AECOM
401 West A Street
Suite 1200
San Diego, CA 92101
www.aecom.com

619-610-7600 tel
619-610-7601 fax

March 22, 2019

Mr. Jorge Balderrama
Richard Brady & Associates
2655 Camino Del Rio North, Suite 100
San Diego, CA 92108

Subject: Vibration Impact Assessment
Tie Line 649 Wood to Steel Replacement Project
San Diego Gas & Electric Company
San Diego County, California
AECOM Reference No. 60597643

Dear Mr. Balderrama:

AECOM Technical Services, Inc. (AECOM) is pleased to present this Vibration Impact Assessment related to the San Diego Gas & Electric Company's (SDG&E) Transmission Line (TL) 649 project. Our engineering services were provided under Richard Brady & Associates (Brady) as the prime consultant for the TL649 Wood to Steel project. These engineering services were provided in accordance with our proposal dated January 18, 2019.

Introduction

SDG&E has requested a vibration impact assessment be performed to address the mitigation measure NOI-6 as presented in the Initial Study – Mitigated Negative Declaration (MND) as prepared by the California Public Utilities Commission (CPUC) dated October 2018. The MND identified potentially high vibration level associated with "drilling activity and road reestablishment" if those activities were to occur within 5 feet of the pump station located near Poles 18 (Z188727) and 18.1 (P188727). The pump station and Poles 18 and 18.1 are shown on Figure 1. The mitigation measure is included below.

Mitigation Measure NOI-6: Vibration Impact Assessment
A structural engineer or other qualified professional shall be retained to prepare a vibration impact assessment (assessment) for the water pump station near the proposed project alignment between poles No. 18 and No. 18.1. The assessment shall take into account project-specific information such as the composition of the structures, location of the various types of equipment used during each phase of the project, and the soil characteristics in the project area, to determine whether project construction may cause damage to this structure. If the assessment finds that the project may cause damage to this structure, the structural engineer or other qualified professional shall recommend design means and methods of construction to avoid the potential damage, if feasible. The assessment and its recommendations shall be reviewed and approved by the CPUC. If there are no feasible design means and methods to eliminate the potential for damage, the structural engineer or other appropriate professional shall undertake an existing conditions study (study) of any structures (or, in case of large buildings, of the portions of the structures) that may experience damage. The study will establish the baseline condition of these structures, including, but not limited to, the location and extent of any visible cracks or spalls. The study shall include written descriptions and photographs. The study shall be reviewed and approved by CPUC. Upon completion of the project, the structures (or, in case of large buildings, of the portions of the

structures) previously inspected will be resurveyed, and any new cracks or other changes shall be compared to pre-construction conditions and a determination shall be made as to whether the proposed project caused the damage. The findings shall be submitted to CPUC for review. If the study determines that project construction has resulted in damage to the structure, the damage shall be repaired to the preexisting condition by the project sponsor, provided that the property owner approves of the repair.

Pole 18 (Z188727) will be removed and a new engineered steel pole will be placed approximately 27 feet west of the existing pole location along the transmission line alignment. The new pole will be constructed approximately 45 feet from the pump station. Pole 18.1 (P188917) will be replaced with a direct embedded steel pole at the same location. Work areas for the respective pole replacement acitivities are shown on Figure 2. These work limits and the anticipated construction equipment have been considered during this assessment.

Existing Conditions

AECOM performed a site reconnaissance on February 6, 2019 to evaluate site conditions and observe the existing pump station facilities in the site area. Our site reconnaissance included measurement of approximate distances from the proposed pole locations to the existing pump station facilities. We are providing photo documentation of the pump station facility as shown in Figures 32 through 12. In addition, we performed engineering analyses to evaluate the potential effects on the pump station facilities from the proposed pole replacement project.

The existing Poles 18 and 18.1 are close to the City of San Diego water pump station. Pole 18 is within the fenced property north of the pump station structure, and Pole 18.1 is outside the fencing and southwest of pump station structure. The property is at the southwest end of an access road off Heritage Road in Chula Vista, California. The access road is east of Heritage Road just south of North County Credit Union Amphitheatre. Pole 18 and the pump station are upslope of the access road. The ground slopes gradually up to the east from the access road. An asphalt paved driveway slopes up from the access road past the pump station structure north of the pump station structure. The pump station structure consists of steel pipes and pumps coming up through a concrete slab. An open roofed structure with a partial wall coming down from the roof to about 3 feet above the concrete slab on the west side of the structure.

We understand that the replacement pole for Pole 18 will be constructed by drilling a foundation hole and construction of steel reinforced concrete caisson foundation to support the new pole. The foundation drilling will be performed with a truck mounted drill rig using a large diameter auger. This is the only potentially significant source of vibration associated with the project that will occur in proximity to the pump station. The drill rig represents a source of vibration only at the drill site and only during the drilling of the hole which is located approximately 45 feet from the pump station structures. Other typical construction equipment operating within the work area including pickup trucks, concrete trucks, boom trucks and cranes will not generate vibration levels of consequence at the pump station.

Based on a review of the site geologic conditions and geotechnical report the pole sites are underlain by approximately 10 feet of surficial soils consisting of fill and colluvium. These

surficial deposits are underlain by formational sedimentary deposits of the Otay Formation characterized as stiff and very stiff claystones and medium dense sandstones based on a review of the nearest geotechnical borings. These materials can be drilled with standard auger drilling methods. No rock drilling methods will be required in these materials based on the nearby geotechnical borings and the general geologic setting of the site. In rare instances, core barrel drilling or a percussion tool (hydraulic ram) might be used in this setting if concretionary layers are encountered.

Pole 18.1 will be replaced with a directly embedded new steel pole. The existing wood pole will be removed by hand excavating around the pole to remove it, and then the new pole will be placed in the same hole and backfilled with soil. No significant vibrations will be generated by the hand excavation, removal of the existing pole or placement of the new direct embedded pole using the anticipated construction equipment that will include cranes, boom trucks and other support vehicles.

The other possible activity in the area of the pump station discussed in the MND that could create vibration was reestablishment of pavement. There are no plans to repave in the area of the pump station for either Pole 18 or 18.1 so there are no potential impacts associated with vibratory asphalt compaction equipment; the major source of vibration during paving projects.

Methodology

Using the California Department of Transportation (Caltrans) "Transportation and Construction Vibration Guidance Manual," dated September 2013 (Caltrans Guidance Manual), we evaluated the potential peak particle velocity (PPV) at the existing structure surrounding the water pipes and associated pumps. The existing pump station structure is approximately 34 feet horizontally from existing Pole 18, and approximately 45 feet from its proposed new position 27 feet west of the existing pole. This existing pump station structure is approximately 16 feet from Pole 18.1. We also reviewed the methods from the Federal Transit Administration (FTA) Transit Noise and Vibration Impact Assessment Manual," dated September 2018, which provided similar methodology and results to the Caltrans Guidance Manual.

Based on equations 11 and 12 from the Caltrans Guidance Manual, the PPV at the structure was calculated assuming caisson drilling and conservatively considering a hydraulic ram might be needed to excavate the foundation for Pole 18. The following PPV values were calculated.

SDG&E Pole (Equipment)	Distance to Structure (feet)	PPV (in/sec)
18 (Caisson Drill)	45	0.047
18 (Hydraulic Ram)	45	0.22

Assessment

In our opinion the existing structures, including steel pipes and water pumps, would behave similarly to new residential structures with respect to resistance to distress from vibrations and PPV. The steel pipes observed on site are more ductile than components of a new residential

facility like stucco and glass windows. The construction activities proposed could be considered somewhere between a transient source and a continuous/frequent source of vibration as the construction is continuous, but for a very limited time. Conservatively, we have assumed limits for maximum PPV in accordance with Table 19 of the Caltrans Guidance Manual as repeated below.

Table 19. Guideline Vibration Damage Potential Threshold Criteria

Structure and Condition	Maximum PPV (in/sec)	
	Transient Sources	Continuous/Frequent Intermittent Sources
Extremely fragile historic buildings, ruins, ancient monuments	0.12	0.08
Fragile buildings	0.2	0.1
Historic and some old buildings	0.5	0.25
Older residential structures	0.5	0.3
New residential structures	1.0	0.5
Modern industrial/commercial buildings	2.0	0.5

Note: Transient sources create a single isolated vibration event, such as blasting or drop balls. Continuous frequent intermittent sources include impact pile driver, pogo-stick compactors, crack-and-seat equipment, vibratory pile drivers, and vibratory compaction equipment.

The maximum PPV for new residential structures is 0.5 in/sec for continuous sources which is higher than the calculated PPV from the construction processes assumed.

The calculated PPVs for the assumed construction methods are less that the limits that would cause distress to existing structures for both the Caltrans Guidance Manual criteria. As indicated in NOI-6, the qualified professional shall evaluate whether project construction may cause damage to the existing pump station. In our opinion there are no potential causes of distress to the existing pump station structures from removal and replacement of the SDG&E poles, and no further action is required.

We appreciate the opportunity to assist Brady and SDG&E with this assignment. If you have any questions, please contact Steve Fitzwilliam at (619) 871-7524.

Sincerely,

AECOM Technical Services

Steven M. Fitzwilliam, G.E. 2501
Principal Geotechnical Engineer

cc: James Sonu, NV-5
Kevin Galloway, SDG&E

TL649 - VIBRATION ASSESSMENT
SAN DIEGO GAS & ELECTRIC
CHULA VISTA, CALIFORNIA

AECOM

10 5 0 10 20 Feet
1 inch = 20 feet

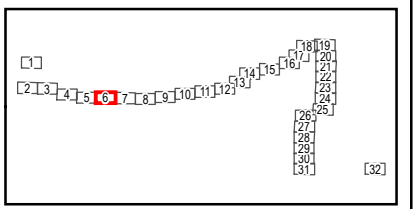
DRAWN BY: EM	DATE: 2/21/2019	FIG NO. 1
PM: MEH	PROJ. NO.: 60597643	

U:\Projects\Richard Brady & Associates\60TL649\400_Technical\GIS\TL649.mxd and \500_Deliverables\TL649 measurement figure.ai 2/8/2019 1:15 PM

Attachment 3-A: Detailed Route Map 6 of 32

Tie Line 649 Wood-to-Steel Replacement Project

- New Stub Pole
- New Steel Pole
- Wood-to-Steel Replacement Pole
- Overhead Work Only
- Pole Removal
- Guard Structure
- Wood-to-Steel Replacement
- Wood-to-Steel Replacement with Distribution Underbuild
- Wood-to-Steel Replacement Distribution Only
- Distribution Removal
- Underground to Overhead Conversion with Distribution Underbuild
- Underground Distribution Intercept
- Approximate Disturbance Area*
- Staging Yard
- Access Road Turnaround/Staging Yard
- Pulling Site
- Stringing Site
- Existing Access Road
- Overland Travel Route
- Access Road Modification



* Area is equivalent to the total estimated square footage of disturbance at each pole, but the actual shape of the work area will be determined during the final design.

1:2,000

0 200 400 Feet

Z:\Projects\SDGE_TL649\MXDs\Adhoc\Pole_Work_Areas.mxd 12/8/2015

Figure 2

Pole Z188727

Utility mark out near Pole 18

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	3
		PM: MH	

Utility mark out near Pole 18

Utility mark out near Pole 18

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	3
		PM: MH	

Pipes and pumps inside existing structure

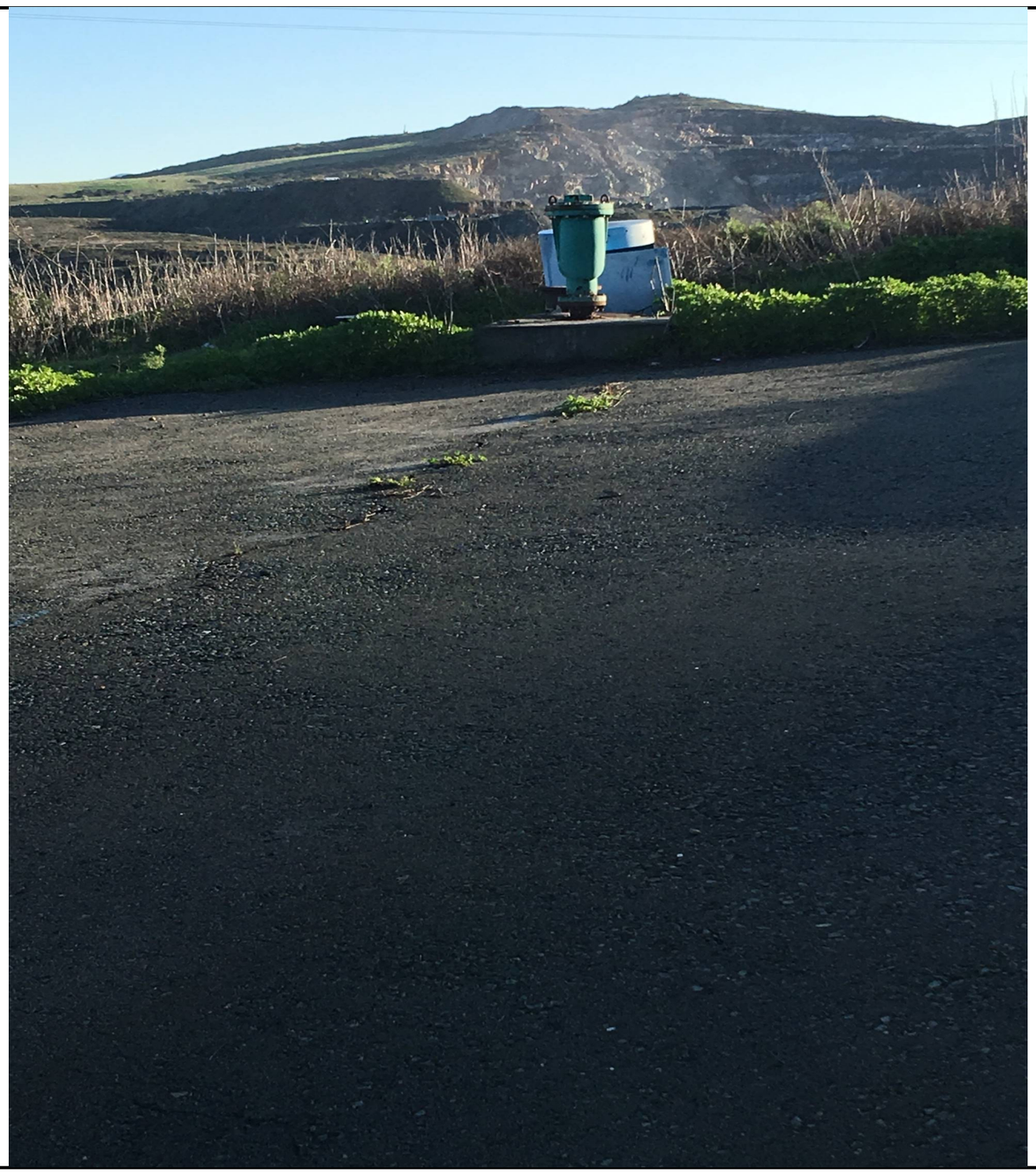
Pipes and pumps inside existing structure

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	4
		PM: MH	

Close up of pump on pipe

Overall view looking south of structure hosing pipes and pumps

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	5
		PM: MH	



Water utility upslope of Pole 18

Existing distress in asphalt concrete near Pole 18

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	6
		PM: MH	

Existing distress in asphalt concrete near Pole 18

Pole 18.1 (P188917)

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	7
		PM: MH	

Minor water lines near Pole 18.1

Electrical transformer within pipe and pump structure

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	8
		PM: MH	

View of pipes within pipe and pump structure near Pole 18.1

fencing and pole around pipe and pump structure

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	9
		PM: MH	

Pipes and pumps looking west near Pole 18.1

Pipes and pumps looking west near Pole 18.1

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	10
		PM: MH	

Looking south into pipes and pump structure

Looking south into pipes and pump structure

AECOM

Photo Documentation
San Diego Gas and Electric - TL 649 Vibration Assessment
Chula Vista, California

PROJ. NO.: 60597643	Date: 2/20/2019
CHECKED BY: SF	11
PM: MH	

Corrosion protection underground west of Pole 18

Water line across the street and west of Pole 18

AECOM	**Photo Documentation** **San Diego Gas and Electric - TL 649 Vibration Assessment** **Chula Vista, California**	PROJ. NO.: 60597643	Date: 2/20/2019
		CHECKED BY: SF	12
		PM: MH	