

SUBJECT

Revised Biosparge Shut Down Test Proposal

TOChristine Matlock, EGLE
Joe Rogers, EGLE
Shawn Shields, EGLE**DATE**

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DEPARTMENT

30214036

PROJECT NUMBER

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COPIES TODave Favero, RACER
Brendan Mullen, RACER
Patrick Curry, Arcadis
Tiffany Linder, Arcadis**NAME**Jackie Saling – PE, Arcadis
734.604.3808

1 Shutdown Evaluation and Monitoring Program

A shutdown evaluation is proposed for Transects A and G at the RACER Lansing Site (Site). The purpose of the proposed shutdown test is to evaluate if, after the temporary shutdown, the short- and long-term objectives of the biosparge system continue to be met. Specifically:

- Do the concentrations along the core of the plume continue to be below start up levels?
- Is the plume stable (vertically and horizontally)?

These questions can be answered by the plan laid out in this proposed shutdown test. The shutdown test is not intended to automatically lead to permanent shutdown of the biosparge system or any portion of the system. At the end of the shutdown test, recommendations will be made based on the data collected during the test. These recommendations may include restarting portions of the system, continued shut down of portions of the system, shut down testing for additional portions of the system, and/or additional monitoring. The system re-start triggers specified in this proposed plan were selected to allow adequate time and data to be collected without triggering a re-start for data fluctuations that are not related to the biosparge system or are within historical fluctuations and do not pose an unacceptable risk to the municipal water supply wells.

A comprehensive pre-shutdown sampling event will be conducted upon EGLE approval of the plan and prior to the shutdown of Transects A and G. The shutdown would begin following the pre-shutdown sampling event. Rebound monitoring, detailed in the sections below, consists of biosparge performance wells and IGMP wells, and will occur throughout the shutdown duration.

As discussed in prior reports, portions of the biosparge system have met the point of diminishing returns as assessed by Arcadis as well as the short and long-term objectives. Transects A and G were selected for rebound testing because they have robust monitoring well networks within the ROI and near-downgradient area to alert of rebound early. Additionally, Transects A and G have been undergoing treatment the longest, as Transect G is where the initial pilot testing occurred in 2016-17 and 2018-19 and Transect A was turned on in Q2 2019 before the larger Plant 2 system was started in Q3 2020. The following well networks are proposed for rebound monitoring.

Plant 2 – Transect G

The wells, location, and sampling frequency for Plant 2 Transect G shut down monitoring is summarized on **Table 1** and shown on **Figure 1**.

Table 1: Plant 2 Transect G Monitoring Location Summary

Well ID	Location	Type	Sampling Frequency
MW-20-129	Central P2	Upgradient Weathered Bedrock	Pre-shut down and Quarterly
TW-14-02	Transect G	Radius of Influence Weathered Bedrock	Pre-shut down and Quarterly
MW-19-122	Central P2	Upgradient Weathered Bedrock	Pre-shut down and Quarterly
MW-19-123	Southern P2	Near Downgradient Weathered Bedrock	Pre-shut down and Quarterly
MW-16-74	Southern P2	Near Downgradient Weathered Bedrock	Pre-shut down and Semi-annual
MW-16-78	Southeast P2	Downgradient Weathered Bedrock	Pre-shut down and Semi-annual
MW-19-121	Transect E	Radius of Influence Weathered Bedrock	Pre-shut down and Semi-annual
MW-12-01	Southwest P2	Side Gradient Bedrock	Annual
MW-13-50	Southern P2	Far Downgradient Bedrock	Annual
MW-13-52	Southern P2	Far Downgradient Weathered Bedrock	Annual
MW-16-75	Southern P2	Downgradient Weathered Bedrock	Annual
MW-16-76	Southwest P2	Side Gradient Weathered Bedrock	Annual
MW-16-77	Southwest P2	Side Gradient Weathered Bedrock	Annual

In general, near upgradient, radius of influence, and near downgradient weathered bedrock wells will be monitored quarterly based on the historical data and the conceptual site model that indicates any potential fluctuations in 1,4-dioxane concentrations would be seen relatively quickly in these wells.

While geographically close to Transect G, MW-16-74 has remained below the drinking water criteria of 7.2 µg/L, including prior to the biosparge system start up. The conceptual Site model in this area indicates a rise in bedrock elevation in this area that is less permeable than the weathered bedrock zone. This pushes groundwater to flow easterly rather than to the south. It is unlikely that shut down of Transect G will affect the concentration at MW-16-74, therefore more frequent sampling has been deemed unnecessary.

Three additional biosparge performance monitoring wells in the vicinity of Transect G will continue to be monitored semi-annually during the shutdown test. Based on the historical data and the conceptual site model these wells are at distances far enough from Transect G that any changes in concentrations related to the shutdown will take longer than three months to observe.

The remaining locations will be sampled annually as planned for the 2025 routine monitoring, as they are either outside the historical plume, not influenced directly by the biosparge system, or too far downgradient to see any fluctuations within 6-12 months of shutdown.

Plant 3 – Transect A

The wells, location, and sampling frequency for Plant 2 Transect G shut down monitoring is summarized on **Table 2** and shown on **Figure 2**.

Table 2: Plant 3 Transect A Monitoring Location Summary

Well ID	Location	Type	Sampling Frequency
MW-13-22	Northern P3	Upgradient Weathered Bedrock	Pre-shut down and Quarterly
MW-12-21	Northern P3	Upgradient Deep Overburden	Pre-shut down and Quarterly
AS-19-A05	Transect A	Radius of Influence Weathered Bedrock	Pre-shut down and Quarterly
TW-15-11	Central P3	Near Downgradient Weathered Bedrock	Pre-shut down and Quarterly
PW-14-03	Central P3	Near Downgradient Weathered Bedrock	Pre-shut down and Quarterly
MW-13-29	Eastern P3	Downgradient Deep Overburden	Pre-shut down and Semi-annual

MW-13-23	Northeast P3	Upgradient/Side Gradient Deep Overburden	Annual
MW-13-28	Northern P3	Upgradient Bedrock	Annual
MW-13-34	Southeast P3	Far Downgradient Weathered Bedrock	Annual
MW-13-46	Southern P3	Far Downgradient/Side Gradient Weathered Bedrock	Annual
MW-13-47	Southeast P3	Far Downgradient Bedrock	Annual
MW-13-48	Southeast P3	Far Downgradient Deep Overburden	Annual
MW-91-6	Southern P3	Far Downgradient/Side Gradient Bedrock	Annual

In general, near upgradient, radius of influence, and near downgradient weathered bedrock wells will be monitored quarterly based on the historical data and the conceptual site model that indicates any potential fluctuations in 1,4-dioxane concentrations would be seen relatively quickly in these wells.

One additional biosparge performance monitoring well (MW-13-29) in the vicinity of Transect A will continue to be monitored semi-annually during the shutdown test. Based on the historical data and the conceptual site model, this well is at a distance far enough from Transect A that any changes in concentrations related to the shutdown will take longer than three months to observe.

The remaining locations will be sampled annually as planned for the 2025 routine monitoring, as they are either outside the historical plume, not influenced directly by the biosparge system, or too far downgradient to see any fluctuations within 6-12 months of shutdown.

Note that Transects B, E and F downgradient of Transect A will remain operational during the shutdown test and therefore there is little/no risk of offsite migration of groundwater associated with the shutdown test.

2 Restart Thresholds

The shutdown evaluation will be conducted in a manner that protects the short- and long-term objectives of the biosparge remedy, including preventing lateral migration of 1,4-dioxane offsite and preventing vertical migration to the underlying bedrock aquifer. The associated transects will be restarted immediately upon confirmation sampling that any of the following thresholds have been exceeded:

- Concentrations in weathered bedrock or deep overburden upgradient wells exceed their maximum historical concentrations.
- Concentrations in weathered bedrock or deep overburden ROI and near downgradient wells exceed pre-start up concentrations.
- For all other wells (not weathered bedrock or deep overburden upgradient, ROI or near downgradient):

- An increasing trend, defined as two consecutive increasing concentrations above the pre-shut down concentration (from the pre-shut down event or the most recent sample prior to shut down). Specifically, there will be a baseline sample collected prior to shut down. If the first sample collected after shutdown is above the baseline and the second sample collected after shutdown is higher than the first, that will be considered an increasing trend.
- Concentrations in any well that has historically been non-detect exceeds half the drinking water criteria of 3.6 µg/L.
- For any sample that triggers a restart, a confirmation sample will be collected within two weeks of receipt of data to confirm the result prior to restarting the system.

These thresholds were chosen to allow sufficient rebound for trend analysis, without sacrificing long-term progress. If no restart threshold is exceeded, the associated transects will remain off for a up to a 12-month period, at the end of which the data will be reviewed and recommendations will be made. These recommendations may include restarting portions of the system, continued shut down of portions of the system, shut down testing for additional portions of the system, and/or additional monitoring. A summary of the wells and their restart thresholds, as well as their locations in relation to the Transects and their proposed sampling frequency, are presented in **Table 3** and **Table 4** below.

Table 3: Plant 2 Transect G Monitoring Location Summary

Well ID	Location	Type	Sampling Frequency	Restart Threshold
MW-20-129	Central P2	Upgradient Weathered Bedrock	Quarterly	Max historical concentration of 140 µg/L
TW-14-02	Transect G	Radius of Influence Weathered Bedrock	Quarterly	Pre-start up concentration of 410 µg/L
MW-19-122	Central P2	Upgradient Weathered Bedrock	Quarterly	Max historical concentration of 43 µg/L
MW-19-123	Southern P2	Near Downgradient Weathered Bedrock	Quarterly	Pre-start up concentration of 75 µg/L
MW-16-74	Southern P2	Near Downgradient Weathered Bedrock	Semi-annual	Increasing Trend
MW-16-78	Southeastern P2	Downgradient Weathered Bedrock	Semi-annual	NA, Treated by Transect E

MW-19-121	Transect E	Radius of Influence Weathered Bedrock	Semi-annual	NA, Treated by Transect E
MW-12-01	Southwestern P2	Side Gradient Bedrock	Annual	>3.6 µg/L
MW-13-50	Southern P2	Far Downgradient Bedrock	Annual	>3.6 µg/L
MW-13-52	Southern P2	Far Downgradient Weathered Bedrock	Annual	>3.6 µg/L
MW-16-75	Southern P2	Downgradient Weathered Bedrock	Annual	Increasing Trend ¹
MW-16-76	Southwestern P2	Side Gradient Weathered Bedrock	Annual	Increasing Trend ¹
MW-16-77	Southwestern P2	Side Gradient Weathered Bedrock	Annual	Increasing Trend ¹

¹If the first sampling event following shut down is higher than the pre-shut down concentration, a second sampling event will be completed during the following semi-annual event to evaluate if an increasing trend is observed

Table 4: Plant 3 Transect A Monitoring Location Summary

Well ID	Location	Type	Sampling Frequency	Restart Threshold
MW-13-22	Northern P3	Upgradient Weathered Bedrock	Quarterly	Max historical concentration of 270 µg/L
MW-12-21	Northern P3	Upgradient Deep Overburden	Quarterly	Max historical concentration of 510 µg/L
AS-19-A05	Transect A	Radius of Influence Weathered Bedrock	Quarterly	Pre-start up concentration of 700 µg/L*
TW-15-11	Central P3	Near Downgradient Weathered Bedrock	Quarterly	Pre-start up concentration of 246 µg/L

PW-14-03	Central P3	Near Downgradient Weathered Bedrock	Quarterly	Pre-start up concentration of 223 µg/L
MW-13-29	Eastern P3	Downgradient Deep Overburden	Semi-annual	Increasing Trend
MW-13-23	Northeastern P3	Upgradient/Side Gradient Deep Overburden	Annual	Increasing Trend ¹
MW-13-28	Northern P3	Upgradient Bedrock	Annual	Increasing Trend ¹
MW-13-34	Southeastern P3	Far Downgradient Weathered Bedrock	Annual	Increasing Trend ¹
MW-13-46	Southern P3	Far Downgradient/Side Gradient Weathered Bedrock	Annual	>3.6 µg/L
MW-13-47	Southeastern P3	Far Downgradient Bedrock	Annual	Increasing Trend ¹
MW-13-48	Southeastern P3	Far Downgradient Deep Overburden	Annual	Increasing Trend ¹
MW-91-6	Southern P3	Far Downgradient/Side Gradient Bedrock	Annual	Increasing Trend ¹

* No pre-start up data is available from AS-19-05, therefore using pre-start up concentration from nearby TW-14-06, a ROI performance monitoring well that was abandoned due to casing leakage.

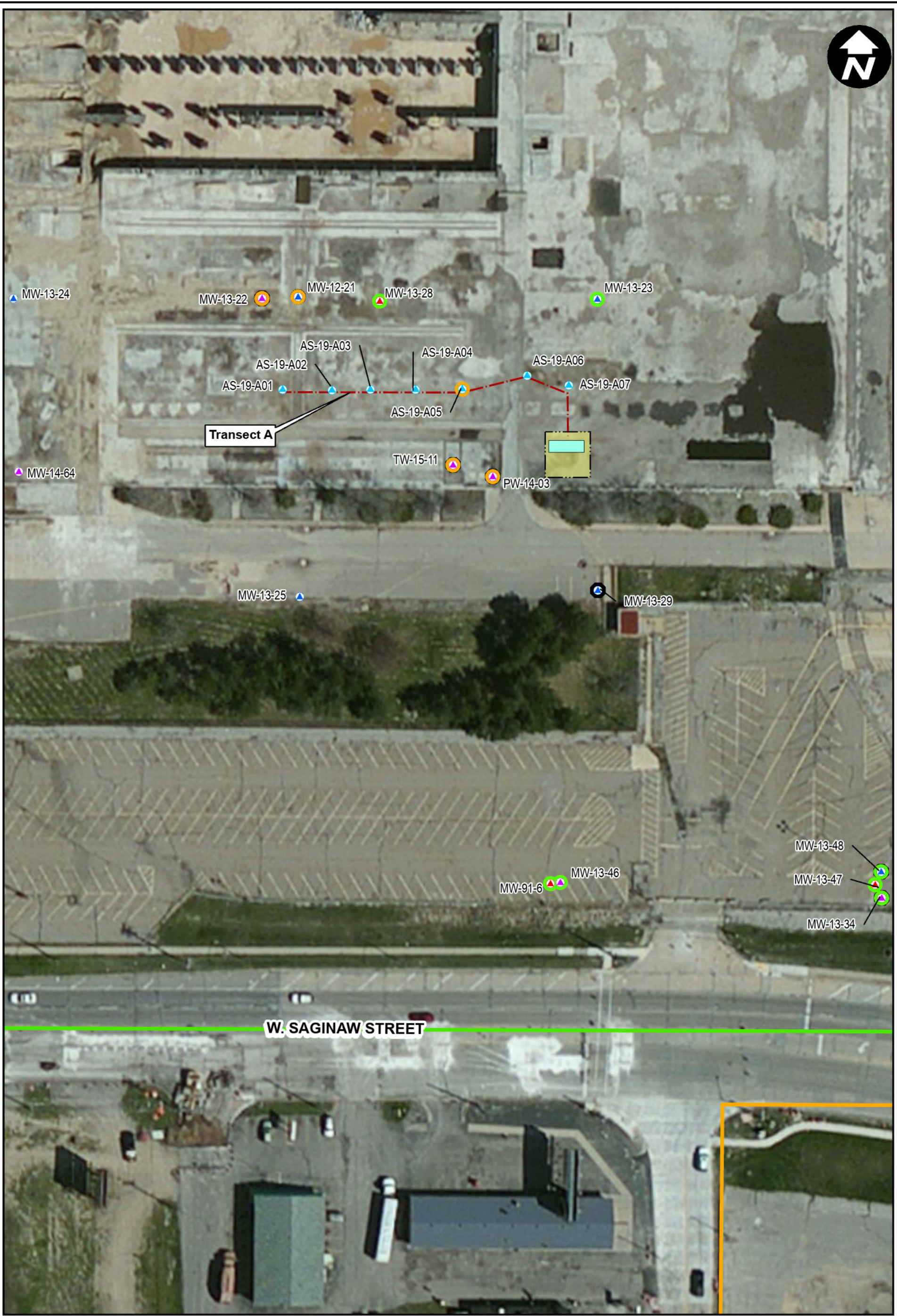
¹If the first sampling event following shut down is higher than the pre-shut down concentration, a second sampling event will be completed during the following semi-annual event to evaluate if an increasing trend is observed

3 Reporting

RACER will provide updates to EGLE during ongoing quarterly meetings as the shutdown test is being conducted. Data will be shared in these meetings with EGLE as it becomes available. If a restart threshold is exceeded and confirmed, the system will be restarted and a report will be submitted within 45 days of the receipt of the confirmation data. If no restart threshold is exceeded throughout the shutdown test, and Transects A and G remain off for 12-months, all data collected throughout the test and recommendations will be documented in a report submitted to EGLE. These recommendations may include restarting portions of the system, continued shut down of portions of the system, shut down testing for additional portions of the system, and/or additional monitoring. The report will be submitted within 45 days of the receipt of data for the last quarterly sampling event.

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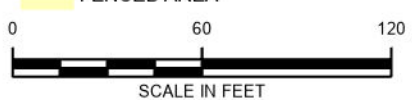
- Figure 1 Plant 2 Biosparge System and Shut Down Test Monitoring Plan
- Figure 2 Plant 3 Biosparge System and Shut Down Test Monitoring Plan



CITY: Novi DIV: ENV PIC: J. BARRETT PM: R. CHRISTENSEN TM: A. LORENZ TR: P. CURRY PROJECT NUMBER: B0064479:2019 COORDINATE SYSTEM: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl
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LEGEND:

- BIOSPARGE
- DEEP OVERBURDEN MONITORING WELL
- WEATHERED BEDROCK MONITORING WELL
- BEDROCK MONITORING WELL
- BIOSPARGE/IGMP SEMI-ANNUAL PERFORMANCE MONITORING WELL
- BIOSPARGE QUARTERLY PERFORMANCE MONITORING WELL
- IGMP ANNUAL MONITORING WELL
- 1-INCH CONVEYANCE HOSE
- SYSTEM BUILDING
- FENCE
- FENCED AREA
- PLANT 2
- PLANT 3



RACER TRUST PLANTS 2, 3 & 6 LANSING, MICHIGAN	
PLANT 3 BIOSPARGE SYSTEM AND SHUT DOWN TEST MONITORING PLAN	
	FIGURE 2