

LAND SUBSIDENCE TECHNICAL MEMORANDUM

To: Curtis Lawler, Stetson Engineers
From: Matt Naftaly, P.G., P.H., Dudek
Kipp Vilker, P.E., Dudek
Subject: Land Subsidence, West and Central Management Areas – Santa Ynez River Valley
Groundwater Basin
Date: October 30, 2020
Attachment(s): Figure 1 – Land Subsidence Index
Figure 2a – Land Subsidence
Figure 2b – Land Subsidence
Figure 2c – Land Subsidence
Figure 2d – Land Subsidence
Figure 2e – Land Subsidence
Attachment A – Santa Ynez River Valley Groundwater Basin Subsidence Monitoring

This memorandum summarizes Dudek’s findings regarding land subsidence potential within the Western Management Area (WMA) and Central Management Area (CMA) of the Santa Ynez Groundwater Basin (Basin) as it relates to the Sustainable Groundwater Management Act (SMGA) undesirable results. It is anticipated that this memorandum may provide the basis for the discussion of land subsidence within the Groundwater Sustainability Plan (GSP).

Land subsidence resulting from aquifer deformation may be of two kinds: elastic or inelastic. Elastic deformation occurs with the compression and expansion of sediments due to pore pressure changes that occur with fluctuations in water levels (Borchers and Carpenter 2014). Therefore, elastic deformation may be cyclical in nature corresponding to seasonal groundwater recharge or groundwater extraction. Elastic deformation does not result in permanent loss of pore space. Inelastic deformation may result in irreversible land subsidence and is commonly related to water extraction from fine grained sediments within clay or silt aquitards (Borchers and Carpenter 2014). Permanent land subsidence related to groundwater withdrawal generally occurs in an unconfined aquifer when groundwater elevations drop below the historic range. Land subsidence may result from causes other than withdrawal of groundwater including vertical displacement from tectonic forces or oil withdrawal.

Geologic Setting and Hydrogeologic Information

As described in the 2004 DWR California Groundwater Bulletin 118, the Basin is bounded by the Purisima Hills on the northwest, the San Rafael Mountains on the northeast, the Santa Ynez Mountains on the south, and the Pacific Ocean on the west. Groundwater occurs in unconsolidated alluvial and terrace deposits, including the Orcutt Formation, Paso Robles, and Careaga Formations. The thickness of water-bearing materials in the eastern portion of the Basin averages about 1,000-feet with a maximum of about 3,000-feet. The maximum thickness of the western portion of the basin is more than 1,500-feet near the Santa Rita syncline. The average specific yield for water-bearing materials in the western portion of the Basin is estimated to be 12 percent. The average specific yield for water-bearing materials in the Basin is estimated to be 8 percent (California’s Groundwater Bulletin 118, 2004 and references therein).

According to Stratigraphic Columns of Santa Ynez River Valley (Geosyntec, May 2020), a typical section through the WMA is comprised of River Gravels consisting of coarse to fine sand, gravel and thin lenses of clay and silt; Young Alluvium consisting of unconsolidated sands, gravels, silts, and clays; Older Alluvium consisting of Unconsolidated gravels, sand, and silt; Orcutt Sand consisting of unconsolidated, well sorted coarse to medium-grained sand and clayey sand with scattered pebbles/gravel stringers; and Careaga Sandstone consisting of weakly indurated, massive, fine to coarse-grained sand, with local lenses of pebbles and seashells. The stratigraphy of the CMA is similar with the exception of River Gravels and the addition of a layer of Paso Robles Formation consisting of weakly consolidated lenticular beds of clay, fine to coarse-grained sand, and gravels.

Extremely fine-grained sediments that are susceptible to inelastic deformation within the aquifers and aquicludes of the WMA and CMA are generally not extensive or homogeneous enough to pose a great risk of land subsidence, even in the event of substantial dewatering. Inelastic compaction of coarse-grained sediment is usually negligible (Borchers and Carpenter 2014).

Historical Evidence of Land Subsidence

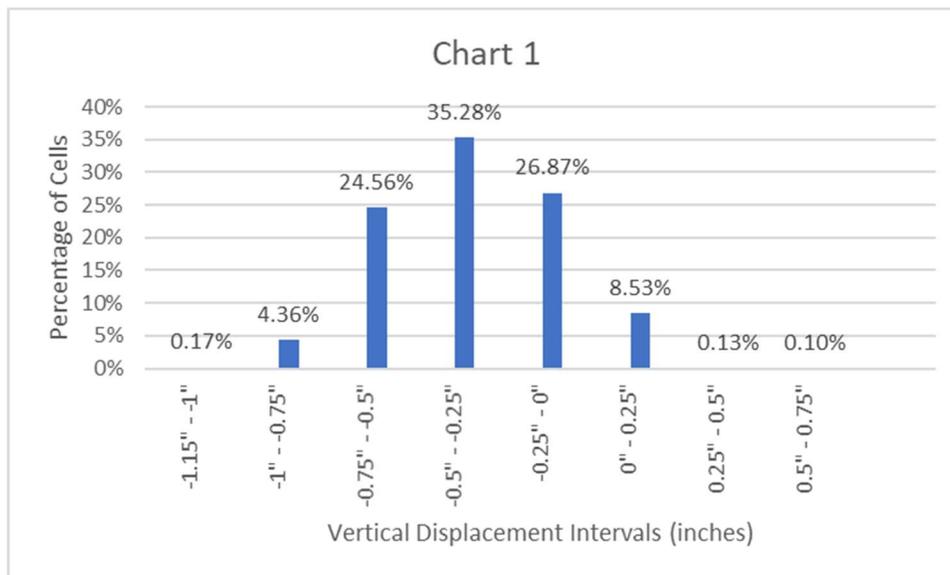
There is little or no documentation of physical evidence of subsidence such as well casing failure, infrastructure disruption, or earth fissures within the WMA and CMA. According to the 2013 City of Lompoc Groundwater Management Plan, there has been no evidence of land subsidence resulting from groundwater-level declines within the Lompoc Groundwater Basin portion of the WMA and the risk of future significant impacts is small because long-term groundwater levels have been mostly static. Dudek made inquiries to the Solvang Public Works Department, Caltrans (District 5), Department of Water Resources (DWR), and Santa Ynez River Water Conservation District regarding infrastructure related failures due to land subsidence within the Basin in the last 100 years. None of these agencies provided evidence of infrastructure disruption due to land subsidence. The Solvang Public Works representative commented that he could not recall any land subsidence issues throughout the Santa Ynez Valley (M. van der Linden, personal communication, August 12, 2020). John Brady of the Central Coast Water Authority (CCWA) engineering department indicated the presence of a 36-inch to 39-inch steel pipeline

between Lake Cachuma and the Lompoc Valley, and north to the Santa Maria Valley, of which approximately 27-miles runs through the WMA and CMA. This pipeline is equipped with seismically triggered isolation valves and has been in place since 1990. Mr. Brady indicated that since the pipeline was built, there have been no triggers of the isolation valves and in his opinion, that there has been no groundwater related land subsidence in the area.

InSAR Vertical Displacement Data

Land Subsidence data is included in DWR’s SGMA Data Viewer. Although data from USGS and DWR extensometers is available for parts of California, none are located near the Santa Ynez River Valley or within Santa Barbara County. The SGMA Data Viewer includes vertical displacement data for the Basin derived from InSAR (Interferometric Synthetic Aperture Radar). The TRE Altamira InSAR Dataset is collected by the European Space Agency from the Sentinel-1A satellite for California from January 2015 through September of 2019 and processed by TRE Altamira (DWR 2020). Although subsidence has been largely unmonitored until recently, analysis of the 100-meter by 100-meter (328-foot by 328-foot) calculation grid cells within the Basin indicates that the majority of the Management Areas have experienced total vertical displacement of less than a half-inch of uplift or subsidence between January 2015 and September 2019.

Vertical displacement of the Management Areas, divided into eight displacement intervals, is illustrated in Figures 1 and 2a through 2e attached. The InSAR raster dataset is displayed and uses the 100-meter by 100-meter grid cells to calculate vertical displacement. Within the Management Areas there are 63,516 cells. The maximum uplift of these cells is 0.51-inches while the maximum subsidence is -1.15-inches and the mean vertical displacement is -0.35-inches. Chart 1 shows the distribution of the number of cells within the eight intervals.



As illustrated in Chart 1 and Figures 1 and 2a-2e, only 4.53% of the WMA and CMA have undergone subsidence of greater than 0.75-inches. The interval with the largest number of cells is the interval displaying between 0.25-inches and 0.50-inches of subsidence, which accounts for 35.28% of the Management Areas.

As noted, variations in land surface elevation may result from temporary elastic or tectonic deformation. Available data indicates insignificant subsidence, likely from causes other than inelastic deformation.

Continuous Global Positioning System

UNAVCO, a non-profit university-governed consortium that facilitates geoscience research and education using geodesy, operates a network of continuous global positioning systems (CGPS) instruments across the Americas, including in California. While there are no stations located within the WMA or CMA of the Basin, there are three stations within the vicinity of the Basin which have recorded daily measurements through December 2020 dating back to between 1996 and 2000. The closest CGPS station to the Basin is station VNDP, located approximately 3-miles south of the southwestern corner of the WMA. Station ORES is located approximately 5-miles north of the northeastern corner of the WMA and station TJRN is located approximately 7-miles southeast of the southeastern corner of the CMA (Figure 1). Monitoring records indicate vertical displacement at station VNDP has decreased in elevation by approximately 40-millimeters (mm) (1.57-inches) since 1996. Monitoring records indicate vertical displacement at station ORES has decreased in elevation by about 230-mm (9.1-inches) since 1999. Monitoring records indicate vertical displacement at station TJRN has increased in elevation by about 10-mm (0.39-inches) since 2000 (UNAVCO 2020). Because none of the stations are located within the Santa Ynez Valley Groundwater Basin, they are not representative of land subsidence that may occur as a result of groundwater extraction within the basin. Stations TJRN and VNDP, located to the south of the WMA and CMA, are not within any DWR defined alluvial groundwater basins and may be representative of the active tectonic conditions of the region. Station ORES is within the San Antonio Creek Valley Groundwater Basin (DWR #3-014) and may be indicative of land subsidence conditions there.

Baseline and Ongoing Subsidence Monitoring

Given the low potential for, and incidence of, substantial land subsidence within the WMA and CMA, there may be the potential to monitor future land subsidence using existing, indirect tools such as the InSAR data discussed above. However, direct measurement of land subsidence may also be conducted via baseline and periodic land survey and may provide a greater level of accuracy and detail. Attachment A is a current proposal from Stantec Consulting Services Inc. for land survey monitoring within the WMA and CMA. Two transects have been identified for survey: in the WMA along Floradale Avenue, and in the CMA along the Avenue of Flags. Control points would be set in stable locations at opposite ends of a 2- to 3-mile line in both locations. Up to eight additional monitoring points could be established along the lines. After a baseline has been established, additional monitoring could take place

at the desired frequency. The estimated cost for baseline surveys is \$21,000 and for periodic monitoring is \$9,000 for both areas.

InSar Data, which has been collected since January 2015 and is discussed above, may also provide accurate vertical displacement data. The data provides 16 mm vertical accuracy at a 95% confidence level (DWR 2020). Although there are occasional gaps in coverage within the Basin, the WMA and CMA are widely covered, and accurate data is expected to be produced in the future. The dataset is funded through mid-2023 and will most likely continue beyond that time (B. Brezing, personal communication, August 10, 2020).

Conclusions

The Basin is at low risk for subsidence as a result of inelastic deformation. Minor amounts of vertical displacement have been observed in the Basin between January 2015 and September 2019 but may be mostly the result of elastic processes. As shown in the InSAR data, only 4.53% of the Basin has experienced land subsidence greater than 0.75-inches between January 2015 and September 2019. Variations in land surface elevation may result from temporary elastic or tectonic deformation. Ongoing monitoring of potential land subsidence resulting from groundwater extraction may be conducted with existing remote data sources or direct land survey as discussed above.

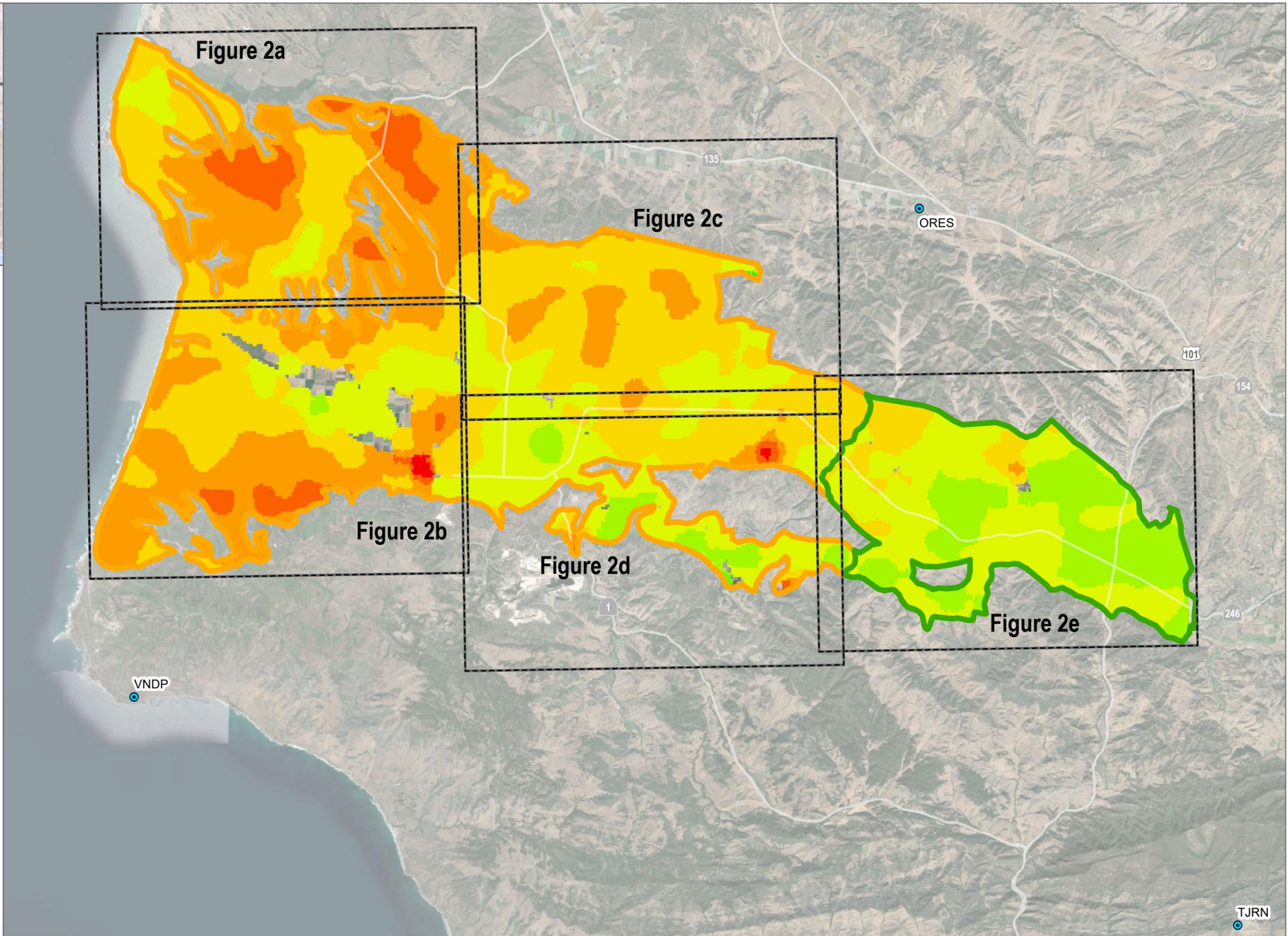
References

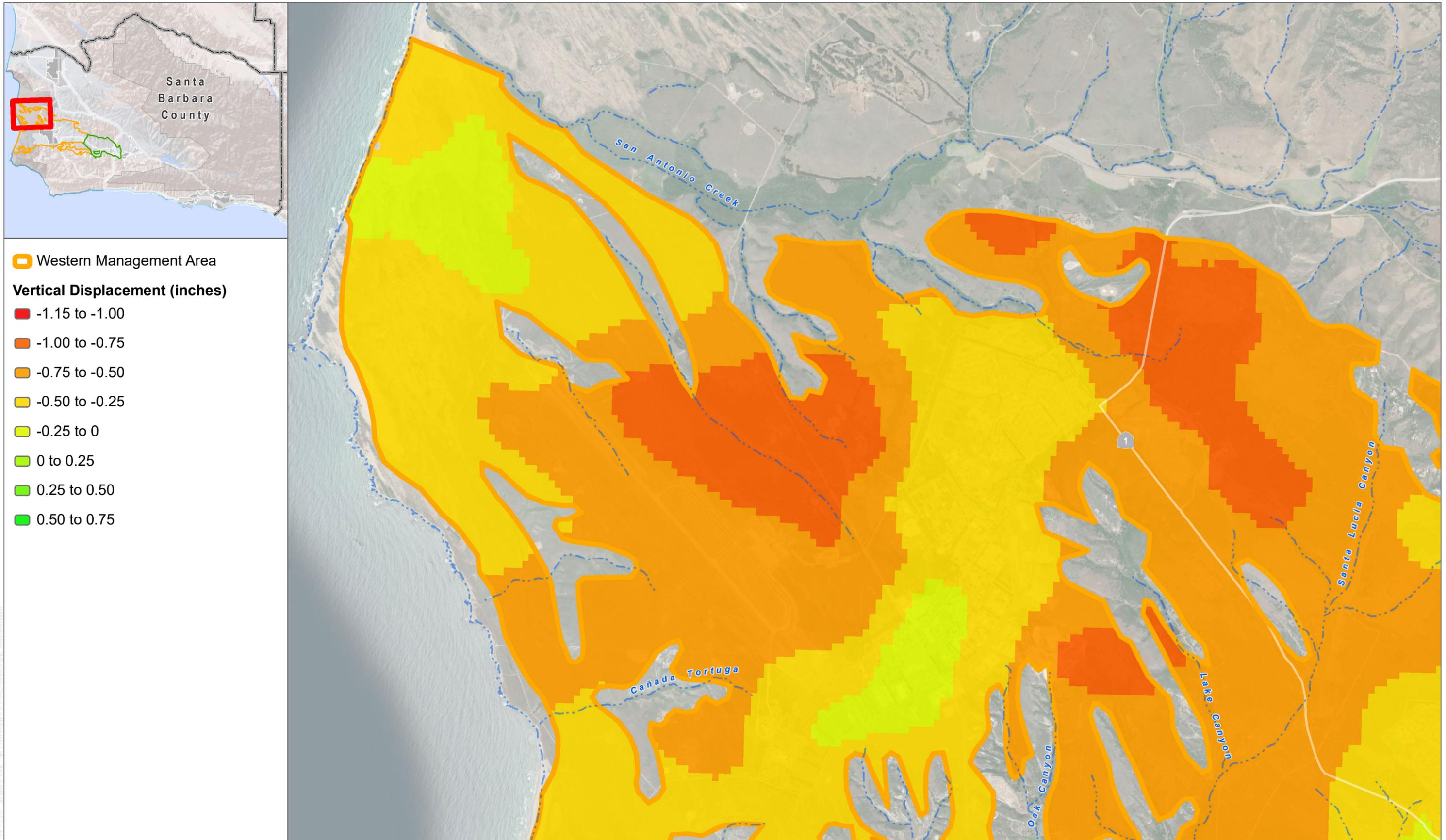
- Borchers, J.W., and M. Carpenter. 2014. *Land Subsidence from Groundwater Use in California*. Summary Report. Prepared by Luhdorff & Scalmanini Consulting Engineers with support from the California Water Foundation. April 2014.
- California's Groundwater Bulletin 118. 20004. Central Coast Hydrologic Region. Santa Ynez River Valley Groundwater Basin. Last Update 2/27/04.
- DWR. 2020. DWR SGMA Data Viewer–Land Subsidence, Land Subsidence Layers and TRE Altamira Displacement Point Data. Accessed April 23, 2020.
<https://sgma.water.ca.gov/webgis/?appid=SGMADataViewer#landsub>.
- Geosyntec. 2020. Draft Technical memorandum. Regional Geology and 3D Geologic Model for the Santa Ynez River Valley Groundwater Basin. May 2020.
- UNAVCO. 2020. All Real-Time Networks & Stations Monitoring.
<https://www.unavco.org/instrumentation/networks/status/all/realtime>. Accessed December 17, 2020.

FIGURES



- ▭ Western Management
 - ▭ Central Management
 - UNAVCO Monitoring Station
- Vertical Displacement (inches)**
- -1.15 to -1.00
 - -1.00 to -0.75
 - -0.75 to -0.50
 - -0.50 to -0.25
 - -0.25 to 0
 - 0 to 0.25
 - 0.25 to 0.50
 - 0.50 to 0.75



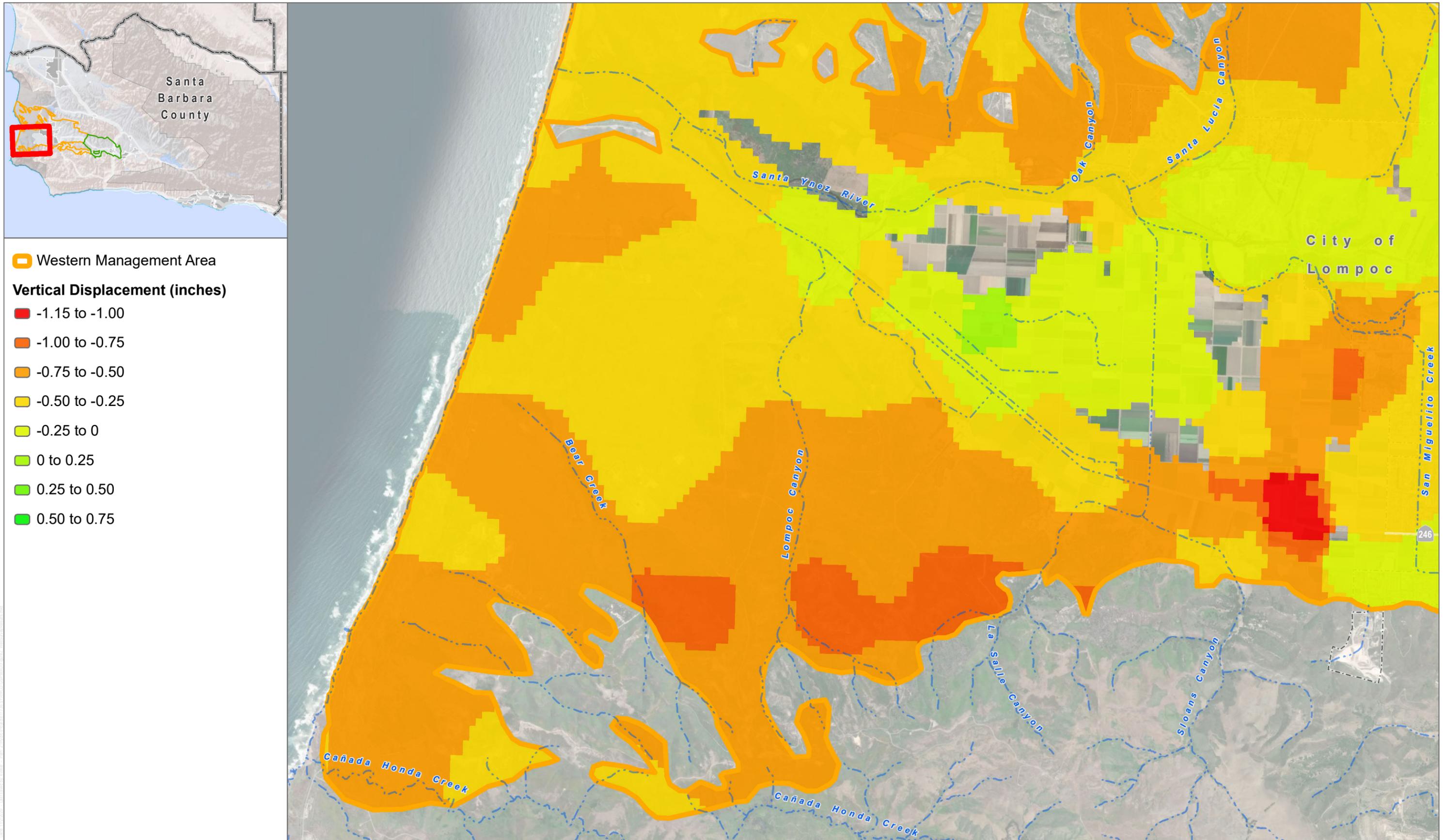


Sources: SGMA TRE ALTAMIRA InSAR Dataset, ESRI



FIGURE 2a

Land Subsidence

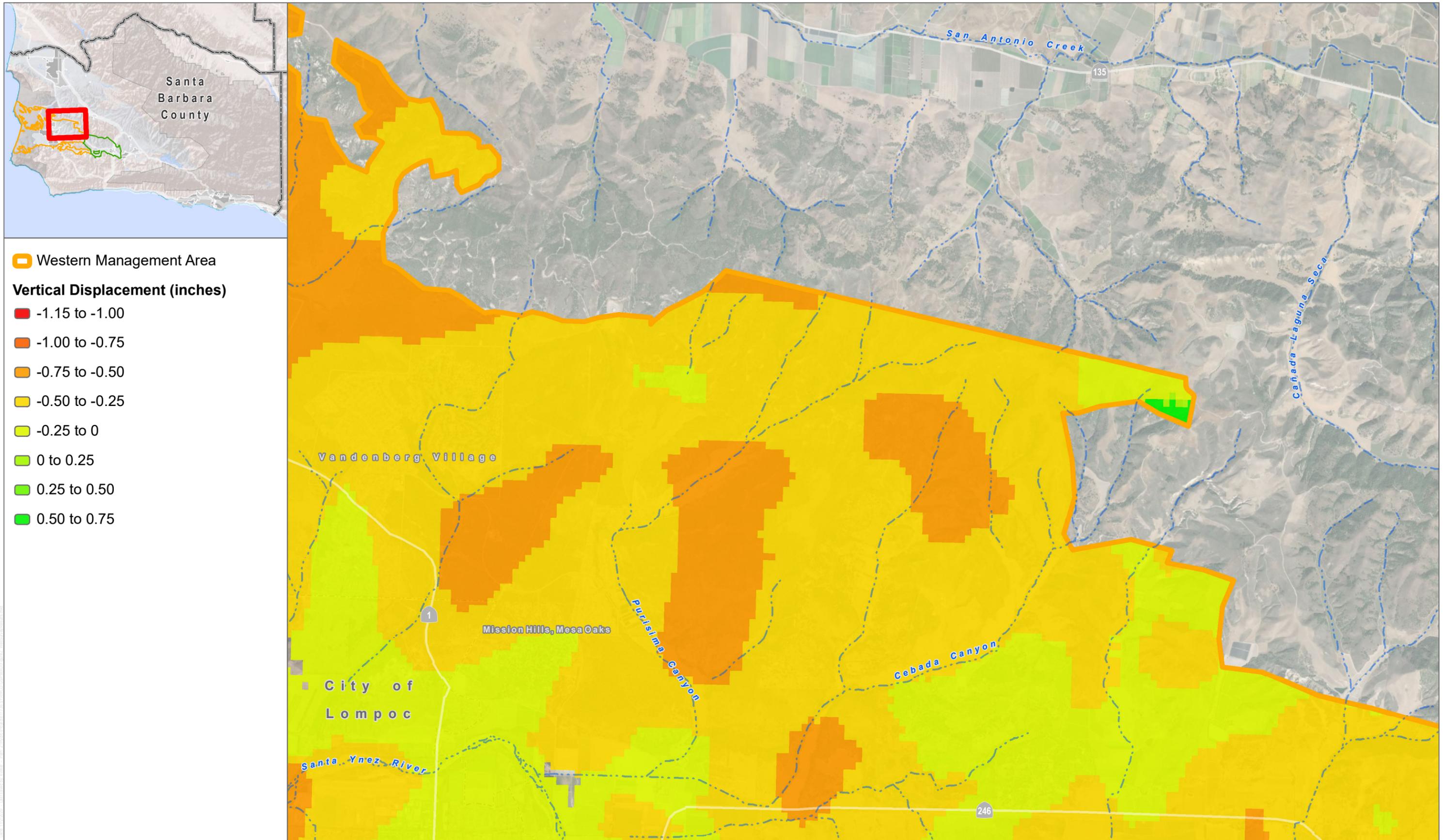


Sources: SGMA TRE ALTAMIRA InSAR Dataset, ESRI



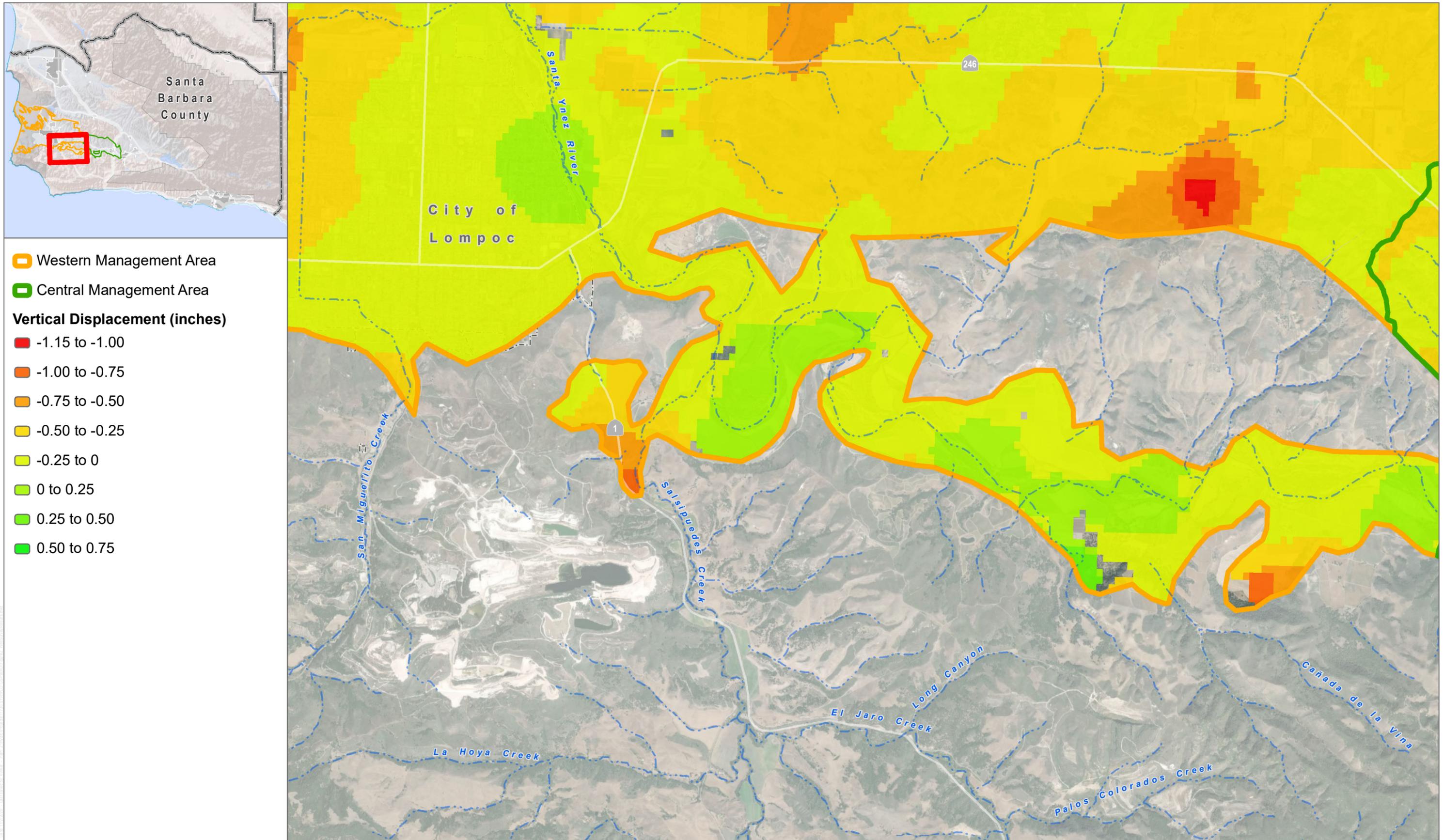
FIGURE 2b
Land Subsidence

Task 3 & 4 Services for Santa Ynez GSP Preparation - Western and Central Management Areas



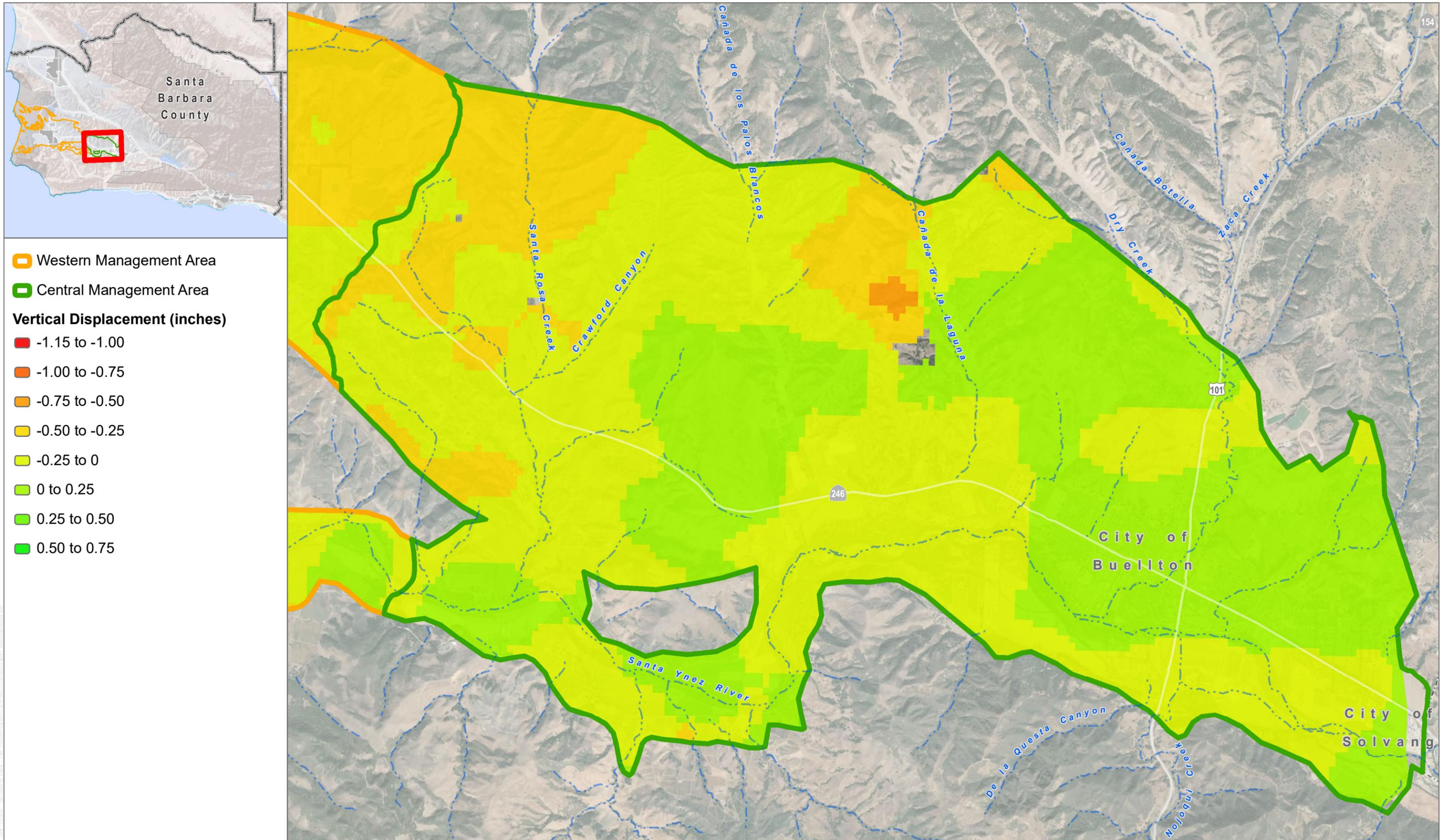
Sources: SGMA TRE ALTAMIRA InSAR Dataset, ESRI

FIGURE 2c
Land Subsidence



Sources: SGMA TRE ALTAMIRA InSAR Dataset, ESRI

FIGURE 2d
Land Subsidence



Sources: SGMA TRE ALTAMIRA InSAR Dataset, ESRI



FIGURE 2e
Land Subsidence

Task 3 & 4 Services for Santa Ynez GSP Preparation - Western and Central Management Areas

Attachment A

Survey Estimate



Stantec Consulting Services Inc.
2646 Santa Maria Way Suite 107 Santa Maria CA 93455

06 August 2020

File: 206483000

Attention: Kipp Vilker
DUDEK
621 Chapala Street
Santa Barbara, CA 93101

Dear Mr. Vilker,

Reference: Santa Ynez River Valley Groundwater Basin Subsidence Monitoring

Thank you for contacting us regarding the Lompoc Subsidence study. We are very pleased to present to you this proposal and look forward to helping Stetson Engineers with this and future surveying needs.

UNDERSTANDING OF PROJECT REQUIREMENTS

We understand that Dudek is preparing a grant funding request for subsidence monitoring in the Santa Ynez River Valley Groundwater Basin (SYRVGB), monitoring is needed in the Western Management Area (WMA) and Central Management Area (CMA). Active water well pumping has created subsidence concerns and a monitoring network has been proposed to measure and quantify this anomaly. Stantec is prepared to assist in this effort according to the following scope of work for Control Baseline and Monitoring surveys.

At the time of this proposal, two baselines have been identified for survey: in the WMA along Floradale Avenue, and in the CMA along the Avenue of Flags. Additional monitoring baseline may be identified in the future and shall be addressed by additional authorization.

Thank you for considering Stantec for this project.

Regards,

Stantec Consulting Services Inc.

Ian McClain, PLS
Senior Surveyor
Phone: (805) 357-1348
ian.mcclain@stantec.com

Jim Wilson, PLS
Principal Surveyor
Phone: (805) 308-9157
Jim.Wilson2@stantec.com

Attachments: Terms & Conditions | 2020 Billing Rates
c. File

Reference: Santa Ynez River Valley Groundwater Basin Subsidence Monitoring

SCOPE OF WORK

Stantec shall provide the following surveying services for this project as follows:

Control Baseline

- Set a minimum of two stable control point “pairs” at opposite ends of the River Valley in an approximately 2 to 3-mile line in a general North to South orientation. Control points shall be corrosion resistant disks or caps permanently set in stable ground, substantial permanent fixtures or rock outcroppings in areas unlikely to be affected by subsidence. Stantec will meet with and obtain approval from Stetson on the locations selected for these control points. Up to 8 additional monitoring points such as metal caps set in concrete filled pipes, drilled in permanent concrete fixtures such as headwalls, or footings, or reference marks set into the side of utility poles.
- A two-person crew will perform a closed loop level survey over the course of two days, beginning at one of the control point pairs, running through all monitoring points, turning on the second control point pair and running back through all monitoring points to ensure a precise baseline from which to compare future monitoring events. Leveling will be performed with a digital level and adhere to Federal Third Order procedures. Elevations will be referenced to a published datum by GPS observations.
- Download, process, and tabulate survey data into an MS Excel spreadsheet. NOTE – *All elevation references will be shown to the hundredth of a foot (0.01’).*

Monitoring

- When requested, Stantec will provide a level run survey over the course of one day, beginning at one of the control point pairs, observing each monitoring point and ending at the second control point pair.
- Download, process, and tabulate survey data into an MS Excel spreadsheet with delta comparisons to the Control Baseline and any preceding monitoring events.
- Deliverables shall include the MS Excel spreadsheet file, signed and sealed by a California Licensed Land Surveyor, and PDF copies of the spreadsheet. Hard copies available upon request.

SERVICES NOT INCLUDED

All other services not specifically listed herein are excluded.

ASSUMPTIONS

Our estimate and scope are based on the following assumptions:

- Stetson Engineers will provide direction and approval of stable control points selected to be outside the subsidence area.
- Regular Monitoring Events will occur on a frequency of 6, 12 or 24 months.

PROPOSED FEE AND METHOD OF PAYMENT

Our proposed services will be performed on a fixed fee basis and shall be billed monthly as a percentage complete of our services. Materials (Reimbursable Expenses) are not included in the fixed fee. "Materials"

Design with community in mind

06 August 2020

Kipp Vilker

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Reference: Santa Ynez River Valley Groundwater Basin Subsidence Monitoring

include all reimbursable expenses, such as photocopies, postage, shipping/delivery, plots, prints, maps/documents and outside consultant fees. Our fee for the services described herein will be as follows:

WMA Control Baseline	\$10,500
WMA Monitoring	\$4,500*
CMA Control Baseline	\$10,500
CMA Monitoring	\$4,500*

*-Subject to annual fee increases per our billing rates in effect.

TIME OF PERFORMANCE

Based on our understanding of the scope of work, a Control Baseline will be completed within 15 business days of authorization, and Regular Monitoring Event will be completed within 10 business days upon authorization.

06 August 2020

Kipp Vilker

Page 4 of 4

Reference: Santa Ynez River Valley Groundwater Basin Subsidence Monitoring

AUTHORIZATION

By signing this proposal, Dudek authorizes Stantec to proceed with the services herein described and the Client acknowledges that it has read and agrees to be bound by the attached Professional Services Terms and Conditions.

This proposal is accepted and agreed on this ____ day of _____, 2020.

Per: Dudek

Print Name & Title

Signature

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misc\012.283_stetson\accounting\proposals\dudek\pro_santa_ynez_basin_monitoring.docx

SCHEDULE OF BILLING RATES – 2020

Billing Level	Hourly Rate	Description												
3	\$98	Junior Level position <input type="checkbox"/> Independently carries out assignments of limited scope using standard procedures, methods and techniques <input type="checkbox"/> Assists senior staff in carrying out more advanced procedures <input type="checkbox"/> Completed work is reviewed for feasibility and soundness of judgment <input type="checkbox"/> Graduate from an appropriate post-secondary program or equivalent <input type="checkbox"/> Generally, one to three years' experience												
4	\$108													
5	\$123													
6	\$127	Fully Qualified Professional Position <input type="checkbox"/> Carries out assignments requiring general familiarity within a broad field of the respective profession <input type="checkbox"/> Makes decisions by using a combination of standard methods and techniques <input type="checkbox"/> Actively participates in planning to ensure the achievement of objectives <input type="checkbox"/> Works independently to interpret information and resolve difficulties <input type="checkbox"/> Graduate from an appropriate post-secondary program, with credentials or equivalent <input type="checkbox"/> Generally, three to six years' experience												
7	\$132													
8	\$143													
9	\$149	First Level Supervisor or first complete Level of Specialization <input type="checkbox"/> Provides applied professional knowledge and initiative in planning and coordinating work programs <input type="checkbox"/> Adapts established guidelines as necessary to address unusual issues <input type="checkbox"/> Decisions accepted as technically accurate, however may on occasion be reviewed for soundness of judgment <input type="checkbox"/> Graduate from an appropriate post-secondary program, with credentials or equivalent <input type="checkbox"/> Generally, five to nine years' experience												
10	\$154													
11	\$165													
12	\$174	Highly Specialized Technical Professional or Supervisor of groups of professionals <input type="checkbox"/> Provides multi-discipline knowledge to deliver innovative solutions in related field of expertise <input type="checkbox"/> Participates in short and long range planning to ensure the achievement of objectives <input type="checkbox"/> Makes responsible decisions on all matters, including policy recommendations, work methods, and financial controls associated with large expenditures <input type="checkbox"/> Reviews and evaluates technical work <input type="checkbox"/> Graduate from an appropriate post-secondary program, with credentials or equivalent <input type="checkbox"/> Generally, ten to fifteen years' experience with extensive, broad experience												
13	\$183													
14	\$192													
15	\$204	Senior Level Consultant or Management <input type="checkbox"/> Recognized as an authority in a specific field with qualifications of significant value <input type="checkbox"/> Provides multi-discipline knowledge to deliver innovative solutions in related field of expertise <input type="checkbox"/> Independently conceives programs and problems for investigation <input type="checkbox"/> Participates in discussions to ensure the achievement of program and/or project objectives <input type="checkbox"/> Makes responsible decisions on expenditures, including large sums or implementation of major programs and/or projects <input type="checkbox"/> Graduate from an appropriate post-secondary program, with credentials or equivalent <input type="checkbox"/> Generally, more than twelve years' experience with extensive experience												
16	\$225													
17	\$232													
18	\$239	Senior Level Management under review by Vice President or higher <input type="checkbox"/> Recognized as an authority in a specific field with qualifications of significant value <input type="checkbox"/> Responsible for long range planning within a specific area of practice or region <input type="checkbox"/> Makes decisions which are far reaching and limited only by objectives and policies of the organization <input type="checkbox"/> Plans/approves projects requiring significant human resources or capital investment <input type="checkbox"/> Graduate from an appropriate post-secondary program, with credentials or equivalent <input type="checkbox"/> Generally, fifteen years' experience with extensive professional and management experience												
19	\$248													
20	\$258													
21	\$274													
Survey Crews		<table border="1"> <thead> <tr> <th>Crew Size</th> <th>Regular Rate</th> <th>Overtime Rate</th> </tr> </thead> <tbody> <tr> <td>1-Person</td> <td>\$185</td> <td>\$225</td> </tr> <tr> <td>2-Person</td> <td>\$275</td> <td>\$380</td> </tr> <tr> <td>3-Person</td> <td>\$375</td> <td>\$510</td> </tr> </tbody> </table>	Crew Size	Regular Rate	Overtime Rate	1-Person	\$185	\$225	2-Person	\$275	\$380	3-Person	\$375	\$510
Crew Size	Regular Rate	Overtime Rate												
1-Person	\$185	\$225												
2-Person	\$275	\$380												
3-Person	\$375	\$510												

Expert Witness Services carry a 50% premium on labor. Overtime will be charged at 1.5 times the standard billing rate. All labor rates will be subject to annual increase.



The following Terms and Conditions are attached to and form part of a proposal for services to be performed by Consultant and together, when the Client authorizes Consultant to proceed with the services, constitute the Agreement. Consultant means the Stantec entity issuing the Proposal.

DESCRIPTION OF WORK: Consultant shall render the services described in the Proposal (hereinafter called the "Services") to the Client.

DESCRIPTION OF CLIENT: The Client confirms and agrees that the Client has authority to enter into this Agreement on its own behalf and on behalf of all parties related to the Client who may have an interest in the Project.

TERMS AND CONDITIONS: No terms, conditions, understandings, or agreements purporting to modify or vary these Terms and Conditions shall be binding unless hereafter made in writing and signed by the Client and Consultant. In the event of any conflict between the Proposal and these Terms and Conditions, these Terms and Conditions shall take precedence. This Agreement supercedes all previous agreements, arrangements or understandings between the parties whether written or oral in connection with or incidental to the Project.

COMPENSATION: Payment is due to Consultant upon receipt of invoice. Failure to make any payment when due is a material breach of this Agreement and will entitle Consultant, at its option, to suspend or terminate this Agreement and the provision of the Services. Interest will accrue on accounts overdue by 30 days at the lesser of 1.5 percent per month (18 percent per annum) or the maximum legal rate of interest. Unless otherwise noted, the fees in this agreement do not include any value added, sales, or other taxes that may be applied by Government on fees for services. Such taxes will be added to all invoices as required.

NOTICES: Each party shall designate a representative who is authorized to act on behalf of that party. All notices, consents, and approvals required to be given hereunder shall be in writing and shall be given to the representatives of each party.

TERMINATION: Either party may terminate the Agreement without cause upon thirty (30) days notice in writing. If either party breaches the Agreement and fails to remedy such breach within seven (7) days of notice to do so by the non-defaulting party, the non-defaulting party may immediately terminate the Agreement. Non-payment by the Client of Consultant's invoices within 30 days of Consultant rendering same is agreed to constitute a material breach and, upon written notice as prescribed above, the duties, obligations and responsibilities of Consultant are terminated. On termination by either party, the Client shall forthwith pay Consultant all fees and charges for the Services provided to the effective date of termination.

ENVIRONMENTAL: Except as specifically described in this Agreement, Consultant's field investigation, laboratory testing and engineering recommendations will not address or evaluate pollution of soil or pollution of groundwater.

PROFESSIONAL RESPONSIBILITY: In performing the Services, Consultant will provide and exercise the standard of care, skill and diligence required by customarily accepted professional practices normally provided in the performance of the Services at the time and the location in which the Services were performed.

INDEMNITY: The Client releases Consultant from any liability and agrees to defend, indemnify and hold Consultant harmless from any and all claims, damages, losses, and/or expenses, direct and indirect, or consequential damages, including but not limited to attorney's fees and charges and court and arbitration costs, arising out of, or claimed to arise out of, the performance of the Services, excepting liability arising from the sole negligence of Consultant.

LIMITATION OF LIABILITY: It is agreed that the total amount of all claims the Client may have against Consultant under this Agreement, including but not limited to claims for negligence, negligent misrepresentation and/or breach of contract, shall be strictly limited to the lesser of professional fees paid to Consultant for the Services or \$50,000.00. No claim may be brought against Consultant more than two (2) years after the cause of action arose. As the Client's sole and exclusive remedy under this Agreement any claim, demand or suit shall be directed and/or asserted only against Consultant and not against any of Consultant's employees, officers or directors.

Consultant's liability with respect to any claims arising out of this Agreement shall be absolutely limited to direct damages arising out of the Services and Consultant shall bear no liability whatsoever for any consequential loss, injury or damage incurred by the Client, including but not limited to claims for loss of use, loss of profits and/or loss of markets.

Liability of Consultant shall be further limited to such sum as it would be just and equitable for Consultant to pay having regard to the extent of its responsibility for the loss or damage suffered and on the assumptions that all other consultants and all contractors and sub-contractors shall have provided contractual undertakings on terms no less onerous than those set out in this Agreement to the Client in respect of the carrying out of their obligations and have paid to the Client such proportion of the loss and damage which it would be just and equitable for them to pay having regard to the extent of their responsibility.

DOCUMENTS: All of the documents prepared by or on behalf of Consultant in connection with the Project are instruments of service for the execution of the Project. Consultant retains the property and copyright in these documents, whether the Project is executed or not. These documents may not be used for any other purpose without the prior written consent of Consultant. In the event Consultant's documents are subsequently reused or modified in any material respect without the prior consent of Consultant, the Client agrees to defend, hold harmless and indemnify Consultant from any claims advanced on account of said reuse or modification.

Any document produced by Consultant in relation to the Services is intended for the sole use of Client. The documents may not be relied upon by any other party without the express written consent of Consultant, which may be withheld at Consultant's discretion. Any such consent will provide no greater rights to the third party than those held by the Client under the contract, and will only be authorized pursuant to the conditions of Consultant's standard form reliance letter.

Consultant cannot guarantee the authenticity, integrity or completeness of data files supplied in electronic format ("Electronic Files"). Client shall release, indemnify and hold Consultant, its officers, employees, Consultant's and agents harmless from any claims or damages arising from the use of Electronic Files. Electronic files will not contain stamps or seals, remain the property of Consultant, are not to be



used for any purpose other than that for which they were transmitted, and are not to be retransmitted to a third party without Consultant's written consent.

FIELD SERVICES: Consultant shall not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with work on the Project, and shall not be responsible for any contractor's failure to carry out the work in accordance with the contract documents. Consultant shall not be responsible for the acts or omissions of any contractor, subcontractor, any of their agents or employees, or any other persons performing any of the work in connection with the Project. Consultant shall not be the prime contractor or similar under any occupational health and safety legislation.

GOVERNING LAW/COMPLIANCE WITH LAWS: The Agreement shall be governed, construed and enforced in accordance with the laws of the jurisdiction in which the majority of the Services are performed. Consultant shall observe and comply with all applicable laws, continue to provide equal employment opportunity to all qualified persons, and to recruit, hire, train, promote and compensate persons in all jobs without regard to race, color, religion, sex, age, disability or national origin or any other basis prohibited by applicable laws.

DISPUTE RESOLUTION: If requested in writing by either the Client or Consultant, the Client and Consultant shall attempt to resolve any dispute between them arising out of or in connection with this Agreement by entering into structured non-binding negotiations with the assistance of a mediator on a without prejudice basis. The mediator shall be appointed by agreement of the parties. The Parties agree that any actions under this Agreement will be brought in the appropriate court in the jurisdiction of the Governing Law, or elsewhere by mutual agreement. Nothing herein however prevents Consultant from any exercising statutory lien rights or remedies in accordance with legislation where the project site is located.

ASSIGNMENT: The Client shall not, without the prior written consent of Consultant, assign the benefit or in any way transfer the obligations under these Terms and Conditions or any part hereof.

SEVERABILITY: If any term, condition or covenant of the Agreement is held by a court of competent jurisdiction to be invalid, void, or unenforceable, the remaining provisions of the Agreement shall be binding on the Client and Consultant.

CONTRA PROFERENTEM: The parties agree that in the event this Agreement is subject to interpretation or construction by a third party, such third party shall not construe this Agreement or any part of it against either party as the drafter of this Agreement.

FLORIDA CONTRACTS: PURSUANT TO FLORIDA STATUTES CHAPTER 558.0035 AN INDIVIDUAL EMPLOYEE OR AGENT MAY NOT BE HELD INDIVIDUALLY LIABLE FOR DAMAGES RESULTING FROM NEGLIGENCE.