BART Agreement Number: 6M8207 **Approval Date: 01/21/26**

Work Plan A.06-01 BART S-Line Stray Current Corrosion Control Evaluation

Scope:

2.0 SERVICES TO BE PERFORMED BY CONSULTANT AND WORK BREAKDOWN STRUCTURE (WBS)

1. Project Management

The GFT Team will be led by Corrpro Project Manager, Ren Calhoun, supported by GFT Program Manager, Tiffani Bryant.

The PM staff will perform the following management tasks:

A. Prepare and manage the Workplan & Schedule
B. Prepare and Manage Budget and Invoices (No time to be charged for these activities, per current BART policy)
C. Support SSWP / Track Allocation process, including virtual track access request meetings
D. Meetings – Prepare agendas and minutes

2. Project Initiation

2.1. Kick-Off Meeting

A kickoff meeting will be held to meet with BART staff to:

A. Detailed review of stray current issues specific to the S-Line.

B. Validate schedule assumptions

C. Review the envisioned field evaluation plan including:

1) DC rail-to-ground potential and negative grounding device (NGD) current monitoring through Corrpro-supplied cellular-based remote monitoring units

(RMUs) for a minimum of 2 weeks. It is expected equipment setup and retrieval can be done during daytime revenue operations.

2) Section-by-section track-to-earth resistance measurements (ASTM G165) during non-revenue periods.

3) On-the-job training for BART personnel on the assorted field test procedures and data interpretation. This is envisioned to be a combination of in-the-field training while performing measurements, and office and virtual review and analysis of the collected data.

D. Review expected outcome of the above field procedures and deliverables.

E. Review specific coordination and support requirements for the above field procedures, including track safety training and participation in virtual track access meetings as needed.

F. Identify additional information required from BART to finalize the field evaluation plan, e.g. TPSS NGD locations and access requirements for setting the RMUs, and rail insulating joint and impedance bond locations and support details for temporarily disconnecting traction power cables at certain locations to facilitate the track-to-earth resistance measurements.

G. Conclude a tentative schedule, including submission of the field evaluation plan for review/approval by BART and actual implementation of the field studies.

H. Initiate SSI, RWP training and SSWP / track allocation processes.

3. S-Line Field Evaluation

A. DC rail-to-ground potential and NGD current monitoring:

1) Monitoring rail-to-ground potential and NGD current over time is foundational to characterize overall stray current leakage levels and magnitude/time patterns associated with a DC-powered rail negative return system such as BART. This will include quantifying the firing frequency of the NGDs, the interaction of conditions along the rail line, and possible abnormal conditions.

2) Corrpro will supply instrumentation (remote monitoring units, RMUs) on a rental basis to capture data every second and transmit to a secured cloud-based server every hour for subsequent analysis by the project team. BART staff can also have direct access to the data portal if desired. Data transmission is based on adequate cellular connectivity.

3) The RMUs are AC-powered and require access to a 115VAC wall outlet at each monitoring location. The instrumentation will be connected to the wall outlet via a Corrpro-supplied surge protector and extension cord as needed. Insulated test wiring will be used with all equipment and wiring safely placed so as to not interfere with other activities.

4) Tentative monitoring locations are listed below, subject to finalizing the field evaluation plan.

Location #	Description	MP	Distance to Next (Miles)	Rail-to-Ground Potential RMU	NGD Current RMU
1	***Warm Springs / South Fremont Station***	28.62	0.05	--	1
2	Warm Springs TPSS	28.67	0.96	1	1
3	Warren Avenue TPSS	29.63	1.86	1	1
4	Kato Road TPSS	31.49	0.80	1	1
5	Midway between Kato Road and Railroad Court	32.29	0.80	1	--
6	Railroad Court TPSS	33.09	2.02	1	1
7	Montague Parkway TPSS	35.11	0.13	1	1
8	***Milpitas Station***	35.24	1.60	--	1
9	Hostetter TPSS	36.84	1.26	1	1
10	Berryessa Gap Breaker	38.10	0.14	--	--
11	**Berryessa/North San Jose Station**	38.24	0.01	1	1
12	Berryessa TPSS	38.25	0.75	1	1
13	Bumping Posts - South End of S Line	39.00	--	1	--
			TOTALS	**10**	**10**

5) Minimum monitoring period is 2 weeks after all instrumentation is set at all locations. Monitoring period can be extended as needed depending on observed conditions.

6) Time to set instrumentation at each location is 1-2 hours. Work plan and schedule are based on BART staff retrieving the instrumentation. Corrpro will then collect all instrumentation from BART at one time.

7) Hands-on training of BART staff is included in the above monitoring effort. This will include setting the instrumentation and cloud-based access to the data.

B. Track-to-earth resistance testing during non-revenue periods:

1) Stray current leakage from BART is predominantly inversely proportional to the resistance to earth of the traction power negative return circuit, principally the running rails and connections to ground through the NGDs. Using Ohm's Law, characterizing the track-to-earth resistance in conjunction with rail-to-ground potential and NGD current trending establishes a good foundation for estimating the magnitude and polarity of the stray current leakage. These data and analyses will then be used for ranking overall stray current corrosion severity. It will also help identify possible electrical "shorts" to ground and or other anomalous conditions that can result in excessive stray current electrical interference and corrosion, equipment malfunction, unsafe operations, etc. Once such conditions are identified by the track-to-earth resistance testing, troubleshooting and corrective action can be undertaken. Often, cause(s) of low track-to-earth resistance and excessive stray current leakage can be remedied with little effort once identified.

2) Track-to-earth resistance testing needs to be performed during non-revenue periods with no trains operating in the area. Temporary powering down of the traction power system upstream/downstream of the particular section of track under test will also be required. Temporary disconnection of certain traction power negative cables will also be required, e.g. at impedance bond cables across certain rail insulating joints and possibly the negative return cables at substations within the track section under test.

3) The track-to-earth resistance measurements will follow procedures in ASTM G165, *Standard Practice for Determining Rail-to-Earth Resistance*. The typical procedure entails applying a DC test current between the rails and ground such that the rail-to-ground potential change caused by the test current does not exceed 36 volts. The rail-to-ground potential change and distribution of test current in the rail (using a special clamp-on ammeter placed around the rail) is measured at different locations along the track section under test. Ohm's law is then used to calculate the resistance to earth on a track section by track section basis.

4) Tentative track test sections are listed below, subject to finalizing the field evaluation plan:

Test Section	From	To	From MP	To MP	Length (Miles)
1	N. End of Warms Springs Crossovers	N. End of Kato Crossovers	28.67	31.49	2.8
2	N. End of Kato Crossovers	N. End of Railroad Court Crossover	31.49	33.09	1.6
3	N. End of Railroad Court Crossover	N. End of Montague Crossovers	33.09	35.11	2.0
4	N. End of Montague Crossovers	N. End of Berryessa Dbl. Crossovers (north of station)	35.11	38.10	3.0
5	N. End of Berryessa Dbl. Crossovers (north of station)	S. End of Berryessa Dbl. Crossovers (south of station)	38.10	38.25	0.1
6	S. End of Berryessa Dbl. Crossovers (south of station)	Bumping Posts, S. End of S Line	38.25	39.00	0.8
				TOTAL	10.3

5) Troubleshooting is not included in the current work scope or fee estimate. Should conditions warranting troubleshooting during the same time as the base field testing be encountered, the BART project manager will be notified within 8 hours after detection to determine if the troubleshooting should proceed.

6) Hands-on training of BART staff is included in the above track-to-earth resistance testing. This will include instrumentation use, calculations, and interpretation of results.

4. Exclusions

A. This work plan excludes consultation from Traction Power Subject Matter Experts, as requested by the BART PM. However, if services are needed in the future, we can provide an updated proposal/fee for approval.

Prime: GANNETT FLEMING

Subconsultant	Amount
Corrpro	$ 241,335

Total Work Plan Value: $ 267,354