City of Marina GSA 180/400-Foot Aquifer Groundwater Sustainability Plan

Introduction and Overview August 7, 2019



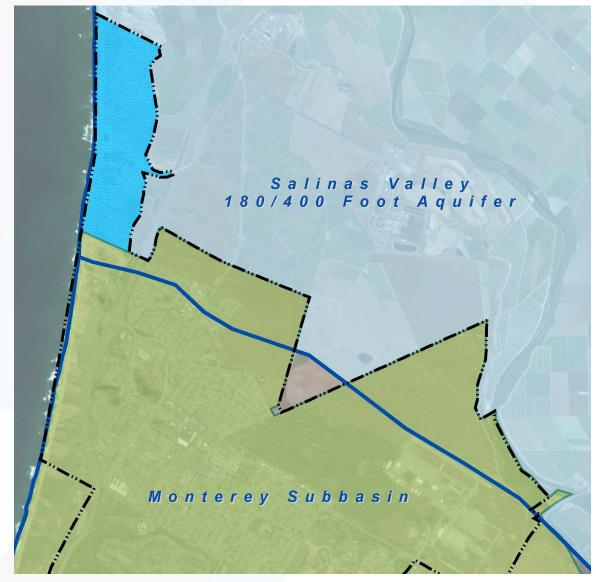
# **Agenda Topics**

- ✓ Background
- ✓ Objectives
- ✓ Approach
- ✓ Schedule
- ✓ Opportunities for Involvement
- ✓ References



# Background

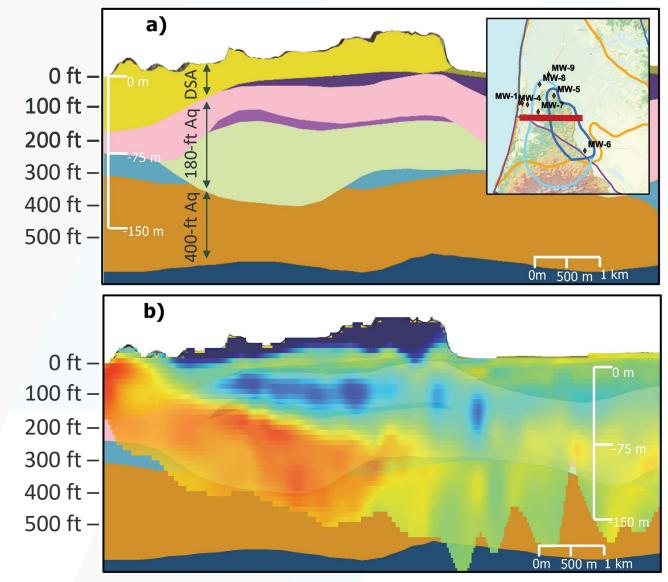
✓ The City has land use responsibility for a ~450-acre area outside the MCWD service area for which it has filed to be the Groundwater Sustainability Agency (GSA), forming the Marina GSA or MGSA.



Source: Sustainability Agency for a Portion of the Salinas Valley Groundwater Basin 180/400 Foot Aquifer Subbasin in Monterey County, dated April 16, 2018.

# Background

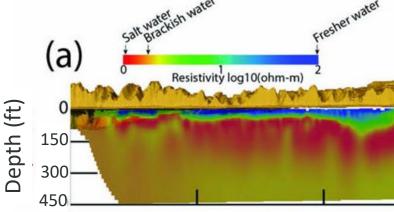
- ✓ Recent work indicates groundwater conditions are more complex in this area than previously assumed.
- ✓ Areas of higher quality groundwater exist in the otherwise seawater intruded aquifers



Source: Gottshalk et al, 2018. Figure showing the interpretation of subsurface stratigraphy and water quality distribution in a cross section beneath the MGSA jurisdictional area.

# Sellinas

Source: MCWRA, 2017. Figure showing the locations of areas where the 180/400-ft Aquitard is thin or absent.



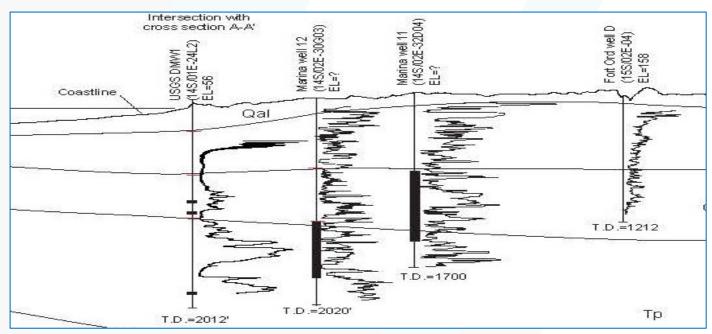
Source: Pidlisecki et al, 2016. Figure showing ERT section near the MGSA. Downward reddish-brown streaks are indicative of downward migration of saline water.

# Background

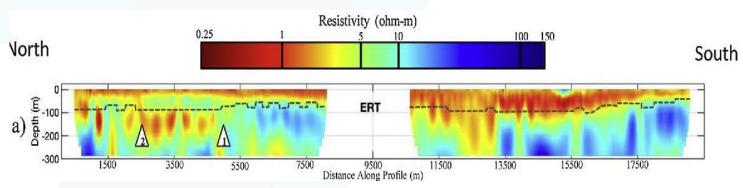
- ✓ The lower permeability layers (aquitards) have recently been demonstrated to contain gaps (discontinuities) that allow saline groundwater to migrate vertically between aquifers.
- ✓ Seawater is already migrating downwards from the 180-ft to the 400-ft aquifer

# Background

- ✓ Monterey County Water Resources Agency (MCWRA) has determined the Deep Aquifers are potentially at risk of seawater intrusion by vertical percolation from the overlying 400-ft Aquifer
- ✓ MCWRA has prohibited construction of additional Deep Aquifer wells until the connection between the 400-ft and Deep Aquifers can be better investigated and any necessary protective actions taken

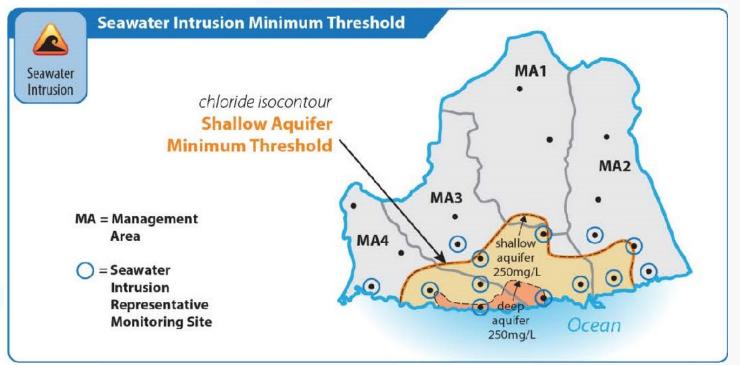


Source: MCWRA, 2017. Hydrostratigraphic cross section with electrical logs of several wells drilled into the Deep Aquifers, illustrating the variable permeability of sediments separating the 400-ft and Deep Aquifers.



Source: Goebel et al, 2019. Electrical Resistance Tomography profile along the shore from approximately 5 miles north to 5 miles south of the MGSA, illustrating the downward migration of saline waters along a broad fault zone south of the City of Marina.

Hypothetical example illustrating application of local Management Areas to address seawater intrusion. The MGSA GSP will have only one management area, but will function in a similar way.



Source: DWR, 2018. Note the hypothetical example uses a chloride concentration of 250 mg/L to define seawater intrusion; whereas, the regional and MGSA GSPs in the 180/400-ft Aquifer Subbasin will adopt a concentration of 500 mg/L. (Note that water meeting the definition of seawater intrusion may still have beneficial uses as a current and potential drinking water supply that requires protection.)

# Background

- ✓ A Groundwater
  Sustainability Plan (GSP) is
  being prepared at a regional
  scale for the entire 180/400ft Subbasin.
- ✓ A locally-focused GSP is needed in addition to the general regional plan to assure groundwater resources in MGSA's jurisdiction are sustainably managed in compliance with SGMA

# Objectives

- ✓ Provide local control to manage local conditions and risks.
- ✓ Describe local conditions.
- ✓ Develop a local management approach that fits within the larger GSP framework.
- ✓ Coordinate with the SVBGSA to provide a basinwide management approach.



# Approach Basin Setting

✓ Characterize local conditions addressed by the GSP

Use published data for regional context (Investigations, Databases, Draft GSPs)

Describe local conditions using work by Stanford, MCWRA and others

Describe potential risks ("Undesirable Results") to water resources

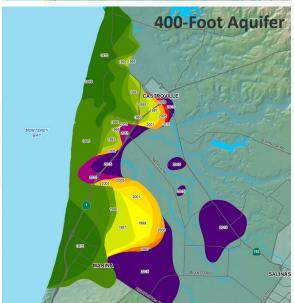
Identify data gaps and uncertainties

# Approach Sustainable Management Criteria

- ✓ Define Criteria that
  - Protect Local BeneficialUses and Users
  - Prevent LocalUndesirable Results
  - Support RegionalSustainability Goals



# 



Source: MCWRA, 2017. Figures showing the extent of seawater intrusion in 2015.

# Approach Sustainability Indicators

- ✓ Seawater Intrusion and Water Quality: Develop Framework Based on Local Data
- ✓ Interconnected Surface Water and GDEs: Develop Framework Based on Local Data and GDEpulse
- ✓ Groundwater Level Decline/Storage
  Depletion: Coordinate with Regional GSP
- ✓ Subsidence: Coordinate with Regional GSP

# Approach

#### **CONSIDER:**

**Underground Sources of Drinking Water** 

- Defined by USEPA
- < 10,000 ppm TDS

#### **PROTECT:**

**Potential Sources of Drinking Water** 

- Defined by SWRCB
- < 3,000 ppm TDS

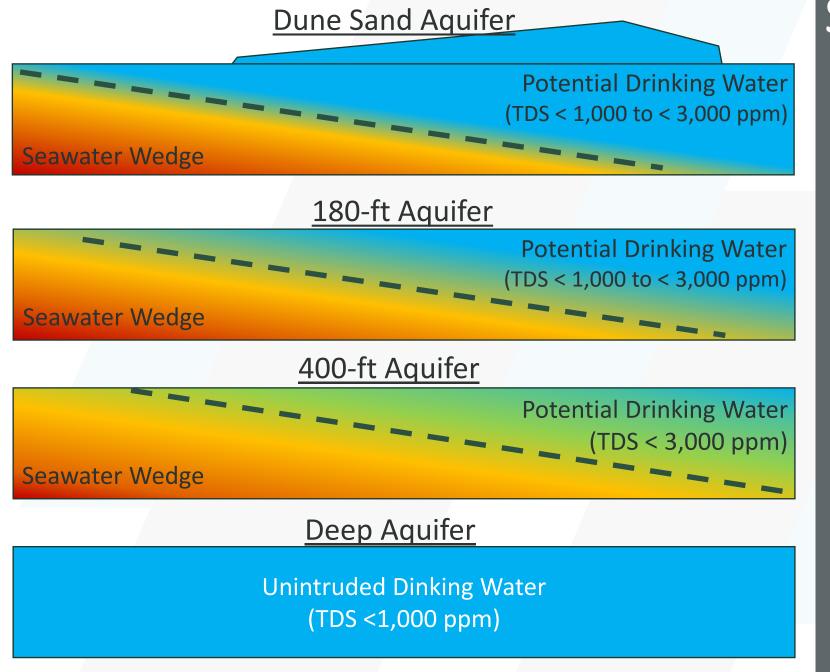
#### **PROTECT:**

**Current Drinking Water** 

- Regulated by DDW
- SMCL < 1,000 ppm TDS
- Short Term SMCL< 1,500 ppm TDS</li>

✓ Identify
current and
potential
sources of
drinking
water that
require
protection

Beneficial Uses



## Sustainability Goals

- ✓ Maintain recharge
- ✓ Maintain water quality
- ✓ Maintain extent of higher quality groundwater area
- ✓ Maintain water quality
- ✓ Maintain extent of higher quality groundwater area
- ✓ Maintain water quality
- ✓ Prevent seawater intrusion

- ✓ Maintain water quality
- ✓ Prevent seawater intrusion

# Approach Monitoring

✓ Water Levels, Gradients and Chemistry

 Existing monitoring wells for the test slant well

Other nearby wells

Gaging/sampling or transducers/sensors

✓ Area of Higher Quality Groundwater/Extent of Seawater Intrusion Front

Electrical Resistance Tomography (ERT) Transects

✓Integrate Data Management with other GSAs/GSPs



### Dune Sand Aquifer **Potential Drinking Water** (TDS < 1,000 to < 3,000 ppm) Seawater Wedge 180-ft Aquifer Potential Drinking Water TDS < 1,000 to < 3,000 ppmSeawater Wedge 400-ft Aquifer **Potential Drinking Water** (TDS < 3,000 ppm) Seawater Wedge Deep Aquifer **Unintruded Dinking Water** (TDS <1,000 ppm)

## Monitoring

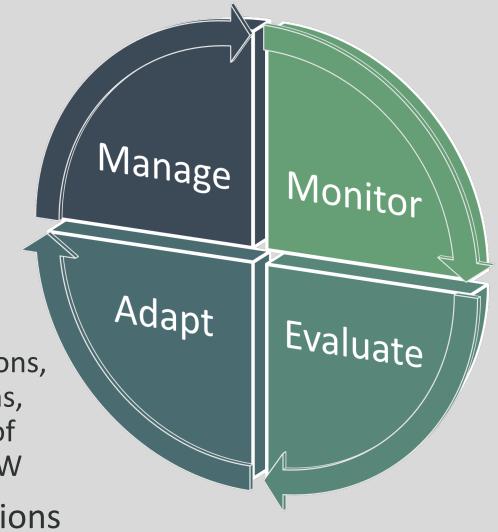
- ✓ Impervious surface area
- ✓ GW level and quality
- ✓ Extent of higher quality groundwater (ERT)
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- ✓ GW level and quality

# Approach

Management Actions



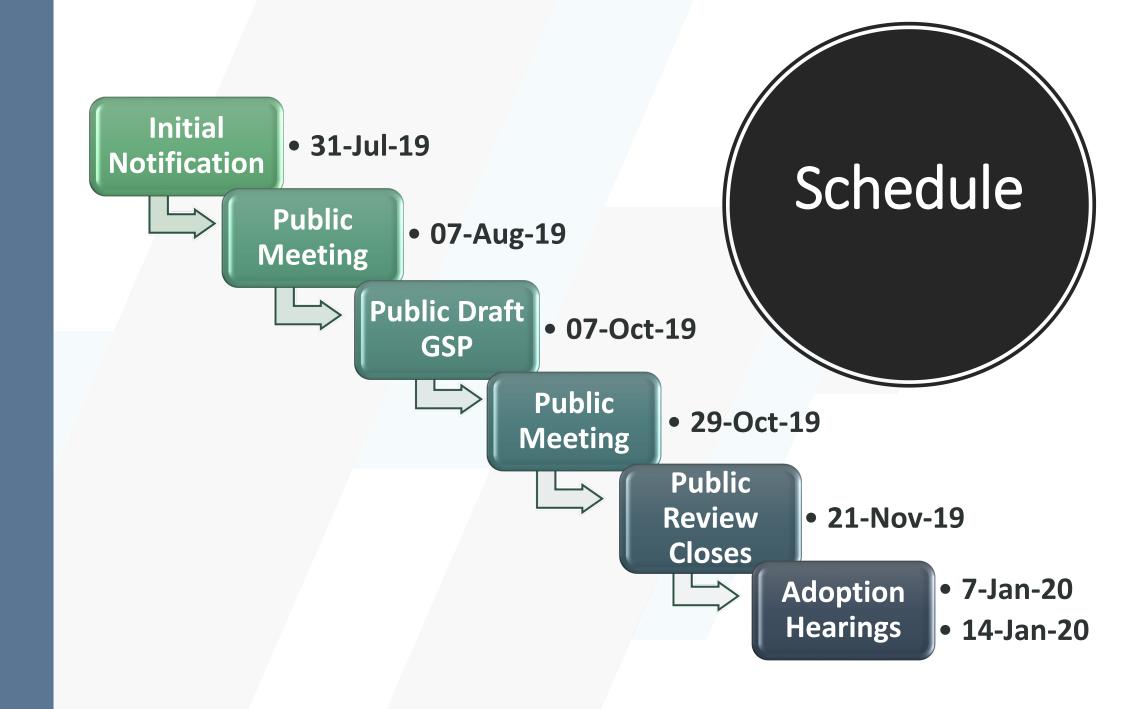
- Understandable
- Measurable
- Successive
- E.g., Concentrations,
   Contour Locations,
   Gradients, Area of
   Higher Quality GW
- ✓ Management Actions
  - Escalating
  - Adaptive
  - Regionally Compatible



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### Management Actions

- ✓ Tier 1 Trigger
  - Investigate/Characterize
  - Prepare Corrective ActionPlan (CAP) for RWQCBapproval
- ✓ Tier 2 Trigger
  - Implement CAP
  - Maintain upward gradient
- ✓ Tier 1 Trigger
  - Investigate/Characterize
  - Prepare CAP for RWQCB approval
- ✓ Tier 2: Implement CAP





## References

✓ Please refer to the following documents for more information

- California Department of Water Resources (DWR), 2017. Best Management Practices for the Sustainable Management of Groundwater, Sustainable Management Criteria BMP DRAFT. November.
  - https://water.ca.gov/LegacyFiles/groundwater/sgm/pdfs/BMP Sustainable Management Criteria 2017-11-06.pdf
- Goebel, Pidlisecky, and Knight, 2017. Resistivity imaging reveals complex pattern of saltwater intrusion along Monterey coast. Journal of Hydrology, Vol 551, p. 746-755. August. <a href="https://www.sciencedirect.com/science/article/pii/S0022169417301154">https://www.sciencedirect.com/science/article/pii/S0022169417301154</a>
- Goebel, Knight, and Halkjaer, 2019. Mapping saltwater intrusion with an airborne electromagnetic method in the offshore coastal environment, Monterey Bay, California. Journal of Hydrology: Regional Studies, Vol 23, p. 1-18. June. <a href="https://www.sciencedirect.com/science/article/pii/S221458181930028X?via%3Dihub">https://www.sciencedirect.com/science/article/pii/S221458181930028X?via%3Dihub</a>
- Gottschalk, Ian, R. Knight and others, 2018. Interpretation of Hydrostratigraphy and Water Quality from AEM Data Collected in the Northern Salinas Valley, CA. Prepared for Marina Coast Water District. March 15. <a href="https://www.c4justwater.org/uploads/9/9/6/7/99678170/aem\_report\_final.pdf">https://www.c4justwater.org/uploads/9/9/6/7/99678170/aem\_report\_final.pdf</a>
- Monterey County Water Resources Agency (MCWRA), 2017. Recommendations to Address the Expansion of Seawater Intrusion in the Salinas Valley Groundwater Basin. Special Reports Series 17-01. October. https://www.co.monterey.ca.us/home/showdocument?id=57394
- Pidlisecky, Moran, Hansen, and Knight, 2016. *Electrical resistivity imaging of seawater intrusion into the Monterey Bay aquifer system.* Groundwater, Vol. 54, No. 2, p. 255-261. <a href="https://www.ncbi.nlm.nih.gov/pubmed/26085452">https://www.ncbi.nlm.nih.gov/pubmed/26085452</a>