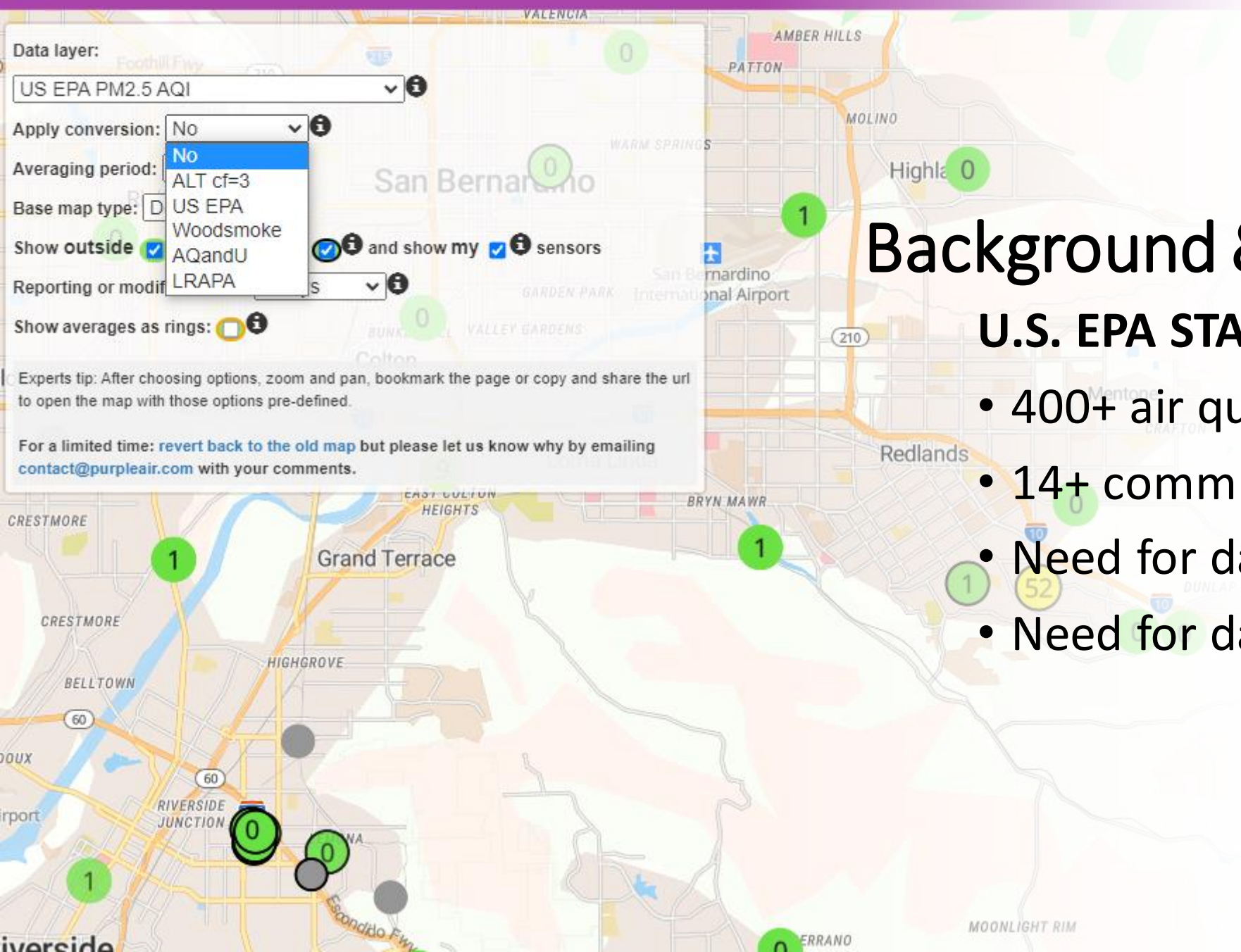




# AQPortal: Lessons learned in developing a data management platform

Brandon Feenstra, Ph.D. | Quality Assurance Manager



## Background & Motivation:

### U.S. EPA STAR grant

- 400+ air quality sensors
- 14+ communities
- Need for data management
- Need for data visualization

# Where did we start?

- Monitoring and Analysis Division (MAD)
  - Air Quality Sensor Performance Evaluation Center (AQ-SPEC)
    - U.S. EPA STAR Grant
- Internal Information Management (IM) Team
- Initial Quotes for Complete Solution
  - Significant cost on security
- Collaborated with Microsoft to develop a Proof of Concept (POC)
- Developed Scope and Vision documentation

Links: [www.aqmd.gov/aq-spec](http://www.aqmd.gov/aq-spec) and <https://www.aqmd.gov/aq-spec/special-projects/star-grant>

# Phase 1: Air Quality Sensors

- Aeroqual AQY
- PurpleAir PA-II



Design overall system architecture for collecting and displaying air quality sensor data



Manage sensor data and devices



Develop data visualization framework to build interactive data dashboards



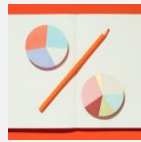
Develop an Application Programming Interface (API) for data access

# Phase 2: All Programs

- Regulatory Network
- AB 617
- Rule 1180
- Laboratory
- Mobile



Discovery phase for data flows to cloud and wireframe development for all MAD programs



Unified Analytics Approach

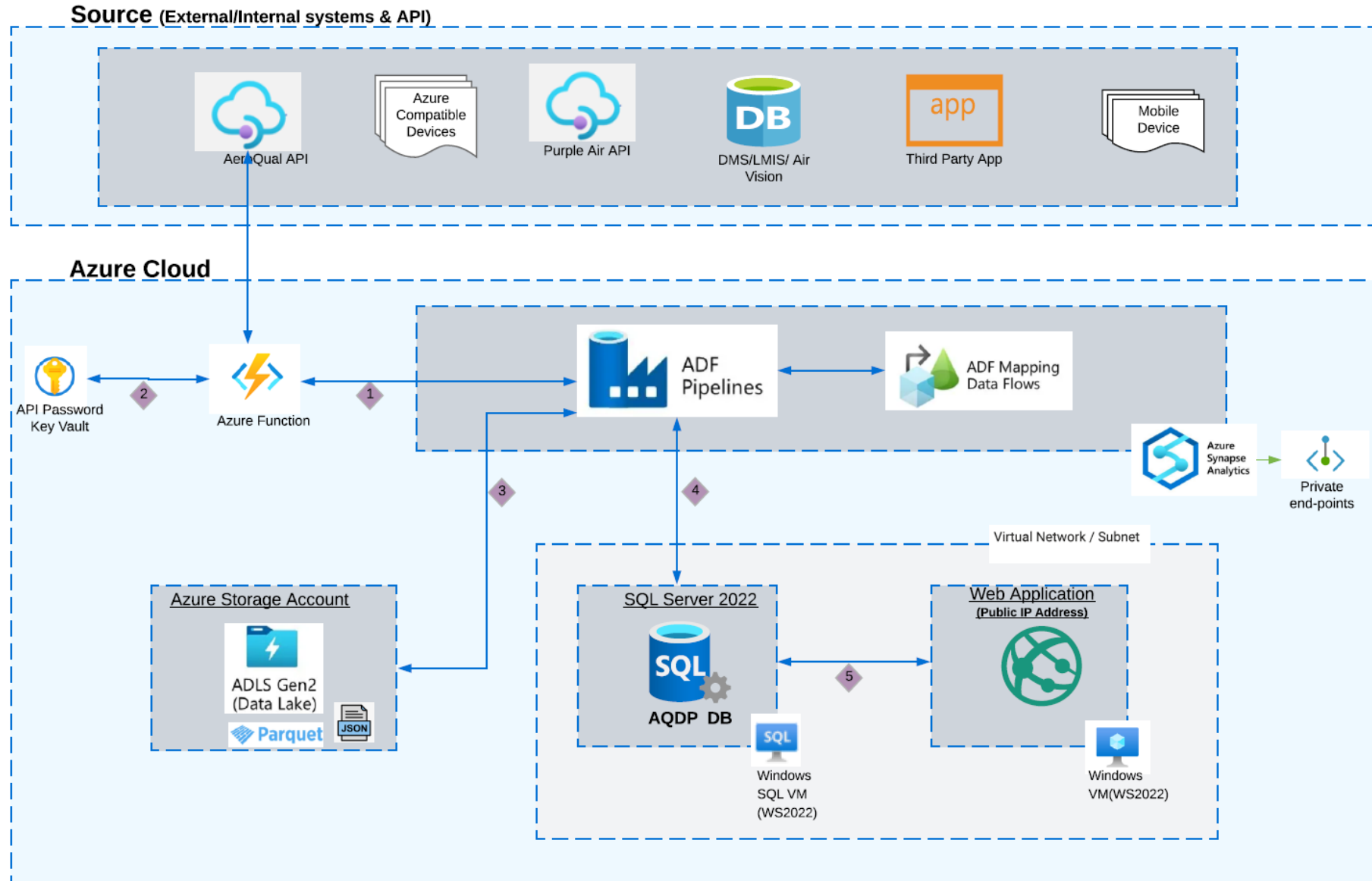


Integrate additional databases



Enhance Data Visualization Capabilities

# AQPortal Architecture (Rebuild)



# The Process of Developing Dashboards



Gather Stakeholder input and define user needs and user levels



**Wireframes** (requirements)

**Mock-ups** (organization, look & feel)

**Development** (functional dashboards)



User acceptance testing



Publish dashboards online



Maintain and monitor over time





# Easily accessible User Guide

User Guide Pollutant Time Averages

PM<sub>2.5</sub>@1hr

Navigable platform

Simple filters

Indication of sensor status

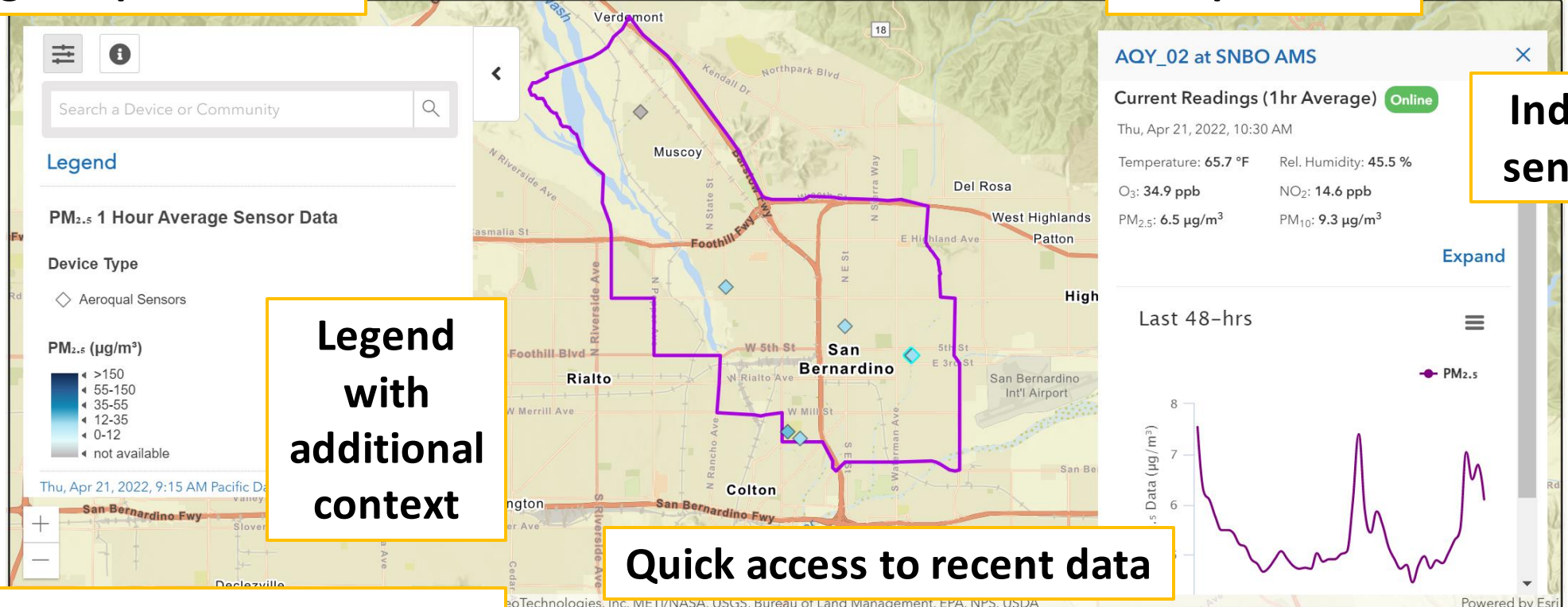
Legend with additional context

Quick access to recent data

Interactive map with sensors and additional information

Community boundaries (defined by AB 617 Program)

## EXAMPLE: COMMUNITY SENSOR NETWORK DASHBOARD







Sensor health tools

Data download and report sharing capabilities

Additional context available

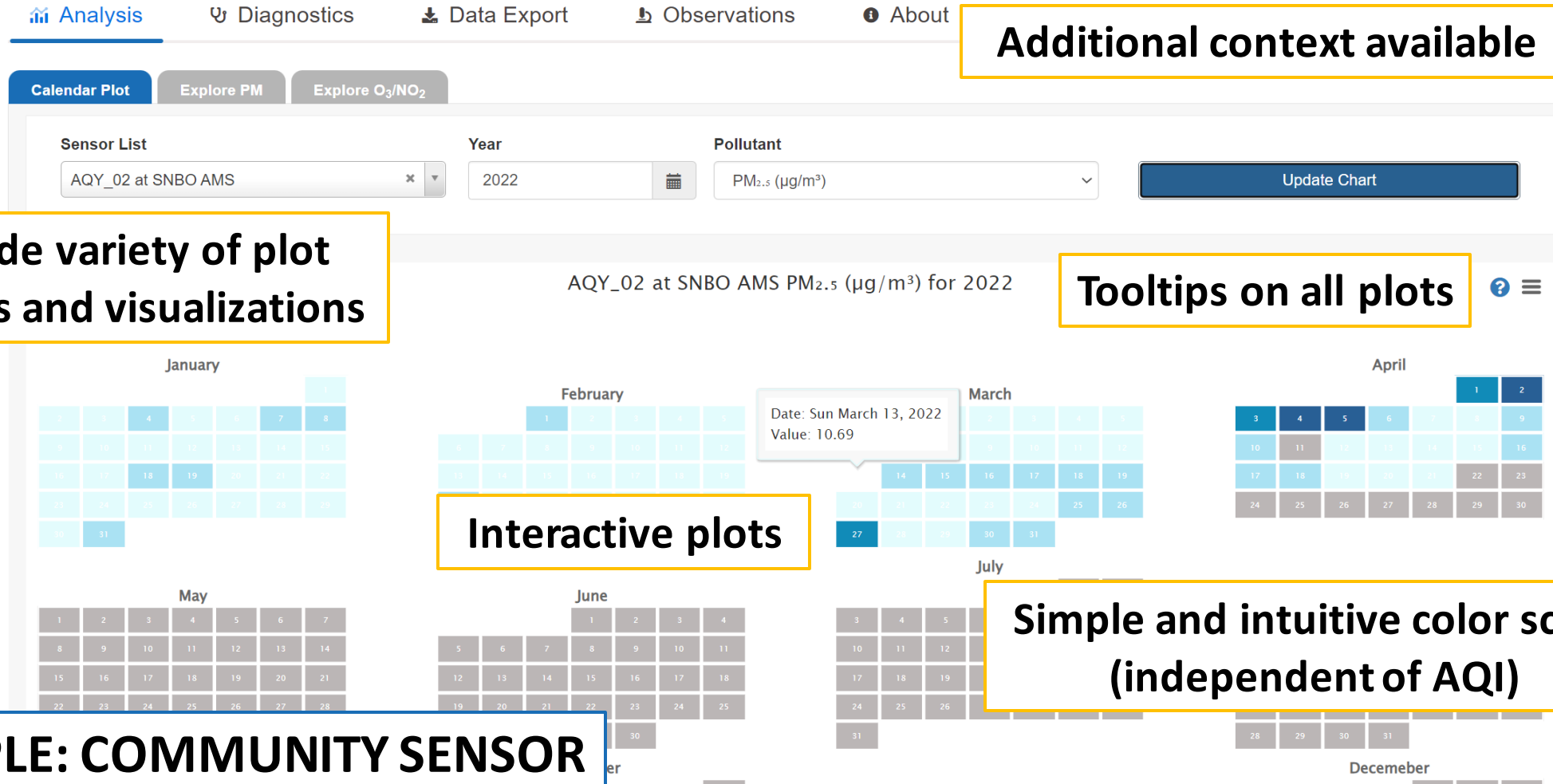
Wide variety of plot types and visualizations

Tooltips on all plots

Interactive plots

Simple and intuitive color scale (independent of AQI)

EXAMPLE: COMMUNITY SENSOR NETWORK DASHBOARD



# Home page Mock-up (Level 1 User)

The mock-up shows the 'Air Quality Data Platform' interface. At the top, there is a blue header with the South Coast AQMD logo and the text 'Air Quality Data Platform'. Below this is a grey navigation bar with 'My Air Quality' and a 'Change Location' button. The main content area is divided into several sections: a yellow 'Current Advisories' banner with a count of 3; a 'Current AQI' section featuring a circular gauge with a value of 65, categorized as 'MODERATE', with a main pollutant of PM<sub>2.5</sub> and a last update time of 1:00 pm on August 1, 2021; a 'Recent Daily AQI' section; a 'Current AQI Map' section; and a section explaining AQI calculations with buttons for various monitoring programs like 'Community Monitoring (AB 617 Program)', 'Refinery Emissions Monitoring', 'Stationary Sensors', 'Mobile Sensors', 'Laboratory', 'Advanced Mobile Monitoring', and 'Air Toxics Studies (MATES - Multiple Air Toxics Exposure Study)'. On the right side, there is a sidebar with the heading 'Follow these links for more information:' and buttons for 'Historical AQI Maps', 'Data (Concentration and AQI)', 'Forecast AQI', and 'Advisories Webpage'. At the bottom right, there is a 'Download' button for the 'South Coast AQMD's Mobile App' with 'Download on the App Store' and 'GET IT ON Google Play' logos. The footer contains copyright information for 2022 South Coast Air Quality Management District and links for 'Questions/Need Info?' and 'Report Website Problem'.

**Air Quality Data Platform**

South Coast AQMD My Air Quality

Diamond Bar - south [Change Location](#)

**Current Advisories** 3

**Current AQI**

My Air Quality is **MODERATE**

This means air quality is acceptable; however, unusually sensitive people should consider limiting prolonged outdoor exertion.

Main pollutant: **PM<sub>2.5</sub>**

Last updated at: 1:00 pm on August 1, 2021

65 AQI

[Learn more about AQI](#)

**Recent Daily AQI**

**Current AQI Map**

AQI calculations are based on pollutants with national ambient air quality standards. South Coast AQMD also measures other types of pollutants through the programs below:

[Community Monitoring \(AB 617 Program\)](#) [Refinery Emissions Monitoring](#) [Stationary Sensors](#) [Mobile Sensors](#) [Laboratory](#)

[Advanced Mobile Monitoring](#) [Air Toxics Studies \(MATES - Multiple Air Toxics Exposure Study\)](#)

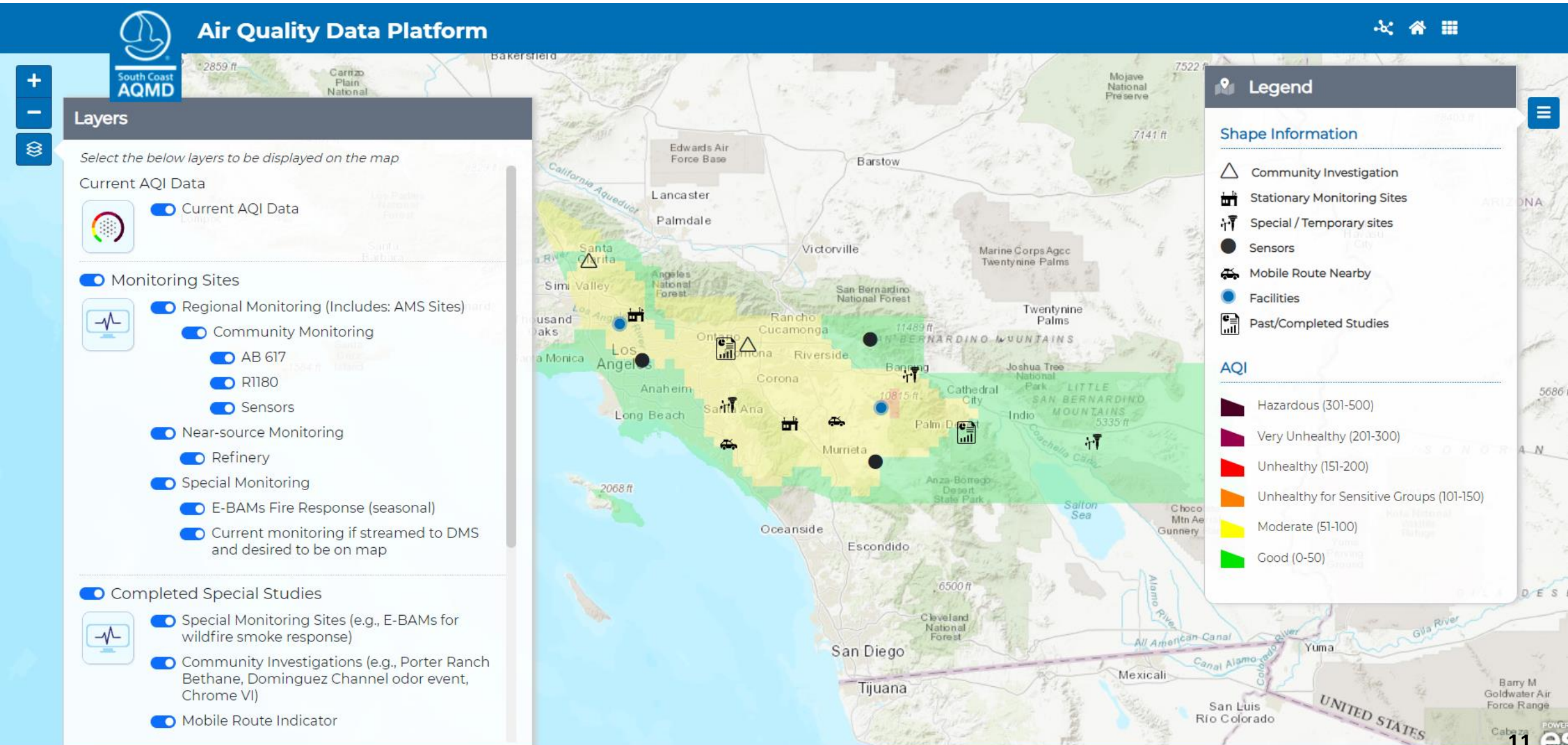
[Download](#)

**South Coast AQMD's Mobile App**

Download on the App Store GET IT ON Google Play

© 2022 South Coast Air Quality Management District [Questions/Need Info?](#) [Report Website Problem](#)

# Level 2 & 3 user (Mock-up)



# Communicate Dashboard Release and Supplemental Resources

Share “beta” version with the public / end users to collect feedback



Supplemental resources that our team found useful to provide alongside the beta Dashboards include:

**User Guides**

**Video Tutorials**

**Surveys**

**Tooltips**

# Key Lessons Learned

## Cloud-based Development

- Develop architecture with input from Cloud Service Provider (e.g., Microsoft)
- Design architecture with cost and efficiency in mind
- Connect directly to vendor API rather than developing IoT connection

## Data Flows

- Understand current and proposed cloud data flows
- Involve team members that process the data
- Fully define your QA/QC requirements

## Cloud Cost

- Ensure resources are turned off when not in use
- Scale your dev/stage environments as needed

## Data Dashboards

- Define user groups and design intuitively for each user group



## Contact:

Brandon Feenstra

QA Manager

[bfeenstra@aqmd.gov](mailto:bfeenstra@aqmd.gov)

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- AQ-SPEC Team
- [info.aq-spec@aqmd.gov](mailto:info.aq-spec@aqmd.gov)
- IM Team