Casitas Municipal Water District
WATER RESOURCES COMMITTEE
Baggerly/Spandrio

October 15, 2019 – 10:00 A.M.
at
Casitas Municipal Water District
1055 Ventura Ave.
Oak View, CA 93022

AGENDA

1. Roll Call
2. Public Comments
3. Board Comments.
4. Manager Comments.
5. Discussion and Update of the Comprehensive Water Resources Plan: Policy Recommendations.
6. Review and Discussion of the Matilija Deep Wells Technical Advisory Committee Technical Memorandum.

Right to be heard: Members of the public have a right to address the Board directly on any item of interest to the public which is within the subject matter jurisdiction of the Board. The request to be heard should be made immediately before the Board's consideration of the item. No action shall be taken on any item not appearing on the agenda unless the action is otherwise authorized by subdivision (b) of ¶54954.2 of the Government Code.
If you require special accommodations for attendance at or participation in this meeting, please notify our office in advance (805) 649-2251, ext. 113. (Govt. Code Sections 65954.1 and 54954.2(a). Please be advised that members of the Board of Directors of Casitas who are not members of this standing committee may attend the committee meeting referred to above only in the capacity of observers, and may not otherwise take part in the meeting. (Govt. Code Section 54952.2(c)(6)

MEMORANDUM

TO: Water Resources Committee

From: Michael L. Flood, General Manager

RE: **Review and Discussion of the Matilija Deep Wells Technical Advisory Committee Technical Memorandum**

Date: October 11, 2019

RECOMMENDATION:

The Committee include their discussions on this matter as part of the mid-year budget process.

BACKGROUND:

In April of this year, the Board of Directors engaged Pueblo Water Resources to gather a technical advisory committee (TAC) that would do a feasibility review of the Matilija Deep Wells Project.

Mike Burke, Martin Feeney and other hydrologists met and reviewed a array of information on the Matilija Deep Wells Project including project reports, drilling logs of nearby wells, and other items.

The TAC produced a draft report and delivered it to the District in July.

DISCUSSSION:

The Matilija Deep Wells Project is one of several water security projects that the District has been working on over the last three years.

Originally named the Horizontal Bore or HoBo Project, a Vertical Bore or VerBo was added to the project concept in 2018.

The projected cost of nearly $2M to complete a test bore for the project created concern for the District in the overall feasibility of the project and thus the TAC was engaged.

The draft TAC technical memo has a number of questions that should be asked of the consultant should the Board of Directors decide to move forward with the project but a key

finding is the need for a Basis of Design report that would, at a minimum, provide answers to those questions.

A representative of Pueblo Water Resources will attend the meeting to go over the TAC draft memo and answer questions from the Committee.

DATE: July 1, 2019

TO: Casitas Municipal Water District

Julia Aranda, P.E., Engineering Manager

1055 N. Ventura Avenue
Oak View, California 93022

FROM: Matilija Groundwater Supply Project TAC

Martin Feeney, P.G., C.Hg., C.E.G

Paul Sorensen, P.G., C.Hg., C.E.G.

Joseph Oliver, P.G., C.Hg.

SUBJECT: Matilija Formation Groundwater Supply Project Technical Advisory Committee, Memorandum #1

The Matilija Sandstone Groundwater Supply Project Technical Advisory Committee (Matilija Fm TAC, or TAC) gathered and reviewed pertinent reference materials regarding the proposed Robles Deep Vertical Bore (RDVB) Test Well[1] that is being considered by the Casitas Municipal Water District (CMWD). The purpose of the TAC's review is to better understand the project's technical details and to disseminate this understanding to CMWD staff in order to help guide important decisions regarding project implementation.

Information Reviewed. Thus far, the TAC has obtained and reviewed the following project-specific documents as well as related technical reference materials.

- Padre Associates, Inc., 2018. *Casitas Municipal Water District's Robles Deep Vertical Bore Test Well Project – Proposal to Provide Environmental Review Assistance*. Prepared for CMWD, 12/20/2018.
- Water Resource Engineering Associates, 2018. *Robles Deep Vertical Bore Test Well Project in Matilija Formation*. Preliminary design planset prepared for CMWD, 12/14/2018.
- Water Resource Engineering Associates / Kear Groundwater, 2018. *Project Description, Casitas Municipal Water District Robles Deep Vertical Bore (RDVB) in Matilija Formation*. Preliminary draft report prepared for CMWD, 12/12/2018.

[1] The proposed project has also been referred to as the "VerBo" for Vertical Bore, or Matilija Project, in various project-related documents. The predecessor project was referred to as "HoBo" for Horizontal Bore.

- Water Resource Engineering Associates, 2018. Engineering Study Project Timeline, Robles Deep Vertical Bore (RDVB) in Matilija Formation. Preliminary project timeline prepared for CMWD, 10/22/2018.
- Davis, Thomas L., 2017. *Structural transect along Highway 33, Ventura to the Cuyama Badlands, California*. Guidebook prepared for Coast Geological Society field trip, 4/2/2017.
- Water Resource Engineering Associates / Kear Groundwater, (2019). Geologic Cross Section Along Trajectory of Eastern HOBO (313.5 deg nw trend) and Robles Deep Vertical Bore (VERBO). Digital file provided by Padre Associates, Inc. (filename: X sec 2-22-19.pdf).
- Water Resource Engineering Associates / Kear Groundwater, 2016. *Preliminary Water Security Project Analysis*. Report prepared for CMWD, 11/4/2016.
- California Geological Survey, 2015. Digital coverage of eastern half of Santa Barbara 100k geology.
- Rockwell, Thomas, 1988. *Neotectonics of the San Cayento fault, Transverse Ranges, California*. Geological Society of America Bulletin, v. 100, p. 500-513, 4/1988.
- Dibblee, Thomas W., Jr., 1987. *Geologic map of the White Ledge Peak quadrangle, Santa Barbara and Ventura Counties, California*. Dibblee Geological Foundation Map DF-11.
- California State Mining Bureau, 1925. Industrial No. 10-1 well, Ventura County. Driller's log and well abandonment documents for test well.
- Resources Agency of California, Department of Conservation, Division of Oil and Gas, 1952. Chismahoo Test Well, Ventura County. Report of Well Abandonment and Driller's log documents for test well.

At this time the TAC is requesting that CMWD staff view the listing above to ascertain if there are any other pertinent documents regarding this proposed project that CMWD is aware of, and if so, we would like to request these as part of our review.

Key Findings and Conclusions. A water supply exploration and development project of the magnitude proposed with the RDVB would typically be preceded by a Basis of Design report that details the feasibility of the project, the geologic and hydrogeologic constraints and risks, the potential costs of the project along with contingency outlays, and an overall risk/benefit analysis. It appears that a Basis of Design analysis has not been prepared. The TAC's fundamental finding and recommendation is that a feasibility Basis of Design report be prepared and submitted to CMWD for review and approval before proceeding further with the project.

It is the opinion of the TAC members that the proposed Basis of Design report include the investigation and analysis of the following list of preliminary questions.

1. The 2016 Water Security Project Analysis (p. 6) describes the expected water quality to be in the range of 400 to 800 mg/L Total Dissolved Solids (TDS), with possible elevated concentrations of iron, manganese and sulfate, but not expected to be detrimental to project implementation. The basis for this statement needs to be better documented. This document also includes a map (as Attachment 1) showing the locations of three oil test wells, the closest of which ("Baldwin No. 1") is located approximately three miles from the site of the currently proposed RDVB test well. The TAC has also acquired documentation for another oil test well ("Industrial No. 10-1") approximately one mile south from the currently proposed site that was drilled to a depth of 5,012 feet in 1924. From the log of this well it can be interpreted to have been drilled into the Sespe (Ts) and Coldwater (Tcw) geologic units; accordingly, the information suggests some natural gas should be expected. The intended borehole path for the proposed RDVB test well would also encounter the stratigraphically underlying Cozy Dell (Tcd) Shale, where even more gas should be anticipated. It is not clearly described in the available documentation what the potential effect of natural gas and/or oil occurrence may have on the test well water quality, and needs to be described in more detail, including potential treatment. In addition, it is likely that appropriate wellhead controls (i.e., blowout preventer) will be needed during drilling and should be specified and included in the project cost estimate.

2. As described in the 2018 RDVB project description (p. 2), the exploration is to be conducted on CMWD-owned property approximately 1,100 feet southwest of the Robles Canal on the west side of the Ventura River near the intersection of Rice Canyon and Cooper Canyon Roads (site of the diversion facilities). It is the TAC's understanding that this site is located near to one of the four sites that had been previously proposed for potential horizontal bore exploration. That site was described as the "10,000-FT East HoBo" in the 2016 Water Security Project Analysis (p. 5), where it is stated that this HoBo would likely be the lowest pressure/production of those described in that analysis. Given this understanding from the project proposers, it is not clearly documented why this nearby location has been selected as the preferred location for the currently proposed RDVB project.

3. The 2018 RDVB project description document (p. 1) states that the test well boring will be drilled to approximately 7,000 feet vertically into the Matilija (Tma) Sandstone. However, this document does not include any details on how that borepath total depth was calculated and what geologic information was utilized as the data source(s) for this estimated depth into the target Tma. Thus far, the TAC's review of available geologic information indicates that bedding dips in the nearby area vary significantly (and in some locations are overturned) between available published and unpublished maps, and dips also vary significantly within the mapped Tma on these geologic maps, both of which tend to increase the uncertainty of the depth that the Tma might be encountered at the planned location. Accordingly, the TAC believes that a range of potential error in terms of the depth of the borehole needs to be developed if this has not already been done.

4. The TAC recognizes that the Tcw is a very hard indurated sandstone, likely making drilling conditions difficult to keep the borehole vertical while encountering the contact with this unit at an oblique angle. It is not clear from the available information that the TAC has reviewed whether this issue has been considered and addressed.

5. The 2016 Water Security Project Analysis includes (as Attachment 2) a geologic cross section drawn approximately north-south across the central portion of the originally proposed horizontal borings. This cross section depicts flat-lying or gently-dipping beds south of the Arroyo Parida fault, and more steeply-dipping beds (~30 to 45 degrees) to the north, closer to horizontal bore locations between the Arroyo Parida and Santa Ynez faults. However, these dips are relatively shallow when compared with those shown on both published and unpublished geologic maps of the area. These sources show dips closer to vertical and even overturned in some locations near the trend of the cross section line. The technical basis for the relatively shallow dips shown on the Attachment 2 cross section should be rectified with the available geologic mapping of the region.

6. A geologic cross section has been prepared by the project consultants and is labeled "Geologic Cross Section Along the Trajectory of Eastern HOBO (313.5 deg nw trend) and Robles Deep Vertical Bore (VERBO)". This cross section depicts the Matilija Sandstone as being encountered in the proposed RDVB test hole approximately between elevations of -5,300 and -6,800 feet. The section also depicts differing stratigraphic thickness for the Matilija Sandstone at the surface and at depth. The technical basis for the depiction of the subsurface geology at this location needs to be described and referenced.

7. The 2016 Water Security Project Analysis (p. 5) includes a discussion of the "Chismahoo oil exploration well", describing that it encountered the Tma between 5,800 feet depth to the well's total well depth at over 8,000 feet. The location of this exploration well is not shown on the map in Attachment 1 of that report. It is the TAC's understanding that this well's location is about 6 miles southwest of the proposed RDVB location. Given the variability of site-to-site geologic conditions (and the general steepening of dips to the east), the relevance of the Chismahoo site to the currently proposed RDVB site should be better described and defended.

Summary and Key Recommendations. The TAC recommends the preparation of a Basis of Design report that addresses the preliminary questions outlined above and details the feasibility of the project. Included with the report should be a project cost estimate, including potential contingency efforts and costs. It is the opinion of the TAC members that a Basis of Design report is necessary before the CMWD proceeds further with the project.

As discussed in the TAC's proposal to CMWD, a final summary memorandum will be prepared by the TAC following completion of Task 3 of the proposal (Review and Assessment of Available Information). Preparation of a Basis of Design report that incorporates the questions, concerns, and conclusions outlined in this Memorandum #1 will then expedite the TAC's understanding of the technical details and provide a better basis for the final summary

memorandum. We appreciate the opportunity to provide assistance to the CMWD with the evaluation of the Matilija Project feasibility.

Attachments: none

April 11, 2019
Project No. 18-0145

Casitas Municipal Water District
1055 N. Ventura Avenue
Oak View, California 93022

Attention: Julia Aranda, P.E.
Engineering Manager

Subject: Proposal for Professional Services, Matilija Formation Groundwater Supply Project Technical Advisory Committee.

Dear Ms. Aranda:

The Casitas Municipal Water District (District) contracted with Kear Groundwater (KG) and Water Resource Engineering Associates (WREA) to investigate the feasibility of developing emergency groundwater supply from a deep vertical well drilled into the Matilija Sandstone Formation in the Santa Ynez Mountains near Ojai, California. The first step in the investigation would be the drilling of a test well, which would be constructed on District property located approximately 1,100-feet southwest of the Robles Diversion Dam on the west side of the Ventura River, near the intersection of Rice Canyon and Cooper Canyon Roads. It is intended that information acquired and knowledge gained through the drilling and testing of the test well would be used to evaluate the feasibility and provide information for a permanent, full-scale Matilija Formation Groundwater Supply Project (Matilija Project).

Because of the unconventionally deep drilling and proposed well completion depths (up to 7000 feet), likely difficult drilling and well construction conditions, uncertainties regarding instantaneous and sustainable yield of such a bedrock well, water quality concerns, and likely high pilot drilling/testing and full-scale project costs, the District has asked Pueblo Water Resources, Inc. (Pueblo) to assist in project evaluation by coordinating and facilitating an independent, third-party review of pilot project plans and full scale project feasibility. To accommodate the District's request, Pueblo has assembled a Technical Advisory Committee (TAC) for the Matilija Project consisting of a team of highly qualified experts with extensive experience with Santa Ynez Mountain hydrogeology and the planning and execution of high capacity groundwater supply projects. This proposal presents a scope and budget for the Matilija Project TAC. Based on the availability of existing materials for the TACs review and consideration, we envision that the TAC evaluation will be conducted in incremental phases, with the likely results of this first phase including a request for additional information from the District's consultants for further review and analysis. This proposal presents the scope and fees associated with the first phase of TAC review.

Technical Advisory Committee Members

The TAC will consist of three members: Martin Feeney, P.G., C.Hg., C.E.G.; Paul Sorensen, P.G., C.Hg., C.E.G.; and Joe Oliver, P.G., C.Hg. The careers of all three of the TAC

members have focused on groundwater supply projects within the Central Coast area. Mr. Feeney was one of the founding Principals of Staal, Gardner, and Dunne, Inc., and has worked as a consulting hydrogeologist, with significant well and water supply project experience, for the past thirty seven years. Mr. Sorensen, Principal Hydrogeologist with GSI Water Solutions in San Luis Obispo, has also focused his career on groundwater supply projects in Santa Barbara, San Luis Obispo, and Monterey Counties for the past forty years. Mr. Sorensen's specific expertise is with groundwater supply and development, basin analysis, and water resource management. Mr. Oliver has over 40 years' experience as a groundwater professional. He was formerly the Water Resources Manager for the Monterey Peninsula Water Management District where he was responsible for the development and oversight of numerous groundwater supply development projects, including those dealing with fractured bedrock systems. Since his retirement in 2017, Mr. Oliver has been working as an independent, consulting hydrogeologist. During much of their respective careers, the three members of the TAC have had professional relationships with each other and have worked together on numerous water supply projects. Bios of each of the TAC members are attached.

Scope of Work

Based on our understanding of the project and the District's needs, and our extensive experience with similar projects for other municipal clients, we have developed the following scope of work.

Task 1. Project Management and TAC Coordination

Pueblo will serve as the manager and the coordinator of the TAC throughout the project. This will include serving as the primary point of contact between the District and the TAC. Pueblo will coordinate TAC activities, facilitate meetings between the TAC members when required, and establish schedules for TAC deliverables. This will include serving as the primary point of contact between the District and the TAC.

Task 2. Project Definition and TAC Scope Development

Pueblo will schedule an internal kick-off meeting to initiate the TAC process. The purpose of the kick-off meeting is to discuss the project description, take inventory of the materials to be reviewed, and define the goals and objectives of the TAC. The goals and objectives of the TAC will be focused on providing the District with a sound, independent review regarding the preliminary feasibility of the Matilija Project. The unified TAC goals and objectives will be discussed with the District for review to establish consensus moving forward with the TAC review.

Task 3. Review and Assessment of Available Information

Each of the TAC members will perform an independent review and assessment of available materials, and will establish, comments, concerns, and questions regarding their respective evaluation of materials. These assessments will include questions and conclusions about the materials provided to that point, and recommendations for further action or requirements. Once each TAC member has performed their respective reviews, a meeting amongst the TAC members will be held to discuss results of the independent TAC reviews. The reviews will be discussed in terms of the goals and objectives previously established by the TAC and approved by the District.

Task 4. TAC Summary Memorandum

A unified, summary memorandum will be prepared following completion of Task 3 incorporating the questions, concerns, and conclusions resulting from the TAC review. The memorandum will first be issued as a draft, and Pueblo will meet with the District to discuss. Following consideration of District input, the memorandum will be finalized. Pueblo will be available to present and discuss the memorandum with District staff and/or Board members at a committee meeting.

Estimated Fees

The total cost for the first phase of the Matilija Project TAC is estimated to total $25,172. The cost estimate is based on the established scope of work and the fee schedules of the various TAC members, and includes a 15% markup on fees for Pueblo's TAC subconsultants. A spreadsheet showing estimates of costs by task is attached, and a summary of the estimated costs is presented in the table below:

Estimated Costs Summary
Matilija Formation Water Supply Project TAC – Phase 1

Task Description	Estimated Cost
1 – Project Management and TAC Coordination	$2,460
2 – Project Definition and TAC Scope Development	$3,420
3 – Review and Assessment of Available Information	$12,040
4 – Consolidated TAC Summary Memorandum	$7,252
Total Estimated Costs	**$25,172**

Project Schedule

All members of the TAC are prepared to begin work immediately upon notice to proceed. An estimate of the time of completion of each task, from the notice to proceed date, is provided below:

Task Description	Completion from NTP
1 – Project Management and TAC Coordination	4 weeks
2 – Project Definition and TAC Scope Development	6 weeks
3 – Review and Assessment of Available Information	10 weeks
4 – Consolidated TAC Summary Memorandum	12 weeks
Total Project Completion Duration	**3 months**

We appreciate the opportunity to provide assistance to the District with the evaluation of the Matilija Project feasibility. Please contact me if you have any questions or require additional information regarding the TAC or this proposal.

Sincerely,

PUEBLO WATER RESOURCES, INC.

Michael S. Burke, P.G., C.Hg
Principal Hydrogeologist

Attachments: TAC Committee Member Bios
Cost Estimation Worksheet

TECHNICAL ADVISORY COMMITTEE BIOS
MATILIJA FORMATION GROUNDWATER SUPPLY PROJECT

Martin Feeney, P.G., C.E.G., C.Hg.

Mr. Feeney is a California Professional Geologist with specialty certifications in engineering geology (CEG) and hydrogeology (CHg) in with more than 35 years' experience in groundwater consulting. Mr. Feeney is also holds the title of Certified Ground Water Professional from the National Ground Water Association. Mr. Feeney was a founding Principal of the Ventura Consulting Firm, Staal, Gardner and Dunne, Inc. Mr. Feeney has been an independent consultant for the last 20 years. Mr. Feeney's experience in groundwater supply issues includes basin analysis, well siting and design, groundwater modeling (both flow and solute-transport), perennial yield analysis, water quality assessments, and regulatory compliance.

During his career, Mr. Feeney has designed and managed the construction of over 130 municipal wells with depths to 2,500 feet, diameters to 24-inches and discharge rates of up to 6,000 gpm. Mr. Feeney has significant experience in drilling and well construction technology as well as the assessment and rehabilitation of existing wells. Mr. Feeney also has significant experience with hydrogeologic issues associated with desalination facilities, and has designed, permitted, and installed intake and brine disposal wells for projects in California and in the Caribbean.

In recent years, Mr. Feeney has served on various advisory panels and water commissions, including those for the Seaside Basin Watermaster, the City of Santa Barbara, and the City of Ventura.

Paul Sorensen, P.G., C.E.G., C.Hg., GSI Water Solutions, Inc.

Paul Sorensen has more than 35 years of experience managing and performing projects related to hydrogeology and geology with specific expertise in groundwater supply and development, basin analysis, and water resource management. His technical expertise includes water well and monitoring well design and construction of deep municipal wells in unconsolidated and consolidated aquifer environments in Santa Barbara, San Luis Obispo, and Kern counties, regional groundwater basin analyses, perennial yield and basin-wide water balance calculations, groundwater quality studies, and aquifer test analyses. Paul is also an integral part of GSI's senior team of groundwater specialists that addresses the complex issues arising from California's Sustainable Groundwater Management Act (SGMA).

Joe Oliver, P.G., C.Hg.

Mr. Oliver has over 40 years' experience in the field of groundwater hydrology. He was formerly the Water Resources Manager for the Monterey Peninsula Water Management District (MPWMD) where he was the principal investigator for all groundwater-resources investigations conducted by MPWMD for more than two decades, including the construction of numerous monitoring and production wells. His work at MPWMD included the oversight of groundwater

supply investigations from fractured rock aquifer systems in the Monterey Peninsula region, and development of a database to better track and understand the opportunities and constraints associated with these resources.

His previous engagements have included the U.S. Geological Survey, the Colorado Department of Natural Resources, and several private consulting firms specializing in water resources management throughout the Western U.S. He holds a bachelor's and master's degree in geology, specializing in hydrogeology and is a California Registered Geologist and Certified Hydrogeologist. His expertise includes geochemistry, well technology, well rehabilitation, aquifer testing, aquifer storage and recovery, groundwater modeling, and water resources sustainability assessment.

Casitas Municipal Water District

Matilija Formation Groundwater Supply Project TAC - Phase 1

Estimated Fees for Professional Services

LABOR		Principal Professional Pueblo	M. Feeney	P. Sorensen GSIWS	J. Oliver	Hours by Task	Estimated Task Cost *
	Hourly Fee	$205	$200	$260	$190		
Task	Task Description						
1	Project Management and TAC Coordination	12				12	$ 2,460
2	Project Definition and TAC Scope Development	4	4	4	4	16	$ 3,420
3	Review and Assessment of Available Information	8	16	16	16	56	$ 12,040
4	Consolidated TAC Summary Memorandum	8	4	4	16	32	$ 7,252
				Total Labor Hours:		116	
				Total Labor Costs:		$25,172	

* Includes 15% Markup on TAC Subconsultants