Project No.
7496.1.001.01

October 23, 2006

Ms. Yousra Tilden
RMC Water and Environment
2290 N. First Street, Suite 212
San Jose, CA 95131

Subject: Marina Coast Recycled Water Pipeline – 100% Design
Marina, California

PRELIMINARY TRENCHING EVALUATION

Reference: LandMarine Geotechnics; Preliminary Geotechnical Investigation, Marina Coast Water District, Regional Urban Water Augmentation Project, 30% Design, Marina, California, July 2006, Project No. 107.001.

Dear Ms. Tilden:

This letter records the results of our preliminary consultation regarding trenching conditions along the Marina Coast Recycled Water Pipeline. Our consultation is based on our review of the referenced report for 30% design, interviews, and a site reconnaissance recently conducted for the project. ENGEO Incorporated is currently providing geotechnical services for final design in accordance with our proposal dated October 10, 2006.

TRENCHING CONDITIONS

Review of existing data suggests that the entire proposed alignment is underlain by Stabilized Dune Deposits consisting of clean to silty sands, which are loose to medium dense, in the upper 10 feet or so. The sands have varying moisture content, depending on the surfacing, local hydrology, and the time of year. The variables of fines content, density, and moisture content all effect trench stand-up time and, as a result, excavation shoring options.

Soil conditions along the chosen project alignment appear to be relatively uniform and not particularly favorable for trenching. Review of the available data indicates that there likely is not a pattern to the occurrence of silty soils which are more favorable to trench stand-up time. A good example of this is from the geotechnical investigation we reviewed for General Jim Moore Boulevard where borings drilled at 1,000-foot spacing revealed sands with fines content varying from 3 percent to 10 percent and moisture contents generally less than 5 percent. At the north end of the alignment an investigation for the Regional Wastewater management system yielded similar results. It is interesting to note that this latter investigation

included test pits. The pits encountered essentially the same material type. One pit caved, and one did not.

INTERVIEWS

Our staff has conducted several interviews with contractors, professionals, and local agency employees familiar with the area and has gathered a significant amount of information.

Don Chapin Company – Our engineer spoke with an employee of Don Chapin Company, a contractor based out of Salinas, California. Company projects include the Castroville Water Project, the Quail Meadows Project, the Gilroy Sports Park, Campo Pico Blanco and others. Several contacts have recommended them as knowledgeable about construction practices for pipelines along the Monterey Bay and Central Coast.

The staff member we talked to told us that the sands in the Marina and Seaside areas can be problematic for trenching because they tend to slough into the trench and undermine the adjacent pavement if cut too close to vertical. This person told us that they would personally rather use a trench shield than speed shoring; however, they acknowledged that where existing utilities conflicted with the proposed trench, a shored system such as plywood sheeting with speed shores would be necessary. The employee generally said that sands in the Marina area were able to stand open more easily than those in the Seaside or Sand City areas. This person did confirm that the soils are variable in the area and that differentiating reaches with good trenching conditions versus difficult trenching conditions could be challenging.

Sanco Incorporated - An employee with Sanco Incorporated, based in Campbell, California, communicated with our representative regarding potential trenching conditions that might be encountered in the Marina area. Company projects include a large commercial and retail center in the Marina area for Shea Homes, including a large underground stormwater drainage system, and similar projects throughout the central coast. Other contacts have recommended them as extremely knowledgeable about pipeline construction along the Monterey Coast. They claimed that speed shores were not an option they used for similar work in the Marina area. They said that they open cut the streets and then installed trench shields and pulled them along as they excavated at two recent projects in Marina.

Their staff member indicated that the sand would run at close to ¾:1 slope (horizontal:vertical) and that the material is similar to beach sand. The employee said that they did install some jacks with plywood to cross under utilities. They mentioned that a large amount of existing utilities would make it difficult to pull a trench shield, and that they thought it may be necessary to both remove and replace the utilities as you proceed or open the street wide enough to allow for the angle of repose.

Monterey Peninsula Engineering – Our engineer talked to an employee of Monterey Peninsula Engineering regarding potential trenching conditions in the area. MPE is currently constructing improvements on General Jim Moore Boulevard which will connect into the southern end of the proposed pipeline. The staff member we talked to claimed that vertical cuts up to eight feet deep could be accomplished if they were properly shored; however, deeper than eight feet, the trench would begin to slough in. The staff member claimed that in some areas you might get "12 feet if you were lucky" and in other areas much less. This person confirmed that conditions were variable throughout the area.

Monterey Bay Engineers – Our engineer talked to an employee of Monterey Bay Engineers, an engineering consulting company. Contacts at the City of Marina recommended them as knowledgeable about construction practices for pipelines in the project vicinity.

Their employee claimed that caving is generally not a construction issue if the excavation is less than six feet; however, this was assuming an open cut trench with sloped back sides. The employee indicated that "no one in the area counts on vertical trenches staying open". Typically, this employee has seen slopes up to ½:1 stand open. Trenches deeper than six feet would need trench boxes for protection from caving.

Local Sanitary District – An inspector with the local sanitary district was able to speak with our representative regarding previous trenching experience in the area. The inspector was able to confirm that speed shoring was not feasible below approximately 5 feet in depth because of the tendency of the soils to cave. The inspector suggested that a good method to try and use would be the angled bucket recently used on Reservation Road to install pipeline to approximately 5 feet in depth. Review of pictures of this bucket show an angle of approximately 1:1 to ¾:1.

City of Marina – Members of the City of Marina staff confirmed the existence of variability in the tendency of the soils to stand open in relatively shallow vertical cut trenches throughout the area.

CSUMB – Staff members with the university spoke to our representative briefly about soil conditions along the proposed alignment. They confirmed that common methods used in the area for trenching include open cut with slopes of ¾:1 to 1:1.

Marina Coast Water District – Staff with the MCWD were able to talk with our representative regarding previous trenching experience in the area, some of which is directly applicable to the currently proposed alignment.

The water district recently installed a pipeline along Reservation Road between Imjin Avenue and Crescent Avenue. This section of pipeline was installed using open cut trenches to approximately 5 feet in depth, laid back at an angle of about ¾:1. The contractor had planned to use trench boxes but in general, did not have to use them for most of the installation. This trench

was excavated using an angled bucket, as shown in photographs received from the district. This particular method proved very successful and may be a method for consideration by contractors if the necessary trench section proves acceptable.

In addition, district employees related that past experience with contractors in the area had consisted of almost exclusive use of open cut trenches with slopes of ¾:1 to 1:1 (horizontal:vertical). These trenches were often shored with trench boxes to protect workers; however, sheet piling was very rarely used.

Field representatives of the Water District were also interviewed regarding trenching conditions. They related similar experience and gave specific information regarding Crescent Avenue and Reservation Road. The field staff interviewed said that conditions along our proposed alignment could vary considerably with some areas standing up at angles greater than 1:1, and others acting like "sugar sand". Along Reservation Road, during installation of pipeline, much of the trench stood open at about ¾:1; however, there were also areas that were like "baby powder". They also said that the hill on Crescent Avenue tended to be more dry towards the top (north of Reservation Road) and would stand open better the farther down towards Reservation Road you trenched.

The field staff interviewed also indicated that the intersection of Reservation and Crescent Avenue has a large number of underground utilities running through it. In general, for the Marina area, they said that utilities were sometimes removed and replaced if too close to an excavation.

Field staff confirmed that speed shoring would likely not be feasible for vertical cuts greater than about 5 feet deep.

Fort Ord Reuse Authority – Staff with FORA related their experience in the area regarding prior trenching work. In general, the staff said that you could expect stand up time of a few hours until the sand dries out. They also confirmed that speed shoring would be difficult to use below 5 feet deep, primarily because the sand would begin to run. The staff indicated that cribbing (similar to speed shoring) could be used if the sands were not running. FORA staff also said that they had seen trench boxes and speed shoring equipment at the nearby University Village Project (on the south side of 12th Avenue), but they had not seen them in use.

CONCLUSIONS AND DISCUSSION

At this time we can not differentiate different reaches of the project where flowing sand will or will not be encountered. Due to the nature of the sand deposition, there likely are local areas historically dominated by transient dunes where loose, dry, clean sand exists. There are also historic low areas where more silty sands may have accumulated. Also, areas likely exist where grading for the development of the streets and the military base has altered the natural

deposition. We will attempt to identify areas of varying conditions; however, realistically, conditions likely will vary over short distances and will be difficult to characterize.

It is our opinion that the project can be accomplished using sloped open cuts and an alternative trapezoidal trench backfill section. This may result in conflicts where adjacent utilities exist within the trench influence zone and will result in a larger area of street reconstruction than would vertical trenches. In some areas, particularly where shallow trenches are feasible, trenches may stand open vertically a sufficient time to allow for the use of internal shoring (plywood and speed shores/cribbing). While this configuration may save time and cost, it will likely be unacceptable where utilities are located within the influence zone of the trench.

In order to address these concerns we suggest the following:

- Identify areas where sloped open cuts will not interfere with adjacent utilities and allow sloped open cuts or internal shoring at the contractors own risk and discursion.

- In areas with close adjacent utilities, consider that the contractor may need to:

    - Use sheet piling with trench shields as cross bracing.
    - Relocate selected utilities and use sloped open cuts.

- Specify selected reaches of trenchless construction, as needed.

The Marina Coast Water District's standard specifications for recycled water pipelines prescribe minimum cover of 42 inches above the pipe (assuming a 12-inch pavement section). This implies a trench depth of 6 to 7 feet to the bottom of pipe bedding. Based on these dimensions and approximately 6 inches of clearance on either side of the pipe, we anticipate that an open cut trench with sides sloped at 1.5:1, as prescribed by OSHA for type C soils, can be constructed with a minimum saw cut of approximately 11 feet, side to side. In turn, existing utilities should have at least 1 foot of cover in the temporary cut, meaning that utilities with adequate vertical cover could be unaffected within 2 to 3 feet of the trench walls, and not have to be replaced. For planning purposes, we anticipate that an 8-foot zone clear of existing utilities centered along the pipeline will be sufficient to avoid significant removal and replacement activity due to disturbance by trenching activity. In areas where this is not feasible, sheet piling could be driven utilizing a trench shield as cross bracing. This may prove more cost effective than removal and replacement, and should be evaluated by the design team based on the anticipated areas and extent of utility conflicts.

We recommend that the project team proceed with the geotechnical investigation, including the further evaluation of trenching conditions, as planned. We will continue to consider this important issue in all the work we do on the project. We will work with you to provide appropriate design guidelines and information for the contractor to base their bids upon.

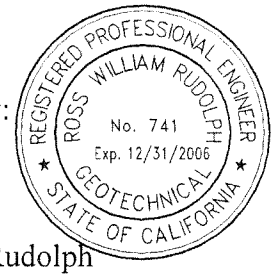
Please let us know if you have any questions or comments.

Very truly yours,

ENGEO INCORPORATED

Douglas Wahl
dw/le:trnch

Reviewed by:

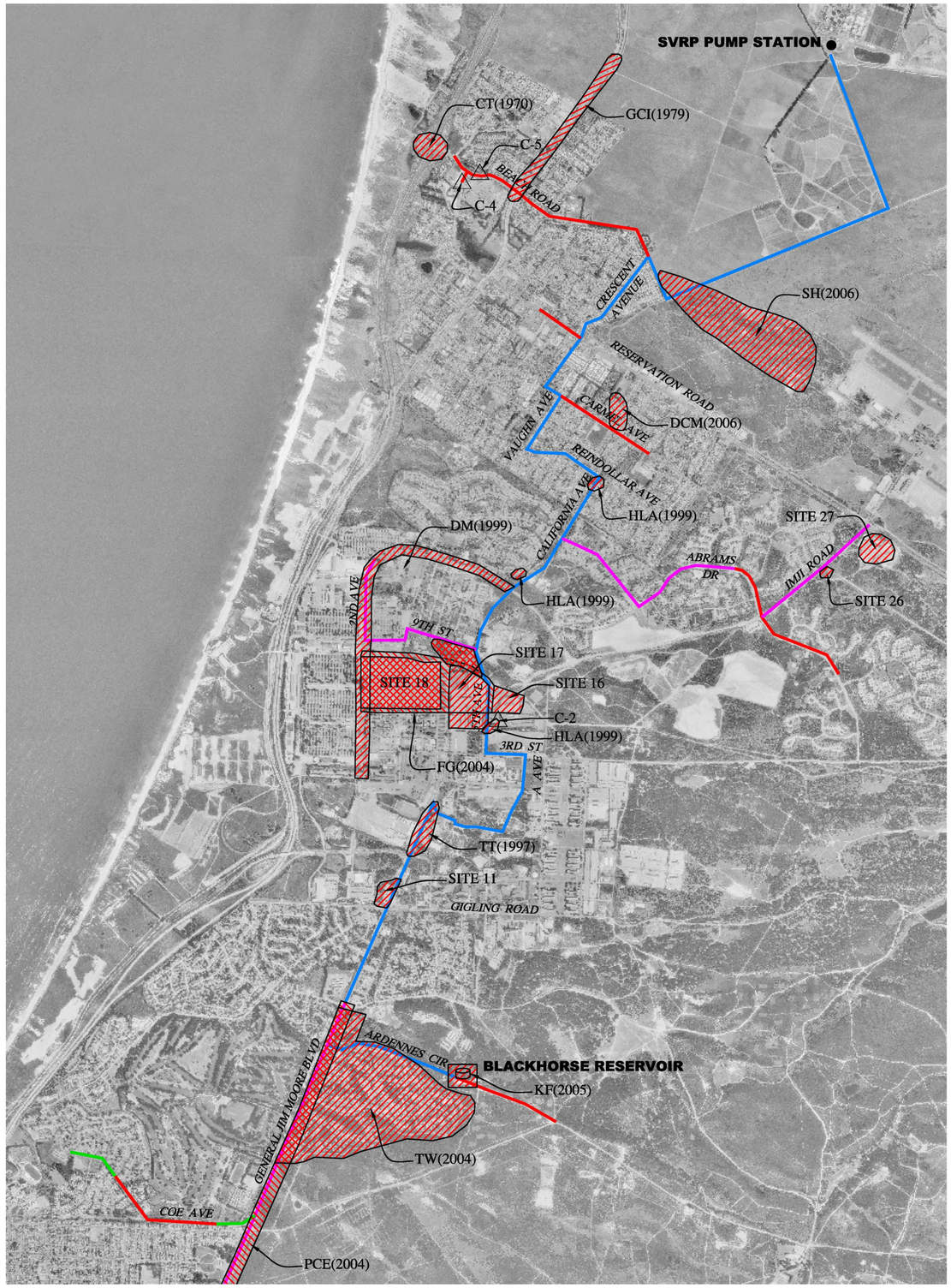


R. William Rudolph

Attachment: Figure 5, Existing Geotechnical Information – Draft

cc: 1 – Mr. Bob Hoffman – Carollo Engineers
1 – Mr. Brad Hamada – RMC Water and Environment (e-mail only)
1 – Mr. Lou Carella – Carollo Engineers (e-mail only)

DRAFT



EXPLANATION

- DESIGNED BY OTHERS
- EXISTING RW PIPELINE
- TRANSMISSION MAIN (20"Ø)
- LATERALS (6"-8"Ø)

C-5 △ CPT (LAND MARINE GEOTECHNICS, 2006)

N

0 FEET 2500
0 METERS 1250

GEOTECHNICAL EXPLORATION REFERENCES:

CT 1970 - Reservation Road Undercrossing, soil logs obtained from Cal Trans District 5, 1970. (See Appendix F)

GCI 1979 - Geotechnical Investigation, Phase II, Regional Wastewater Management System, Stage II, Monterey County, California, Prepared by Geotechnical Consultants Inc., April 1979. (See Appendix F)

D & M 1999 - Report of Geotechnical Investigation, 12th Street Gateway/2nd Avenue Realignment, Former Fort Ord, Marina and Seaside, California, Prepared by D & M Consulting Engineers, Inc., November 1999. (See Appendix F)

PCE 2004 - Geotechnical Investigation for General Jim Moore Boulevard and Eucalyptus Road, Seaside, California, Prepared by Pacific Crest Engineering Inc., February 2004. (See Appendix F)

TW 2004 - Geotechnical Engineering Investigation Report, Proposed Fitch Park Military Housing, Fort Ord Military Reservation, Seaside, Monterey County, California, Prepared by Twining Laboratories, Inc., November 12, 2004. (See Appendix F)

KF 2005 - Geotechnical Investigation Proposed East Garrison, "B" Zone Tanks, "D" Zone Reservoirs, "E" Zone Hydropneumatic Pump Station, and Transmission Mains, Marina Coast Water District, Marina, California, Prepared by Kleinfelder Inc., September 28, 2005. (See Appendix F)

Site 11 - HLA. 1994. Harding Lawson Associates. Volume II - Remedial Investigation. Basewide Surface Water Outfall Investigation. Final. October 19, 1995. (See Appendix F)

Site 16 - HLA. 1994. Harding Lawson Associates. Volume II - Remedial Investigation. Sites 16 and 17. Final. October 19, 1995. (See Appendix F)

Site 17 - HLA. 1994. Harding Lawson Associates. Volume II - Remedial Investigation. Sites 16 and 17. Final. October 19, 1995. (See Appendix F)

Site 18 - HLA. 1994. Harding Lawson Associates. Volume IV - Baseline Ecological Risk Assessment. Final. October 19, 1995. (See Appendix F)

Site 25 - HLA. 1994. Harding Lawson Associates. Volume IV - Baseline Ecological Risk Assessment. Final. October 19, 1995. (See Appendix F)

Site 26 - HLA. 1994. Harding Lawson Associates. Volume IV - Baseline Ecological Risk Assessment. Final. October 19, 1995. (See Appendix F)

Site 27 - HLA. 1994. Harding Lawson Associates. Volume IV - Baseline Ecological Risk Assessment. Final. October 19, 1995. (See Appendix F)

HLA 1999 - Test Pit Logs Obtained From Fort Ord Reuse Authority, Logged by Harding Lawson Associates, November 1999, Location Maps Included. (See Appendix F)

TT 1997 - Boring Logs Obtained From Fort Ord Reuse Authority, Logged by TerraTech Inc., February 1997, No Location Map Included. (See Appendix F)

SH 2006 - Draft Well Installation Completion Report, Armstrong Ranch, Operable Unit 1, Former Fort Ord, California, Total Environmental Restoration Contract, Contract No. DACW05-96-D-0011, Prepared by Shaw Environmental Group Inc., September 2006. (See Appendix F)

DCM 2006 -Geotechnical Engineering Investigation Report, Marina Coast Water District, 2005 Marina Sewer Improvement Projects, Marina, California, Prepared by DCM Engineering, August 2006. (See Appendix F)

FG 2004 - Geotechnical Study, California State University Monterey Bay, North Campus Housing, Monterey County, California, Prepared by Fugro West Inc., March 2004. (See Appendix F)

BASE MAP SOURCE: USGS, TERRASERVER, 1989

DRAFT

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EXISTING GEOTECHNICAL INFORMATION
MARINA COAST RECYCLING WATER PIPELINE
MARINA, CALIFORNIA

PROJECT NO.: 7496.1.001.01
DATE: OCTOBER 2006
DRAWN BY: PC
CHECKED BY:

FIGURE NO. 5

ORIGINAL FIGURE PRINTED IN COLOR

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