Dear Mr. Yelton:

In accordance with your request, Lindmark Engineering, Inc. (LE) has reviewed the Draft Removal Action Work Plan (RAW) dated December 2019 and prepared by Jacobs Engineering Group Inc (Jacobs) for Lots 12, 13 and 13A located south of North Santa Monica Boulevard between Alpine Drive and Doheny Drive in the City of Beverly Hills (site). Union Pacific Railroad (UPRR) is the responsible party for the removal action. The site is owned by the Beverly Hills Land Company (BHLC). Adjoining properties are City of Beverly Hills (City) rights-of-way. The City entered into a voluntary oversight agreement with the DTSC in August 2018 (DTSC, 2018). The agreement requires the City to provide monitoring and reporting of landscaping activities conducted at the site by the BHLC.

Based on our review of the RAW it is our understanding that Jacobs evaluated several remedial alternatives and selected Alternative 5, Excavation with Off-Site Disposal during Development. Under this alternative, approximately 4,400 cubic yards of soils will be excavated to 2 feet below ground surface (bgs) in 29 designated areas; see Figures 5a through 5d, Attachment A. Of these designated areas, ten are on Lot 12, seventeen on Lot 13 and two on Lot 13A. No excavation is planned outside the boundaries of the site.

In summary, based on the RAW, the soil within the site that is outside the designated areas will not be excavated, and the upper 2 feet of this soil (outside the designated excavation areas) will serve as a 2-foot cap for underlying soil. Similarly, the backfilled soils in the designated excavation areas would serve as a 2-foot cap for underlying soil. The soil at 2 feet bgs and below to 5 feet bgs that is above the 75 milligrams per kilogram (mg/kg) arsenic action level will be left-in-place with institutional controls (IC), i.e. deed restriction and future soil management. The RAW proposes collecting confirmation samples from the excavation sidewalls after removal of soil from the designated areas.

PROPOSED SITE USE

Lot 12 is proposed for a 4-story office building development with subterranean parking (Gensler, 2020). Lot 13 and 13A are proposed to be deeded to the City for park/recreational use with no habitable buildings. The City-owned property directly west of Lot 12 and east of Civic Center Drive will not be developed.

The excavation for the subterranean parking on Lot 12 will be approximately 25 feet deep. There will be ramps to the subterranean parking from Civic Center Drive at both ends and along the south side from...
Civic Center Drive. Approximately 200 feet from both ends of Lot 12, the subterranean parking space will extend 23 feet south of the property line, below Civic Center Drive.

**ASSUMPTIONS OF RAW**

The RAW is developed based on several assumptions as noted below.

1. The site was a former railroad right-of-way and there are no known railroad operations (Section 2.4, page 2-5).

2. The source of arsenic contamination is unknown and is likely associated with fill material placed at the site. Soil sample data does not indicate elevated levels of arsenic in soil below 5 feet bgs (Section 2.4, page 2-5).

3. The highest arsenic concentrations are within the shallow soil along the centerline of the site and decrease in concentrations away from the centerline of the site (Section 2.3, Page 2-4).

4. The site is gently sloping from the south to the north (Section 1.3, page 1-2).

5. The Soluble Threshold Limit Concentration (STLC) analysis and the groundwater investigation have shown that the arsenic in soils is not leachable and has not impacted groundwater (Section 2.3, page 2-5).

6. Excavations will be conducted within the upper 2 feet of soil where arsenic concentrations exceed 25 mg/kg. Arsenic concentrations in soil samples collected at 2 feet bgs are considered representative of soils below 2 feet and are not used to identify excavation areas (Section 5.1, page 5-1).

7. Soil removal goals will be verified upon excavation to 2 feet bgs within designated areas by collecting one sample per every 50 feet of sidewall at a depth of approximately 1 foot bgs. No samples will be collected at the bottom of the excavations. If a sidewall confirmation sample result exceeds 25 mg/kg, over-excavation of arsenic-impacted soil will be conducted to the extent feasible (Section 6.1, page 6-1).

8. Excavated areas within the proposed development footprint would be left open, i.e., not backfilled, to allow construction to proceed (Section 4.1.5, page 4-3).

9. Dust monitoring will follow the South Coast Air Quality Management District’s (AQMD) Rule 403 (Section 5.5.5.1, page 5-4).

10. The groundwater beneath the site does not present a complete exposure pathway (Section 2.1.5, page 2-3).

11. The site investigatory data referenced in the RAW reasonably characterize the subsurface contamination of arsenic to the point that a remedy and scope can be selected.
Below is a summary of our comments.

**Topography**

The topographic slope across the site is to the southeast (USGS, 1995) which is also the prevailing flow direction of shallow perched groundwater in the site vicinity (Lindmark, 2002a); (Lindmark, 2002b).

**Historic Site Use**

A railroad was operated on the site from approximately 1909 to 1954 when passenger service ended (Wikipedia-Pacific Electric-Beverly Hills). A photograph from circa 1910 shows Beverly Hill’s first train station located on the southwest corner of Santa Monica Boulevard and Canon Drive (Water and Power Associates). Freight service continued past 1954, but in the 1960s all service ended, and the railroad was removed (LE, 2017). Photographs of the railroad illustrating the tracks and freight and passenger operations are contained in Attachment B.

**Source of Arsenic Contamination**

The source of the arsenic contamination detected in soil at the site is not unknown, or associated with import fill, but is from historic applications of sodium arsenite which was sprayed on the tracks and the railroad right-of-way using tank cars. According to an October 10, 1928 article in the Pacific Electric Magazine (Attachment C), weed killing using water-soluble sodium arsenite was the more economical weed destroyer at that time which coincides with the time of railroad operations at the site. Sodium arsenite is freely soluble in water (NCBI) and therefore arsenic in a liquid solution would percolate through the soil.

Interestingly, the 1928 article discusses the emerging use of diesel fuel as a weed killer with one of the benefits being the settling of dust. Diesel fuel was probably later used at the site as there is evidence of dark staining on the railroad right-of-way, see Photo 1, Attachment B. Unlike arsenic, which is persistent in the subsurface, diesel fuel applied at the ground surface would tend to degrade over time.

**Limitations of Investigatory Data used by the RAW**

The RAW is based on the evaluation of arsenic soil sampling data obtained from 1998 to 2007 and groundwater data from 1998 to 2010. The soil samples were almost exclusively taken from within the boundaries of the site. The locations of soil samples collected through 2007 with detected arsenic concentrations, and proposed excavations, are shown on Jacobs’s figures contained in Attachment A. The RAW does not refer to CH2M Hill’s (CH2M) 2015 Removal Action Work Plan (CH2M, 2015), but many sections of the RAW appear to be copied from this 2015 removal action work plan.

Between 2015 and 2018, a large number of soil samples were collected at the ground surface and at 0.5 and 2 feet bgs by Rincon Consultants and LE. The assessments are presented in reports listed in the reference section. The sample locations are shown on Figures LE5a through LE5d contained in Attachment D. LE believes an incorporation of these data into the RAW would have revealed that the approach to remediate the arsenic investigation as outlined in the RAW would be inadequate.
Arsenic Leachability

The RAW states STLC analyses of soil have shown arsenic not to be leachable and has not impacted groundwater. The RAW further states that arsenic in soils is not migrating from the shallow soils and the centerline of the site. However, the above referenced STLC analyses were run on samples containing a maximum of 90.5 mg/kg arsenic. The maximum concentration of arsenic detected to date at the site (996 mg/kg) is an order of magnitude greater. This maximum concentration was detected at 2 feet bgs in A18 located near the east end of Lot 13 (Figure 5d).

In 2016, LE analyzed five soil samples with arsenic concentrations ranging from 53.8 to 123 mg/kg for STLC (LE, 2016). The sample with the highest arsenic concentration (C19) had an STLC of 7.13 milligrams per liter (mg/L). Since that concentration exceeded 5 mg/L it would designate any excavated soil at that specific location and depth as a hazardous waste and further indicate that the arsenic is leachable. Sample C19 was collected from the surface of the soil at an approximate depth of 0.1 feet bgs in an area on Lot 12 (Figure LE5b), inside the curb west of Beverly Boulevard which was deemed to be free of contamination in the RAW and not proposed to be excavated.

In Table 1, contained in Attachment E, LE used linear regression to find the best fitting straight line through the points with total arsenic in mg/kg on the x-axis and the STLC values (mg/L) on the y-axis. The fitted line has a strong correlation (0.854) and the 5 mg/L STLC value is intersected by a total concentration of 112.8 mg/kg. Based on 95 percent confidence, an arsenic concentration less than 104.4 mg/kg would not have an STLC of 5 mg/L while a concentration over 121.2 mg/kg with 95 percent confidence would exceed 5 mg/L. Theoretically, an arsenic concentration of 50 mg/kg could have an STLC of 5 mg/L, and would need to be tested for waste profiling purposes, but LE will assume that an arsenic concentration of 121.2 mg/kg or greater will have an STLC above 5 mg/L that would designate any profiled soil as hazardous.

The soil analytical data for SB02 located near the western end of Lot 12 (Figure 5a) show the presence of elevated arsenic concentrations (152 mg/kg) into the native soil at a depth of 30 feet bgs which indicates vertical migration. This sample was not STLC tested but the elevated concentration suggests a probable exceedance of 5 mg/L if it had been STLC tested.

Distribution of Arsenic in Soil

The conceptual site model presented in the RAW assumes there were no railroad operations and that arsenic was brought to the site in fill material. Based on these assumptions, and other assumptions mentioned above, the remediation options were evaluated and one selected, Excavation with Off-Site Disposal during Development.

Based on LE’s evaluation of the historic operations, there were two parallel tracks for westbound and eastbound traffic, see photographs in Attachment B. Therefore, the spraying of water soluble sodium arsenite from the tank cars would likely have occurred from both tracks and would have been distributed a distance away from the tracks. Furthermore, LE believes after the dirt near the tracks had dried out, dust would be generated that would spread the arsenic farther away, including off-site.

Based on LE’s dust monitoring in the area, the prevailing wind direction is to the northeast. However, the worst scenario for dust migration would likely occur during Santa Ana conditions when the prevailing wind direction is to the southwest. LE believes, this may, at least in part, explain the greater distribution of arsenic to the south of the site compared to the north.
Ground Surface to 5 Feet Below Ground Surface

The RAW assumes arsenic concentrations detected at 2 feet bgs belong to the depth interval 2 to 5 feet bgs even if there were no sample data collected above 2 feet bgs. LE believes concentrations detected at 2 feet bgs are not necessarily only representative of soils below 2 feet bgs, but there is an equal chance a concentration at 2 feet bgs would be similar to a concentration at 1.99 feet bgs or 2.01 feet bgs. As an example, the western end of Lot 12 is not designated for excavation of arsenic-impacted soil due to arsenic concentrations at 2 feet bgs in LE1, SB3 and SB1 at 36.2 mg/kg, 44.9 mg/kg and 37.4 mg/kg, respectively, which are attributed in the RAW to soils below 2 feet bgs. However, a surface soil sample collected from approximately 0.1 feet bgs in C1, approximately 20 feet west of LE1 (Figure LE5a), had an arsenic concentration of 53.8 mg/kg and, therefore, the soils in the western end of Lot 12 should be excavated since shallow arsenic concentrations in that area are elevated, above the 25 mg/kg action level.

The great variability in arsenic concentrations laterally and vertically in shallow soil is also illustrated by the data for the eastern end of Lot 12 (Figure 5b) which is also not designated for excavation in the RAW. Although the arsenic concentrations in A6 at 0.5, 2 and 5 feet bgs were below 25 mg/kg, they were above 25 mg/kg in nearby surface soil samples, RS18 (56.3 mg/kg) and C19 (123 mg/kg), see Figure LE5b. Furthermore, the arsenic concentration in C19 was hazardous (LE, 2016).

In Lot 13, no excavation is proposed at LE16 near the west end of Lot 13 (Figure 5b) where the arsenic concentration at 2 feet bgs was 107 mg/kg, because it was assumed, without basis, that the soil above would have a concentration less than 25 mg/kg. Several other similar examples exist in the RAW where the soil is not proposed to be excavated.

The areas of LE7, 150 feet west of Elm Drive, (Figure 5a) and LE11, 100 feet west of Maple Drive, (Figure 5b) which had arsenic concentrations of 196 mg/kg and 168 mg/kg, respectively, at 2 feet bgs were also not proposed for excavation although the soil would likely have been designated as hazardous if it had been tested. Although no sample was taken above 2 feet bgs in LE7, the RAW assumes this soil has a concentration below 25 mg/kg and will be left as a 2-foot cap on top. Since 196 mg/kg is above the 75 mg/kg action level from 2 to 5 feet bgs (for landscape areas) the RAW assumes the existing soil above 2 feet bgs will serve as a cap and the soil from 2 to 5 feet will be managed by a deed restriction and would require soil management in case it is disturbed.

Except for the 40-foot wide Lot 13A, located within the island east of Lot 13, the site is 60 feet wide. However, as mentioned earlier there were two parallel tracks for eastbound and westbound traffic. Therefore, the centerline of the site will be between the two tracks and not at the centerline of a single track. As a consequence, the distribution of arsenic will be greater across the width of the site than if it had been a single track. Based on supplemental arsenic results discussed above and the arsenic results for five columns of step-out borings across the site: A31 through A32 (in Lot 12), A38 through A37 (in Lot 12), A43 through A44 (in Lot 13), A49 through A48 (in Lot 13), and A55 through A56 (in Lot 13A), LE believes the entire site is likely impacted above a concentration of 25 mg/kg down to 2 feet bgs and a significant portion of the site has arsenic concentrations above 75 mg/kg from 2 feet to 5 feet bgs, see table below.
Arsenic contamination above the 25 mg/kg action level in shallow soil also extends off-site. As mentioned earlier, an elevated arsenic concentration was detected in C1 at 0.1 feet bgs. C1 was taken from the City right-of-way west of Lot 12. Therefore, this right-of-way is impacted by arsenic contamination above the 25 mg/kg action level.

Based on the sampling done for the eucalyptus grove in the City right-of-way south of Lot 13 in 2018 (LE, 2019a), the arsenic concentrations in samples collected at 2 feet bgs ranged from 6.41 mg/kg to 88 mg/kg with a mean concentration of 22.2 mg/kg and a 95 percent upper confidence limit (UCL) of 27.9 mg/kg. Elevated arsenic concentrations were found to extend at least 10 feet south of Lot 13. The soil waste profile sample had an arsenic concentration of 21.1 mg/kg (Lindmark, 2019a). No arsenic sampling was performed to the south of Lot 13 northeast from Site No. 51 (Figure LE5d). Also, the City right-of-way immediately north of Lot 13A has not been tested for arsenic.

There is little arsenic data for the proposed subterranean parking extension on Lot 12, 23 feet south of the property line. Because this area is outside the railroad right-of-way, the arsenic impact will likely be limited to shallow soil. Two borings, BK-1 and BK-2, were drilled on Civic Center Drive close to the 23-foot extension line (Figure 5a). The arsenic concentrations ranged from 17.4 mg/kg to 27.3 mg/kg with the highest concentration detected in BK-1 at 2 feet bgs. Based on data south of Lot 13, the arsenic concentrations decrease with distance away from the former railroad-right-of-way, and this will likely also be the case for the area south of Lot 12.

**5 Feet Below Ground Surface to 50 Feet Below Ground Surface**

Since soil will be excavated to a depth of approximately 25 feet bgs within Lot 12, the concentrations of arsenic with depth is of importance and are summarized in the table below.

<table>
<thead>
<tr>
<th>Sample Step-Out Borings</th>
<th>0-2 feet bgs &gt; 25 mg/kg No. Samples/Total Samples</th>
<th>2-5 feet bgs &gt; 75 mg/kg No. Samples/Total Samples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lot 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A31-A29-A27-A21-LE2-A28-A30-A32</td>
<td>12/14 (85.7%)</td>
<td>8/14 (57.1%)</td>
</tr>
<tr>
<td>Lot 12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A38-A35-A34-LE12-A33-A36-A37</td>
<td>8/13 (61.5%)</td>
<td>3/14 (21.4%)</td>
</tr>
<tr>
<td>Lot 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A43-A41-A39-LE20-A23-A40-A42-A44</td>
<td>11/14 (78.6%)</td>
<td>9/14 (64.2%)</td>
</tr>
<tr>
<td>Lot 13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A49-A47-A45-LE23-A24-A46-A48</td>
<td>11/11 (100.0%)</td>
<td>6/12 (50.0%)</td>
</tr>
<tr>
<td>Lot 13A</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A55-A53-A51-LE36-A26-A52-A54-A56</td>
<td>11/14 (78.6%)</td>
<td>4/14 (28.6%)</td>
</tr>
</tbody>
</table>
Although there are fewer samples that have been collected below 5 feet than at 5 feet, there does not appear to be a significant reduction from 5 to 10 feet bgs, and at 30 feet bgs the mean concentration increases to 36.0 mg/kg from 14.5 mg/kg at 25 feet. This increase results from the high concentration of 152 mg/kg in one sample taken at 30 feet bgs but indicates that high concentrations, that would likely designate soil as hazardous, persist to greater depths.

The concentrations of arsenic with depth for Lot 13 and 13A are summarized in the table below.

<table>
<thead>
<tr>
<th>Depth (feet)</th>
<th>No. Samples</th>
<th>Mean Concentration (mg/kg)</th>
<th>Concentration Range (mg/kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>99</td>
<td>33.0</td>
<td>2.4-33.6</td>
</tr>
<tr>
<td>10</td>
<td>14</td>
<td>12.5</td>
<td>6.54-21.6</td>
</tr>
<tr>
<td>15</td>
<td>9</td>
<td>6.9</td>
<td>1.98-10.7</td>
</tr>
<tr>
<td>20</td>
<td>9</td>
<td>16.8</td>
<td>3.1-51.9</td>
</tr>
<tr>
<td>25</td>
<td>4</td>
<td>16.7</td>
<td>10.2-22.1</td>
</tr>
<tr>
<td>30</td>
<td>7</td>
<td>15.1</td>
<td>12.1-24.5</td>
</tr>
<tr>
<td>35</td>
<td>5</td>
<td>16.0</td>
<td>12.7-20.1</td>
</tr>
<tr>
<td>40</td>
<td>3</td>
<td>19.4</td>
<td>17.9-28.3</td>
</tr>
<tr>
<td>45</td>
<td>4</td>
<td>23.0</td>
<td>11.3-43.2</td>
</tr>
</tbody>
</table>

The average concentrations at depth are similar to those below Lot 12. The increase in arsenic concentrations from 30 feet bgs at 5-foot increments to 45 feet bgs indicate vertical migration through the soil which appears to have impacted groundwater.

**Railroad Ballast**

Based on boring logs, gravel base materials were found below the surface at SB10 (1 foot thick) and SB11 (1.5 feet thick) in Lot 13, Figure 5d. SB10 and SB11 were approximately drilled 20 feet apart. LE believes the gravel is likely associated with ballast installed for the two tracks. Therefore, the gravel at SB10 would represent ballast for the northern track and the gravel at SB11 ballast for the southern track. Therefore, the centerline of the site would likely not be the centerline of one of the tracks, but between the two tracks. LE believes the arsenic water solution would have quickly penetrated through
the gravel into the underlying soil. When railroads are abandoned, the spurs and ties are typically removed, but the ballast left in place. Although the ties typically would be removed, remnants of ties such as pieces of wood and metals may be encountered.

Based on an Internet search, the standard railroad gauge was 4 feet 8.5 inches or 4.7 feet (Wikipedia-Pacific Electric). As the ballast had to support the spurs and ties, the width of the ballast would reasonably be about 6 feet and the volume of gravel beneath the site would, therefore, be approximately 1,900 cubic yards assuming an average thickness of 1.25 feet, a width of 6 feet and a length of 3,400 feet per track.

**Groundwater Condition**

The RAW does not address the groundwater sampling in 2006 and 2008 by CH2M. In 2006, CH2M obtained groundwater samples from four borings: SB1, SB5, SB8, and SB11. The arsenic concentrations ranged from 10 micrograms per liter (μg/L) to 35 μg/L (CH2M, 2006). The highest concentration beneath Lot 12 was detected in SB5, 35 μg/L at 54 feet bgs (Figure 5b), and the highest concentration beneath Lot 13 was detected in SB11, 20 μg/L, at 35 feet bgs (Figure 5d). At that time (in 2006) the EPA Maximum Contaminant Level (MCL) was 50 μg/L. Based on this MCL, the DTSC determined no remediation of groundwater was required (DTSC, 2008). On November 28, 2008, the MCL for arsenic was lowered to 10 μg/L.

In October 2008 CH2M obtained groundwater samples from eight boreholes, No. 1 through No. 8, located onsite and offsite (CH2M, 2008a). The concentration of arsenic in groundwater ranged to 270 μg/L. Based on groundwater elevation measurements taken from eight boreholes by CH2M in 2008 (CH2M, 2008a), the groundwater flow direction is shown to the northwest across Lot 12 and to the west-northwest across Lot 13. These flow directions are opposite of the topographical slope and prevailing shallow groundwater flow direction in the site vicinity. The gradient was approximately 1 percent which is a fairly steep gradient. The arsenic concentrations in groundwater beneath Lot 12 were 70 μg/L (No.1) and 270 μg/L (No. 2) and beneath Lot 13, 140 μg/L (No. 3) and 40 μg/L (No. 4). Groundwater samples were also collected and analyzed from boreholes north and south of Lots 12 and 13; however, no samples were collected immediately downgradient of the two hot-spots (No. 1 and No. 3).

The highest concentration north of the site was 5.3 μg/L in No. 5 on Foothill Road, 450 feet northwest of Lot 12. The highest concentration south of the site was 22 μg/L in No. 8, 300 feet southeast of Lot 13, on Oakhurst Drive. LE believes the arsenic concentration in No. 8 indicates probable movement of arsenic in groundwater from the site to the southeast based on the prevailing flow direction and suggest the finding of a reverse groundwater flow in 2008 (CH2M, 2008a) could have resulted from communication between the shallow groundwater and deeper, usable groundwater zones within which well 4 is perforated. LE found no soil sampling data for the eight boreholes. Arsenic sampling data would have been especially useful for the borings drilled off-site to establish background concentrations at depth. LE found no boring logs for No. 1 through No. 8.

Based on the arsenic data from the eight boreholes, CH2M prepared a work plan (CH2M, 2008b) to install five monitoring wells (MW-1 through MW-5). MW-2 and MW-4 were proposed to be located near the hot spots on Lot 12 and 13; however, only the two proposed wells near the hot spots were installed in 2009 and relabeled MW-1 and MW-2 (CH2M, 2009). LE found no boring logs for MW-1 and MW-2. MW-1 was located near the middle of Lot 12 (Figure 5a) in an area designated for excavation. MW-2 was located near the middle of Lot 13 (Figure 5c) also in an area designated for excavation. The
wells were sampled twice. The maximum total arsenic concentrations detected in MW-1 and MW-2 were 1.2 μg/L and 4.1 μg/L, respectively (CH2M, 2010). In the groundwater samples collected from MW-1 in October 2009, the dissolved arsenic concentrations were higher than the total arsenic concentrations which should not be the case since the samples were filtered before the dissolved arsenic analyses. However, the report (CH2M, 2010) provided no explanation.

In the boring for MW-1, the maximum arsenic concentration in soil was 63 mg/kg at 0.5 feet bgs (see Figure 5a). From 10 feet bgs to 50 feet bgs in MW-1, the maximum arsenic concentration was 19 mg/kg (at 10 feet bgs). In the boring for MW-2 (see Figure 5c), the maximum arsenic concentration in soil, 350 mg/kg, was detected at 0.5 feet bgs. From 10 feet bgs to 35 feet bgs in MW-2 the maximum arsenic concentration was 21 mg/kg (at 30 feet bgs).

The wells were abandoned in 2010. CH2M’s workplan (CH2M, 2008b) states “the monitoring wells will be abandoned in accordance with Los Angeles County and City of Beverly Hills well abandonment requirements”. However, LE has not been able to obtain information regarding well sampling field records, well elevations and coordinates, groundwater elevations, well installation details, and permits for installation and abandonment. Since the wells were installed through highly arsenic-contaminated soil, the proper abandonment of the wells is of particular importance.

No groundwater elevation data for the wells were provided in the referenced reports LE reviewed. The assumption by CH2M was that the groundwater flow direction would be perpendicular to the centerline of the site and flow to the northwest. If that had been the case, the groundwater elevations in MW-1 and MW-2 would have been identical. However, at a minimum three wells are needed to locally establish a groundwater flow direction and gradient. Furthermore, as mentioned earlier, the assumed groundwater flow direction (northwest) is opposite of the topographical slope across the site and in the site vicinity.

In DTSC’s letter approving the abandonment of the two wells (DTSC 2010), DTSC stated the site “had elevated levels of arsenic in soil down to groundwater”. DTSC also stated that “hydropunch samples and the two rounds of well samples all show that arsenic in groundwater is below the allowed MCL of 10 μg/L”. However, it should be noted that many hydropunch samples had arsenic concentrations above the MCL, ranging to 270 μg/L. Therefore, LE believes the hydropunch sampling results, 27 times higher than the MCL, did not justify the closure of the groundwater case for the site.

Water Supply Wells

The RAW also does not address the four City water wells located in relative proximity to the site. The wells are used for drinking water production and are equipped by cement annular seals extending to 324 feet bgs. These seals are intended to work in conjunction with natural clay aquitards to prevent any potential vertical migration of contaminants downward toward the perforated intervals of these wells. Additionally, these wells extract their supply from the two deepest aquifers within the San Pedro Formation (Lindmark, 2002).

The nearest water supply well in the vicinity of the site is well 4 located north of North Santa Monica Boulevard, approximately 100 feet north of the site but not within 500 feet of the previous monitoring wells, MW-1 and MW-2. Well 4 is the City well with the historically highest arsenic concentrations detected. In 2008 the average arsenic concentration was 17.5 μg/L with a range from 15.7 μg/L to 18.2 μg/L (City, 2009). In 2018, well 4 was tested during rehabilitation (GTC, 2019). The testing was done in four zones and the results ranged from 8.6 μg/L to 11 μg/L. The report does not identify the specific
depth intervals of each zone.

Based on a piloting report for the City’s water treatment plant (Carollo, 2018), the highest mean arsenic concentration recorded in April 2016 (21.5 μg/L) was in well 4 which also had concentrations that exceeded the water quality objectives for total dissolved solids and manganese.

**Applicable AQMD Rule**

Based on the arsenic concentrations, LE believes AQMD Rule 1466 *Control of Particulate Emissions from Soils with Toxic Air Contaminants* applies to this RAW and supersedes Rule 403 as the primary applicable AQMD rule. Rule 1466 is not mentioned in the RAW. Rule 1466 has much more rigorous requirements regarding notifications, training, monitoring and implementation than Rule 403 and will affect the scope, cost, and schedule of the soil removal action.

**Proposed Excavations**

The RAW evaluates several remedial alternatives and selects Alternative 5, *Excavation with Off-Site Disposal during Development*. In the initial presentation of the alternatives in the RAW, this alternative is not mentioned to have ICs, i.e. deed restriction and future soil management, but later it becomes clear ICs will be necessary.

The RAW proposes that the soil removal actions will be completed once the designated areas have been excavated to a depth of 2 feet bgs and sidewall verification samples (one per 50 feet of sidewall taken at 1 foot bgs) indicate concentrations are below 25 mg/kg, and at that time a Removal Action Completion Report will be submitted to the DTSC with a request for no further action status for the site. For landscaped areas, the arsenic action level is 25 mg/kg from 0 to 2 feet bgs and 75 mg/kg from 2 to 5 feet bgs (DTSC, 2012). The basis for leaving arsenic-contaminated soil in-place above 75 mg/kg is that the upper 2-foot soil layer, assumed to meet the cleanup level (25 mg/kg), will serve as a cap.

LE believes there is no basis for attributing the arsenic concentrations at 2 feet bgs only to the range 2 to 5 feet bgs, and the higher cleanup level of 75 mg/kg, as the lower cleanup level, 25 mg/kg, would have applied if the sample had been collected at any fraction of an inch above 2 feet bgs which is within the margin of accuracy for field measurements of sampling depths. Therefore, to be conservative, the results for 2 feet bgs should be applied to both the upper 2 feet of soil with a cleanup level of 25 mg/kg and the 2-foot to 5-foot depth range with a cleanup level of 75 mg/kg.

LE believes collecting verification sidewall samples at 50-foot intervals at 1 foot bgs is not a viable approach because sampling results for immediately adjacent soil borings and even duplicate samples show significant variability in arsenic concentrations within soil samples taken inches apart. The great variability of arsenic concentrations within small volumes of soil taken within 6 inches apart is illustrated by duplicate results of some soil samples, e.g. SB11 at 10.5 feet bgs which had a concentration of 21.6 mg/kg with a duplicate result of 12.1 mg/kg (78 percent lower).

LE believes not excavating the entire footprint of the site will lead to a significant risk of leaving highly arsenic-contaminated soil near the ground surface, such as at C19 where the soil meets hazardous characteristics. C19 was taken at 0.1 feet bgs in an area not proposed for excavation.

If Lot 12 were not proposed to be excavated to approximately 25 feet bgs, LE believes the UPPR would have to excavate all soil within that lot to 5 feet bgs to meet the action levels. Therefore, the excavations
could not be terminated at 2 feet bgs. Furthermore, as discussed in our recommendations below, dust monitoring and regulatory oversight for Lot 12 will need to continue in full force until the excavation has been completed. While the excavation below 5 feet bgs is driven by the proposed development, the arsenic-impacted soil will result in costs for dust monitoring and regulatory oversight, as well as disposal cost for the soil, which would not be incurred if the soil were clean.

RECOMMENDATIONS

Lots 13 and 13A

Remedial action should be designed to limit or preferably eliminate long term operation and maintenance costs associated with ICs. Therefore, LE recommends the entire footprint of Lots 13 and 13A be excavated based on the historic spraying of sodium arsenite and pervasive spread of arsenic over the entire lots. Since Lots 13 and 13A are proposed for park/recreational use, LE believes an excavation to minimum 2 feet for the entire lots and capping with clean import soil will be sufficient as long as the DTSC would not require dust monitoring and regulatory oversight for future park maintenance and landscaping activities.

At the locations were utilities intersect Lots 13 and 13A, or any arsenic-impacted City-right-of-way, LE recommends trenches be dug to the bottom of the utilities and be backfilled with clean import soil. Detectable warning tape should be placed over the utilities so they can be located in the future. The trenches will need to be of adequate width so the utilities can be dug out in the future without contacting adjacent arsenic-impacted soil below 2 feet bgs.

LE does not recommend a cap thickness of less than 2 feet since there are soils between 2 and 5-foot depths that will meet the hazardous waste characteristics criteria based on the maximum arsenic concentration at 5 feet bgs (336 mg/kg) and LE’s STLC evaluation.

For the City right-of-way south of Lot 13, additional sampling will be needed to determine the extent of soil removal to meet the 25 mg/kg action level. Additional sampling will also be needed on the City-owned portion of the island directly north of Lot 13A. Any arsenic-impacted soil on City rights-of-way above the 25 mg/kg action level should be remediated in the same way as on Lots 13 and 13A.

The ballast material left from the railroad tracks should be located and completely removed from the site along with any remnant pieces of wood and metals associated with ties. This waste will need to be profiled separately.

Based on the elevated arsenic concentrations, HAZWOPER certification will be required for all site workers involved in the excavation and handling of arsenic-contaminated soil. DTSC oversight and AQMD monitoring will be required until all impacted soils have been removed, the site restored and DTSC has approved regulatory closure.

Lot 12

Since the arsenic-impacted City right-of-way west of Lot 12 will not be developed LE believes an excavation to minimum 2 feet for the entire right-of-way and capping with clean import soil will be sufficient as long as the DTSC will not require dust monitoring and regulatory oversight for future landscaping activities. Any utilities intersecting the City right-of-way should be addressed as described for Lots 13 and 13A.
The ballast material left from the railroad tracks should be located and completely removed from the site along with any remnant pieces of wood and metals associated with ties. This waste will need to be profiled separately.

The probability that soil will be hazardous is greatest for the shallow soil in the upper 5-feet and decreases with depth. Therefore, it is important that the shallow soil is stockpiled separately from deeper soil and not mixed.

Based on the arsenic data from ground surface to 10 feet bgs, and the arsenic concentration in SB2 at 30 feet bgs (152 mg/kg), LE believes arsenic concentrations meeting the STLC criterion for hazardous will likely be encountered within Lot 12 in spots extending to depths near the bottom of the proposed excavation for the subterranean parking. Therefore, LE recommends DTSC oversight and AQMD monitoring until all arsenic-impacted soils have been removed. Based on the elevated arsenic concentrations at depth, HAZWOPER certification will be required for all site workers involved in the excavation and handling of arsenic-contaminated soil.

Even if waste profile samples would not designate the excavated soil as hazardous, the average arsenic concentrations are above normal background for California soils and DTSC’s general cleanup goal of 12 mg/kg for California sites (DTSC, 2009); therefore, the excavated soil cannot be reused and must be disposed at a permitted facility that accepts elevated non-hazardous arsenic-contaminated soils.

The monitoring with oversight from the DTSC and AQMD will need to begin with the drilling and excavation for shoring installation or as soon as equipment with the potential to generate dust is brought on-site.

**Groundwater**

In order to better evaluate the groundwater data for wells MW-1 and MW-2, LE recommends that the UPPR provide well sampling field records, well elevations and coordinates, groundwater elevations, well installation details, and permits for installation and abandonment. Since the wells were installed through highly arsenic-contaminated soil, the proper abandonment of the wells, in accordance with the requirements of the Los Angeles County - Department of Public Health, is of particular importance.

Based on the elevated arsenic concentrations in groundwater beneath the site, ranging to 270 ug/L, the measured groundwater flow direction toward municipal well 4, and the persistent arsenic concentrations in well 4 above the MCL, LE believes a Site Conceptual Model should be prepared, considering the water production wells, groundwater flow directions, and all arsenic data.

To further assess the arsenic impact on groundwater, LE recommends a comprehensive hydrogeological investigation, and preliminary recommends the installation of two groundwater monitoring wells on Lot 12 and 13 in the vicinity of the arsenic-impacted well 4. LE also recommends two wells on Lots 12 and 13 at the two hot spots, No. 2 and No. 3, and two wells both north and south of the site for a total of eight wells. The installation details and locations of the wells should be determined with input from the City, the City’s environmental consultant, and in consultation with the California Regional Water Quality Control Board-Los Angeles Region, if requested by the City.

LE understands that well 4 is currently not in operation. LE recommends the new monitoring wells be installed and monitored before groundwater extraction resumes. When the wells are drilled, the borings must be logged and soil samples for arsenic analysis should be collected at 2 feet and 5 feet bgs.
and on 5-foot intervals below to the bottom of the borings. LE does not believe the groundwater samples should be filtered since MCLs at the source are based on unfiltered water.

REFERENCES


9. CH2M Hill (CH2M), Groundwater Monitoring Well Work Plan (Draft), December 23, 2008b.

10. CH2M Hill (CH2M), Figure 2-Proposed Monitoring Well Locations, August 28, 2009.


26. South Coast Air Quality Control District (AQMD), Rule 1466, Control of Particulate Emissions from Soils with Toxic Air Contaminants, Amended December 1, 2017. 


29. Wikipedia. 

30. Wikipedia. 

Please call us at 818-707-6100 if you have any questions.

Best regards,

David W. Smith, PG
Senior Project Geologist

and

Ulf Lindmark, PE, BCEE
President
Registered Civil Engineer

UML:dws

Attachments:
A Jacobs Figures 5a through 5d
B Photographs
D LE Figures LE5a through LE5d
E Table 1 – Summary of STLC Results
ATTACHMENT A

Jacobs Figures 5a through 5d
Figure 5 shows the Arsenic Concentration in Soil at the Union Pacific Railroad Beverly Hills Site, 9315 Civic Center Drive, Beverly Hills, California. The map includes various Soil Sample Locations and Excavation depths. The legend explains the symbols used for soil sample locations, excavation depths, and county parcels. The map also indicates Soil Concentration and Soil Concentration [Field Duplicate] in milligrams per kilogram (mg/kg). The Service Layer Credits are provided for various sources including CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.
ATTACHMENT B

Photographs
Photo 1. Beverly Hills Station at Canon Drive, looking southwest.  
*Image copyright Pacific Electric Railway Historical Society.*

Photo 2. View of streetcar at intersection of Rodeo Drive looking west.

<table>
<thead>
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<th>Project Name:</th>
<th>REVIEW OF LOTS 12, 13, AND 13A RAW</th>
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</tr>
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<td>Drafted By:</td>
<td>DS</td>
</tr>
<tr>
<td>Approved By:</td>
<td>UML</td>
</tr>
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<td>Project No.:</td>
<td>2020-260</td>
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<tr>
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<td>6/20</td>
</tr>
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<td>1 &amp; 2</td>
</tr>
</tbody>
</table>
Photo 3. View of streetcar looking northeast.

Photo 4. View of railroad (east of Doheny Drive) looking southwest (1965)

REVIEW OF LOTS 12, 13, AND 13A RAW

HISTORICAL RAILROAD OPERATIONS

Project Name:

Title:

Drafted By: DS

Approved By: UML

Project No.: 2020-260

Date: 6/20

Photo: 3 & 4
ATTACHMENT C

October 10, 1928

Weeding Out Weeds on Weedy Rights-of-Way

To the well-known certainties of life—death and taxes—might appropriately be added—weeds on the railway rights-of-way.

Since the laying of the first rail a century ago, the weed nuisance problem has been a nightmare to maintenance-of-way forces of all railways to a greater or less extent. Various methods have been employed in combating the unsightly growth with semi-satisfactory results, but always at a cost that even the thought of would prove fatal to a Scotchman.

In Southern California the Pacific Electric has run the gauntlet of experience in fighting and subduing this vagrant growth. The problem of this railway was intensified due to the fact that in California weeds sprout every month in the year and the well-known "fifty-seven" varieties blush at having considered themselves quite a family. Too, the task was intensified due to our lines passing through many closely located cities and communities whose commendable civic pride resulted in aggressive complaints against a roadbed being garnished with this unsightly growth.

Early Methods

Not so many years ago large crews of men cleared its rights-of-way of weeds by hand. This process of course was an expensive one, and seeking better results, the burning method of elimination, which came into popular favor some years ago, was tried. The mechanical process of so exterminating weeds involved the movement of the weed burner over many sections of the system three or four times each year. While this method proved entirely satisfactory, insofar as it dealt a death blow to the growth, it created a fire hazard that was indeed objectionable.

Followed another plan of dealing with the weeds, it being the now popular and much used chemical process. This method provides for spraying rights-of-way with a chemical known as sodium arsenite, the chemical being diluted with water according to the hardiness and thickness of the vegetation to be destroyed.

This latter process proved far more effective than any tried up to the time of its introduction, and it still remains the more economical weed destroyer where the problem is solely a matter of destroying vegetation.

However, there are other difficulties and angles which suggested the wisdom of an experiment of using crude oil on the rights-of-way as a weed executor. The theory of the results that might be accomplished worked out in actual practice, as in due time it was found that the oiling process serves a four-fold purpose, all of which are useful and important of accomplishment, they being (1) kills weeds; (2) settles dust; (3) improves the appearance of rights-of-way and (4) removes the glare from rock ballasted and other ray-throwing roadbed.

The method of applying the oil to the roadbed is one developed by the Engineering Department of the Pacific Electric, it being very similar to that used in the application of the chemical weed killer. A regulation tank car is converted into an "oiling car" through the addition of a slotted pipe spray connected to the outlet of the tank. The slotted pipe extends from its connection with the bottom tank outlet to either side of the roadbed proper and is so constructed that extensions may be brought into use for the spraying of extra wide strips of right-of-way.

The spraying car is also equipped with a two-inch centrifugal pump connected to a five-horsepower d.c. motor with a hose connection to the tank proper. There are also two lengths of one-inch hose, about twenty-five feet
in length, with a nozzle on each hose through which the pump forces oil. The nozzles atomize the flow so that it is a simple matter for a man to hold the hose and spread the oil evenly. This latter equipment is only called

used when extra wide strips of right-of-way are to be sprayed or when obstacles in the form of posts, poles or fences makes it difficult to use the regular extensions to the roadbed spray.

**Sandwich for Safety**

Immediately following the oil car is a sander, which is a converted flat car, being boxed with sides eighteen inches high. There are four spouts, over which is placed a fine screen, into which men placed on the car shovel sand and the greased effect on the surface of the rail caused by the oil is neutralized, leaving the track in a safe operating condition.

When spraying with regular equipment under average conditions the oiler loses an hour and a half per track mile, and it is known that this can be improved. The oiler can do the job in ten hours per mile with his new sander and spread the oil evenly. The oil is atomized so that it is almost impossible to cause a fire in the right-of-way.

**New Club Site Cleared for Early Action**

Preliminary to actual construction work on the new P. E. Club Building, the structure occupying a portion of the Los Angeles Street site upon which our new club home will be erected, was last month torn down.

Several conferences were held by officials in which the architectural plans were discussed, following which minor changes were made and the many other local conditions encountered.

The oil used for this purpose, commonly known as "diesel" oil, is a low grade distillate with the asphaltum removed and being of twenty-four degree gravity.

The oil penetrates the ground very rapidly, between 1½ and 2 inches within the first hour, and does not leave a gummy or sticky surface as might be surmised. The cost per barrel of diesel oil at this writing varies between $1.08 and $1.10, f.o.b. the refinery.

The cost of applying the average coat of oil is $40.00 per single track mile. This figure includes the cost of the storage and handling of equipment, labor and supervision. Where it is necessary to spray by hand, sections of the right-of-way are far distant from the regular equipment, the cost naturally runs higher being estimated at about 0.2 of a cent per square foot.

Experience on the Pacific Electric Railway shows that best results are obtained through the periodical spraying of the roadbed. The oil is applied at intervals of six months until three coats have been applied, after which it is only necessary to repeat the process once about every two years, and then only with a light single coat. It is simply a matter of getting the ground "set for the killing" and then keeping it that way through occasional spraying.

Kills 'Em All

After the three applications of oil, practically all seeds within the soil of the right-of-way have been killed and thereafter seeds that reach the right-of-way, although they do reach the interior of the soil, do not germinate, but begin to die as they approach the oil. The oil applications have "no respecter of persons" being effective against all species of weed growth, and particularly has it been "dynamic" against Bermuda grass, more commonly known as the hated "devil grass."

This Company has oil treated the San Bernardino, Long Beach and San Pedro Lines major arteries, besides various strips on practically every line of the system. Oil has also been effec-tively used in the improving of private right-of-way in the largely populated cities of Glendale, Long Beach and Culver City.

From any angle viewed, so far as the Pacific Electric is concerned, the oiling process is superior to previous methods. Ultimate cost will show a saving credit on the ledger; dust is pleasingly and permanently controlled; roadbed is improved in appearance to the point where complaints have been entirely eliminated and instead come welcome letters of commendation, and the glare strain on motorman's eyes is removed through the darkening effect of the oil applications. The four-fold purpose which the oil serves, as compared with single benefits of the chemical process, places the oiling method in a class by itself so far as the treatment of the railway roadbed and right-of-way are concerned.

**How Old Are You?**

"Age is a quality of mind. If you've left your dreams behind, if Hope is cold, if you no longer look ahead, if your ambition's fires are dead, then your age is 90. But—if from Life you take the best, if in Life you keep the Zest, if Love you hold, no matter how the years go by, no matter how the Birthdays fly, you are not old!"—Selected.

**Trainmen Chosen to Work on Safety Committee**

Having been selected to represent their respective divisions, the following Trainmen will serve on the Safety Committee during the months of October, November and December:

**Northern Division**

H. C. Hampton, Conductor, Macy; D. W. Claudin, Motorman, Pasadena; E. F. English, Freight Motorman, Macy; R. W. Bressie, Conductor, Macy; B. L. Brown, Conductor, Pomona, and J. A. Severance, Motorman, San Bernardino.

**Southern Division**


**Western Division**


Besides representing all three divisions of this railway, the above listed men also represent local, interurban and freight service and are therefore in a position to bring about cooperation and discussion unsafe habits or operating conditions that are now being practiced on any part of the system.

The Safety Committee will appreciate the co-operation of all employees to the extent of calling to its attention operating practices or conditions which may appear to be unsafe or detrimental to the service.

**Safetygrams for Children Urged by Safety Sage**

"Look before you leap," is the plea of Sam Bonea, 81 year old safety sage, and pensioned Southern Pacific train conductor, who urges that every automobile operator posses a safety slogan on his steering wheel.

Bones offers the following safety-grams:

"Ever alert—never hurt. Look both ways—safety pays."

A minute expended for safety beats a month in the hospital.

Taking a chance at a grade crossing works every time—except the last time.

Chance speeds to disaster and thereafter limps on crutches.

The way some drivers act, they must think they have more lives than a cat.

The chance-taker may make good news for the newspapers, but it's bad news for his loved ones.

"It I could afford it," Bones said, "I'd start a national contest among school children, offering big cash prizes for the best safetygrams. Tens of thousands of school children help build or operate automobiles and some way to make them seriously think 'safety first' ought to be devised."

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ATTACHMENT D

LE Figures LE5a through LE5d
SUPPLEMENTAL LEGEND:

C1 - C101 (2016)
SAMPLE DEPTH ~ 0.1 ft bgs
RS9 - RS28 (2015)
SAMPLE DEPTH ~ 0.1 ft bgs
B8 - B13 (2016)

2020-260

C3
15.5
C4
17.5
C5
20
C6
10.6

B8
0.5' (14.7)
2.0' (14.6)

C7
6.6
C8
9.51
C9
7.62
C10
12.9
C11
7.04
C12
6.64
C13
5.45
(5.95)

RS9
13.7
RS10
15.5
RS11
44.9
RS12
17.2
RS13
13.1
RS14
15.2

C1
53.8
C2
7.04

COMMENTS ON JACOBS' DECEMBER 2019 DRAFT RAW

Source: Figure 5a, Jacobs' Draft Remedial Action Work Plan, December 2019.
SUPPLEMENTAL LEGEND:

- C1 - C101 (2016) SAMPLE DEPTH ~ 0.1 ft bgs
- RS9 - RS28 (2015) SAMPLE DEPTH ~ 0.1 ft bgs
- B8 - B13 (2016) SITE NO. 1 - SITE NO. 51 (2018) SAMPLE DEPTH 2.0 ft bgs

Source: Figure 5b, Jacobs’ Draft Remedial Action Work Plan, December 2019.
Source: Figure 5d, Jacobs' Draft Remedial Action Work Plan, December 2019.

SUPPLEMENTAL LEGEND:

C1 - C101 (2016)
SAMPLE DEPTH ~ 0.1 ft bgs

RS9 - RS28 (2015)
SAMPLE DEPTH ~ 0.1 ft bgs

B8 - B13 (2016)
SAMPLE DEPTH 2.0 ft bgs

Site No. 1 - Site No. 51 (2018)
SAMPLE DEPTH 2.0 ft bgs

Legend:

- Soil Sample Location
- Excavation 0-2 feet bgs
- Silica
- County Lines

Notes:

Location ID
Sample Depth
Soil Concentration (mg/kg)
Soil Concentration [Field Duplicate] (mg/kg)
mg/kg = milligrams per kilogram
bgs = below ground surface

COMMENTS ON JACOBS' DECEMBER 2019
DRAFT RAW

Lots 12 and 13A, Beverly Hills

Source: Figure 5d, Jacobs' Draft Remedial Action Work Plan, December 2019.
Table 1 – Summary of STLC Results
Table 1
Summary of STLC Results

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<th>Sample ID</th>
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<th>STLC (mg/L)</th>
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<td>106</td>
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Notes:
- mg/kg = milligrams per kilogram
- mg/L = milligrams per liter
- STLC = Soluble Threshold Limit Concentration

STLC as a Function of Total Arsenic Concentration

\[ y = 0.0739 \times 3.3357 + 0.0739 \times 3.3357 \]

\[ R^2 = 0.7284 \]

\[ \text{Correlation } R = 0.854 \]

STLC of 5 mg/L = 112.8 mg/kg ± 8.4

95% Lower Confidence = 104.4 mg/kg

95% Upper Confidence = 121.2 mg/kg