross-section Surveys, 3D scanning, inclinometer)

Delta – Wide PL84-99 Compliance Map



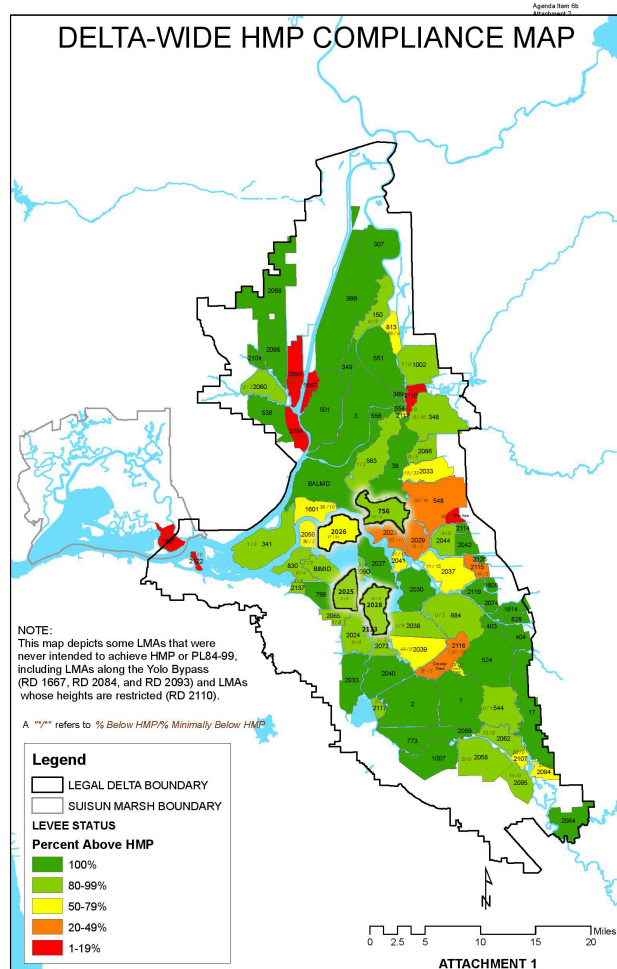
NOTE:
This map depicts some LMAs that were never intended to achieve HMP or PL84-99, including LMAs along the Yolo Bypass (RD 1667, RD 2084, and RD 2093) and LMAs whose heights are restricted (RD 2110).



FEMA HMP

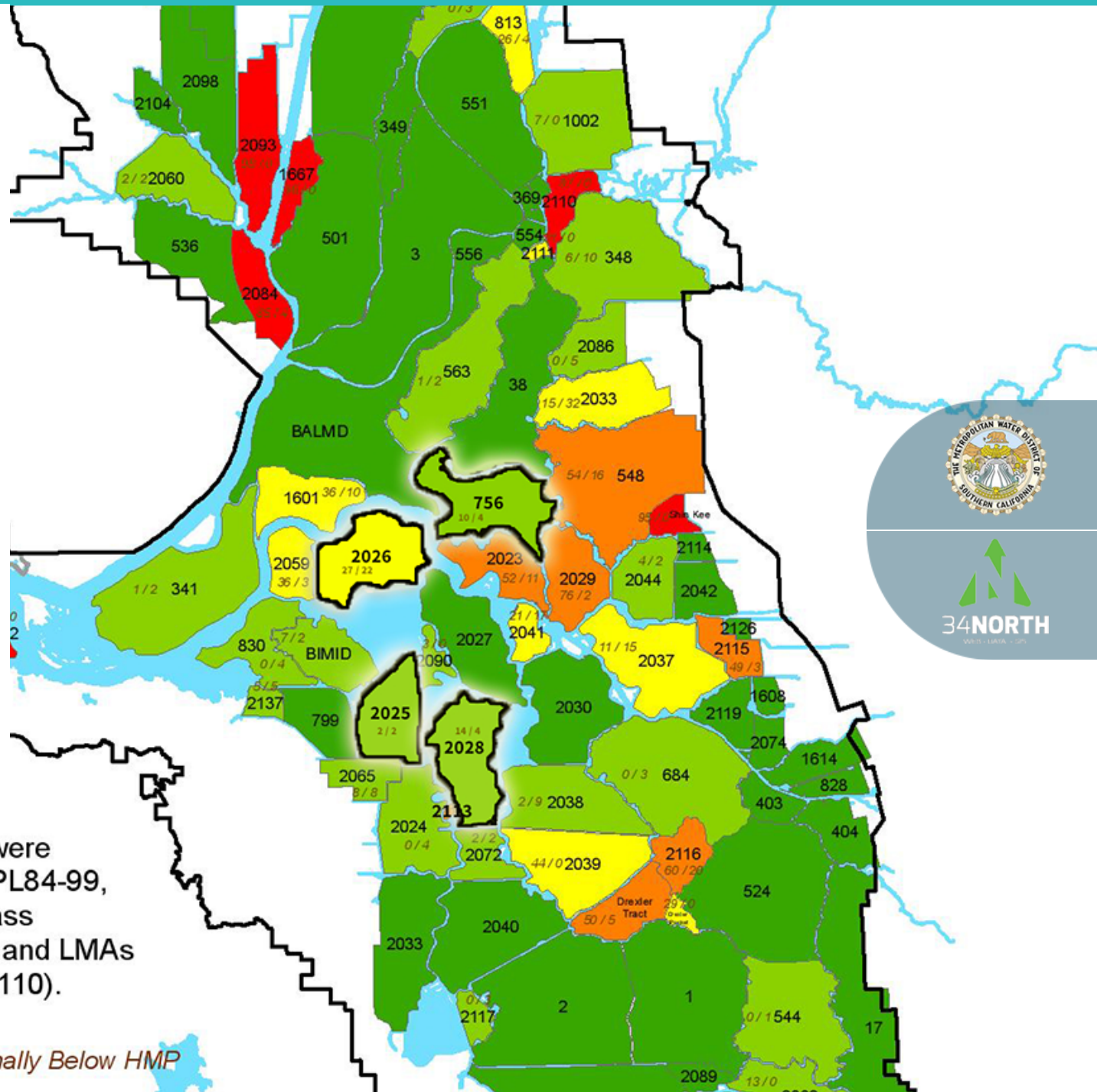
- ✓ Hazard Mitigation Plans – reduce loss of life and property during disasters
- ✓ Levee conditions are part of HMP's
- ✓ Must comply with HMP to qualify for certain funding from FEMA
- ✓ Numerous sections of levees in Delta not in compliance
- ✓ DWR maps of HMP compliance

Delta – Wide HMP Compliance Map

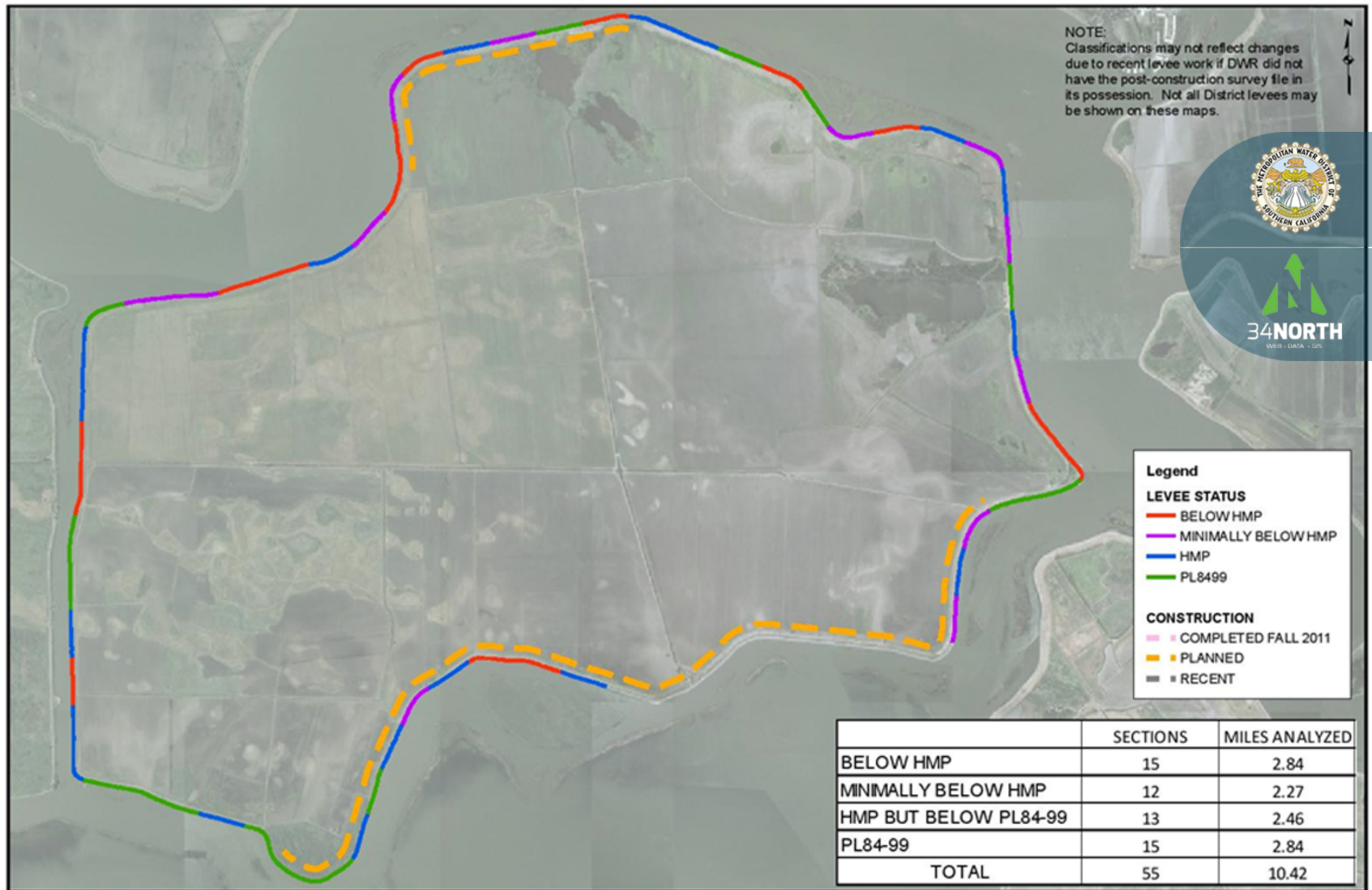


NOTE:
This map depicts some LMAs that were never intended to achieve HMP or PL84-99, including LMAs along the Yolo Bypass (RD 1667, RD 2084, and RD 2093) and LMAs whose heights are restricted (RD 2110).

A "*/**" refers to % Below HMP/% Minimally Below HMP



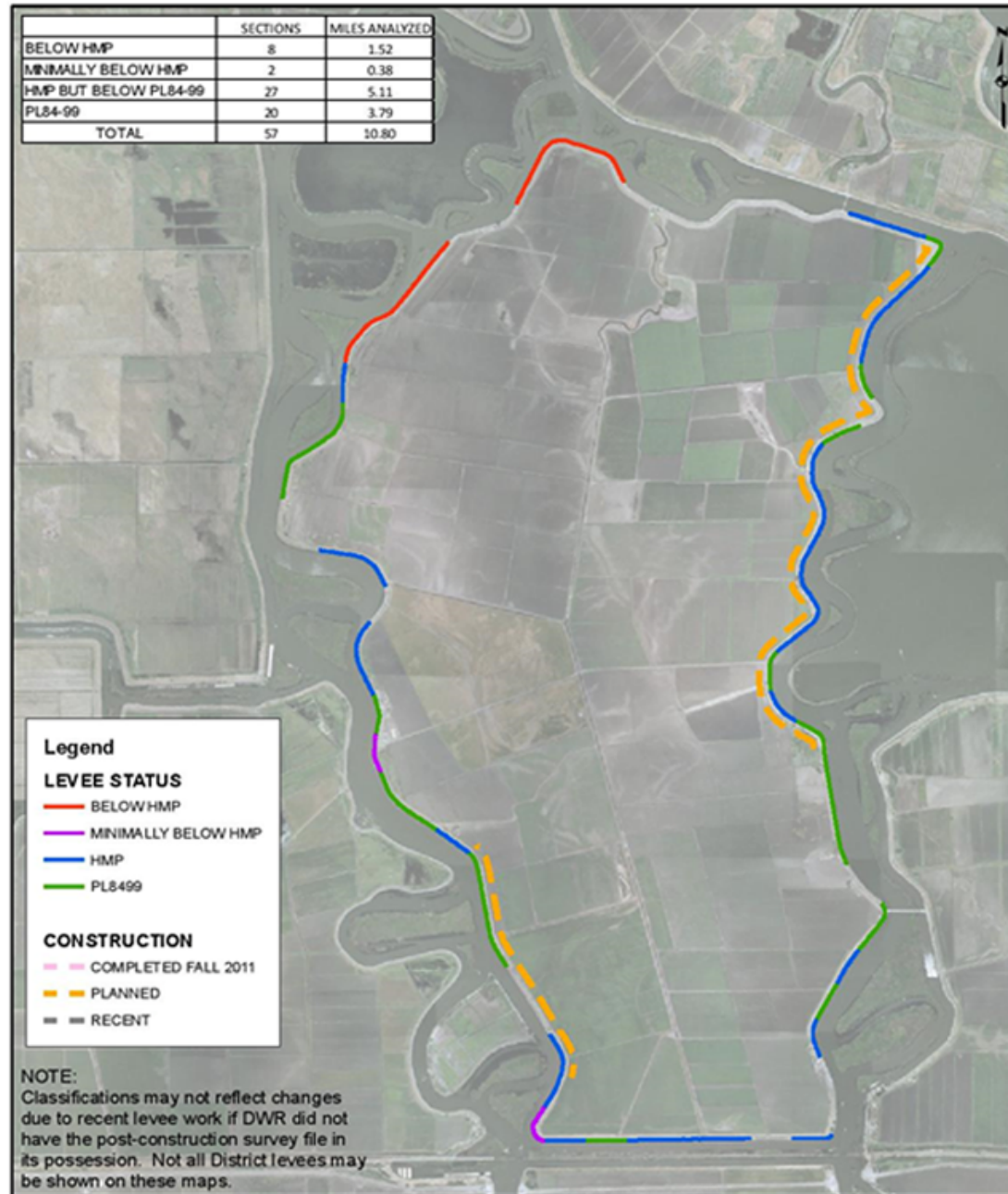
Levee Assessment – RD 2026 -Webb Tract



Levee Assessment - RD 2026 - Webb Tract



Levee Assessment - R D 2028 - Bacon Island

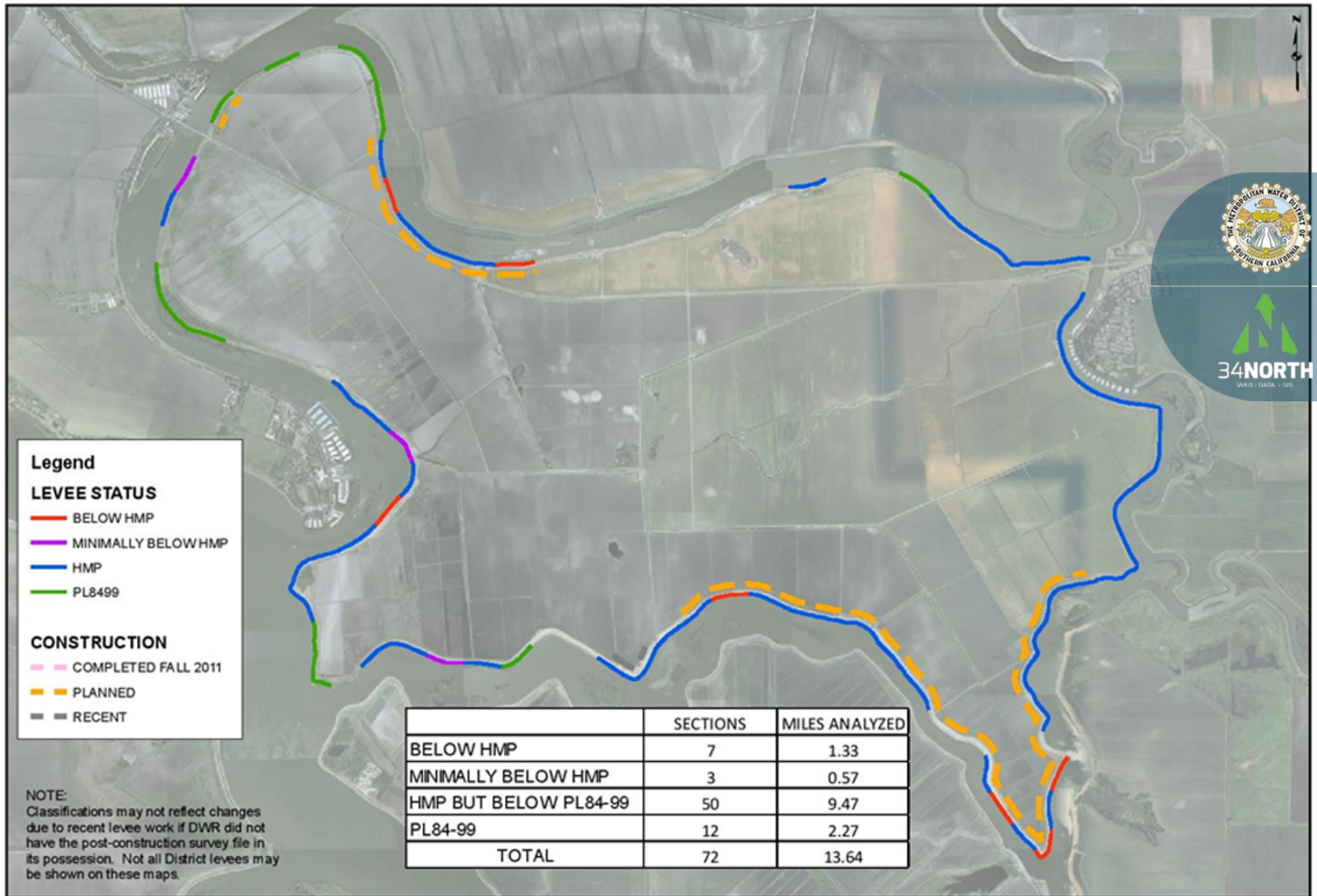


Levee Assessment - RD 2028 - Bacon Island

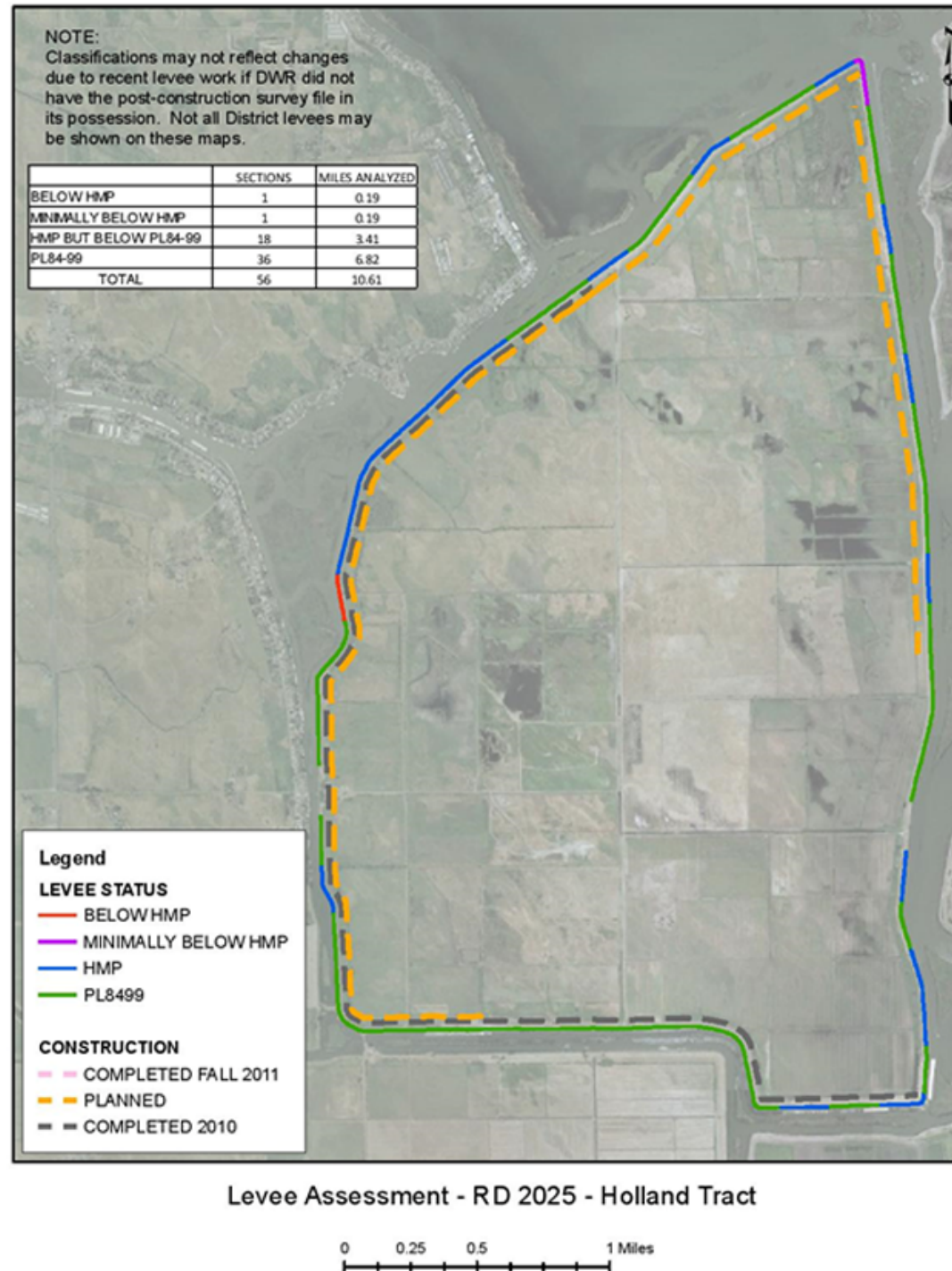
0 0.25 0.5 1 Miles



Levee Assessment - R D 756 - Bouldin Island



Levee Assessment - R D 2025 - Holland Island



Water Supply Reliability and Emergency Planning

Issues include:

- ✓ Levee Management and Maintenance
- ✓ Emergency Freshwater
- ✓ Salinity Management
- ✓ Emergency Management Planning

Emergency Management Planning

- ✓ California has FEMA approved State Hazard Mitigation Plan
 - Many local jurisdictions also have more specific FEMA approved HMPs

Hazard Mitigation Plans identify:

- ✓ Hazards and potential impacts on life and property
- ✓ Actions to reduce losses from hazards
- ✓ Coordinated process to respond and mitigate hazard impacts

Response relies on:

- ✓ Ability to communicate risk
- ✓ Identify immediate mitigation actions and relief efforts

Emergency Response Dashboard using OpenNRM tools

Emergency Management Stakeholders



Environmental Management Use Cases Table

Plan Element	Dataset	Source	OpenNRM Application
Hazard Identification and Location	GIS files, reports, imagery	Local jurisdictions, Office of Emergency Services, FEMA, USGS	Web Map, Geo-located Reports and Imagery, Document Library, Explore Data, Project Pages, Reporting and Compliance Dashboards
Previous Occurrences and Impacts	GIS files, reports, imagery	Office of Emergency Services, Local Jurisdictions	Web Map, Geo-located Reports and Imagery, Document Library, Project Pages, Reporting and Compliance Dashboards
Risk Assessment Relative to Assets	GIS files, reports, imagery	Local jurisdictions, Office of Emergency Services, FEMA, USGS	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards
NFIP Insured Structures	GIS files, reports, imagery	FEMA	Web Map, Geo-located Reports and Imagery, Reporting and Compliance Dashboards
Existing Authorities /Boundaries	GIS files, reports, imagery	State or Local Agencies	Web Map, Reporting and Compliance Dashboards
Preventative Measures	Reports, documents, imagery, GIS	State, Local Agencies, Reclamation Districts or Levee Maintaining Agency, FEMA	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards
Emergency First Response Locations	Emergency First Response Locations	Local Jurisdictions, Fire and Law Enforcement Agencies, State Database	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards

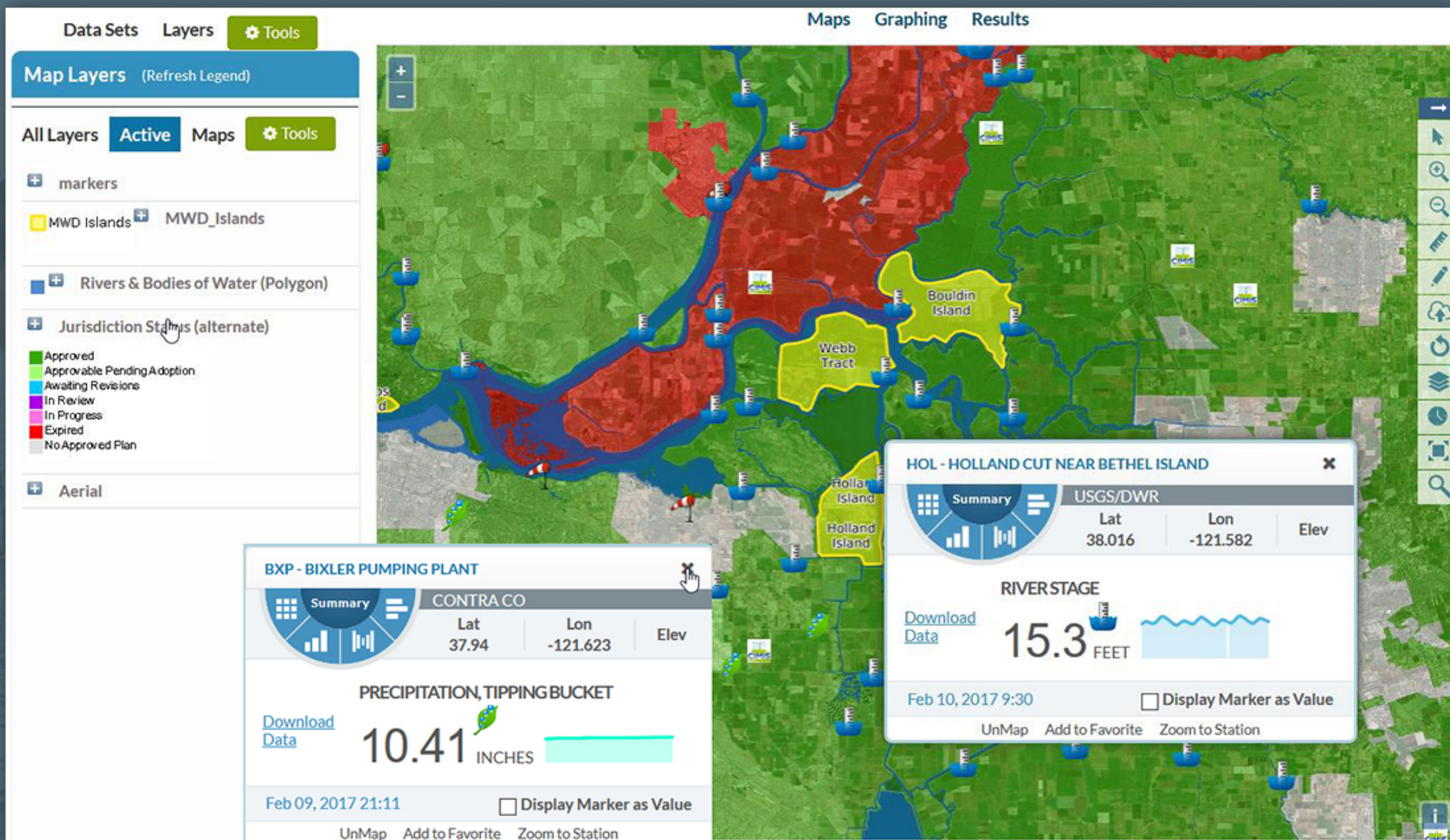
Emergency Management Use Cases Table

Plan Element	Dataset	Source	OpenNRM Application
Relief Locations	GIS files and searchable database of assets	Office of Emergency Services, Local Jurisdictions	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards, Fillable Forms
Roadway Conditions	GIS files, real-time mapping and searchable list	CalTrans	Web Map, Reporting and Compliance Dashboards
Weather Conditions and Notifications	GIS files, real-time mapping and searchable list	NOAA	Web Map and Reporting and Compliance Dashboards
Hospitals and Medical Facilities	GIS files and searchable database of assets	Local Jurisdictions, State database	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards
Community Services Locations	GIS files and searchable database of assets	Local Jurisdictions, State database	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards

Emergency Management Use Cases Table

Plan Element	Dataset	Source	OpenNRM Application
Supply Locations	GIS files and searchable database of assets	Office of Emergency Services, Local Jurisdictions	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards, Fillable Forms
Real-time Alerts and Developments	GIS files, real-time mapping and searchable list, notifications, threshold data dashboards	CalTrans	Web Map, Reporting and Compliance Dashboards
Photos for Incident Tracking and Reporting	Imagery upload, georeferencing of images and fillable reporting form	NOAA	Web Map and Reporting and Compliance Dashboards
Citizen Reports	Imagery upload, georeferencing of images and fillable reporting form	Local Jurisdictions, State database	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards
Citizen Resources/ Skills	Profile database, georeferencing of profile and fillable skills reporting form	Local Jurisdictions, State database	Web Map, Geo-located Reports and Imagery, Document Library, Reporting and Compliance Dashboards

FEMA HMP Status with Real Time Hydrology Conditions on BayDeltaLive



Island Diversions and SB 88

Water diversions made from adjacent rivers and sloughs onto islands

After use, water often discharged back into adjacent waterways

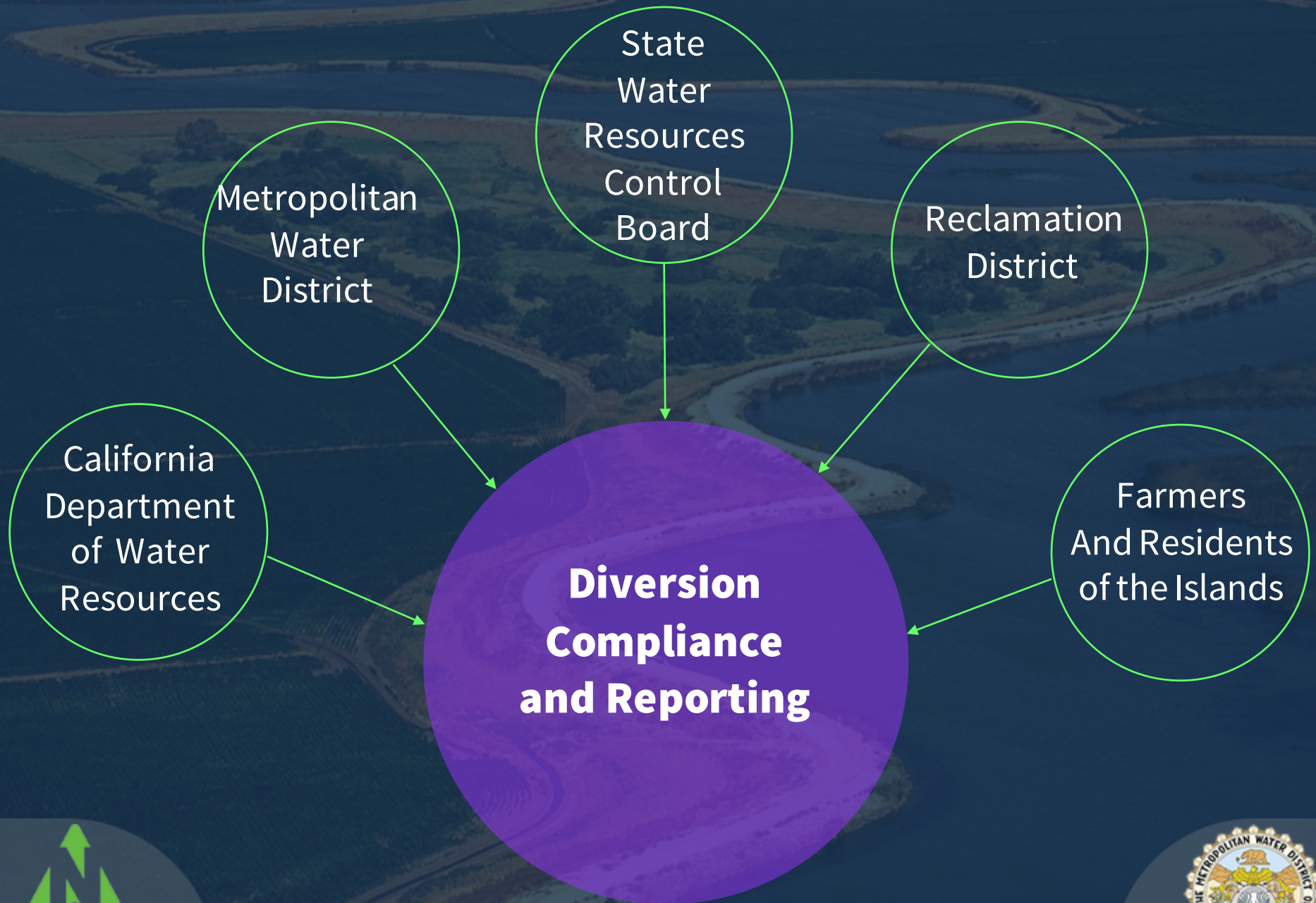
California Water code requires monitoring and reporting of diversions

Monitoring and reporting diversions assists in ensuring proper allocation of State's water resources

SB88 – Emergency Regulation for Measuring and Reporting the Diversion of Water

- ✓ Signed by Governor Brown on June 24, 2015
- ✓ Waterboard implemented law on January 19, 2016
- ✓ Reporting requirements begin January 1, 2017
- ✓ Requires person/organization diverting 10 acre-feet or more per year to meet specific measurement, accuracy, and reporting requirements

Diversion Stakeholders



Diversion Reporting Requirements

Reporting includes:

- ✓ Water right holder information
- ✓ Geographic location
- ✓ Monitoring frequency
- ✓ Monthly diversion rates and amounts
- ✓ Purposes of use
- ✓ Water transfers or changes in information

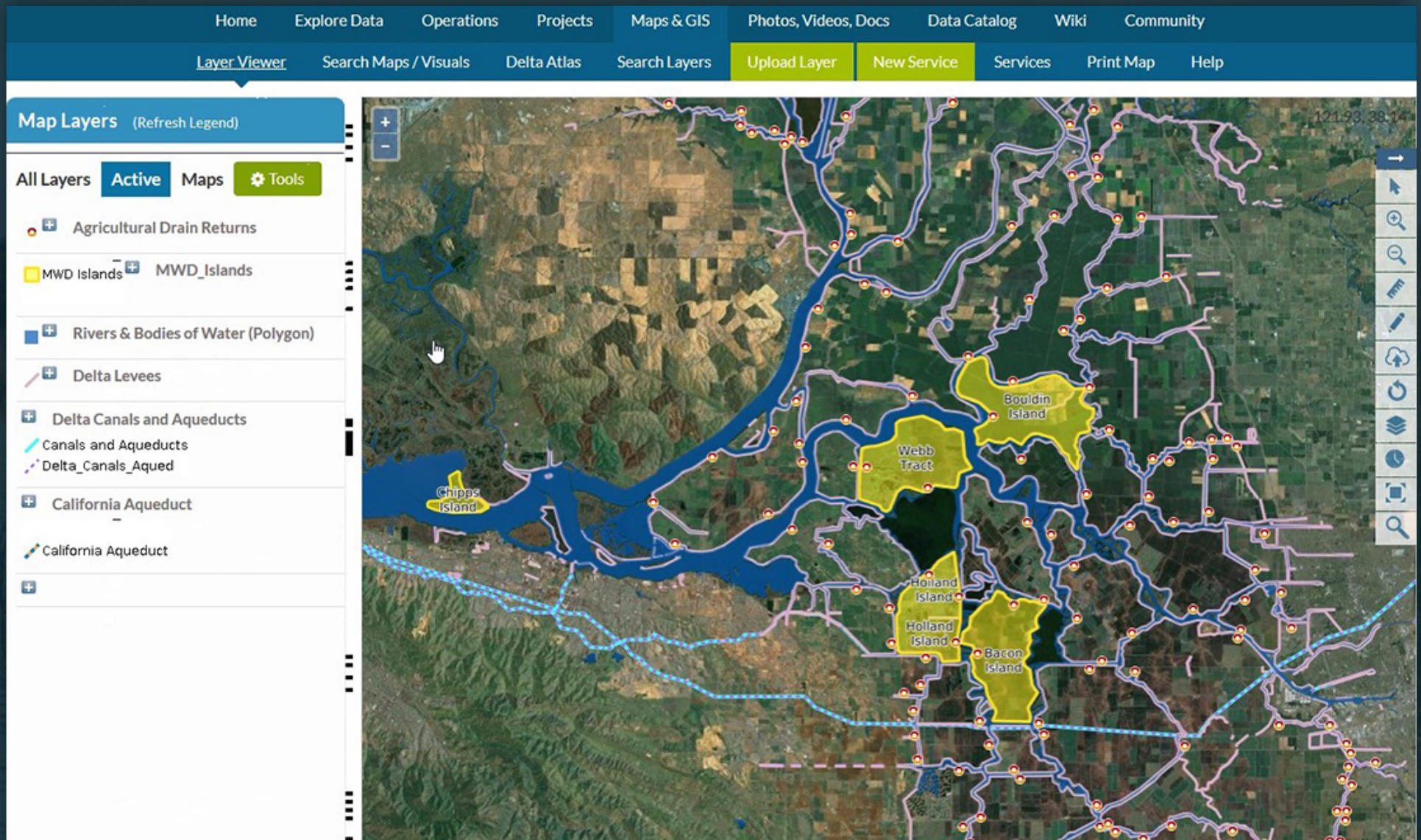
Diversion Monitoring Use Cases

Plan Element	Dataset	Source	OpenNRM Application
Water Right Info	GIS, Documents, Reports	USBR, DWR, Farmer	Web Map, Compliance and Reporting Dashboard, Fillable Forms, Catalog, Projects
Monthly Reporting	Excel, Reports	Farmer, Water Right Holder, Diversion works operator	Compliance and Reporting Dashboard, Data Analytics, Reports
	Excel, Reports	Farmer, Water Right Holder, Diversion works operator	Compliance and Reporting Dashboard, Data Analytics, Reports
	Excel, Reports	Farmer, Water Right Holder, Diversion works operator	Compliance and Reporting Dashboard, Data Analytics, Reports
Diversion Details	Reports, Images	Farmer, Water Right Holder, Diversion works operator	Catalog, Projects, Fillable Form, Compliance and Reporting Dashboard
Measurement Methods	Reports, Images	Farmer, Water Right Holder, Diversion works operator	Catalog, Projects, Fillable Form, Compliance and Reporting Dashboard, Web Map
Beneficial Uses	Excel, Reports	Farmer, Water Right Holder, Diversion works operator	Compliance and Reporting Dashboard, Data Analytics, Reports
Beneficial Uses	Reports, Images	Farmer, Water Right Holder, Diversion works operator	Catalog, Projects, Fillable Form, Compliance and Reporting Dashboard, Web Map

SB 88 Accuracy Timeline Table

Type of Diversion (af = acre-feet)	Installation Deadline	Required Accuracy	Required Monitoring Frequency	Qualifications For Installation and Certification
Direct Diversion \geq 1,000 af/year Storage \geq 1,000 af	January 1, 2017	10%	Hourly	Engineer/Contractor/ Professional
Direct Diversion \geq 100 af/year Storage \geq 200 af	January 1, 2017	10%	Daily	Engineer/Contractor/ Professional
Direct Diversion \geq 10 af/year Storage \geq 50 af	January 1, 2018	15%	Weekly	Individual experienced with measurement and monitoring
Storage \geq 10 af	January 1, 2018	15%	Monthly	Individual experienced with measurement and monitoring

Levees, Ag Discharges, and Water Infrastructure Data



California Water Fix Monitoring and Collaboration

- ✓ **California Water Fix requires substantial monitoring and reporting to minimize environmental impacts**
- ✓ **Data collected for island management can be integrated into reporting and mitigation for the Water Fix project**
- ✓ **Monitoring and reporting mandated in the EIR for Water Fix integrated into platform**
- ✓ **Types of data collected will have crossover with existing research efforts and island management strategies**
- ✓ **Monitoring topics for California Water Fix include:**
 - Flows management
 - Turbidity
 - Salinity
 - PH
 - Fish rescue and salvage
 - Biological monitoring of listed and endangered species
 - Storm water quality monitoring
 - Compliance with all existing environmental standards and regulations

Water Fix Relation Diagram

Municipal Management - Water Supply

34 North data management services can be used to guide water supply asset operations.

Data Dashboards of water supply conditions:

- Real-time hydrology conditions
- Water diversion rates monitoring
- Agricultural discharge monitoring
- Pumping rates for water projects
- Reservoir levels

Reporting Dashboards for SB88:

- Custom reporting platform for compliance with diversion reporting.

Levee Safety and Asset Protection

Visual data integration for levee monitoring using data management tools.

Dashboards of spatial data and mapping applications:

- Drone and ground imagery
- 3-D scan visual monitoring
- Satellite and LiDAR data monitoring
- Imagery catalog for levee inspections
- Land use monitoring

Report Dashboards for Levee Monitoring:

- Project pages for levee repair and maintenance projects
- Flood models integrating FEMA data

Environmental Management and Conservation

Real-time hydrology and water quality data streams.

Dashboards for water quality and fish population monitoring:

- Spatial locations of fish and wildlife habitats
- Restoration project tracking and mapping
- Critical area identification
- Imagery catalog for levee inspections
- Land use monitoring
- Recreation opportunities
- Project pages to track and manage restoration efforts

California WaterFix and the Delta's Co-Equal Goals

- Two of the islands are on the proposed path of the Delta Tunnels → levee maintenance and monitoring
- Protecting water supplies through accounting, monitoring, modeling of quality and quantity
- Improve flows for fish through forecasting and monitoring of pumping, salinity, turbidity, diversions
- Tracking of ecosystem restoration and conservation; opportunity identification through spatial analyses

Environmental Management

Islands purchased by MWD are in critical areas:

- ✓ on Pacific Flyway
- ✓ In Delta smelt and Chinook salmon habitat
- ✓ Western islands act as salinity buffer
- Chippis island intended for tidal wetland restoration
 - Food and habitat for Delta Smelt

Restoring native tule vegetation could help rebuild peat soils

- ✓ Increase island elevations
- ✓ Reduce carbon emissions from soil decay

An OpenNRM island portal could be a resource and repository for natural resource management information.

Environmental Management Stakeholders Diagram



Environmental Management Data Use Cases

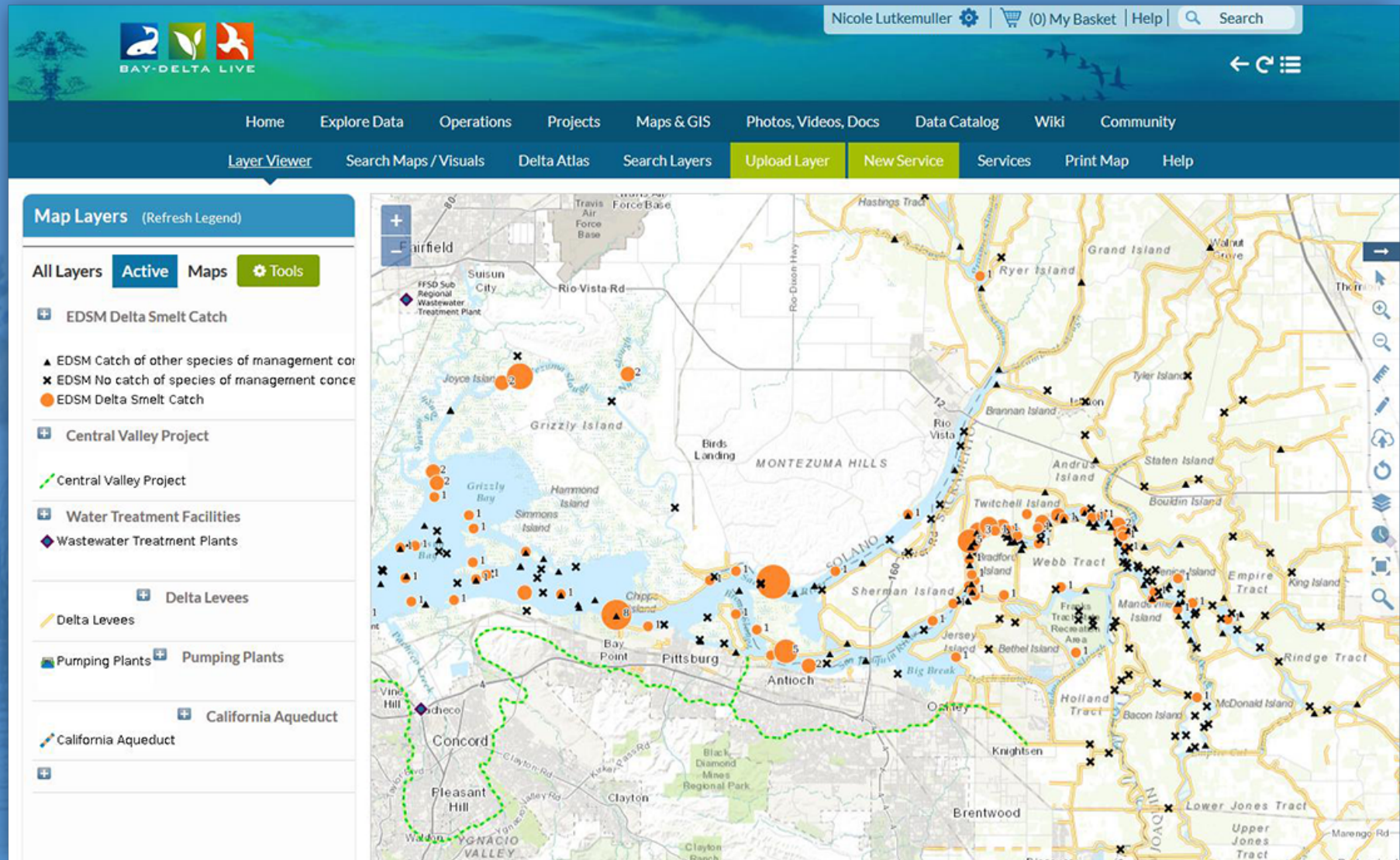
Key topics:

- ✓ Restoration of wetlands
- ✓ Fish population and entrainment monitoring
- ✓ Water quality monitoring
- ✓ Land and habitat conservation
- ✓ Reducing carbon emissions from decaying island peat soils

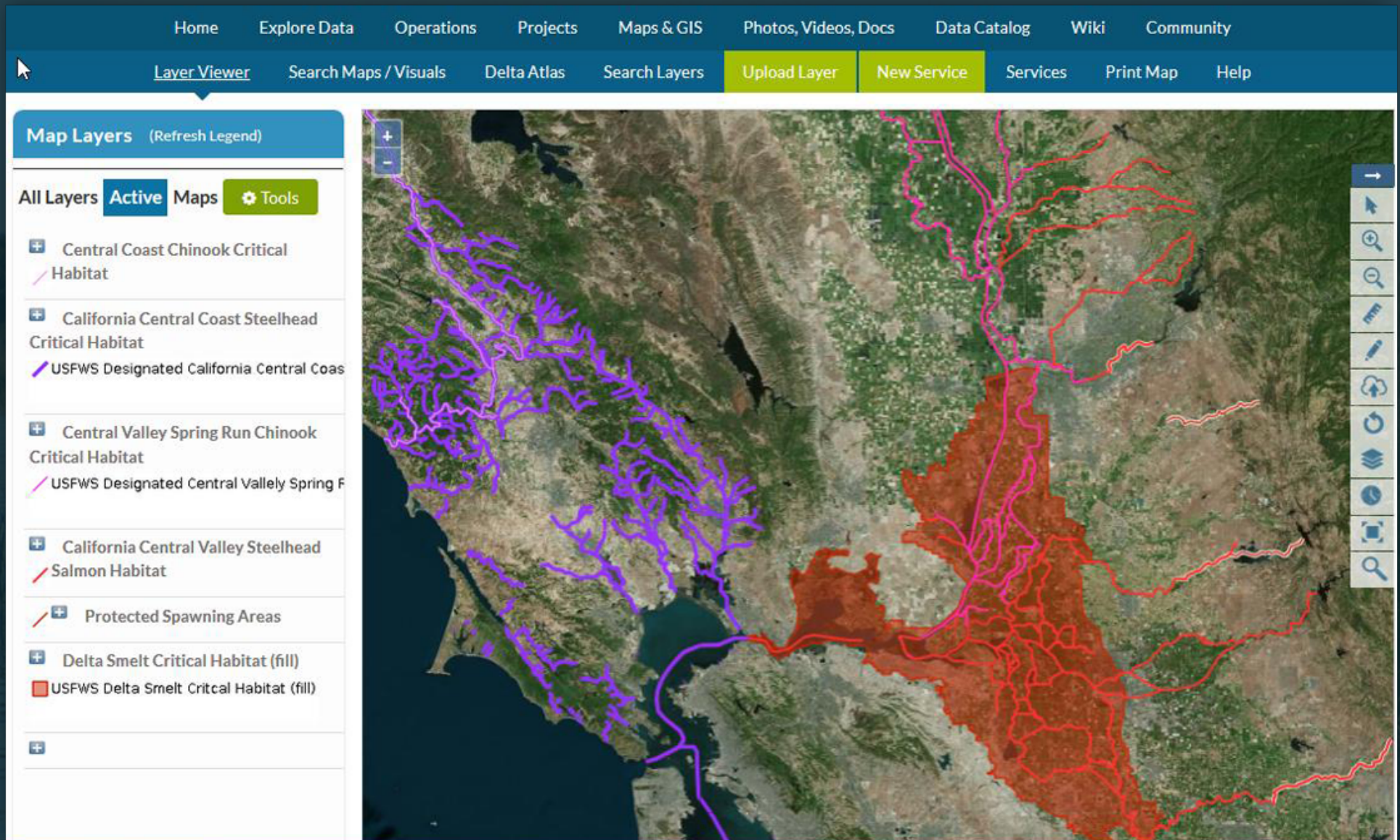
Environmental Management Use Cases

Plan Element	Dataset	Source	OpenNRM Application
Restoration tracking	GIS files, reports, data	Various agencies and organizations	Web Map, Data Stories, Projects, Compliance and Reporting Dashboards
Fish	Excel, PDF, GIS files, Web Services, data	USFWS, CDFW, DWR	Web Map, Data Stories, Compliance and Reporting Dashboards
Water Quality, salinity, turbidity	Excel, Web Services, data	SWRCB, DWR, USFWS, CDFW	Explore Data, Models, Data Analytics, Tables, Compliance and Reporting Dashboards
Land/habitat conservation	GIS files, reports, data	Various agencies and organizations	Web Map, Data Stories, Projects, Compliance and Reporting Dashboards

Delta Smelt Monitoring Data on BayDeltaLive



Critical Fish Habitats and Protected Spawning Areas



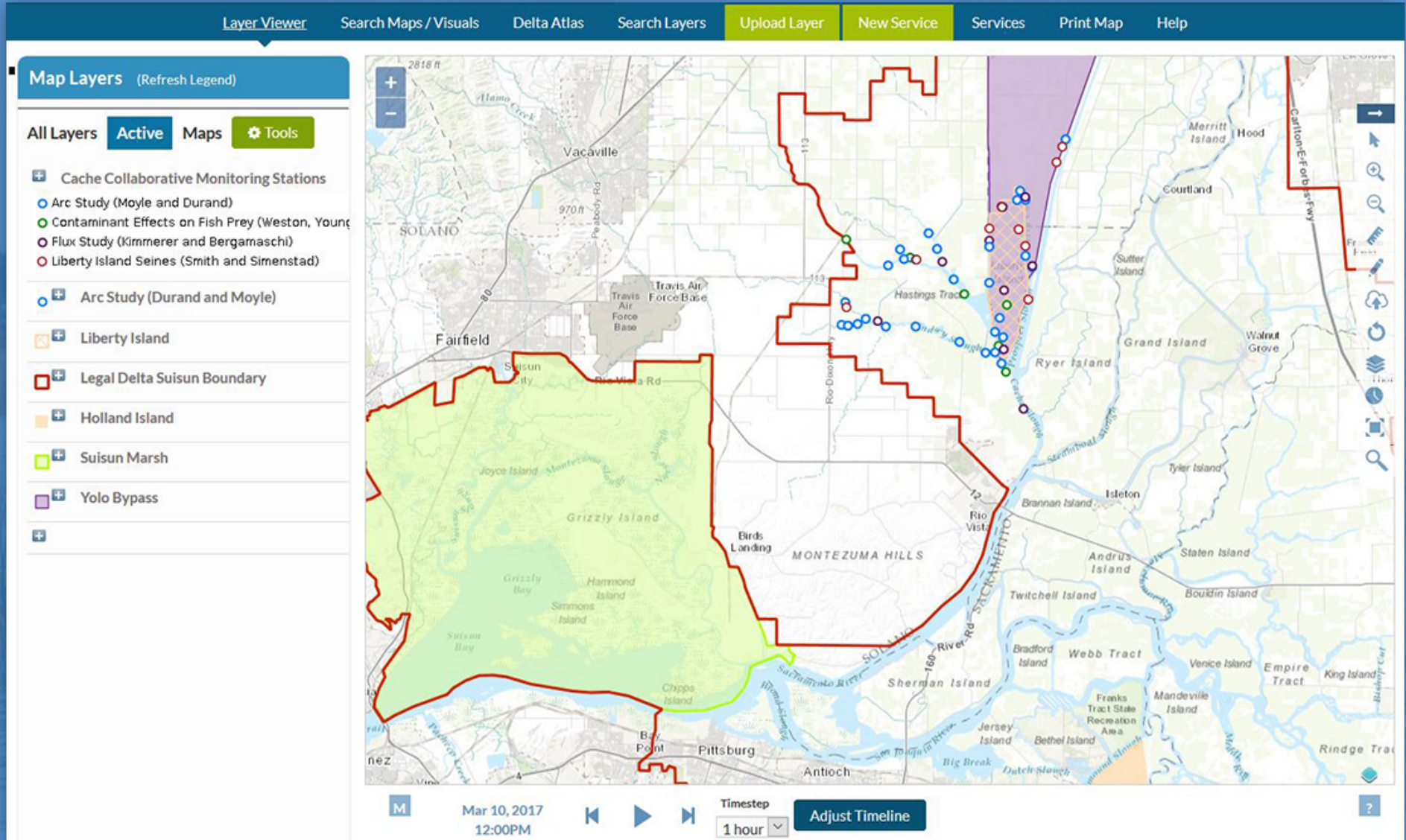
Connecting with Existing Research

- ✓ Delta is a food limited and tidal wetland
- ✓ Research and monitoring conducted to identifying effective restoration practices and locations



- ✓ Islands can be used for research or to supplement ongoing research
- ✓ Data can contribute to Delta studies
- ✓ The Arc Study (Peter Moyle and John Durand) and other Cache and Susuin studies can be used to inform management of islands
- ✓ Other ongoing monitoring and research can be expanded to other Delta islands

Cache Collaborative and other Delta Research Areas



Island Specific Solution

- ✓ Build on Bay Delta Live infrastructure
- ✓ A new private data management platform would provide sub-domain access for each island
- ✓ Build on environmental management and monitoring data projects and products developed for BDL. e.g.
 - ✓ Fisheries Monitoring Program Dashboards
 - ✓ Operations
 - ✓ CDEC/NWIS/CEDEN Data Services
 - ✓ 300+ GIS layers
- ✓ Develop templates specific to island management reporting requirements and stakeholder collaboration
- ✓ Full service software and data support

34 North Tools

- ✓ Spatial Tools: Library, WMS, WFS, and WMST
- ✓ Web Based Mapping Tools
- ✓ Database and Data Management Tools
- ✓ Data Visualization, Analytics, Animations, and 3-D Mapping
- ✓ Explore Data Real-time Data Streams and Web Services
- ✓ Configurable Dashboards for index and threshold management
- ✓ Catalogs for images, videos, documents, reports, and research

OpenNRM Features Use Case Table

Key Issues	Monitoring Component	GIS and Interactive Map Tools	Catalogs for Content Mgmt.	Data Mgmt., Analytics, Animations	Explore Data Real-Time Sensor Network	Compliance and Reporting Dashboards	Projects and Data Stories	Fillable Forms
Levee Monitoring	Daily Visual Inspections	X	X			X	X	
	Profile and Cross-sections Surveys	X	X			X	X	
	Piezometers	X		X		X	X	
	Inclinometers	X		X		X	X	
	Survey Monuments and GPSCORS	X	X	X		X	X	
	Terrestrial 3D Scanning	X		X		X		
	Aerial LiDAR/Photogrammetry	X		X		X		
	Acres of Agricultural Land	X				X	X	

OpenNRM Features Use Case Table

Key Issues	Monitoring Component	GIS and Interactive Map Tools	Catalogs for Content Mgmt.	Data Mgmt., Analytics, Animations	Explore Data Real-Time Sensor Network	Compliance and Reporting Dashboard s	Projects and Data Stories	Fillable Forms
Diversion Compliance and Reporting	Water Right Info	X	X			X		X
	Monthly Reporting	X	X	X	X	X	X	X
	Diversion Details	X	X			X	X	X
	Measurement Methods		X			X	X	X
	Beneficial Uses		X			X	X	X
	Transfers and Changes		X			X	X	X

OpenNRM Features Use Case Table

Key Issues	Monitoring Component	GIS and Interactive Map Tools	Catalogs for Content Mgmt.	Data Mgmt., Analytics, Animations	Explore Data Real-Time Sensor Network	Compliance and Reporting Dashboards	Projects and Data Stories	Fillable Forms
Environmental Management	Restoration Project Tracking	X	X		X	X		
	Fish Population Monitoring	X	X	X	X	X	X	
	Water Quality, Salinity, Turbidity	X		X	X	X	X	
	Land/Habitat Conservation	X	X	X	X	X	X	
	Wildlife Population Counts and Monitoring	X	X	X	X	X	X	

OpenNRM Features Use Case Table

Key Issues	Monitoring Component	GIS and Interactive Map Tools	Catalogs for Content Mgmt.	Data Mgmt., Analytics, Animations	Explore Data Real-Time Sensor Network	Compliance and Reporting Dashboards	Projects and Data Stories	Fillable Forms
Emergency Management	Hazard Identification and Location	X	X	X	X	X	X	
	Previous Occurrences and Impacts	X	X			X	X	
	Risk Assessment Relative to Assets	X	X		X	X	X	
	Existing Authorities and Boundaries	X	X			X	X	
	Preventative Measures	X	X			X	X	
	Emergency First Response Locations	X	X			X	X	
	Relief Locations	X	X			X	X	
	Roadway Conditions	X	X			X	X	
	Weather Conditions and Notifications	X			X	X		

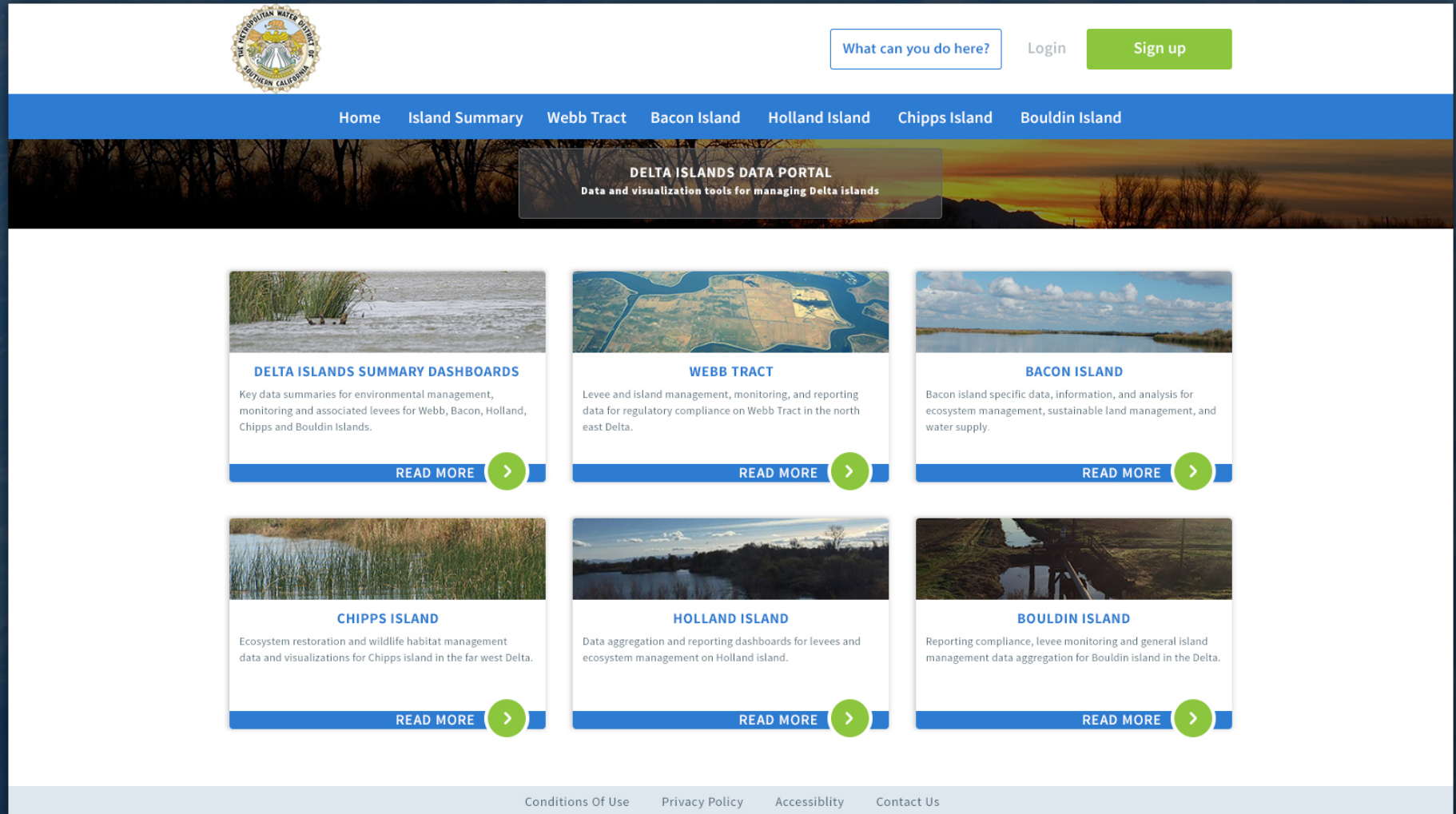
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Key Issues	Monitoring Component	GIS and Interactive Map Tools	Catalogs for Content Mgmt.	Data Mgmt., Analytics, Animations	Explore Data Real-Time Sensor Network	Compliance and Reporting Dashboards	Projects and Data Stories	Fillable Forms
Emergency Management	Hospitals and Medical Facilities	X	X		X	X	X	
	Community Services Locations	X	X			X	X	
	Supply Locations	X	X		X	X	X	
	Real-time Alerts and Developments	X				X	X	
	Photos for Incident Tracking and Reporting	X	X			X		X
	Citizen Reports	X	X			X	X	X
	Citizen Resources and Skills	X	X		X	X	X	X

34 North Services and Implementation

- ✓ Data Aggregation and Inventory
- ✓ Develop data management plan and data workflow, including data provenance
- ✓ UX for user interaction with data
- ✓ Content management schema and aggregation
- ✓ Database set up and architecture
- ✓ New instance of OpenNRM: set up management themed sub sections (catalogs, GIS, data libraries, wikis)
- ✓ Customize management admin for data contributors
- ✓ Custom GIS
- ✓ Databases and data interoperability
- ✓ Reporting Dashboards
- ✓ QA/QC, Debugging
- ✓ Project Management

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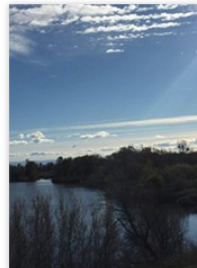
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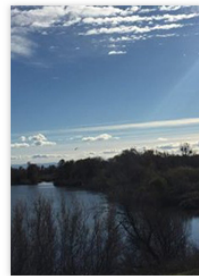
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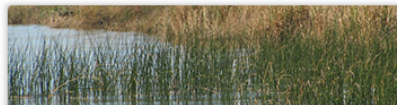
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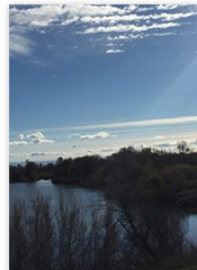
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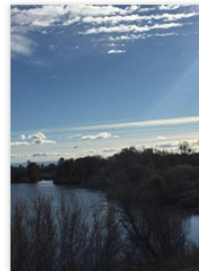
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