

AMENDMENT NO. 7

AGREEMENT FOR PROFESSIONAL SERVICES  
FOR  
ENGINEERING SERVICES  
BETWEEN  
THREE RIVERS LEVEE IMPROVEMENT AUTHORITY AND  
ENGEIO INCORPORATED

THIS SEVENTH AMENDATORY AGREEMENT is made effective MAR 21, 2017, by and between Three Rivers Levee Improvement Authority ("TRLIA") and ENGEIO Incorporated ("the Consultant"), who agree as follows:

1. **Recitals.** This Amendment is made with reference to the following background recitals:
  - 1.1. Effective December 1, 2011 the parties entered into an Agreement for Professional Services relating to Engineering Services for TRLIA's Construction Program.
  - 1.2. Effective August 7, 2012 the parties entered into the first Amendatory Agreement to increase the budget by \$350,000 to a total of \$850,000.
  - 1.3. Effective August 14, 2013 the parties entered into the second Amendatory Agreement to increase the budget by \$500,000 to a total of \$1,350,000 and to extend the Termination Date of the contract from June 30, 2013 to December 31, 2014.
  - 1.4. Effective February 17, 2015 the parties entered into the third Amendatory Agreement to extend the Termination Date of the contract from December 31, 2014 to December 31, 2016.
  - 1.5. Effective March 15, 2016 the parties entered into the fourth Amendatory Agreement to increase the budget by \$75,000 to a total of \$1,425,000.
  - 1.6. Effective June 14, 2016 the parties entered into the fifth Amendatory Agreement to increase the budget by \$100,000 to a total of \$1,525,000.
  - 1.7. Effective September 20, 2016 the parties entered into the sixth Amendatory Agreement to extend the Termination Date of the contract from December 31, 2016 to December 31, 2018.
  - 1.8. Article C.24 of the AGREEMENT, states that modifications or amendments to the terms of the AGREEMENT shall be in writing and executed by both parties;

1.9. TRLIA and the CONSULTANT desire to amend the AGREEMENT;

NOW, THEREFORE, TRLIA and the CONSULTANT agree as follows.

2. **Seventh Amendment to Agreement.** The Professional Services Agreement is hereby amended as follows:

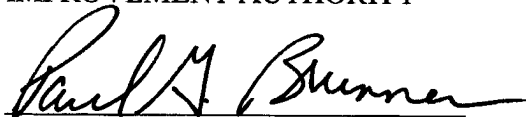
2.1. The scope of services (Attachment A to the Agreement for Professional Services between TRLIA and ENGEO) is amended by the addition of effort to the original tasks. These additional efforts are described in Exhibit 1 attached to this amendment agreement.

2.2. The payment, budget, and not-to-exceed amounts, Condition B.1 in Attachment B to the Agreement for Professional Services between TRLIA and ENGEO Technical Services, Inc. are amended to include the additional amount of \$2,720,000 for a total contract amount of \$4,245,000.

3. **No Effect on Other Provisions.** Except for the amendments in Section 2, the remaining provisions of the Professional Services Agreement shall be unaffected and remain in full force and effect.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement on  
MAR 21, 2017.

THREE RIVERS LEVEE  
IMPROVEMENT AUTHORITY



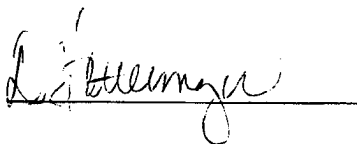
Paul G. Brunner  
Executive Director

ENGEO INCORPORATED



Josef Tootle, GE  
Principal

ATTEST:  
DONNA STOTTEMEYER  
SECRETARY, THREE RIVERS



APPROVED AS TO FORM:  
ANDREA P. CLARK  
GENERAL COUNSEL, TRLIA

*Andrea P. Clark.*





— Expect Excellence —

GEOTECHNICAL  
ENVIRONMENTAL  
WATER RESOURCES  
CONSTRUCTION SERVICES

Project No.  
**9389.000.000**

March 14, 2017

Mr. Paul Brunner, PE  
Three Rivers Levee Improvement Authority  
1114 Yuba Street, Suite 218  
Marysville, CA 95901

Subject: Yuba Goldfields  
Marysville, California

**REQUEST FOR AMENDMENT NO. 7  
TASK 4: YUBA GOLDFIELDS 200-YEAR UFRR FINAL DESIGN**

Dear Mr. Brunner:

We are pleased to submit this amendment request to provide design services for the Yuba Goldfields 200-year UFRR setback levee. As you know, we have been providing ongoing assistance to the design team with development of the final 200-year alignment to satisfy local stakeholders. This has involved preparation of technical documents and illustrations, continued geotechnical exploration and analyses, and general geotechnical consultation. We are happy to continue with design services for the 200-year setback levee

**PROJECT DESCRIPTION**

To meet the State of California's 200-year flood protection goal, a new setback levee is proposed to protect RD 784 from flood water that could emanate from a breach in the tailing piles within the Goldfields. Alignment 4C-3a extends from the existing Upper Yuba Levee Improvement Project (ULYIP) levee near its connection to the Goldfields, extends southeast to Hammonton-Smartville Road, and then extends along the north side of Hammonton Smartville Road to natural high ground. The proposed levee is approximately 3.6 miles in length.

**ENGEO TEAM**

The ENGEO team of experienced geotechnical engineers, civil engineers, and engineering geologists are committed to making this project a top priority. To support our civil design efforts, we have included Wood Rodgers, an engineering firm with extensive levee design experience. We pride ourselves in providing technically sound, cost effective solutions, and bring comprehensive knowledge of levee investigation and design. Based on our experience in the area for the 100 and 200-year Goldfields projects, we have developed in-depth knowledge of the local geology and the anthropologic history of the area. We will use this experience to develop an economical levee design as described below.

**GEOTECHNICAL APPROACH**

Our geotechnical approach for setback levee design is to utilize our knowledge of the existing subsurface data as well as the underlying geologic formations and apply engineering judgement

for a safe and economical subsurface exploration program. Our approach is intended to meet the requirements of the following documents:

- California DWR, Urban Levee Design Criteria, May 2012
- USACE Engineering and Design; Design and Construction of Levees, Engineer Manual; EM 1110-2-1913; April 30, 2000
- USACE Sacramento District Engineering Division; Geotechnical Levee Practice; REFP10L0.DOC; Effective 04/11/08 Rev 2

Based on the published geologic maps, the western end of the proposed setback levee is underlain by relatively young Holocene Alluvium estimated to be younger than 11,000 years old (Helley and Harwood, 1985) and may also be underlain by historic hydraulic mining outwash from the 1800's (Busacca, 1989). Recent geomorphologic mapping for the Upper Yuba Levee Improvement Project (WLA, 2008) shows recent channels and crevasse splay deposits crossing the western portion of the proposed alignment. Additionally, historic topographic maps show that a portion of the historic Yuba River channel crossed near the UYLIP tie-in location; this channel was subsequently filled and is now relatively flat agricultural land. The majority of the proposed setback levee to the east lies over the relatively old Pleistocene Riverbank Formation consisting of alluvium estimated to be 130,000 to 450,000 years old. The Riverbank Formation soils generally consist of gravel, sand, and clay that are commonly very dense and clayey. The eastern most portion of the proposed setback levee is mapped within the even older Laguna Formation consisting of alluvial deposits considered to be Pliocene-age, older than 1.8 million years (Helley and Harwood, 1985). The limited existing subsurface data correlates well with this geologic mapping and appears to be relatively consistent particularly within the Riverbank Formation that underlies the majority of the proposed setback levee.

We propose an increased boring density in the western portion of the proposed levee alignment due to the geologically younger and more variable soils, the historic Yuba River channel location, and the previous geomorphology mapping. To the east, we decreased the boring density because the geologic conditions appear to be more consistent within the Riverbank Formation. Because of the dense clayey nature of the majority of the soil, we anticipate the hydraulic conductivity may be lower than typical gravel deposits; therefore, we propose performing packer testing to evaluate the insitu hydraulic conductivity at various depths. These insitu measurements would be intended to lower construction costs by reducing uncertainty in the design and potentially reducing cutoff wall depths. For long-term groundwater monitoring, we propose to install vibrating wire piezometers in various locations. Additionally, we will explore potential borrow sites by digging test pits.

Based on our recent drilling experience along the alignment, we anticipate encountering substantial gravel and cobble and propose to utilize a combination of sonic, mud rotary, and auger drilling methods. The advantages and disadvantages of each drilling method are described below:

- Sonic - Large continuous samples, good drilling production rates in gravel and cobble but does not allow for driven sample and blow counts
- Mud Rotary – Allows for traditional standard penetration test (SPT) blow counts, drive samples, packer testing but sometimes slow and troublesome advance rates in gravel

- Auger – Allows for traditional SPT blow counts, drive samples, good production for shallow borings to identify landside blanket thickness but can only extend to limited depths
- Test Pits – Continuous exposure of soil, economical to excavate many locations, hand samples collected for laboratory testing but limited depth of exploration

The proposed setback levee alignment and the proposed exploration locations and details are shown on Figure 1; a summary of explorations is presented in the attached Table 1.

### **SCOPE OF SERVICES**

We propose the following scope of services for design of the setback levee.

#### Subtask 4.1: Project Management

- Prepare monthly status reports and invoicing
- Team coordination and communication

#### Subtask 4.2: Project Coordination Meetings

- Attend project kickoff meeting
- Attend monthly design in-person meetings
- Weekly conference calls

#### Subtask 4.3: Independent Panel of Experts (IPE) Meetings

- Prepare for and attend Independent Panel of Expert (IPE) board meetings

#### Subtask 4.4: Records Review

- Gather and review utilities information and data
- Gather and review right-of-way information
- Coordinate with project stakeholders including local landowners, utilities
- Review existing geotechnical, geologic, and geomorphology data
- Review historical aerial photographs and topographic maps

#### Subtask 4.5: Geotechnical Investigation

- Prepare geotechnical approach and subsurface investigation plan
- Secure permission to enter (PTE) and utility clearance for exploration locations
- Perform site reconnaissance and geologic mapping of exposed surface soils
- Perform subsurface exploration for proposed levee alignment and borrow areas including insitu testing/instrumentation
- Develop and execute laboratory testing program
- Prepare Geotechnical Data Report

#### Subtask 4.6: Topographic Survey and Mapping

- Prepare topographic surveying and mapping for the area of the setback levee and irrigation canal relocation.
- Prepare survey base map of property boundaries and easements within project area.

Subtask 4.7: Geotechnical Analysis

- Reach identification
- Cross section and geotechnical parameter development
- Seepage and slope stability modeling and analysis
- Design optimization analysis
- Levee penetrations and canal relocations
- Prepare Geotechnical Basis of Design Report

Subtask 4.8: Preliminary Design, 30% Plans

- Develop design criteria and technical approach
- Prepare draft Civil Basis of Design Report
- Perform quality assurance review – draft report
- Prepare final Civil Basis of Design Report
- Perform quality control/quality assurance – final report

Subtask 4.9: Assist in Obtaining Permits and Authorizations

- Provide CEQA/NEPA and ESA permitting assistance
- Provide public outreach support
- Provide utility and canal relocation assistance
- Prepare CVFPB encroachment permit application
- Facilitate USACE 408 authorization

Subtask 4.10: Prepare Plans, Specifications, and Cost Estimates

- 60% Design Submittal - plans, specifications, cost estimate, quality assurance review
- 90% Design Submittal - plans, specifications, cost estimate, quality assurance review
- 100% Design Submittal - plans, specifications, cost estimate, quality assurance review
- Final Design Submittal - plans, specifications, cost estimate, quality assurance review

**FEE**

We will provide the above services on a time-and-expense basis in accordance with the terms and conditions of our previous Agreement for Professional Services dated November 28, 2011. We estimate our fee for this project to be \$2,720,000, as shown in the itemization below.

**TASK 4: Fee Estimate - 200-Year UFRR Final Design**

SUBTASK	DESCRIPTION	FEE ESTIMATE
4.1	Project Management	\$ 320,000
4.2	Project Coordination Meetings	\$ 190,000
4.3	Independent Panel of Experts (IEP) Meetings	\$ 100,000
4.4	Records Review	\$ 60,000
4.5	Geotechnical Investigation	\$ 600,000
4.6	Topographic Survey and Mapping	\$ 140,000

SUBTASK	DESCRIPTION	FEE ESTIMATE
4.7	Geotechnical Analysis	\$ 330,000
4.8	Preliminary Design, 30% Plans	\$ 130,000
4.9	Assist in Obtaining Permits and Authorizations	\$ 70,000
4.10	Prepare Plans, Specifications, and Cost Estimates	\$ 780,000
<b>Total</b>		<b>\$2,720,000</b>

Assumptions

- Approximately 3.6-mile-long setback levee
- 18-month project duration
- Preliminary Title Reports are assumed to be provided by others
- The design water surface will be provided by MBK
- Three levee penetrations included in the design plans
- We assume the geotechnical exploration program meets the intent of the guidance documents
- Four Independent Panel of Expert (IPE) board meetings will be 1 day each

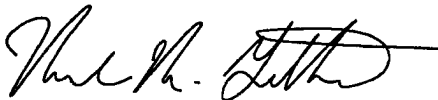
**AGREEMENT FOR PROFESSIONAL SERVICES AMENDMENT**

If the above scope of services and fee estimate are acceptable, please forward a contract amendment to our previous Agreement for Professional Services dated November 28, 2011, for our review and signature.

We look forward to serving you on this project. If you have any questions or comments regarding the scope of services or fee, please call and we will be glad to discuss them with you.

Sincerely,

ENGEO Incorporated



Mark Gilbert, GE  
Principal  
tc/pc/mmg/jjt/bvv



Josef J. Tootle, GE  
Principal

Attachments: Figures 1- 3: 200-Year UFRR Final Design Exploration Plan  
Table 1: 200-Year UFRR Final Design Exploration Table









**TABLE I**

**Proposed 200-year UFRR Setback Levee Exploration**

**1 Levee Exploration, 17 Locations**

ID	Station	Lateral Location of Boring	Depth	Drill Method	Notes
GFSL01+80CS	1+80	Crest	75	Sonic	
GFSL04+60CS	4+60	Crest	75	Sonic	
GFSL08+00CS	8+00	Crest	75	Sonic	
GFSL13+40CS	13+40	Crest	75	Sonic	
GFSL18+55CS	18+55	Crest	75	Sonic	
GFSL29+90CS	29+90	Crest	75	Sonic	
GFSL37+20CS	37+20	Crest	80	Sonic	
GFSL52+45CS	52+45	Crest	80	Sonic	
GFSL56+85CS	56+85	Crest	80	Sonic	
GFSL74+50CS	74+50	Crest	70	Sonic	
GFSL90+75CS	90+75	Crest	70	Sonic	
GFSL104+40CS	104+40	Crest	65	Sonic	
GFSL119+50CS	119+50	Crest	60	Sonic	
GFSL134+15CS	134+15	Crest	55	Sonic	
GFSL151+10CS	151+10	Crest	50	Sonic	
GFSL166+50CS	166+50	Crest	45	Sonic	
GFSL189+55CS	189+55	Crest	40	Sonic	

ID	Station	Lateral Location of Boring	Depth	Drill Method	Notes
GFSL4+60WTM	4+65	Waterside Toe	75	Mud Rotary	
GFSL4+60LTM	4+55	Landside Toe	75	Mud Rotary	
GFSL4+460FA	4+45	Landside Field	20	Auger	Packer Test
GFSL18+55WTM	18+65	Waterside Toe	75	Mud Rotary	
GFSL18+55LTM	18+50	Landside Toe	75	Mud Rotary	Packer Test, Piezometer Installation
GFSL18+55LFA	18+45	Landside Field	20	Auger	
GFSL30+60LFA	30+60	Landside Field	20	Auger	
GFSL37+20WTS	37+25	Waterside Toe	80	Sonic	
GFSL37+20LTM	37+20	Landside Toe	80	Mud Rotary	Packer Test
GFSL37+20LFA	37+10	Landside Field	20	Auger	
GFSL52+75LFA	52+75	Landside Field	20	Auger	
GFSL56+85LTM	56+85	Landside Toe	80	Mud Rotary	Packer Test
GFSL56+85LFA	56+85	Landside Field	20	Auger	
GFSL74+50WTS	74+50	Waterside Toe	70	Sonic	
GFSL74+50LTM	74+50	Landside Toe	70	Mud Rotary	Packer Test, Piezometer Installation
GFSL74+50LFA	74+50	Landside Field	20	Auger	
GFSL104+40WTS	104+35	Waterside Toe	65	Sonic	
GFSL104+40LTM	104+40	Landside Toe	65	Mud Rotary	Packer Test
GFSL104+40LFA	104+45	Landside Field	20	Auger	
GFSL134+15WTS	134+10	Waterside Toe	55	Sonic	
GFSL134+15LTM	134+20	Landside Toe	55	Mud Rotary	Packer Test, Piezometer Installation
GFSL134+15LFA	134+25	Landside Field	20	Auger	
GFSL166+30WTS	166+30	Waterside Toe	45	Sonic	
GFSL166+00LTM	166+00	Landside Toe	45	Mud Rotary	Packer Test
GFSL165+10LFA	165+10	Landside Field	20	Auger	
GFSL189+55WTS	189+65	Waterside Toe	40	Sonic	
GFSL189+55LTS	189+55	Landside Toe	40	Sonic	
GFSL189+55LFA	189+60	Landside Field	20	Auger	

**Borrow Area Exploration**

ID	Station	Location	Depth	Drill Method	Notes
TPGA	1+00 to 13+50	Borrow Area	10	Test pits	Test pit groups (1 day)
TPGB	13+50 to 56+10	Borrow Area	10	Test pits	Test pit groups (2 days)
TPGC	85+25 to 113+85	Borrow Area	10	Test pits	Test pit groups (1.5 days)

Total Borings	45
Total Test pits	30