

**REVISED**

**SOUTHWEST KINGS GROUNDWATER SUSTAINABILITY AGENCY**

944 Whitley Avenue, Suite E, Corcoran, CA 93212

559-762-7240 [www.swkgsa.org](http://www.swkgsa.org)

**AGENDA**

**SPECIAL MEETING OF THE BOARD OF DIRECTORS**

**April 8, 2022**

**1:00 pm**

**944 Whitley Avenue, 2<sup>nd</sup> Floor Boardroom**

**Corcoran, CA 93212**

**Join Zoom Meeting**

<https://us02web.zoom.us/j/81828020370?pwd=Ukg4ckdSa3FNaWlBTVF5aG43RmVGUT09>

**Meeting ID: 818 2802 0370**

**Passcode: 609786**

**Dial in: 1 669 900 9128**

The public may participate in the meeting as otherwise permitted under the Brown Act by calling into the telephone number above. Any member of the public may address the SWKGSa Board of Directors concerning any item on the agenda before or during its consideration of that matter, as appropriate.

**CALL TO ORDER** 1:00 pm

**ROLL CALL** John Vidovich, Chair  
Mark Grewal, Vice Chair  
Kimberly Brown, Secretary/Treasurer  
Jim Wilson

**PUBLIC COMMENT**

The Board of Directors welcomes participation in Board meetings. The public may address matters under the jurisdiction of the Board that have not been posted in the Agenda. However, California Law prohibits the Board from taking action on any matter that is not on the posted Agenda unless the Board determines that it is an emergency or one of the other situations specified in Government Code section 54954.2. The public will be given the opportunity to address the Board on any item on the Agenda at this time or before the Board's consideration of that item. If members of the public desire to address the Board relative to a particular Agenda item at the time it is to be considered, they should so notify the Chair of the Board at this time. The Chair may limit the total amount of time allocated for public testimony on particular issues for each individual speaker.

**POTENTIAL CONFLICTS OF INTERESTS**

*(Any Board member who has a potential conflict of interest may now identify the item and recuse him/herself from discussing and voting on the matter.)* [FPPC § 87105.]

**CONSENT CALENDAR**

1. Minutes of the Regular Board Meeting held on February 4, 2022
2. Warrants and Finances (02/01/2022 – 03/31/2022)

3. Treasurer's Report
4. Continued use of Zoom meetings in accordance with AB361

### **ACTION CALENDAR**

5. Review and consider **appointment of individual to represent the "White Areas"**
  - a. Report by Executive Director
  - b. Discussion
  - c. Public Comments / Questions
  - d. If desired, motion to appoint a representative with a term through November 2023
6. Review and consider action on **evapotranspiration data contract with Land IQ**
  - a. Presentation by Executive Director
  - b. Discussion
  - c. Public Comments/Questions
  - d. If desired, motion to approve proposal for scope of work
7. Review and consider action to **approve the engagement letter with Luhdorff & Scalmanini for modeling of the Tulare Lake Subbasin.**
  - a. Presentation by Executive Director
  - b. Discussion
  - c. Public Comments/Questions
  - d. If desired, motion to approve proposal for scope of work

### **COMMUNICATIONS/DISCUSSION ITEMS**

8. Director's Reports/Comments/Suggestions
9. Communications
10. Reports of General Interest
  - a. California Strategies Update – David Armanasco and Rusty Areias
  - b. Tulare Lake Subbasin Update – Amer Hussain
    - i. Annual Report
    - ii. SGM Grant Program
    - iii. Response to DWR Comments
  - c. Legal Counsel Update – Jason Howard
  - d. Other updates, as appropriate

### **CLOSED SESSION**

#### **11. CLOSED SESSION**

Anticipated Litigation [Govt. Code Sec. 54956.9 (d)(4)]

**Conference with legal counsel regarding potential litigation (2 cases)**

#### **12. RETURN TO OPEN SESSION - REPORT OF ACTION TAKEN IN CLOSED SESSION and/or ACTION ON MATTERS DISCUSSED IN CLOSED SESSION**

## **ADJOURNMENT**

13. Adjourn to the next Regular Board Meeting, scheduled for Friday, June 3, 2022 at 1:00 pm, at 944 Whitley Avenue, Corcoran, or as otherwise directed by the Board.

- ❖ Items on the Agenda may be taken in any order.
- ❖ Action may be taken on any item listed on the Agenda.
- ❖ Writings relating to open session Agenda items that are distributed to members of the Board of Directors will be available for inspection at the Authority office, excluding writings that are not public records or are exempt from disclosure under the California Public Records Acts.

**Americans with Disabilities Act of 1990:** Under this act, a qualifying person may request that the Authority provide a disability-related modification or accommodation in order to participate in any public meeting of the Authority. Such assistance includes alternative formats for the agendas and agenda packets used for any public meetings of the Authority. Requests for assistance shall be made in person, via telephone, or in written form to the SOUTHWEST KINGS GROUNDWATER SUSTAINABILITY AGENCY Office at 944 Whitley Avenue, Suite E, Corcoran, CA 93212 (559) 762-7240. Requests must be received at least 48 hours prior to a scheduled public meeting.

**SOUTHWEST KINGS GROUNDWATER SUSTAINABILITY  
AGENCY  
REGULAR BOARD MEETING  
MINUTES**

**February 4, 2022**

The Board of Directors of the Southwest Kings Groundwater Sustainability Agency met in the second-floor conference room, 944 Whitley Avenue, Corcoran, California, on Friday, February 4, 2022, at the hour of 1:00 p.m. The meeting was available via Zoom for interested parties.

Vice Chair Grewal presided and Staci Wilkins kept the minutes.

**DIRECTORS PRESENT:** Mark Grewal  
Kim Brown  
Jim Wilson  
John Vidovich

**DIRECTORS ABSENT:**

**OTHERS PRESENT:** Deanna Jackson, Executive Director  
Staci Wilkins, Executive Assistant  
Jason Howard, McCormick Barstow  
Amer Hussain, Geosyntec  
Kiti Campbell, Westlands Water District  
Joel Kimmelshue, Land IQ  
David Armanasco, California Strategies  
Riley Jones, Tulare Lake Compost  
Rusty Areias, California Strategies  
Bryan Platt, DWR

Vice Chair Grewal called the meeting to order at 1:00 p.m.

It was noted that Ceil W. Howe III resigned his position as Director prior to the meeting, effective February 4, 2022.

**PUBLIC COMMENT**

No public comment

**CONSENT CALENDAR** (Agenda items 1 – 4)

Upon the motion of Director Wilson and seconded by Director Brown, the Consent Calendar consisting of Minutes of the December 3, 2021 Regular Board Meeting, Warrants and Finances

dated between 11/16/2021 and 01/31/2022, the Treasurer's Report and AB361 was approved as presented by the following roll call vote:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

**ACTION CALENDAR**

5. Consider action to elect Officers for calendar year 2022.

On the motion of Director Wilson and seconded by Director Brown, the following Directors were nominated as officers: Director Vidovich, Chair; Director Grewal, Vice Chair; and Director Brown, Secretary/Treasurer. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

\*At this point in the meeting, Director Vidovich conducted the meeting.

6. Review and consider day and time for regular Board meeting schedule.

The Bylaws state that meetings will be held on the first Friday of even-numbered months at 10 am. Due to conflicts in schedules, it has been determined that 1 pm is more convenient for everyone's schedule. Director Brown motioned to keep the meetings at 1 pm on the first Friday of even-numbered months which was seconded by Director Wilson. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

7. Consider action to approve the engagement letter with Cuttone & Mastro to perform the audit for year ending December 31, 2021.

Director Grewal motioned to approve the engagement letter with Cuttone & Mastro which was seconded by Director Brown. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

8. Consider for adoption Resolution 22-01 A RESOLUTION IN SUPPORT OF THE TULARE LAKE SUBBASIN GROUNDWATER RECHARGE AND SUSTAINABILITY PROJECTS.

Executive Director Jackson explained that the grant is available to critically overdrafted basins and each grant is worth up to \$7.6 million. It is a non-competitive grant and the resolution is required in order to receive this grant. Director Grewal motioned to approve the Resolution with a second by Director Wilson. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

9. Review and consider approving tolling agreement with Westlands Water District.

Mr. Howard explained that he executed a one-week extension of the last agreement since it was due to expire prior to the Board meeting on February 4, 2022. The new agreement would extend the termination date to January 31, 2023. On the motion of Director Brown and seconded by Director Wilson, it was motioned to approve the agreement thru February 7, 2023. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

10. Review and consider action on evapotranspiration data contract with Land IQ.

Joel Kimmelshue from Land IQ gave a presentation of how data was gathered, the level of accuracy and how it was used by other GSAs. Following a lengthy discussion, no action was taken by the Board.

11. Review and consider approval of 2022 Budget for Geosyntec.

Amer Hussain discussed the breakdown for the seven different tasks that Geosyntec would be working on this year. Following discussion, Director Grewal motioned to approve the 2022 Geosyntec budget with a second by Director Wilson. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

## **COMMUNICATIONS/DISCUSSION ITEMS**

12. **Director's Reports/Comments/Suggestion**

Director Vidovich indicated that there should be more monitoring within the Subbasin.

13. Communications

- a) Amer Hussain presented the letter received for the Subbasin from DWR. There was discussion regarding the deficiencies found and what the next steps in making corrections to the GSP would be.

14. Reports of General Interest

- a) California Strategies –David Armanasco/Rusty Areias  
There is still not a date set for Secretary Crowfoot to tour the area. Their office has been working diligently to get this arranged.

- b) Tulare Lake Subbasin Update – Deanna Jackson / Amer Hussain  
None
- c) Legal Counsel Report – Jason Howard  
None
- d) Other updates, as appropriate  
Due to some conflicts with dates, the next regular meeting will be held on Friday, April 8, 2022, at 1 pm.

**ADJOURNMENT**

15. There being no further business to come before the Board on the occasion of February 4, 2022, meeting, Chair Vidovich asked for a motion to adjourn the meeting at 2:41 pm until the next meeting on April 8, 2022, at 944 Whitley Avenue, Corcoran, or as otherwise directed by the Board. Director Grewal motioned to adjourn with a second by Director Wilson. The Directors voted as follows:

<b>Brown</b>	<b>Wilson</b>	<b>Vidovich</b>	<b>Grewal</b>
Aye	Aye	Aye	Aye

Attest:

\_\_\_\_\_  
Kim Brown, Secretary

\_\_\_\_\_  
Mark Grewal, Vice Chair

# Southwest Kings Groundwater Sustainability Agency

## Check Detail February - March, 2022

DATE	TRANSACTION TYPE	NUM	NAME	MEMO/DESCRIPTION	CLR	AMOUNT
Bill.com Money Out Clearing						
02/01/2022	Bill Payment (Check)		M. Green and Company, LLP	Multiple invoices (details on stub)-- bill.com Check Number: 60261519 - bill.com Check Number: 60261519		-1,410.00
						-1,410.00
02/01/2022	Bill Payment (Check)		LAND IQ	Multiple invoices (details on stub)		-
						14,635.69
						-
						14,635.69
02/01/2022	Bill Payment (Check)		South Fork Kings GSA	Inv #60-- bill.com Check Number: 60258145 - bill.com Check Number: 60258145		-1,797.24
						-1,797.24
02/01/2022	Bill Payment (Check)		McCormick Barstow LLP	Inv #2102317		-525.00
						-525.00
02/25/2022	Bill Payment (Check)		Tri County Water Authority	Multiple invoices		-
						14,000.00
						-
						14,000.00
02/25/2022	Bill Payment (Check)		M. Green and Company, LLP	Inv #156324		-500.00
						-500.00
02/25/2022	Bill Payment (Check)		Provost & Pritchard Consulting Group	Inv #89554		-110.79
						-110.79
02/25/2022	Bill Payment (Check)		California Strategies and Advocacy, LLC	Inv #0122053		-3,600.00
						-3,600.00
02/25/2022	Bill Payment (Check)		Geosyntec Consultants, Inc.	Inv #32459574		-3,803.79
						-3,803.79
02/25/2022	Bill Payment (Check)		Kings River Conservation District	Inv #4774		-1,173.60
						-1,173.60
02/25/2022	Bill Payment (Check)		Cuttone & Mastro	Inv #4713		-210.00
						-210.00
03/15/2022	Bill Payment (Check)		McCormick Barstow LLP	Inv #2104108		-175.00
						-175.00
03/15/2022	Bill Payment (Check)		California Strategies and Advocacy, LLC	Inv #0222058		-3,600.00
						-3,600.00
03/15/2022	Bill Payment (Check)		Tri County Water Authority	Inv #740		-7,000.00
						-7,000.00



# Southwest Kings Groundwater Sustainability Agency

## Check Detail

February - March, 2022

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DATE	TRANSACTION TYPE	NUM	NAME	MEMO/DESCRIPTION	CLR	AMOUNT
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**Note**  
No assurance is provided on these financial statements.

# Southwest Kings Groundwater Sustainability Agency

## Statement of Net Assets

As of March 31, 2022

	TOTAL		
	AS OF MAR 31, 2022	AS OF MAR 31, 2021 (PY)	CHANGE
<b>ASSETS</b>			
Current Assets			
Bank Accounts			
101 BofA Checking	0.00	164,820.16	-164,820.16
102 LAIF	351,404.76	300,447.34	50,957.42
103 Citizens Bank	73,195.67		73,195.67
<b>Total Bank Accounts</b>	<b>\$424,600.43</b>	<b>\$465,267.50</b>	<b>\$ -40,667.07</b>
Accounts Receivable			
Accounts Receivable	68,901.94	84,879.03	-15,977.09
<b>Total Accounts Receivable</b>	<b>\$68,901.94</b>	<b>\$84,879.03</b>	<b>\$ -15,977.09</b>
<b>Total Current Assets</b>	<b>\$493,502.37</b>	<b>\$550,146.53</b>	<b>\$ -56,644.16</b>
<b>TOTAL ASSETS</b>	<b>\$493,502.37</b>	<b>\$550,146.53</b>	<b>\$ -56,644.16</b>
<b>LIABILITIES AND EQUITY</b>			
Liabilities			
Current Liabilities			
Accounts Payable			
Accounts Payable	7,463.99	7,230.80	233.19
<b>Total Accounts Payable</b>	<b>\$7,463.99</b>	<b>\$7,230.80</b>	<b>\$233.19</b>
<b>Total Current Liabilities</b>	<b>\$7,463.99</b>	<b>\$7,230.80</b>	<b>\$233.19</b>
<b>Total Liabilities</b>	<b>\$7,463.99</b>	<b>\$7,230.80</b>	<b>\$233.19</b>
Equity			
Retained Earnings	403,140.51	332,593.95	70,546.56
Net Income	82,897.87	210,321.78	-127,423.91
<b>Total Equity</b>	<b>\$486,038.38</b>	<b>\$542,915.73</b>	<b>\$ -56,877.35</b>
<b>TOTAL LIABILITIES AND EQUITY</b>	<b>\$493,502.37</b>	<b>\$550,146.53</b>	<b>\$ -56,644.16</b>

**Note**

No assurance is provided on these financial statements.

Accrual Basis

# Southwest Kings Groundwater Sustainability Agency

Budget vs. Actuals: FY\_2021 - FY21 P&L

January - March, 2022

	TOTAL			
	ACTUAL	BUDGET	OVER BUDGET	% OF BUDGET
<b>Income</b>				
401 Benefit Assessment	135,305.64		135,305.64	
<b>Total Income</b>	<b>\$135,305.64</b>	<b>\$0.00</b>	<b>\$135,305.64</b>	<b>0.00%</b>
<b>GROSS PROFIT</b>	<b>\$135,305.64</b>	<b>\$0.00</b>	<b>\$135,305.64</b>	<b>0.00%</b>
<b>Expenses</b>				
502 Accounting	585.00		585.00	
503 Legal	2,695.00		2,695.00	
506 Website	247.29		247.29	
<b>520 GSP</b>				
520-3 Monitoring/DMS	17,166.78		17,166.78	
<b>Total 520 GSP</b>	<b>17,166.78</b>		<b>17,166.78</b>	
<b>580 Outside Services</b>				
580.1 Consulting	10,800.00		10,800.00	
580.3 Management Fees	21,000.00		21,000.00	
<b>Total 580 Outside Services</b>	<b>31,800.00</b>		<b>31,800.00</b>	
590 Other	491.00		491.00	
<b>Total Expenses</b>	<b>\$52,985.07</b>	<b>\$0.00</b>	<b>\$52,985.07</b>	<b>0.00%</b>
<b>NET OPERATING INCOME</b>	<b>\$82,320.57</b>	<b>\$0.00</b>	<b>\$82,320.57</b>	<b>0.00%</b>
<b>Other Income</b>				
490 Interest	30.81		30.81	
495 Miscellaneous	546.49		546.49	
<b>Total Other Income</b>	<b>\$577.30</b>	<b>\$0.00</b>	<b>\$577.30</b>	<b>0.00%</b>
<b>NET OTHER INCOME</b>	<b>\$577.30</b>	<b>\$0.00</b>	<b>\$577.30</b>	<b>0.00%</b>
<b>NET INCOME</b>	<b>\$82,897.87</b>	<b>\$0.00</b>	<b>\$82,897.87</b>	<b>0.00%</b>

**Note**

No assurance is provided on these financial statements.

# LAND IQ ET – A DATA DRIVEN METHOD FOR EVAPOTRANSPIRATION AT THE FIELD LEVEL – SOUTHWEST KINGS GSA

**PREPARED FOR:** Deanna Jackson/Southwest Kings GSA

**PREPARED BY:** Joel Kimmelshue/Land IQ  
Juan Geng/Land IQ  
Zhongwu Wang/Land IQ  
Frank Anderson/Land IQ  
Seth Mulder/Land IQ  
Casey Gudel/Land IQ

**DATE:** April 4, 2022

## INTRODUCTION

This scope of work proposal was developed at the request of the Southwest Kings GSA (SWKGSA) for the purpose of developing a monthly and annual calculation of actual, field by field evapotranspiration (ET) (consumptive use) occurring within the Tulare Lake Subbasin for a 12-month period.

Calculation of ET can be performed accurately using weighing lysimeters and eddy correlation monitoring techniques. These methods are limited, however, because they provide point values of ET for a specific location and fail to provide the ET on a regional scale. This limitation has motivated the development of using remotely sensed (RS) data from satellites to evaluate ET over large areas. Satellite data are well suited for deriving spatially continuous ET surfaces that can be sometimes pared down to the field scale because of their temporal and spatial characteristics. However, the most accurate use of RS models require calibration to surface measurements and work from the field level originally. The approach proposed for the tasks in this scope of work includes a combination of high-density, specific ground measurements and remotely sensed modeling, calibrated with those measurements.

## STAFFING RESOURCES AND PROJECT COOPERATORS

Staff expected to work on this project from Land IQ have been involved in various aspects of evapotranspiration modeling, agricultural remote sensing, and regulatory support for the last 3 to 27 years, and are listed below. Other appropriately qualified staff may also participate to facilitate completion of any tasks approved by SWKGSA as a part of this proposed scope of work.

- Principal in Charge and Principal Agricultural Scientist – Joel Kimmelshue, PhD
- Project Manager/Client Relations – Casey Gudel, MS
- Principal Remote Sensing Analyst – Zhongwu Wang, PhD
- Biometeorologist – Frank Anderson, MS
- Agricultural Scientist – Seth Mulder, MS

- Agricultural Scientist – Chris Stall, MS
- Remote Sensing Analyst – Juan Geng, MS
- GIS Analyst – Justin Sitton, BS
- Agricultural Scientist/Field Technician/JB Buller, BS
- Support Staff – Various as needed

Land IQ also welcomes input and collaboration with GSA and/or District staff and intends on integrating staff into continued instrumentation efforts, data collection, and monitoring programs as the on-the-ground, local component of the team, if possible and feasible for the client organization(s).

Implementation of these tasks may also include coordination efforts with other technical providers that Land IQ will manage as a part of this overall effort. Land IQ intends on working openly with these parties to help facilitate, to the extent possible, understanding and acceptance of the work approaches and data management used for analysis and ultimate results.

## TASKS

This scope of work has been developed based on individual task discussions and requests from the SWKGSA. These tasks include:

- **Task 1** – Monthly Consumptive Use Analysis (12 months)
- **Task 2** – Monthly and Annual Reporting (2021)
- **Task 3** – Outreach and Presentations

Each of these tasks is discussed in detail below and includes schedule and deliverables. A cost summary for all work is provided.

### TASK 1. MONTHLY CONSUMPTIVE USE ANALYSIS (2021)

**Scope of Work:** It is proposed that the Land IQ ET data driven approach developed for Semitropic Water Storage District (used since 2016), North Kern Water Storage District (used since 2018), Shafter Wasco Irrigation District (used since 2018), East Kaweah Groundwater Sustainability Agency (currently installed in 2020), Tule Subbasin Groundwater Sustainability Agencies (used since May 2020), Southern San Joaquin Municipal Utilities District and the remainder of the entire Kaweah Subbasin be used. The LDDM is used to interpret image data and leverages robust and repeated ground station data to be implemented within the SWKGSA as well as a more direct image analysis. The approach yields more accurate results when repeated and representative ground calibration data are available. It is also less labor-intensive than METRIC-based (or similar) remote sensing methods at this refined scale.

Because the Land IQ ET data driven approach establishes calibration and validation data at the field level and also analyzes at the field level, the result is field-level consumed water which can then be rolled up to any regional area or crop type desired. This is unique to the Land IQ ET data driven approach as compared to other RS approaches and models.

This method does, however, require robust ground truthing data. Representative ground truthing stations installed within the SWKGSA and also results from neighboring districts will be used for calibration and validation datasets. This effort will employ Landsat 8, Landsat 9, and Sentinel 2 satellite imagery (freely available) as well as Maxar Imagery (contracted by Land IQ and included in the overall cost). Satellite data will be screened for cloud cover and terrain corrected. It is important that some of

the images used contain a clear sky. Ground measurements from monitored eddy covariance and surface renewal stations will be used to generate hourly ET data correlated to Landsat 8, Sentinel 2 and Maxar Imagery satellite overpasses and then used as a dependent variable in the modeling process.

It should be noted that Land IQ has entered into a collaboration agreement with Dr. Daniele Zaccaria and Dr. Rick Snyder (emeritus) from the University of California, Davis as collaborating partners. As such we are able to use the data from 6 neighboring eddy covariance/surface energy balance stations for this project in addition to other existing and neighboring stations, in addition to dozens of Land IQ installed and maintained stations. These stations are owned by UC Davis and operated by Land IQ and UC Davis. The partnership between UC Davis and Land IQ allows Land IQ to use the data from these stations and also provides for independent review.

**Deliverables:** None

**Schedule:** Individual analyses will be completed monthly and annually at the end of each calendar year (Task 2) and results delivered to the SWKGSA within approximately 25 days from the end of the previous month.

## TASK 2. MONTHLY AND ANNUAL REPORTING (2021)

**Scope of Work:** Monthly template reports will be developed. An annual report will also be developed which summarizes the previous year, once completed. The first of the 12 monthly reports will begin approximately 25 days following completion of recording of 30 days of climatic data and will be delivered within 30 days of the end of the previous month.

**Deliverables:** Monthly results will be delivered in data summary, shape file, and report formats. Annual results will be delivered in report format only. Results can also be delivered in a format that can be consumed by online tools for delivery to growers directly. This does not include the partitioning of results by ownership.

In addition to ET reporting, Land IQ will provide field by field crop type mapping as well as field by field precipitation for the SWKGSA in electronic and summary form at least annually and more frequently for multi-cropping areas. These data will be the same type and quality of data for crop mapping that are provided to the State of California, Department of Water Resources as Land IQ is the contractor for that dataset as required by SGMA.

**Schedule:** Individual analyses and reporting will be completed monthly and results delivered within approximately 25 days of the end of the previous month being analyzed. Annual summarization and reporting will be completed within approximately 45 days following the end of the previous 12-month period.

## TASK 3. OUTREACH AND PRESENTATIONS

**Scope of Work:** This task accounts for up to three meetings per year to assist with or participate in outreach meetings with growers and irrigation district representatives.

**Deliverables:** Presentation materials

**Schedule:** As needed or directed by the SWKGSA.

## TOTAL COST AND PAYMENT TERMS

According to State of California Subbasin and GSA boundaries, SWKGSA records and Land IQ mapping there are a total of approximately 179,738 acres. The SWKGSA has requested a 12-month contract with subsequent possible annual continuation contracts each year. Two costs are provided per this request. The first cost (Tasks 1, 2 and 3) is for the irrigated portion of the district only at a rate of \$0.76/acre/year. It is usually the case that Land IQ analyzes the entire footprint of a GSA for the same cost. Because SWKGSA is unique in that it has a large portion of the GSA that is not cropped, only the cropped portion will be evaluated. If, in the future, the GSA prefers to have the native ground area evaluated, Land IQ can provide a cost to do that work.

It should be noted that without ground truthing stations, the accuracy of the results should be reasonable, but also will only be as good as the calibration data received from the limited number of installed stations and stations within neighboring areas. If the SWKGSA decide to continue this work after the 12-month trial period, it will be necessary to install stations and measure the climatic parameters within the analysis area for a 3-year commitment at a current price of \$0.76/acre/year.

The analysis will cover 21,434 acres at a rate of \$0.76/acre/year totaling \$16,289 or \$1,357/month for a 12 month period.

The cost listed includes all rental station equipment, labor, expenses, supplies, project management, and all other associated costs.



February 11, 2022

*DRAFT*  
LSCE File No: 21-1-113

Mr. Jeof Wyrick  
El Rico GSA  
1001 Chase Ave.  
Corcoran, CA 93212  
E-mail: [JWyrick@jgboswell.com](mailto:JWyrick@jgboswell.com)

**SUBJECT: LETTER OF ENGAGEMENT – DEVELOPMENT OF  
TULARE LAKE SUBBASIN INTEGRATED HYDROLOGIC MODEL (TULIM)**

Dear Mr. Wyrick,

In response to your request, Luhdorff & Scalmanini Consulting Engineers, Inc. (LSCE) developed an approach for the development of a numerical groundwater flow model for the Tulare Lake Subbasin – the Tulare Lake Subbasin Integrated Hydrologic Model (TuLIM), and an associated scope of work and cost estimate. The purpose of the model is to serve the five groundwater sustainability agencies (GSAs) in the Tulare Lake Subbasin (TLSB) (i.e., Mid-Kings River, South Fork Kings, Southwest Kings, El Rico, and Tri-County Water Authority GSA) as a comprehensive, long-term tool to aid in the development of Groundwater Sustainability Plans (GSPs) for compliance with the Sustainable Groundwater Management Act (SGMA) and to be utilized in the analysis of projects and management actions as part of SGMA compliance. We understand that this work would be contracted through El Rico GSA, who would be acting as the representative for this collaboration between GSAs in the TLSB.

## **BACKGROUND**

Two numerical groundwater flow models were recently developed that are of interest for the proposed work herein. Both of these models were built on the MODFLOW2005 platform, which was developed by the U.S. Geological Survey (USGS).

As part of the 2020 TLSB GSP effort, Wood (2020)<sup>1</sup> developed a calibrated model (2020 TLSB Model) that employed an external process (i.e., decoupled farm process from the groundwater flow process) to estimate groundwater extraction for irrigation and deep percolation from irrigation (i.e., a source of groundwater recharge). This information was part of the model input.

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<sup>1</sup> Wood, 2020, Tulare Lake Subbasin Hydrologic Model for Groundwater Sustainability Plan Development: Calibration and Predictive Simulations. Prepared for Mid-Kings River Groundwater Sustainability Agency. Project FR18161220. January 8, 2020.



Mr. Jeof Wyrick  
February 11, 2022

*DRAFT* Letter of Engagement  
TuLIM Development

Prior to the development of the 2020 TLSB Model, LSCE developed a calibrated numerical groundwater flow model of the TLSB and surrounding areas (El Rico Model)(Figure 1).

The primary purpose of the El Rico Model was to quantify and understand the historical water budget components of El Rico GSA based on aquifer types, well distribution and characteristics. Specifically, the model was used in predictive modes to evaluate groundwater level responses to different pumping scenarios. The model was internally used by the El Rico GSA to assess SGMA compliance including potential Minimum Thresholds (MTs), and to quantify the lateral flow between El Rico GSA and adjacent GSAs and aquifer-based change in storage based on different future pumping scenarios.

For this purpose, the El Rico Model used a wealth of actual well extraction records and assigned them to existing wells (including precise well locations and well construction information) in the EL Rico GSA. Extraction from wells with no available data, groundwater recharge, and other important model inputs were sourced from the Central Valley Hydrologic Model (CVHM)(also developed by the USGS and currently being updated under the abbreviation CVHM2).

## APPROACH FOR MODEL UPDATE

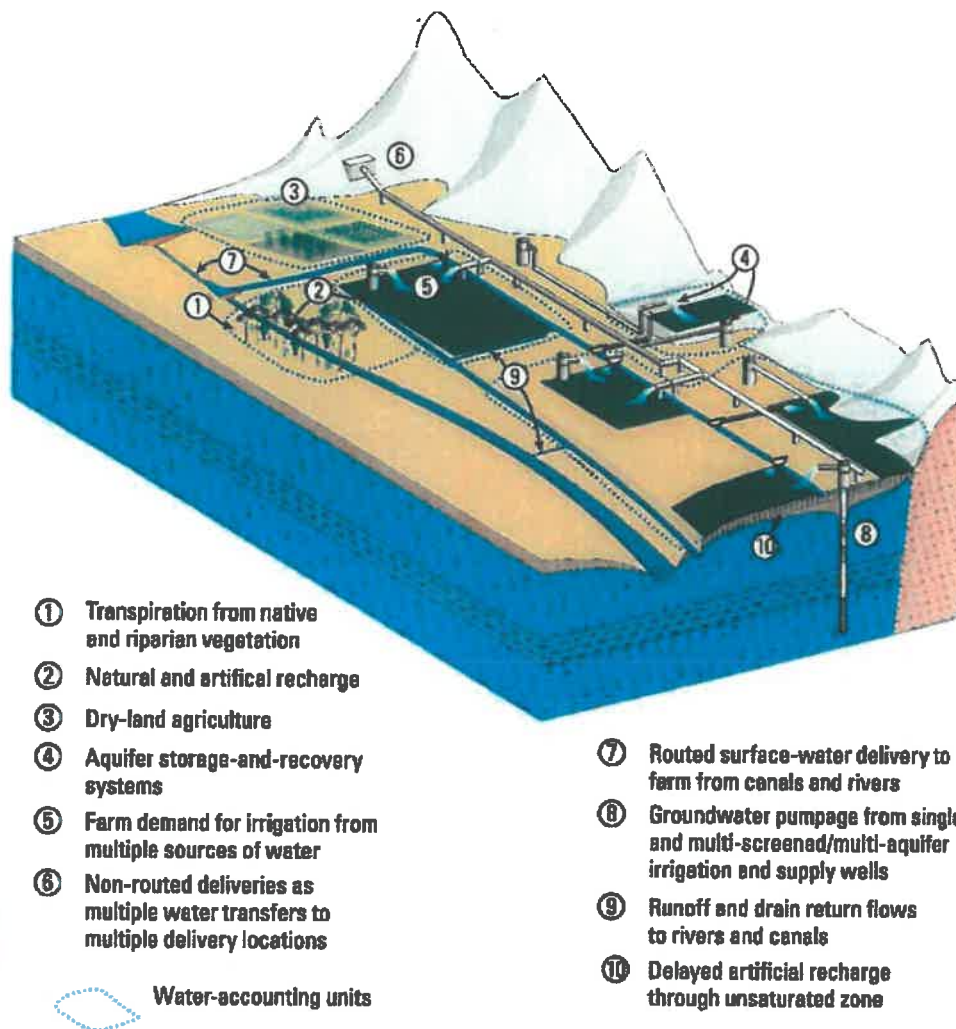
Since the development of the models introduced above, the USGS released the One-Water Hydrologic Flow Model code (One-Water). The One-Water Hydrologic Flow Model (One-Water) is an integrated hydrologic flow modeling software developed by the USGS to evaluate groundwater-surface water interaction and conjunctive use and is very well suited to addressing the broader goals defined by SGMA (Boyce et al., 2020)<sup>2</sup>. Specifically, it overcomes laborious preprocessing associated with the decoupled approach and improves groundwater extraction estimates in those areas where actual extraction records are not available as it allows dynamic coupling between farm and groundwater processes.

Currently, One-Water is one of two codes explicitly recommended by the California Department of Water Resources (DWR) for GSP development. One-Water is based largely on the Farm Process (FMP) developed under the MODFLOW2005 platform, which is the same platform that Wood and LSCE used to develop their respective models. The code integrates various processes and packages to enable the robust simulation of landscape supply and demand, climate, groundwater surface water interaction, and groundwater flow (Figure 2).

Therefore, based on LSCE's understanding of GSP guidelines and regulations, we recommend updating the 2020 TLSB Model's platform to the One-Water Hydrologic Flow Model code and enhancing it with components from the El Rico Model, as appropriate. As part of this effort, we also recommend revisiting the 2020 TLSB Model's hydrogeologic conceptual model.

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<sup>2</sup> Boyce, S.E., Hanson, R.T., Ferguson, I., Schmid, W., Henson, W., Reimann, T., Mehl, S.M., and Earll, M.M., 2020, One-Water Hydrologic Flow Model: A MODFLOW Based Conjunctive Use and Integrated Hydrologic Flow Model (2020): U.S. Geological Survey Techniques and Methods 6-A60, 435 p.



**Figure 2. Diagram of One-Water conceptualization highlighting hydrologic interdependencies (modified from Schmid and Hanson, 2009)<sup>3</sup>**

The proposed model update provides two critical improvements:

- (1) Dynamic linkage between the landscape system (climate and agricultural supply and demand), groundwater system (pumping, recharge, and groundwater flow) and surface water system (streamflow and stream-aquifer interaction)<sup>4</sup>. The integration of all the

<sup>3</sup> Schmid, Wolfgang, and Hanson, R.T., 2009, The Farm Process Version 2 (FMP2) for MODFLOW-2005—Modifications and Upgrades to FMP1: U.S. Geological Survey Techniques and Methods 6-A-32, 102 p.

<sup>4</sup> Equations governing landscape, surface water and groundwater processes are tightly coupled and solved simultaneously in the model code.

hydrologic components in the Subbasin greatly facilitates the quantification of water budgets for GSP preparation as well as the understanding of the Subbasin hydrology.

- (2) The modeling platform was developed to work with readily available fundamental data (e.g., crop type, rainfall, reference-ET, surface water delivery) as an input. This enables water managers to more efficiently and effectively evaluate the impacts of factors such as climate, land use or water supply on Subbasin conditions and develop management actions to evaluate their efficacy mitigating undesirable results.

## SCOPE OVERVIEW

The development of TuLIM will focus on integrating the existing 2020 TLSB Model with landscape, climate, and water supply data into the One-Water modeling platform and enhancing it with components from the El Rico Model, as appropriate. As both the 2020 TLSB and the El Rico models rely on the underlying MODFLOW2005 structure, many model components (e.g., model grid, geology, well construction) that were previously developed for these models are expected to be compatible so that they can be either directly used or effectively leveraged in developing TuLIM. The key model update centers around coupling landscape processes (land use, climate, and water supply information) to the TuLIM framework in order to internally calculate estimates of agricultural supply and demand, groundwater recharge and pumping<sup>5</sup>. The work starts with an initial effort of consultation with Tulare Lake Subbasin (TLSB) GSAs and review of the 2020 TLSB GSP to fully understand what projects and management actions the TLSB GSAs are planning to implement and would like the updated model to simulate to assess the effectiveness and feasibility of desired projects. This will be followed by the collection, compilation, and analysis of data pertaining to land use, climate, surface water supply (diversions and imports) and soils to ensure that the updated model will be a reliable tool to evaluate projects and management actions and to be used in the development of the 2025 GSP update. Other important components of the model update include:

- (1) Update to the hydrogeologic conceptual model, including integration of relevant data used for TLSB's 2020 GSP;
- (2) Refinements to hydrogeologic framework, model structure, and inputs outside of the El Rico GSA based on coordination and input from cooperating GSAs within the Tulare Lake Subbasin (TLSB);
- (3) Extension of the model period to encompass more current hydrology;
- (4) Updated model calibration to measured water levels, subsidence and observed pumping data available within the entire TLSB.

Project deliverables include:

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<sup>5</sup> External demands and recharge such as municipal and industrial pumping, applied water for pre-irrigation or infiltration from percolation ponds can also be specified.

- (1) Report on the updates to the hydrogeologic conceptual model;
- (2) Callbrated model encompassing the TLSB and including GSP historical and current water budget periods;
- (3) Report describing model inputs, model calibration and discussion of model results including historical and current water budgets.
- (4) Model projections per SGMA requirements (baseline and climate)
- (5) As requested, GSA specific analysis of projects, boundary conditions, etc. with associated presentation of results.

## SCOPE OF WORK

The scope of work is organized in the following six tasks:

- (1) Exploratory Conversations with GSA Leadership
- (2) Data Acquisition, Compilation, and Analysis
- (3) Update to Hydrogeologic Conceptual Model
- (4) Numerical Model Update and Calibration
- (5) Project Report
- (6) Model Projection Development
- (7) Evaluation of Project Management Actions
- (8) Project Management and Communication

### Task 1 Exploratory Conversations with GSA Leadership

This task provides for LSCE's measured review of the 2020 TLSB Model in conjunction with the GSA's feedback on that effort. As part of this effort, we envision exploratory conversations and coordination with GSA leadership within the TLSB to identify needs and expectations on the updated model with respect to SGMA implementation. Key information gathered during this effort will be used to refine the scope of work and associated cost estimates as necessary.

### Task 2 Data Acquisition, Compilation, and Analysis

This task focuses on gathering, compiling, and evaluating data throughout the TLSB and adjacent Subbasins which overlap the existing model domain. These data will be used to refine the hydrogeologic inputs in portions of the existing model domain which currently lack sufficient refinement, and to develop inputs for the FMP used to simulate landscape processes in the One-Water platform.

This effort includes coordination and communications with the GSAs in the TLSB and adjacent areas, and other local, state, and federal agencies to collect and compile pertinent data with respect to water supply (surface water deliveries, groundwater pumping, well construction), land use (local and relevant county and statewide land use coverage), observations (streamflow, groundwater levels, subsidence, groundwater pumping), and climate and

hydrology (precipitation, potential ET, tributary inflows). These data will be incorporated into new and existing relational and spatial databases and evaluated for quality and reliability.

### **Task 3 Update to Hydrogeologic Conceptual Model**

The results from Task 2 will be used to update and refine the existing hydrogeologic conceptual model (HCM) of the Subbasin and surrounding areas. The goal of this task is to characterize subbasin hydrogeologic conditions and identify factors that influence local and regional groundwater levels and subsidence. The conceptual model constitutes the very foundation of the numerical model. It integrally factors into the success of subsequent calibration efforts and largely determines the degree to which the model will be able to generate realistic results. Due to the importance of this work, the conceptual model will be described and documented in a stand-alone technical memorandum (TM). This TM will later be incorporated into the Project Report (Task 5) by reference.

### **Task 4 Numerical Model Update and Calibration**

This task includes updating the model code that was used in the previous models to the One-Water platform and use of the FMP process. This effort will rely on a synthesis of data acquired in Task 2, the HCM, and the development of scripts and utilities to build and analyze model files to appropriately represent hydrologic processes within the Subbasin.

The model time period will be updated to establish a study period that captures appropriate climatic conditions as well as recent hydrologic conditions that can be used in the upcoming 5-year GSP update. The study period will incorporate recent groundwater and land use conditions including any SGMA guidance conveyed through Best Management Practices (BMPs) issued by DWR.

The model calibration will be updated based on the observation data from the updated calibration period. Observations used in model calibration will include measurements of groundwater levels, subsidence and compaction, surface water flow and groundwater pumping. Per GSP guidelines, model calibration will include an analysis of model sensitivity using PEST and summary of model fit statistics.

Model results post-processing and analysis will be conducted in different forms (e.g., water budgets, groundwater levels, subsidence, surface water flows, etc.). The model will be able to support analyses on different scales (e.g., subbasin wide or GSA scales).

### **Task 5 Project Report**

LSCE will prepare a model report including a description of the work conducted in each task and the results of the TuLIM model calibration, summary of pertinent water budgets and estimate of the subbasin sustainable yield. The report will be provided in draft for client

review/comment. Comments will be addressed in a revised model report. The TM that was prepared under Task 3 will be incorporated into the Project Report by reference.

## Task 6 Model Projection Development

In accordance with SGMA regulations and GSP best management practices identified by DWR, the calibrated flow model from Task 4 will be used to evaluate projected hydrologic conditions over a 50-year period, each referred to as a model projection. A model projection is a predictive model run given a certain set of assumptions. The model projections will ultimately be used to comprehensively evaluate Project Management Actions (PMA) with respect to sustainability goals. LSCE will develop the following three model projections in accordance with SGMA requirements.

**Baseline Projection.** The baseline projection will use a 50-year record of historical climate and hydrologic data, and include estimates of projected changes to land use, water supply and population.

**Two Climate Change Projections.** The historical climate data from the Baseline Projection will be replaced with two different climate data sets obtained from California's Fourth Climate Change Assessment to yield two distinct Climate Change Projections, including wet and moderate warming (CNRM-CM5-RCP45) and wet and hot conditions (HadGEM-ES2-RCP85).

## Task 7 Evaluation of Project Management Actions

In this task, LSCE will use the three model projections to evaluate PMAs. The associated cost estimate was developed as a unit cost for the evaluation of one PMA, its associated three model runs, post-processing of model output and the presentation and communication of results to the client (e.g., via a presentation). LSCE will work closely with the TLSB GSAs to understand and clearly define desired PMAs. To the extent possible, LSCE will help GSA leadership to understand likely qualitative effects of specific PMAs on groundwater conditions. This will facilitate PMA selection, modification, and/or their bundling for the benefit of effectively developing model scenarios that provide quantitative answers that help GSAs maximize available water resources while attaining sustainability goals. The cost estimate associated with this task is somewhat hypothetical because it does not pertain to any specific PMA.

## Task 8 Project Management and Communication (Year 1)

This task provides for program management and administrative activities such as: (i) contractual arrangements, (ii) ongoing examination regarding adherence to the scope, cost estimate, and schedule, (iii) coordination of staff resources, (iv) internal review of work products, (v) billing review, and (vi) additional scoping and costing, as requested by client.

This task enables LSCE to be responsive to client’s questions and communication needs, and to engage in conversations (e.g., with state agencies, researchers, consultants) on client’s behalf for the benefit of this project.

This task also provides time to participate in meetings unrelated to Task 1, and to prepare presentations documenting the model development effort.

## Cost Estimate

Cost estimates for individual tasks and the overall effort are provided in Table 1. We propose to complete the work as scoped and bill on a time and material basis in accordance with our 2022 Schedule of Fees (attached), subject to change on a calendar year basis. Should the cost of services exceed this estimate, we would report the status of completed work, estimate additional cost, and receive authorization from client before proceeding. Note that Task 8 is scoped for Year 1 of this project, whereas other tasks are scoped through their completion.

**Table 1: Cost Estimate**

Task Description	Cost by Task
Task 1 Exploratory Conversations with GSA Leadership	\$24,900
Task 2 Data Acquisition, Compilation, and Analysis	\$81,820
Task 3 Update to Hydrogeologic Conceptual Model	\$125,580
Task 4 Numerical Model Update and Calibration	\$197,335
Task 5 Project Report	\$95,670
Task 6 Model Projection Development	\$120,250
Task 7 Project Management Actions (PMAs) Development (ea.)	\$19,070
Task 8 Project Management, Meetings, and Technical Coordination (Year 1)	\$91,560
	Sub Total \$756,185
	Direct Cost (lump sum) [1] \$3,000
	Grand Total \$759,185

[1] Includes mileage and travel, reproduction, postage, incidentals. All deliverables will be submitted in electronic file format.

Mr. Jeof Wyrick  
February 11, 2022

**DRAFT** Letter of Engagement  
TuLIM Development

Thank you for giving us the opportunity to prepare this letter of engagement.

Sincerely,

Luhdorff and Scalmanini  
Consulting Engineers

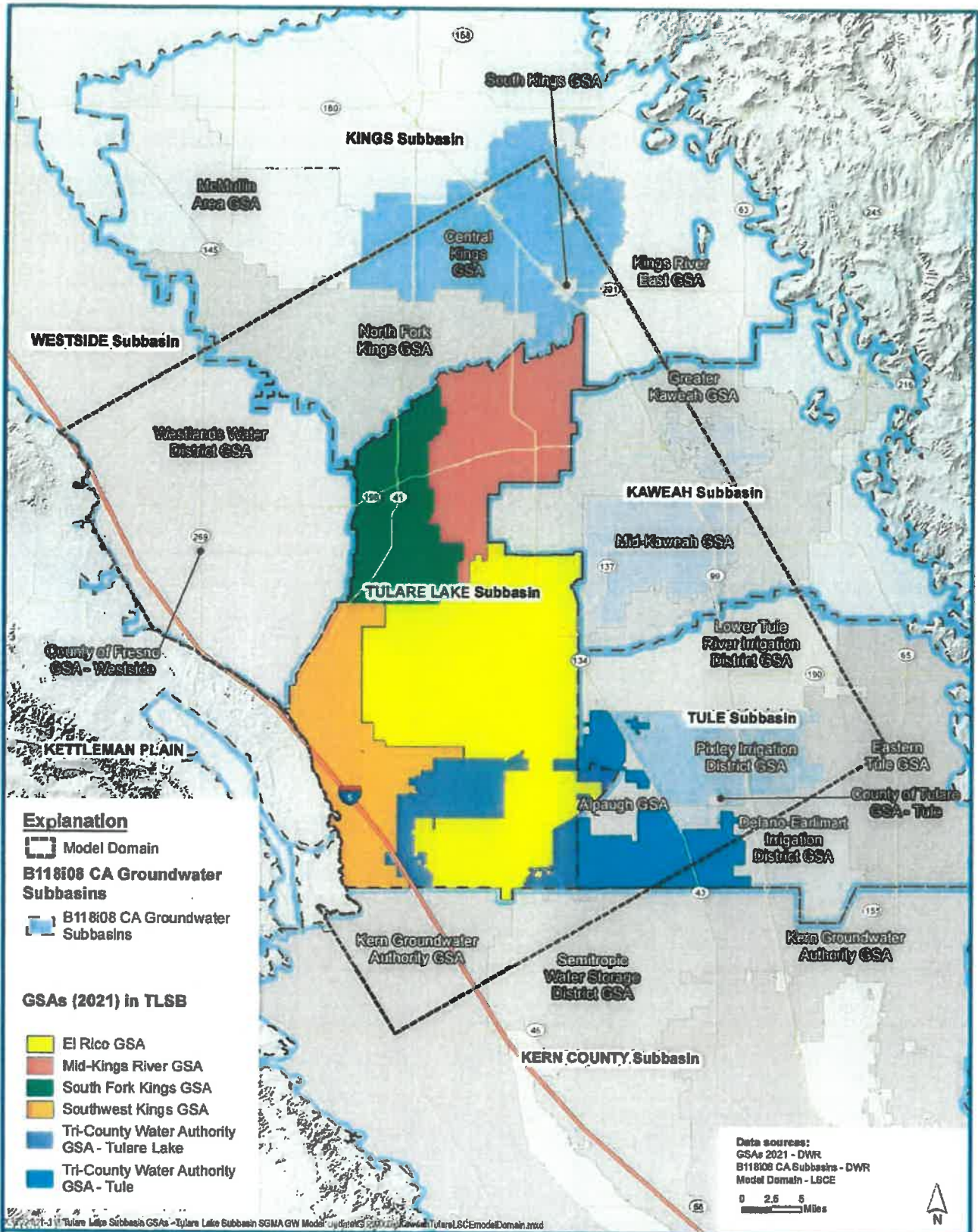
*draft*  
Till Angermann, PG, CHG  
Sr. Principal Hydrogeologist

*draft*  
Mohamed Nasser, PhD  
Senior Engineer

**Attachment:**  
Figure 1: Subbasins, GSAs, and El Rico Model Domain  
LSCE 2022 Schedule of Fees

**DRAFT**







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## 2022 SCHEDULE OF FEES

### ENGINEERING AND RELATED FIELD SERVICES

**Professional\***

Senior Principal .....	\$235/hr.
Principal Professional.....	\$225 to 230/hr.
Supervising Professional .....	\$210 to 220/hr.
Senior Professional .....	\$175 to 210/hr.
Project Professional .....	\$155 to 175/hr.
Staff Professional .....	\$135 to 155/hr.

**Technical**

Engineering Inspector .....	\$140/hr.
ACAD Drafting/GIS .....	\$142/hr.
Engineering Assistant.....	\$115 to 140/hr.
Scientist.....	\$115 to 140/hr.
Technician.....	\$115 to 140/hr.

**Clerical Support**

Word Processing, Clerical.....	\$90/hr.
Digital Communications Specialist .....	\$90 to 100/hr.
Project Admin/Accounting Assistant .....	\$90 to 110/hr.

Vehicle Use	\$0.58/mi.
Subsistence	Cost Plus 15%
Groundwater Sampling Equipment (Includes Operator)	\$170.00/hr
Copies	\$0.20 ea.
Professional or Technical Testimony	200% of Regular Rates
Technical Overtime (if required)	150% of Regular Rates
Outside Services/Rentals	Cost Plus 15%
Services by Associate Firms	Cost Plus 15%

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\* Engineer, Geologist, Hydrogeologist, and Hydrologist