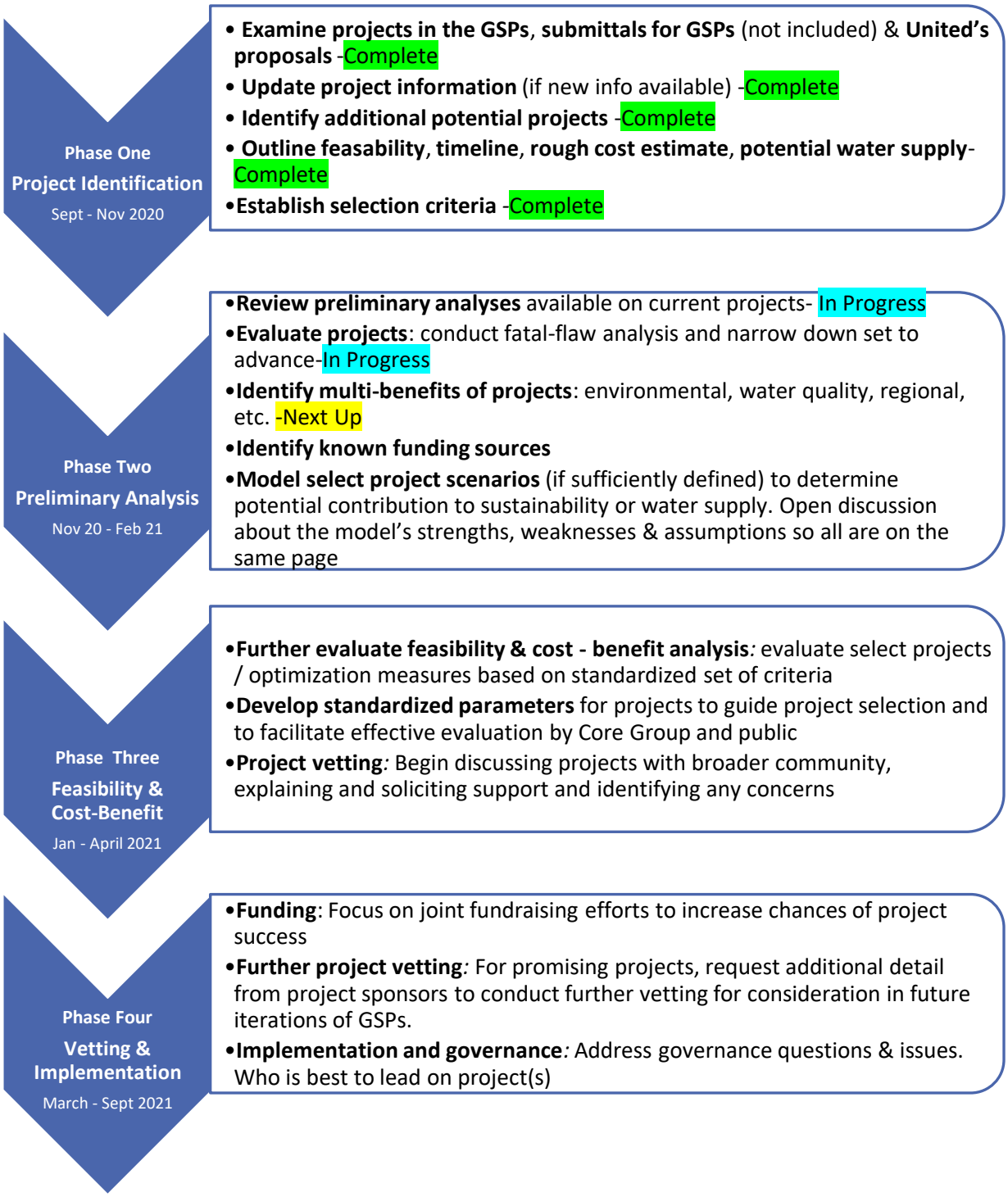
Fox Canyon Groundwater Oxnard Subbasin and Pleasant Valley Basin Facilitated Process

This set of recommended projects / optimization measures was approved by the OPV Core Stakeholder Group to move forward for further analysis at the group's meeting on 12/15/20

OPV Projects Committee Recommendations

This summary presents the Projects Committee's recommendations for a set of near-term to middle-term projects and optimization measures to move forward for further analysis. This summary also describes potential longer-term solution options and a suggested pathway for the modeling recommended prior to advancement of the projects / optimization measures under consideration. This summary concludes with a review of the projects the committee plans to further explore, but that were not included in the recommendations due to insufficient information.

Projects Work Plan



Recommendation for Set of Projects / Optimization Measures to Prioritize for Further Analysis

The chart below describes the Projects Committee's recommendations for a set of near-term to middle-term projects and optimization measures to move forward for further analysis. It also describes the phases of a potential longer-term solution: a "hybrid approach" that combines optimization with components of a seawater intrusion extraction barrier.

Project	Hybrid Approach
Recycled water to farms (2021)	4,600
Recycled water to recharge (---)	0
Voluntary fallowing (2021)	2,700
SWP Interconnect flushing (2027)	500
Freeman Expansion Ph. 1 (2028)	4,000
Freeman Expansion Ph. 2 (2036)	4,000
SWP Art. 21, exchanges, transfers (2021)	6,000
Optimization Ph. 1 (2027)	4,000
Optimization Ph. 2 (2030)	1,000
Optimization Ph. 3 (2035)	0
Brackish Water Ext. Ph. 1 (2027)	12,000-16,000
Brackish Water Ext. Ph. 2 (2035)	0
Reduce pumping	8,000-12,000?

Projects included in the GSPs' Sustainable Yield Estimates

The sustainable yield estimates in the GSPs include the following projects:

- Delivery of 4,600 AFY of recycled water from the Oxnard GREAT Program to farmers in the vicinity of Hueneme Road.
- Expansion of the GREAT Program to increase groundwater recharge by 4,500 AFY in the Saticoy Spreading Grounds.
- Approximately 2,700 AFY reduction of pumping, principally in the LAS, through temporary fallowing of farmland in the area of the pumping depression.

Oxnard Recycled Water Project Expansion

AWPF can be expanded from 7,000 AFY to 10,500 AFY using existing wastewater flow.

AWPF Expansion Costs: The estimated AWPF expansion capital cost (from 7,000 AFY to 10,500 AFY) is ~ $31 million. The estimated cost also includes a new recycled water reservoir. The estimated annual O&M cost is $400-600 per AF.

Riverpark-Saticoy Recycled Water Project -Note: Not included in the recommendation as this project is not likely to move forward

Artificial recharge using City of Oxnard's recycled AWPF water in UWCD's Saticoy basins. Potential gains to sustainable yield already captured in GSPs as part of AWPF.

Potential new water creation: 5,000 + AF/Yr.

Project cost estimate: $6.4 million in capital costs (~$30 AFY produce) and $5-7.5 million in annual costs ($1,000 – 1,500 AF/ yr produce).

Project status: Delivery of recycled water from the AWPF to United's spreading grounds for groundwater recharge does not seem to be a viable project due to the fact that Oxnard is planning to use the water for the City's ASR project.

Fallowing

The GSPs included a project to pay farmers to fallow land on a temporary basis. Farmers would stop groundwater pumping; that water demand would be retired during the contractual period. The GSP assumed fallowing was strategically applied in particular areas. This was targeted to reduce pumping from the Lower Aquifer System.

Fallowing in the GSPs yielded these results in reduced pumping annually:

- 2200 AFY in Pleasant Valley
- 500 AFY in Oxnard

Recommendations for Near-Term to Middle-Term Projects

Blow Off for Flushing SWP Interconnect Pipeline

The City of Ventura's planned SWP Interconnect Pipeline project will include a blow off within United's spreading grounds for discharging of flushed water generated as a result of operations and maintenance of the pipeline. Flushed water can be recharged at the Saticoy Spreading Grounds. The SWP Interconnection project also includes two turn outs that may provide opportunities for delivery of modest quantities of water from Calleguas MWD (and wheeled through the SWP Interconnect Pipeline) or the City of Ventura, if available and under certain circumstances. The additional water may serve as supplement M&I supply for customers served by United within Metropolitan-annexed areas.

Potential increase in water supply: approximately 500 AFY of flushed water (long-term average). Project cost estimate: $5 million.

Project status: United is coordinating with the City of Ventura and designing the extension pipeline for the two turnouts in the vicinity of Vineyard and Rose Avenues.

Challenges: Purchasing water from Calleguas MWD will be subject to the agencies' joint agreements and specific terms and conditions.

Freeman Expansion

Increase capacity of UWCD's existing diversion and groundwater recharge system, benefitting the basins of the Oxnard coastal plain by expanding and extending water conveyance and recharge capacity, taking advantage of the reclaimed Rose and Ferro aggregate mining pits.

Potential increase in sustainable yield: 6,000 to 9,000 AFY (long-term average).

Project cost estimate: $50 million spread over two phases of project development.

Project status: United plans to expand the Freeman Diversion in two phases, with Phase 1 completed in 2028 and Phase 2 completed in 2036. Yields and costs are contingent on some factors outside of United's control, such as permitting and fish passage.

Challenges: Permitting & weather dependent

State Water Project (SWP) - Imported Article 21 and other Table A Water Purchase/Exchange/Transfer

Likely gains to sustainable yield: 6,000 AFY. Assumes average cost of $400 per AF for water, $50 per AF incremental cost for planning, permitting, and O&M efforts.

Challenges: Weather dependent and competition for finite amounts of SWP water.

Recommendation for Longer Term Solution: Seawater Intrusion Barrier / Optimization-Hybrid Scenario

A seawater intrusion (SWI) barrier and full-scale optimization are by far the two highest potential opportunities to increase the sustainable yield / create additional water supply in OPV. A SWI barrier has the potential to yield greater gains to the basin than full-scale optimization in a one-for-one comparison. However, a SWI barrier approach would also likely be more expensive and have more permitting hurdles. Given these trade-offs, for the next stages of modeling the Projects Committee recommends prioritizing a hybrid approach between these two options. United would be able to model other scenarios later if that proves to be of interest.

United is planning to prepare model input in January 2021 and may request information from stakeholders during this period. Subject to availability of modeling staff, United hopes to run the "hybrid scenario" in February. The model may take multiple iterations to determine the optimal positioning of extraction wells, pumping rates, and reduced pumping at existing wells to achieve the sustainability goals. If the planned schedule is achievable, initial sharing out of preliminary results with the Projects Committee would occur in February or March. Modeling of other scenarios, including an updated "baseline" scenario for comparison, a seawater-intrusion-barrier-focused scenario, and a scenario that relies solely on optimization (shifts in existing pumping locations and depths) would occur later in spring of 2021.

Seawater Intrusion Barrier Concept

Seawater Intrusion Extraction Barrier & Treatment, Southern Oxnard Plain

Desalt brackish Upper Aquifer System water in areas south of Hueneme Road

Potential net gains to sustainable yield: 10,000-20,000 AFY, with an additional 2,000-4,000 AFY of net new water supply (total max net benefit of 12,000-24,000 AFY, combining both net "product water" and gain in sustainable yield).

Project cost estimate: $300 million spread over two phases (10,000 AF/yr each) of project development. Estimated total cost per acre foot is about $1,500 / AF, when improved sustainable yield is included as a benefit to the project. Modeling is in progress, so there is still uncertainty regarding whether the second phase would be necessary or achievable.

Other notes: A seawater intrusion barrier project would make most of the possible inland and northward optimization measures redundant. An important aspect of a SWI barrier (compared to counting solely on optimization) is that optimization is going to do better during wet years than in drought years, while a barrier should work well virtually all the time. Additionally, a SWI barrier provides additional control because barrier wells can be

strategically placed in select locations. At this time, United suspects that combining an extraction barrier with a modest optimization scenario will likely result in the best cost-benefit ratio for enhancing sustainable yield of the basin while providing good hydraulic control of seawater intrusion. However, significant modeling and design will be required in 2021 to firm up estimates of costs and benefits.

Challenges: First of its kind in the world, permitting, brine disposal, TDS similar to ocean water, relatively high cost

Seawater Intrusion Injection Barrier, Southern Oxnard Plain (Alternative SWI Model Under Consideration)

Creation of a seawater intrusion barrier via injection wells

This approach to the seawater intrusion barrier could theoretically have the potential to create similar gains in sustainable yield as the extraction barrier (10,000-20,000 AFY). However, it does not create additional new "product" water. In fact, it is unclear where the water to be used for injection would come from. There are no current cost estimates for this project, however the costs could be less than an extraction barrier because treatment of brackish water would not be included. However, injection barriers are a proven technology and have been in operation in Southern California for decades and therefore may represent lower permitting and environmental risks than the extraction barrier concept.

This project concept will require a water source which has yet to be identified, though the amount of water necessary for the injection could be significantly less than the optimization that the injection barrier yields. Orange County Water District claims they are able to recoup 95% of the injected water into the aquifer, so net water needed for injection may be less than what might otherwise have been assumed—on the order of 500 to 1,000 AFY.

Challenges: Uncertain injection water source, questions about the ultimate fate of existing seawater that has already intruded into the aquifer north of the ideal locations for an injection barrier (such water could potentially get "pushed" farther inland by an injection barrier located close to the heads of the Mugu and Hueneme submarine canyons).

Optimization Implementation

Summary of United's Analysis of Optimization Measures that could factor into Planning

United's proposed optimization scenarios are generally focused on shifting pumping away from the coast and up from the Lower Aquifer System (LAS) to the Upper Aquifer System (UAS), consistent with the GSPs. Estimates for yield and cost should be considered conceptual until United can model the optimization scenarios in detail:

- *Optimization Measure 1:* Stop pumping in the seawater intrusion area – increased yield: 2-4,000 AFY at $500 per AF
- *Optimization Measure 2:* Shift United's PTP wells from LAS to UAS –increased yield: 1,000 AFY at cost of $500 AF
- *Optimization Measure 3:* Shift most remaining LAS pumping into UAS in northern areas— increased yield: 12,000 AFY at cost of $500 AF

Projects Discussed but Not Included in the Proposal

Due to insufficient information, lack of feasibility, or low expected return on investment

Projects with Higher Near-term Potential for Additional Consideration

Conejo Creek Storage Expansion

Develop a storage facility to hold increased diversions from Conejo Creek for delivery to agriculture customers in the OPV area. The project could yield approximately 2,500 AFY in additional surface water supplies. Initial cost estimates vary widely depending on the eventual capacity (500-2,500 AFY), dimensions, location, and characteristics of the pond. Camrosa Water District, City of Camarillo, Pleasant Valley County Water District, and United Water Conservation District are beginning discussions about the scope of an initial study to further develop the concept and narrow the range of costs.

M&I Water Market

Conceptually, the development of an M&I Water Market is to allow flexibility within the M&I water user community that is presently available to the agricultural water user community. M&I groundwater producers in the FCGMA typically have a portfolio of sources that they conjunctively manage during wet and dry climatic periods. The ability to transfer groundwater within a market with set rules would allow greater flexibility for the M&I water suppliers. Ideas to benefit groundwater uses have been discussed and include use of an M&I water market that could allow users to sell a portion of their groundwater allocation in a given year making groundwater available to other users, including small mutual water companies. This concept would be open to the FCGMA purchase of groundwater from the market that could be left in the ground. An acre-foot left in the ground is equal to an acre-foot of water supply developed. Leveraging an M&I water market this way would be comparable to the "Ag land fallowing" concept that would leave water in the ground as opposed to creating a new supply.

Additional Opportunities with Oxnard Recycled Water Project Expansion

If Oxnard has availability of recycled water, then the Oxnard recycled water can be considered for regional benefit. The Oxnard Water Resource Plan will determine the availability of recycled water for regional benefit.

Projects Set Aside for Now

Storm Water Capture as source for AWPF

Developing new water by feeding Oxnard's stormwater to the AWPF system

Storm water sources are from Tsumas Creek and Ormond lagoon waterway.
Benefits of this project could include: 1) The source of water would be year-round and 2) The project does not require a lot of infrastructure. Challenges that would need to be addressed: 1) Siphoning water from the local wetlands may yield project opposition; 2) Elevated boron concentrate in the Ormond Lagoon Waterway; 3) May provide recharge water to the semi-perched aquifer on route to the Pacific Ocean which in turn may provide a water supply for groundwater dependent ecosystems (GDEs).

There are no current estimates of costs and potential supply for this project. The original GSP submittal included a preliminary estimate of a 1,000 – 2,000 AFY increase in sustainable yield.

Leveraging Hueneme Canyon Extraction Wells to feed AWPF [Unlikely to advance]

This water source has high total dissolved concentrations that exceed AWPF design criteria.

Leveraging the Semi-Perched Aquifer to feed AWPF [Unlikely to advance]

Due to the relatively low transmissivity of the semi-perched aquifer, it would be difficult to extract sufficient groundwater near the AWPF to provide source water. In addition, pumping from the semi-perched aquifer to feed the AWPF may cause environmental concerns (i.e., affect groundwater supply to coastal wetlands).

Using Ventura Wastewater to feed AWPF [Unlikely to advance]

The City of Ventura is pursuing VenturaWaterPure Program and will rely on its wastewater so a joint project with Oxnard's AWPF would not be possible.

Recycled Water Tile Project

Recycling tile drain water in Pleasant Valley to generate a new water source.

Bottom line – this project is perhaps a low return on investment.
Benefits to the basin are likely limited to about 190 AFY at a cost of ~ $2 million in treatment technology, $300,000 - $500,000 in operating cost and the additional cost of pipeline builds.

Three water supply level scenarios were analyzed by the Pleasant Valley County Water District. Two of the scenarios would have yielded greater than 190 AFY (potentially up to 800 AFY) but they proved unfeasible due to insufficient water supply to blend with the tile water and reduce chloride levels. Environmental impacts could also undermine this project's viability.

Challenges: High cost & low yield

Santa Paula Basin Purchases

Purchase water from the Santa Paula basin for delivery to OPV.

Bottom line- unlikely to see progress on this project as a real option until the Santa Paula Basin Technical Advisory Committee completes its yield-enhancement evaluations in 2022. Santa Paula basin's groundwater pumping is adjudicated, and extractions are approximately equal to the estimated safe (not "sustainable") yield of 25,500 AFY. Additionally, the Santa Paula Basin Judgment prohibits additional exports. Fillmore basin, under the right set of agreements, might be able to send water downstream but there are concerns that would need to be considered. If the ASAP pipeline progresses it would create additional opportunity to take advantage of these flows.

Imported Water

Purchase imported water from MET through Calleguas MWD.

Potential opportunities would require reciprocal benefits to work and be consistent with existing policies restricting the benefit of imported water from Calleguas to the areas within its service area. Calleguas' connection to MET could provide wheeling options for State Water Project water that is available through the Ventura County Watershed Protection District's contractor and its sub-allocations to United WCD, Casitas MWD, and the City of Ventura.

Challenges: Annexation, and MET water is not for agricultural application

Additional Fallowing on top of Level Described in GSPs

If fallowing is to be proposed, the committee would need to consider the following:

- How to modify demand assumptions to incorporate fallowed lands
- How to calculate the pricing of fallowing (Some estimates put cost around $1,600 /AF)
- How fallowing intersects with the water market
- Anticipating grower interest or willingness to fallow land
- Likely will require maintenance of a cover crop
- Requirements for California Environmental Quality Act (CEQA) evaluation, including the socioeconomic impact on community and County (e.g., decrease in workers employed and higher cost of food).

Appendix

Fox Canyon OPV Facilitated Process Projects Committee Evaluation Checklist

Background Information

- **Project Name Description Purpose of Project:** Water supply, infrastructure, water quality, etc.
- **Project Status:**
- **Estimated Time to Project Completion:**
- **Implementation Trigger** (if applicable)
- **Groundwater Basin:**
- **Location:**
- **Basins Benefiting:**
- **Sponsoring Agency:**

Evaluation Criteria

Sustainable Yield

Annual increase in Sustainable Yield (AF/year)
Sustainability indicators addressed (subcomponent of increase in SY) Project has benefit in impacted area of basin
Does project add additional water supply? How does water generation compare to other projects (high/med/low)?

Water-supply Resilience

Strengthen resiliency and operational flexibility of existing and future infrastructure **(**per DWR's California Water Plan Update 2018).

Technical

Construction feasibility
Appropriateness of location
Ability to accomplish purpose
Life expectancy of project (for 50-year sustainable management modeling) Level of uncertainty

Environmental

CEQA/NEPA type and status (timing)
Will project likely be permitted? / Consistent with environmental regs
Sensitivity of location
Multi-benefits?

Political

Consistent with adopted jurisdictional plans
Consistent with planning agency regulations Stakeholder support

Permitting

Permits required
Status / time required
Likelihood of project being permitted

Construction

Time-table to implement

Operation and Maintenance

Description

Funding

Total capital cost
Capital cost per AF/year produced
Annual cost
Annual O&M cost per AF
Funding source(s) - credible funding source Likelihood of project being funded
Likelihood to be grant funded / state funded
Timeline to secure funding