Assessment of Corrective Measures

DTE Electric Company
River Rouge Power Plant Bottom Ash Basin
Coal Combustion Residual Unit

1 Belanger Park Drive
River Rouge, Michigan

April 15, 2019

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Prepared For
DTE Electric Company

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Executive Summary

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the River Rouge Power Plant (RRPP) Bottom Ash Basin (BAB). In accordance with the schedule defined in 40 CFR 257.90(b)(1), a groundwater monitoring system has been installed around the RRPP BAB as required by 40 CFR 257.91, and background groundwater monitoring well sampling has been completed as required by 40 CFR 257.93.

As documented in the January 31, 2018 *Annual Groundwater Monitoring Report for the River Rouge Power Plant*, covering calendar year 2017 activities, DTE Electric Company (DTE Electric) noted that boron, fluoride, and pH were observed within groundwater at one or more downgradient monitoring wells with statistically significant increases (SSIs) above background limits. Therefore, DTE Electric initiated an assessment monitoring program for the RRPP BAB CCR unit pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix IV.

DTE Electric proactively constructed and has been operating a groundwater collection system since March 2, 2018 to mitigate any potential risk of migration of any water from the BAB. The installed collection system controls groundwater flow within the vicinity of the RRPP BAB CCR unit, and groundwater is now directed inward toward the extraction wells. As such, all monitoring wells that were located hydraulically upgradient or downgradient of the RRPP BAB prior to the collection system installation are within the capture zone of the operating groundwater collection system. DTE Electric will continue to operate this groundwater collection system while we proceed with the prescribed steps per the CCR Rule to follow the assessment of corrective measures process as described within this report.

As detailed in the *2018 Annual Groundwater Monitoring Report, DTE Electric Company, River Rouge Power Plant, Bottom Ash Basin Coal Combustion Residual Unit* dated January 2019 (2018 Annual Report), statistically significant groundwater concentrations were reported above the groundwater protection standards (GWPSs) for arsenic and/or lithium Appendix IV constituents during the 2018 assessment monitoring events. According to §257.95(g)(3), in the event that the facility determines, pursuant to §257.93(h), that a result is reported above GWPSs for one or more of the Appendix IV constituents, the facility will, within 90 days of performing the statistical analysis, initiate an Assessment of Corrective Measures (ACM) to prevent further releases, to remediate any releases, and to restore affected area to original conditions. The ACM must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances.

On behalf of DTE Electric, TRC has prepared this ACM to evaluate the effectiveness of potential corrective measures in meeting the requirements and objectives of the remedy specified in §257.96, including protectiveness of human health and the environment, achievement of the GWPS, and source control.

As documented in the October 17, 2016 *Initial Written Closure Plan for a CCR Impoundment - DTE Energy River Rouge Power Plant Ash Basin* submitted in accordance with §257.102(b), DTE Electric proposes to close the RRPP BAB by CCR removal and offsite disposal including decontamination of the unit and backfilling/surface grading to restore the former BAB area to pre-operation conditions. CCR removal and off-site disposal is considered a conservative and viable source material management option for the site, offering a high level of long-term performance and reliability.

As mentioned above, DTE Electric is proactively managing the potential groundwater migration pathway at RRPP BAB CCR unit using an installed groundwater extraction system around the RRPP BAB as an interim measure. DTE Electric will continue to operate this system until such time that CCR source materials are removed, risk of migration of CCR constituents from the RRPP BAB CCR unit to receptors is effectively mitigated and source control and monitoring can be demonstrated to effectively prevent migration of CCR constituents to the Rouge River above actionable cleanup levels. The remedy for RRPP BAB source materials and for addressing affected groundwater will be formally selected per §257.97 after the public meeting required under §257.96(e) is held.

Section 1
Introduction

1.1 Site Overview and Description of CCR Units

The DTE Electric Company (DTE Electric) River Rouge Power Plant (RRPP) is located at 1 Belanger Park Drive, within the City of River Rouge in Wayne County, Michigan. The RRPP, including the Bottom Ash Basin (BAB) Coal Combustion Residual (CCR) unit, was originally constructed in the early 1950s on the southern shore of the Rouge River Short Cut Canal and along the west bank of the Detroit River in River Rouge, Michigan. The BAB located immediately north of the RRPP and south of the Rouge River Short Cut Canal, is a physical sedimentation basin and has received sluiced bottom ash and other process effluent from the RRPP throughout its operational life.

The RRPP BAB is a sedimentation basin that is an incised CCR surface impoundment. In 1998, sheet piling was placed around the perimeter of the open excavation impoundment and the sheets were pushed to a depth of approximately 30 feet below ground surface (ft bgs) into native clay soil. Sluiced ash from the power plant is first pumped to two decanting hydrobin structures; the decanted sluiced ash water gravity drains to the eastern end of the BAB where it combines with other process flow effluent pumped from the power plant. Discharge water from the BAB over tops an overflow weir and flows into a weir box structure before draining to a below-grade pump station on the west side of the BAB.

The pump station contains two sets of centrifugal pumps; one set of pumps recirculates the sluice water back into the plant and the other set of pumps discharges the sluice water to a surface water outfall in the overflow canal with other site storm and process water effluent authorized via a National Pollution Discharge Elimination System (NPDES) permit and/or to the combined sewer to the Wayne County Downriver Wastewater Treatment Plant (WWTP). Settled CCR materials that escape the hydrobin ash separation process are periodically dredged from the basin and disposed offsite.

DTE Electric is proactively managing the potential groundwater migration pathway at the RRPP BAB CCR unit using a groundwater extraction system consisting of 11 groundwater extraction wells installed around the RRPP BAB as an interim measure. The groundwater extraction system was constructed during January and February 2018, began operation in early March 2018, and is currently operational and effectively capturing the affected groundwater in the vicinity of the RRPP BAB.

1.2 Regulatory Background

On April 17, 2015, the United States Environmental Protection Agency (USEPA) published the final rule for the regulation and management of CCR under the Resource Conservation and Recovery Act (RCRA) (the CCR Rule), as amended July 30, 2018. The CCR Rule, which became effective on October 19, 2015 (amendment effective August 29, 2018), applies to the RRPP BAB. In accordance with the schedule defined in 40 CFR 257.90(b)(1), a groundwater monitoring system has been installed around the RRPP BAB as required by 40 CFR 257.91, and background groundwater monitoring well sampling has been completed as required by 40 CFR 257.93.

As documented in the January 31, 2018 *Annual Groundwater Monitoring Report for the River Rouge Power Plant*, covering calendar year 2017 activities, DTE Electric noted that boron, fluoride, and pH were observed within groundwater at one or more downgradient monitoring wells with statistically significant increases (SSIs) above background limits. Therefore, in April 2018, DTE Electric initiated an assessment monitoring program for the RRPP BAB CCR unit pursuant to §257.95 of the CCR Rule that included sampling and analyzing groundwater within the groundwater monitoring system for all constituents listed in Appendix IV.

The results from the assessment monitoring's initial sampling event were used to establish groundwater protection standards (GWPSs) for the Appendix IV constituents in accordance with §257.95(h), as presented in the October 15, 2018 *Assessment Monitoring Data Summary and Statistical Evaluation*. After the initial assessment monitoring sampling event, the monitoring system was sampled for the Appendix III and Appendix IV constituents in May 2018 (within 90 days from the initial Appendix IV sampling event) and in October 2018. Assessment monitoring data that was collected and evaluated in 2018 are presented in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019).

Results were reported above GWPSs for arsenic and lithium in one or more downgradient wells during the initial assessment monitoring event for the groundwater samples collected in May 2018, and for arsenic in one downgradient well during the subsequent assessment monitoring event for the groundwater samples collected in October 2018. DTE Electric placed a notification of the initial assessment monitoring event exceedance into the operating record on November 14, 2018 as required in §257.95(g) and within the timeframe required by §257.105(h)(8). Nature and extent groundwater sampling defined the extent of the potential release of CCR to be well within the groundwater capture zone of the proactively constructed groundwater collection system that has been operated as an interim remedy since March 2, 2018 to mitigate any potential risk of migration of any groundwater from the area of the RRPP BAB.

According to §257.95(g)(3), in the event that the facility determines, pursuant to §257.93(h), that a result is reported above GWPSs for one or more of the Appendix IV constituents, the facility will, within 90 days of performing the statistical analysis, initiate an assessment of corrective measures to prevent further releases, to remediate any releases, and to restore affected area to original conditions. The assessment of corrective measures must be completed within 90 days, unless the owner or operator demonstrates the need for additional time to complete the assessment of corrective measures due to site-specific conditions or circumstances.

Although DTE Electric proceeded with initiating assessment of corrective measures per the CCR Rule by January 14, 2019, as noted above, DTE Electric has been proactively managing the potential migration pathway. As stated above, DTE Electric's initially-selected management strategy is to operate a groundwater extraction system to mitigate any risk of migration of CCR constituents from the RRPP BAB to groundwater. This system was constructed during January and February 2018, began operation in early March 2018, is currently operational, and is effectively capturing CCR-affected groundwater in the vicinity of the RRPP BAB.

1.3 Assessment of Corrective Measures Objectives

On behalf of DTE Electric, TRC has prepared this Assessment of Corrective Measures (ACM) to evaluate the effectiveness of potential corrective measures in meeting the requirements and objectives of the remedy specified in §257.96, including protectiveness of human health and the environment, achievement of the GWPS, and source control. A remedy shall be formally selected upon completion of this assessment. The ACM is an analysis of the effectiveness of potential corrective measures and addresses the following factors:

- The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
- The time required to begin and complete the remedy; and
- The institutional requirements, such as state or local permit requirements or other requirements that may affect implementation of the remedy.

The ACM will be considered completed when it is placed in the facility's operating record as required by §257.105(h)(10).

Section 2
Hydrogeology/Current Conditions

2.1 Geologic/Hydrogeologic Setting

The RRPP BAB CCR unit is located immediately adjacent to the Rouge River near the intersection of the Rouge River and Detroit River (Figure 1). The BAB is constructed with steel sheet pile walls that extend to a depth of approximately 30 ft (approximately 5 ft into an underlying silty-clay confining unit). Soils surrounding the RRPP CCR unit consist of approximately 10 feet of surficial fill of various composition (gravel, sand, silt and clay, brick and/or concrete fragments). The fill is partially saturated in some areas, but is not continuously saturated across the RRPP, does not represent a significant, usable source of water, and is, therefore, not an aquifer. An organic layer is often encountered beneath the surficial fill that is then underlain by a silt/clay-rich unit that ranges from 3 to about 8 feet in thickness near the BAB. Beneath the silt/clay-rich unit, there is a saturated sand and gravel unit that often coarsens from sand to gravel with depth. This coarse-grained sand and gravel unit is present from as shallow as 15 ft bgs to as deep as 25.5 ft bgs. This same coarse-grained unit is observed in most of the historical boring logs across the RRPP and appears to be a relatively continuous unit across the RRPP. Based on this information, this coarse-grained sand and gravel unit represents the uppermost aquifer present at the RRPP BAB CCR unit.

The coarse-grained sand and gravel uppermost aquifer is underlain by more than a 60-foot-thick contiguous silty clay-rich deposit that serves as a natural lower confining hydraulic barrier that isolates the uppermost aquifer from the underlying Dundee limestone that represents the next lower potential aquifer. Therefore, there is no hydraulic connection between the uppermost aquifer and the underlying Dundee limestone, and groundwater within the limestone is artesian.

2.2 Environmental Setting and Monitoring Network

A groundwater monitoring system has been established for the RRPP BAB CCR unit as detailed in the *Groundwater Monitoring System Summary Report – DTE Electric Company River Rouge Power Plant Bottom Ash Basin Coal Combustion Residual Unit* (GWMS Report) (TRC, October 2017). The monitoring well network for the BAB CCR unit currently consists of five monitoring wells that are screened in the uppermost aquifer. The monitoring well locations are shown on Figure 2. Monitoring wells MW-17-06 and MW-17-07 are located south-southwest of the RRPP BAB and provide data on background groundwater quality that has not been affected by the CCR unit (total of two background wells). Monitoring wells MW-16-01 through MW-16-03 are located north-northeast, downgradient of the RRPP BAB CCR unit under non-pumping conditions (total of three downgradient monitoring wells).

As shown on Figure 2, monitoring well MW-16-04S is used for water level measurements only. MW-16-04S had originally been installed as a potential background monitoring well; however, based on concentrations of several Appendix III parameters, the proximity of the well to the BAB and the hydrogeology of the area, monitoring well MW-16-04S does not appear to be representative of background groundwater conditions; therefore, this well was excluded from the background monitoring network. As such, in June 2017, two additional monitoring wells (MW-17-06 and MW-17-07) were installed in the uppermost aquifer further upgradient on the southwest side of the RRPP main building for use as background wells (Figure 2).

Eleven groundwater recovery wells were installed as part of the interim measures groundwater extraction system (Figure 2) to prevent the migration of CCR constituents in groundwater toward the Rouge River. Additional monitoring wells were added to evaluate the groundwater extraction system groundwater capture in the uppermost aquifer. Although operation of the groundwater extraction system has changed groundwater flow significantly near the RRPP BAB CCR unit, the three downgradient monitoring wells (MW-16-01 through MW-16-03) are appropriately positioned to evaluate groundwater quality in the vicinity of the RRPP BAB CCR unit. However, while the groundwater extraction system is operational, inward hydraulic gradients are maintained toward the extraction wells and the RRPP BAB CCR unit, and monitoring wells MW-16-01 through MW-16-03 are no longer immediately downgradient from the RRPP BAB CCR unit. Rather, they are on the upgradient edge of the groundwater capture zone on the downgradient side of the RRPP BAB CCR unit adjacent to the Rouge River. Potentiometric groundwater surface depictions for the uppermost aquifer for pre and post extraction system operation are shown on Figure 3 (September 2017), Figure 4 (April 2018), and Figure 5 (October 2018).

2.3 On-Site Groundwater Flow Conditions

Historically, a definitive groundwater flow direction to the northeast with an average gradient of 0.00067 foot/foot (using data from June 2016 through September 2017) within the uppermost aquifer is evident around the RRPP BAB CCR unit, with potential groundwater flow rates within the uppermost aquifer ranging from approximately 5.8 to 73 feet/year. A representative historic potentiometric groundwater surface (from September 2017) for the uppermost aquifer is displayed on Figure 3.

Due to the installation and continuous operation of the interim measures groundwater extraction system since March 2, 2018, the current groundwater flow regime is significantly different from pre-groundwater extraction system installation/operation monitoring events. The extraction wells surrounding the BAB maintain an inward hydraulic gradient that extends to the edge of the river thus maintaining hydraulic capture of the potentially CCR-affected groundwater. The groundwater capture zone within the uppermost aquifer extends beyond all CCR groundwater monitoring system wells, except for background monitoring well MW-17-07 (Figure 5). Additionally, there is an eastern groundwater flow component on the southeast edge of the site toward the Detroit River (from MW-17-07 to the Detroit River).

2.4 Nature and Extent of Environmental Impacts

2.4.1 Potential Extent of CCR Source Materials

The RRPP BAB was originally installed as an open excavation concurrent with power plant construction in the 1950s and has received sluiced bottom ash generated from coal combustion processes during plant operations for nearly 70 years. The excavation was maintained with 2H:1V side slopes with periodic dredging operations performed to remove the settled CCR materials. In 1998, sheet pile walls were installed around the perimeter of the BAB to a depth of 30 ft below ground surface (bgs) and were supported with sheet pile tie-backs installed approximately 15 ft laterally from the wall. After sheet pile wall installation, the design specification for construction called for the basin bottom to be excavated/dredged to an elevation of 560 ft (approximately 19 ft bgs).

Periodically throughout the operation of the BAB, settled bottom ash has been dredged from the basin and hauled to Sibley Quarry for final disposition. Some CCR may reside outside the confines of the current BAB as a result of the original sheet pile construction efforts and potentially due to the original layout of the BAB prior to the sheet piling in 1998. This material will be removed during removal of CCR.

2.4.2 Characterization of Groundwater

Establishing Groundwater Protection Standards

In accordance with §257.95(h) and the Stats Plan for the site, groundwater protection standards (GWPSs) were established for the Appendix IV indicator parameters following the preliminary assessment monitoring event using nine rounds of data collected from the background monitoring wells MW-17-06 and MW-17-07 (July 2017 through April 2018). The calculation of the GWPSs is documented in the *Assessment Monitoring Data Summary and Statistical Evaluation* (Initial Assessment Monitoring Statistical Evaluation Memo) (TRC, October 2018a). GWPSs are established as the higher of the USEPA Maximum Contaminant Level (MCL) or statistically derived background level for constituents with MCLs, and the higher of the USEPA Regional Screening Levels (RSLs) or background level for constituents with RSLs. The Appendix IV GWPSs are used to determine whether groundwater has been impacted from the RRPP BAB CCR unit by statistically comparing concentrations in the assessment monitoring wells to their respective GWPS for each Appendix IV indicator parameter.

Initial Assessment Monitoring Statistical Evaluation (May 2018)

Following the initial and subsequent assessment monitoring sampling events (April and May 2018), the compliance well groundwater concentrations for Appendix IV parameters were compared to the GWPSs to determine if a statistically significant exceedance had occurred in accordance with §257.93. Consistent with the *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance* (Unified Guidance) (USEPA, 2009), the preferred method for comparisons to a fixed standard are confidence limits. An exceedance of the standard occurs when the 99 percent lower confidence level of the downgradient data exceeds the GWPS. Confidence intervals were established per the statistical methods detailed in the *Assessment Monitoring Statistical Evaluation* technical memorandum for the May 2018 assessment monitoring event (TRC, October 2018b).

For each detected constituent, the concentrations for each well were first compared directly to the GWPS. Parameter-well combinations that included a direct exceedance of the GWPS were retained for further statistical analysis using confidence limits as detailed in the *Assessment Monitoring Statistical Evaluation* (TRC, October 2018b). The calculated upper and lower confidence limits and comparison of the lower confidence limits to the GWPSs are provided in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019).

The statistical evaluation of the May 2018 Appendix IV indicator parameters showed statistical exceedances of the GWPSs for:

- Arsenic at MW-16-01; and
- Lithium at MW-16-01 and MW-16-02.

There were no exceedances compared to background for the remaining Appendix IV indicator parameters during the initial May 2018 assessment monitoring event.

DTE Electric placed a notification of the statistical exceedances into the operating record on November 14, 2018 as required in §257.95(g) and within the timeframe required by §257.105(h)(8). In addition, as required in §257.95(g)(1), nature and extent groundwater sampling was conducted as detailed in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019).

Data Comparison to Background Limits – Second Semiannual Event (October 2018)

Given the timing of the GWPS calculations by October 15, 2018 (TRC, October 2018a) and the semiannual sampling schedule, the second semiannual sampling event was performed in October 2018, concurrent with the initial assessment monitoring statistical evaluation and subsequent next steps related to the initial exceedances of the GWPSs. Statistical analysis for the second semiannual monitoring event was performed using the same approach as the initial assessment monitoring statistical evaluation as discussed in the *October 2018 Appendix IV Assessment Monitoring Statistical Evaluation* (TRC, January 2019). The calculated upper and lower confidence limits and comparison of the lower confidence limits to the GWPSs for the October 2018 event are provided in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019).

The statistical evaluation of the October 2018 Appendix IV indicator parameters showed continued results above GWPSs for:

- Arsenic at MW-16-01

There were no other results reported above GWPSs for the remaining Appendix IV indicator parameters.

Nature and Extent Groundwater Sampling

Per §257.95(g)(1), in the event that the facility determines, pursuant to §257.93(h), that there is a statistical exceedance of the GWPSs for one or more of the Appendix IV constituents, the facility must characterize the nature and extent of the release of CCR as well as any site conditions that may affect the remedy selected. As such, nature and extent groundwater sampling was completed on October 15 and 16, 2018, by TRC personnel from monitoring wells previously installed in conjunction with the installation of the presumptive remedy and/or other existing site monitoring wells.

Groundwater elevation data were collected at all site monitoring wells shown on Figure 5. Groundwater samples were collected at monitoring wells MW-16-04S, MW-17-05, MW-17-13 through MW-17-15, MW-17-18, and MW-17-20. The nature and extent groundwater sampling defined the extent of CCR affected groundwater as presented in the *2018 Annual Groundwater Monitoring Report* (TRC, January 2019).

2.5 Potential Receptors and Exposure Pathways

Surface water bodies present in the area of the RRPP include the Rouge River (dredged bottom depth of 20.5 feet below river surface; 557 feet mean sea level [MSL]), and the Detroit River (bottom depth of approximately 43 feet below river surface; 534.5 feet MSL). Given the depth to the uppermost aquifer sand and gravel unit, there is a potential hydraulic connection between the uppermost aquifer and the adjacent surface water.

Concentrations of arsenic and lithium above the GWPSs were observed in monitoring wells MW-16-01, MW-16-02, MW-17-14, and MW-17-15. These monitoring wells are all located well within the hydraulic capture zone of the groundwater extraction system as shown on Figure 5. Concentrations of the Appendix IV indicator parameters were below the GWPSs in other wells located farther away from the RRPP BAB CCR unit (e.g., MW-16-04S, MW-17-05, MW-17-13, MW-17-18, and MW-17-20), delineating the extent of the potential CCR groundwater release to be well within the capture zone of the groundwater extraction system that has been operational since March 2, 2018. Therefore, as long as the interim measures groundwater extraction system is in operation there is no potential for affected groundwater to migrate off site. In addition, all the land that overlies the potentially affected groundwater is owned by DTE Electric and there are no water supply wells located at the RRPP property.

Section 3
Identification and Assessment of Remedial Options to Develop Corrective Measure Alternatives

3.1 CCR Source Material Management Technologies

In order to remediate potential impacts of CCR source materials, the following list of viable CCR source material management technologies has been assembled and will be further assessed and reviewed herein and compared to a No Action alternative:

1. *In Situ* Management (e.g., capping);
2. Source Removal (with on-site or off-site landfilling, or reuse)

3.1.1 No Action

A source management strategy of no action involves making no efforts to contain or remove the CCR as it currently exists (or as it will exist at the end of the useful life of the BAB). CCR would be left in the basin without a cover or additional containment. A strategy of no action was not considered due to its ineffectiveness of reducing potential exposures to the CCR material or potential migration of CCR material beyond the confines of the BAB.

3.1.2 *In Situ* Management (Capping)

In situ management is completed by achieving the CCR rule cleanup requirements while leaving the CCR materials in place. A protective cap is a potential option to achieve closure in place. The CCR source materials would be left in the BAB and confined by the sheet pile walls and clay bottom. Any CCR material identified outside the confines of the sheet pile walls would be excavated and deposited within the basin limits to confine the CCR material for long-term on-site management. Certified clean fill material would be placed atop any left-in-place CCR material, and a protective cover or cap would be installed at ground surface to contain the CCR, minimize or eliminate infiltration into the former basin, and to prevent the contained materials from migrating or affecting groundwater. The protective cover is often composed of a high-density polyethylene (HDPE) geomembrane liner and a layer of seeded topsoil. This protective cover would serve to isolate the CCR and to minimize the potential for migration of constituents. Groundwater monitoring and cap maintenance would take place regularly for at least

30 years after closure. These required monitoring and maintenance activities represent a significant long term liability for the site as well as an ongoing potential risk for release of contaminants from the closed unit to the environment. Additionally, because of the in-place closure, the future land use in the area of the closed unit would be restricted.

3.1.3 Removal (With Off-Site Landfilling or Beneficial Reuse)

Source removal would be completed by excavating the CCR source material from its current location and transporting to a contained location offsite for disposal (or reuse). The limits of excavation would include the visible CCR within the confines of the sheet pile walls and clay base, removal of sheet piling (and any sheet pile support structures), and removal of any CCR materials identified outside the confines of the sheet piling to ensure that all CCR is removed. Following removal, the excavation cavity would be backfilled to grade with certified clean fill material and covered with a layer of seeded topsoil. Because all CCR material would be removed, no ongoing cap maintenance would be required.

As documented in the October 17, 2016 *Initial Written Closure Plan for a CCR Impoundment - DTE Energy River Rouge Power Plant Ash Basin* submitted in accordance with §257.102(b), DTE Electric intends to close the RRPP BAB by CCR removal and offsite disposal including decontamination of the unit and backfilling/surface grading to restore the former BAB area.

3.2 CCR – Impacted Groundwater Management Technologies

In order to remediate CCR-impacted groundwater, the following list of viable management technologies has been assembled and will be further assessed and reviewed herein:

1. Source Control and Monitoring with Institutional Site Controls (based on applicable regulatory framework);
2. Groundwater Capture/Extraction;
3. Impermeable Barrier (sheet pile or slurry wall) with Strategically-located Groundwater Capture/Extraction; and
4. Permeable Reactive Barrier (PRB) Wall to retard contaminant movement.

Each of these technology options for the site are described in the following subsections and evaluated in Section 4 relative to anticipated effectiveness of the potential corrective measure in meeting the requirements and objectives of the remedy as described under §257.96.

3.2.1 Source Control with Monitoring and Institutional Controls

Source control with monitoring relies on physical, chemical, and/or biological *in situ* processes to act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of constituents in the subsurface environment. A source control and monitoring approach will work best at sites where contaminant source areas have been effectively removed or remediated, and any residual constituents are separated from any nearby receptors by a sufficient time of groundwater travel (affected by distance, permeability, and/or hydraulic gradient) such that any naturally-occurring *in situ* remediation process may effectively eliminate the potential for the contaminant to reach the receptor at concentrations above applicable criteria.

3.2.2 Groundwater Capture

Groundwater capture approaches are utilized to reduce the mobility of constituents of concern (COCs) by preventing groundwater from migrating offsite and/or to surface water receptors. Capture of groundwater is accomplished via installation of a groundwater extraction well network screened within water bearing zones or with recovery trenches used to intercept groundwater flow. System components for an extraction management strategy typically include extraction points, pumps, electrical feed, well vaults, flow meters, and other miscellaneous appurtenances, and a discharge option for extracted groundwater.

3.2.3 Impermeable Barrier with Strategically-Located Groundwater Capture

To reduce the number of wells required to maintain COC capture, an impermeable barrier consisting of a sheet pile or slurry containment wall could be placed to minimize COC migration from the BAB. A slurry wall is a mixture of soil, water and bentonite clay that is poured into trenches to create an impermeable vertical wall. A sheet pile wall consists of driven rigid materials (pilings) into the ground to form an impermeable barrier. Groundwater recover wells, installed at strategic locations in coordination with the barrier, would extract groundwater to prevent the migration of groundwater around the installed barrier. As stated in Subsection 3.2.2, the groundwater extraction system would include extraction points, pumps, electrical feed, well vaults, flow meters, and other miscellaneous appurtenances, and a discharge option for extracted groundwater.

3.2.4 Permeable Barrier

PRB is a wall of a designed reactive material constructed *in situ* in the path of groundwater flow. A PRB uses materials that destroy or enhance the degradation of the constituents or trap the constituents through adsorption or precipitation. The PRB is permeable and therefore allows the treated groundwater to flow through. PRBs are typically installed between the contaminant source and the point(s) of compliance. PRBs are generally installed in a line perpendicular to the ground water flow direction using conventional trenching techniques. The reactive amendment is blended into the trench to form a continuous, flow-through barrier across the plume. The permeability of the installed PRB is targeted to be higher than the native aquifer materials so that the flow through the wall is not impeded at the time of installation or throughout the wall's operational life.

Section 4
Analysis and Comparison of Corrective Measure Alternatives

4.1 CCR Source Material Management

As documented in the October 17, 2016 *Initial Written Closure Plan for a CCR Impoundment - DTE Energy River Rouge Power Plant Ash Basin* submitted in accordance with §257.102(b), DTE Electric intends to close the RRPP BAB by CCR removal and offsite disposal including decontamination of the unit and backfilling/surface grading to restore the former BAB area. CCR removal and off-site disposal is considered a conservative and viable source material management option for the site, offering a high level of long-term performance and reliability.

4.2 Groundwater Management Technologies

4.2.1 Balancing Criteria for Groundwater Corrective Measures

The evaluation process, contained herein, will generally consist of a weighted comparison of each alternative based on the benefits and drawbacks of each option, considering factors such as the following:

- Risk reduction, including:
  - Magnitude of reduction of existing risks;
  - Magnitude of residual risks; and
  - Short term risks;
- Long term management required;
- Time to full protection;
- Potential receptor exposure to remaining wastes;
- Long-term reliability; and
- Potential need for replacement.

The selected corrective measures will be based on the balance between these various criteria for each alternative, rather than basing the corrective measure selection on only one of the criteria (e.g., reliability).

Groundwater management technologies identified in Section 3 are evaluated in the following subsections.

4.2.2 Source Control and Monitoring and Institutional Controls

Source control and monitoring relies on physical, chemical, and/or biological *in situ* processes to act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of constituents in the subsurface environment. This approach works best at sites where contaminant source areas have been effectively removed or remediated, and any residual constituents are separated from any nearby receptors by a sufficient groundwater time of travel (affected by distance, permeability, and/or hydraulic gradient) such that any naturally-occurring *in situ* remediation process may effectively eliminate the potential for the contaminant to reach the receptor at concentrations above the applicable criteria. Source control and monitoring generally offers an advantage over other options considered in that no active remediation system requires installation or maintenance.

> ***Performance:*** In the case of the RRPP's BAB, the contributing source of COCs in groundwater will remain present until the basin is decommissioned. However, the interim groundwater extraction system mitigates this potential. Due to the proximity of the BAB to the nearby receptor (Rouge River; within 75 feet of the BAB) and the presence of COCs in groundwater surface water interface (GSI) monitoring wells above generic GSI criteria, it is not expected for source control and monitoring to effectively reduce existing COC concentrations prior to groundwater venting at the Rouge River without continued operation of the existing interim measures groundwater extraction system. However, once site conditions change due to discontinued operation of the BAB and/or after CCR source removal from the BAB occurs, the performance of source control and monitoring as a viable alternative for CCR constituents in groundwater will be reassessed.
>
> ***Reliability:*** Under current site conditions and without operation of the groundwater extraction system, COC concentrations in groundwater had potential to migrate to and vent to surface water adjacent to the site suggesting that continued groundwater monitoring would not be a reliable alternative for groundwater management. However, once site conditions change due to discontinued operation of the BAB and/or after source removal from the BAB occurs, source control and monitoring, as a groundwater management strategy, will be reassessed to determine whether COC concentrations in groundwater will be effectively attenuated before venting to nearby surface water.
>
> ***Ease of Implementation:*** The existing CCR monitoring well network was effectively designed and installed and is adequate to assess the groundwater

conditions at the site currently and in the future. Therefore, source control and monitoring would require limited effort for its implementation.

From an annual effort perspective, the current monitoring program would be performed as required on a quarterly, semi-annual, or annual basis each calendar year until it can be demonstrated that any CCR contaminant concentrations in groundwater are not reaching any downgradient receptors above applicable criteria. Ongoing groundwater sampling will include laboratory analyses for a minimum of total arsenic, boron, and lithium.

Safety Impacts: Groundwater monitoring under a source control and monitoring approach would have limited safety concerns when compared to other groundwater management technologies considered.

Cross-Media Impacts: Groundwater monitoring activities under a source control and monitoring approach would have no greater impact to air, surrounding surface water, or surrounding soils when compared to other groundwater management technologies considered.

Control of Exposure to Residual Contamination: Prior to implementation of the groundwater extraction system at the site, constituents were migrating toward the Rouge and Detroit Rivers above actionable levels. Once site conditions change due to discontinued operation of the BAB and/or after source removal from the BAB, source control and monitoring, as a groundwater management strategy for this site will be reassessed to determine if source control and monitoring has potential to reduce COC concentrations in groundwater to below actionable levels. Exposure to CCR-impacted groundwater by site workers during sampling would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Time Required to begin and complete: When technically viable, source control and monitoring generally offers a low-cost alternative for site remediation, as minimal capital costs are required for its implementation, and no carbon footprint occurs except for energy usages during site monitoring activities. source control and monitoring could be quickly initiated utilizing the existing well network and ongoing monitoring costs would be incurred on an annual basis. until site closure may be granted. For the RRPP BAB CCR unit, source control and monitoring could be implemented concurrent with shutdown of the interim measures groundwater extraction system. If at any time during the subsequent source control and monitoring demonstration period, an unacceptable exposure of a COC by a sensitive receptor becomes apparent, the idled groundwater extraction system could be restarted to effectively reestablish hydraulic control in the RRPP BAB CCR unit.

Institutional Requirements: Monitoring groundwater on site adjacent to the BAB unit will require the impacted area to be demarcated and defined within the property deed as a restricted use area. All the land that overlies the potentially affected groundwater is owned by DTE Electric. As noted above, monitoring of groundwater conditions in the vicinity of the closed unit will be potentially required until it can be demonstrated that groundwater concentrations are not reaching sensitive receptors above actionable levels.

4.2.3 Groundwater Capture

A groundwater extraction system, if designed, installed, operated, and maintained appropriately in conjunction with source removal will offer an effective remediation solution for the site (as currently demonstrated by on-going operations of the interim measures groundwater extraction system). Using installed piezometers and monitoring wells in proximity to the extraction system, hydraulic capture (before venting to the Rouge River) can be demonstrated. Additionally, since the RRPP has ability to reuse the BAB decant water, extracted groundwater will be managed and discharged with the RRPP facility water under the RRPP NPDES permit.

Groundwater extraction can be accomplished using wells screened within water bearing zones (as with the existing interim measures groundwater extraction system) or with recovery trenches. Necessary system components for an extraction management strategy include extraction points, pumps, electrical feed, well vaults, flow meters, and other miscellaneous appurtenances.

Due to the expected complexity of trench construction near the Rouge River and BAB, capital costs associated with a trench construction would likely surpass costs expected of an equally effective groundwater extraction well system. An extraction well system was chosen for the installed interim measure at the site.

Design and operation of a system shall consider COC migration control, potential changes in oxidation state within water bearing zones that could cause unwanted scale formation in well screens and/or extraction equipment, or the introduction of facultative bacteria within the water bearing zone causing unwanted biogrowth that could affect rates of extraction, or in the case of arsenic, increased solubility and mobilization due to the creation of a more reduced aquifer condition. A routine system inspection and maintenance program would be required to maximize groundwater recovery rates while minimizing system downtime resulting from chemical and/or biological activity.

Prior to implementation of the interim measures groundwater extraction system, groundwater pump tests were performed on wells installed both north and south of the BAB to determine the connectivity of the uppermost aquifer with the Rouge River and extraction rate requirements. The results of these pump tests were used in full-scale system design.

Performance: Groundwater extraction wells or a groundwater recovery trench with strategically-located wells would both achieve adequate groundwater capture at a reasonable extraction rate and therefore will be capable of effectively preventing COC migration before the COCs may vent to the Rouge River. The potential for unintended biological or chemical changes that may occur in extraction well screens, extraction trench collection drains, and associated piping systems due to increased aeration, introduction of soil bacteria to deeper well screen or trench drain areas, and/or changes in certain water quality parameters (pH, temperature, redox, etc.) may negatively affect long-term performance.

Reliability: If properly installed, operated, and maintained, groundwater capture will offer an effective and reliable remediation solution for the site when compared to other alternatives; however, a groundwater extraction system will rely on power consumption in order to continuously capture and contain groundwater to prevent groundwater from discharging at the Rouge River. Interruption of power for any extended period would render the system ineffective.

Ease of Implementation: Installation of vertical extraction wells proximal to the BAB would not be hampered due to spatial limitations and therefore were chosen for the interim measures groundwater extraction system. A groundwater recovery trench would offer more construction challenges than a system consisting only of vertical wells due to the position of the BAB, position of sheet pile hold-back ties, and the position of the Rouge River relative to the layout of a trench. Also, because of limited ground surface space between the BAB and the Rouge River, storage of large volumes of trench backfill in the vicinity of the trench may also affect the practicality of trench construction. Additionally, since the recovered groundwater may be effectively reused by the facility in its industrial operations, the recovered groundwater is pumped into the BAB for reuse. Because only low recovery well extraction rates have been needed for capture of COCs by way of the interim measures groundwater extraction system, discharge into the BAB is not causing BAB capacity concerns. Due to the large groundwater extraction rate necessary from a recovery trench to maintain COC capture (due to the potential large influx of water from the Rouge River), the facility's reuse rate of the BAB water would need to be more closely scrutinized so that a BAB water balance issue does not develop, particularly during periods of low water reuse by the power plant.

Safety Impacts: Installation and operation of a groundwater capture system would have comparable safety concerns to the implementation of other groundwater management technologies considered. Construction efforts, including drilling, excavation, and electrical installation would expose site workers to general site construction safety concerns. Safety impacts to site workers during operation and maintenance activities would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Cross-Media Impacts: Groundwater capture activities would have no greater impact to air, surrounding surface water, or surrounding soils when compared to other groundwater management technologies considered.

Control of Exposure to Residual Contamination: Migration of constituents toward the Rouge and Detroit Rivers are currently being prevented by implementing the interim measures groundwater capture system. Exposure to CCR-impacted groundwater by site workers during operation of the system would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Time Required to begin and complete: DTE Electric's existing interim corrective measure management strategy for addressing groundwater is to operate a groundwater extraction system to mitigate any risk of migration from the RRPP BAB to receptors. This system was constructed during January and February 2018, began operation in early March 2018, is currently operational and is effectively capturing groundwater in the vicinity of the RRPP BAB. It is expected that this interim measure groundwater extraction system will continue to be operated in coordination with CCR source material removal until such time that the system may be idled, and a source control and monitoring approach can be implemented.

Institutional Requirements: Groundwater capture on site adjacent to the BAB unit will require the impacted area to be demarcated and defined within the property deed as a restricted use area. All the land that overlies the potentially affected groundwater is owned by DTE Electric.

Interim Measures Selection: As stated in Section 2.2 and detailed in the above-detailed option screening criteria, an interim measures groundwater extraction system consisting of 11 groundwater extraction wells was installed in early 2018. Prior to design and installation, a groundwater pumping test was performed to estimate the groundwater withdrawal rates for the groundwater extraction system to maintain hydraulic capture around the BAB and to prevent migration of CCR constituents to off-site surface water bodies (e.g., Rouge and Detroit Rivers). Since startup, groundwater has been extracted consistently and continuously from the groundwater extraction system at a combined rate of approximately 40 to 50 gallons per minute (gpm) and groundwater hydraulic capture has been maintained in the RRPP BAB CCR unit. Performance of this interim measures groundwater extraction system will continue to be assessed as a long-term groundwater management strategy through its ongoing operations at the site.

4.2.4 Impermeable Barrier Wall with Strategic Groundwater Extraction

An impermeable barrier wall, constructed of either sheet pile or slurry, could be installed to restrict the groundwater flow paths directly from the BAB to the Rouge River. The impermeable wall would need to be installed into the clay confining unit underlying the uppermost groundwater aquifer at the site. However, because these flow paths are simply diverted, extraction wells located at each edge of the wall would be required to capture/contain this diverted groundwater. The wall would serve the purpose of reducing the total number of extraction points deemed necessary at the expense of installing the barrier wall without complete elimination of ongoing operational costs.

Performance: An impermeable barrier will effectively minimize the movement of COCs directly toward the Rouge River from the BAB. Although unexpected, there is potential for some leakage through the wall at construction joints in the case of a sheet pile wall. Also, groundwater will move around the ends of the impermeable wall and will discharge to the Rouge River; wells would be installed to control this groundwater movement.

Reliability: If properly installed, operated, and maintained, an impermeable wall with strategic groundwater extraction would offer an effective and reliable remediation solution for the site when compared to other alternatives. Interruption of power or if long-term well/pump maintenance affects well capture performance, migration of COCs around the wall and toward the Rouge River may be exacerbated due to the increased gradient around the wall. Ongoing maintenance and pump/well rehabilitation is expected but the relative magnitude of these efforts should be less than the groundwater capture approach described in Section 5.2.2 as there would be fewer extraction points to be maintained.

Ease of Implementation: Similar to the construction of a groundwater recovery trench, installation of a sheet pile or slurry wall would take up considerable space between the BAB and the Rouge River, and the limited space in this area, particularly due to the presence of extraction wells installed as part of the interim measures groundwater extraction system, may make the installation more challenging. Depending on installer preferences, there may be a need to remove trees and other vegetation along the riverbank to enlarge the work area. Both wall types, but more notably for the slurry wall, may prevent vehicular traffic atop the wall following its installation.

Safety Impacts: Installation of an impermeable barrier system would have additional safety concerns compared to other groundwater management technologies considered. Construction efforts, including drilling, excavation, sheet pile or slurry wall install, and electrical installation would expose site workers to general site construction safety concerns. Safety impacts to site workers during operation and maintenance activities would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Cross-Media Impacts: Ambient air could be impacted during the installation of a slurry wall, if installed via excavation. Long-term impacts to site soils, groundwater, and nearby surface water would be minimal using this technology.

Control of Exposure to Residual Contamination: Migration of constituents toward the Rouge and Detroit Rivers would be prevented by implementing an impermeable barrier with strategic groundwater capture approach. Exposure to CCR source materials and CCR-impacted groundwater by site workers during installation and operation of the system would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Time Required to begin and complete: Installation of the sheet pile or slurry walls combined with groundwater extraction would have considerably longer construction duration when compared to other options considered.

Long-term maintenance and monitoring of the extraction system would still be required, consistent with other technologies; however, it is anticipated that pursuing groundwater extraction would require a shorter duration to achieve full protection when compared to source control and monitoring, if implemented in coordination with CCR source material removal.

Institutional Requirements: An impermeable barrier with strategic groundwater capture system installed on site adjacent to the BAB unit will require all impacted areas to be demarcated and defined within the property deed as a restricted use area. All the land that overlies the potentially affected groundwater and location of an impermeable barrier is owned by DTE Electric.

4.2.5 Permeable Reactive Barrier (PRB) Wall

A PRB offers a remediation option for select COCs with no active operational costs other than periodic performance monitoring once installed. However, remediation of other COCs may not be equally effective, and therefore such COCs may pass through the PRB without treatment prior to discharge. Although the PRB offers a relatively low-cost remedial alternative, long term performance cannot be guaranteed, and wall failure would not be easily repaired without considerable reconstruction efforts.

Specific for site COCs, the pH and redox conditions in the subsurface environment will control the solubility of arsenic into groundwater. In low pH and oxidized aquifer conditions, dissolved arsenic resides in a low solubility oxidized ionic state [As5+]. At high pH and reduced aquifer conditions, dissolved arsenic resides in a higher solubility reduced ionic state [As3+]. The presence of organic carbon and aerobic bacteria will also impact the concentration of arsenic in groundwater; both tend to create reduced groundwater conditions, thereby increasing the solubility/mobility of arsenic in the subsurface.

Ferric (oxidized) iron and zero-valent (reduced) iron (ZVI) have been demonstrated to be effective in the removal of arsenic in groundwater by way of adsorption onto the iron surfaces. Once adsorbed, the [As5+] and [As3+] ions will form complexes with iron corrosion products including ferrous hydroxide and ferric oxyhydroxides, and then become occluded by successive layers of corrosion products.

To address arsenic in the uppermost aquifer, the PRB could be constructed using ZVI (with sulfide and organic carbon amendments to sustain the reduced environmental condition in this zone).

Arsenic removal by reactive in situ chemistry has been implemented in pilot and full-scale field installations; however, to be sure of its success and exact construction specifications, the proposed PRB would require an extensive bench treatability study for this site, if a PRB wall was to be implemented.

Lithium is an additional site COC that may be attributable to the historical BAB operations. Lithium treatment by ZVI is undocumented in literature, and therefore *in situ* treatment with ZVI is not expected.

Performance: A PRB wall has potential to control the migration of arsenic in groundwater to the Rouge River. Bench-scale treatment tests would be justified to confirm the overall treatment capability of the wall based on the specific site groundwater conditions and the necessary wall thickness to achieve the targeted treatment capacity (efficiency). Also, because of particle surface occlusion caused by the adsorption of arsenic-iron complexes, there is potential for treatment to become less effective over time; in a worst-case situation, PRB removal and reconstruction could be required prior to project completion.

The PRB will offer less to no certainty toward the control of lithium migration.

Reliability: Since no active pumping would be required in a PRB wall application, the permeable reactive barrier wall would be more reliable to operate than other proposed options. However, a constructed reactive permeable wall has potential to either plug (due to chemical precipitation) or become deactivated (due to chemical reaction and/or binding onto particle surfaces), and therefore, wall replacement in the future could be required.

Lithium, due to the chemical nature of this element, is not expected to be treated with the ZVI wall, and therefore this technology may not be a viable solution for lithium.

Ease of Implementation: PRB wall construction would be performed similarly to slurry wall construction but with different materials of construction. Similar to the slurry wall, the PRB wall construction may be challenging because of the limited space available for installation equipment, trench spoils, and temporary trench materials storage. To be fully passive, a portion of the reactive barrier wall would need to be constructed on the west side of the BAB, further complicating the installation efforts.

Safety Impacts: Installation of a PRB would have similar safety concerns compared to installation of an impermeable slurry wall. Construction efforts, including excavation and PRB installation trenching would expose site workers to general site construction safety concerns. Safety impacts to site workers during operation and maintenance activities would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Cross-Media Impacts: Ambient air could be impacted during the installation of a PRB, if installed via excavation. Long-term impacts to site soils, groundwater, and nearby surface water would be minimal using this technology.

Control of Exposure to Residual Contamination: Long term performance of a PRB for preventing migration of constituents toward the Rouge and Detroit Rivers cannot be easily predicted. Remediation of lithium has not been shown to be as equally effective as arsenic treatment, and therefore lithium may pass through the PRB without treatment prior to discharge at the Rouge River.

Exposure to CCR source materials and CCR-impacted groundwater by site workers during installation and operation of a PRB would be effectively controlled through safe work practices and the use of personal protective equipment (PPE).

Time Required to begin and complete: PRB wall construction would be compare similarly to slurry wall construction in duration, but with different materials of construction.

Long-term monitoring would be required each operating year to verify performance, and if breakthrough of COC occurs. Wall replacement in the future could be required if breakthrough is observed. Compared to other technologies, it is anticipated that a PRB would require a longer duration to achieve full protection as it lacks active pumping. If implemented in coordination with CCR source material removal, the duration to complete groundwater remediation may be reduced.

Institutional Requirements: A PRB installed on site adjacent to the BAB unit will require all impacted areas to be demarcated and defined within the property deed as a restricted use area. All the land that overlies the potentially affected groundwater and location of a PRB is owned by DTE Electric.

Section 5
Corrective Measure Alternatives Evaluation Summary

5.1 CCR Source Material Management

As documented in the October 17, 2016 *Initial Written Closure Plan for a CCR Impoundment - DTE Energy River Rouge Power Plant Ash Basin* submitted in accordance with §257.102(b), DTE Electric intends to close the RRPP BAB by CCR removal and offsite disposal including decontamination of the unit and backfilling/surface grading to restore the former BAB area to pre-operation conditions. The remedy will be formally selected per §257.97 after the public meeting required under §257.96(e) is held. CCR removal and off-site disposal is considered the most conservative and viable source material management option for the site, offering a high level of long-term performance and reliability.

Specific closure operations presuming the RRPP CCR unit BAB is closed through CCR removal are expected to involve: (i) CCR removal by excavation of the bottom ash pond, (ii) removal or decontamination of any areas affected by releases of CCR, (iii) demolition/abandonment of associated non-earthen features, and (iv) regrading to final desired grades using borrow soil for fill, as needed. In accordance with 257.102(b)(3), the initial written closure plan is based on the best information currently available and will be amended to provide additional details after the final engineering design for the closure by removal is completed.

5.2 Groundwater Management

DTE Electric is proactively managing the potential groundwater migration pathway at RRPP BAB CCR unit using an installed groundwater extraction system around the RRPP BAB. This system was constructed during January and February 2018, began operation in early March 2018, and effectively captures groundwater in the vicinity of the RRPP BAB CCR unit eliminating the potential for Appendix III and Appendix IV parameters to migrate off-site from the RRPP BAB CCR unit. DTE Electric will continue to operate this system until such time that CCR source materials are removed, and the potential for migration of CCR constituents from the RRPP BAB CCR unit are mitigated and source control and monitoring can be demonstrated to effectively prevent long-term migration of CCR constituents to the Rouge River above applicable cleanup levels.

The remedy for RRPP BAB source materials and for addressing affected groundwater will be formally selected per §257.97 after the public meeting required under §257.96(e) is held.

Section 6
Report Certification

I, the undersigned Michigan Professional Engineer, hereby certify that I am familiar with the technical requirements of Title 40 Code of Federal Regulations Part 257 Subpart D (§257). I also certify that it is my professional opinion that, to the best of my knowledge, information, and belief, that the information in this demonstration is in accordance with current good and accepted engineering practice(s) and standard(s) and meets the requirements of §257.96.

For the purpose of this document, "certify" and "certification" shall be interpreted and construed to be a "statement of professional opinion." The certification is understood and intended to be an expression of my professional opinion as a Michigan Licensed Professional Engineer, based upon knowledge, information, and belief. The statement(s) of professional opinion are not and shall not be interpreted or construed to be a guarantee or a warranty of the analysis herein.

Name	License Expiration Date	Stamp
David B. McKenzie, P.E.	October 31, 2019	State of Michigan David B. McKenzie Engineer No. 42332 Licensed Professional Engineer
Company	Date	
TRC Engineers Michigan, Inc.	April 15, 2019	

Section 7
References

DTE Electric Company. October 17, 2016. Closure Plan for Existing CCR Surface Impoundment Per 40 CFR 257.102(b) – DTE Energy River Rouge Power Plant Ash Basin, 1 Belanger Park Dr., River Rouge, MI 48218.

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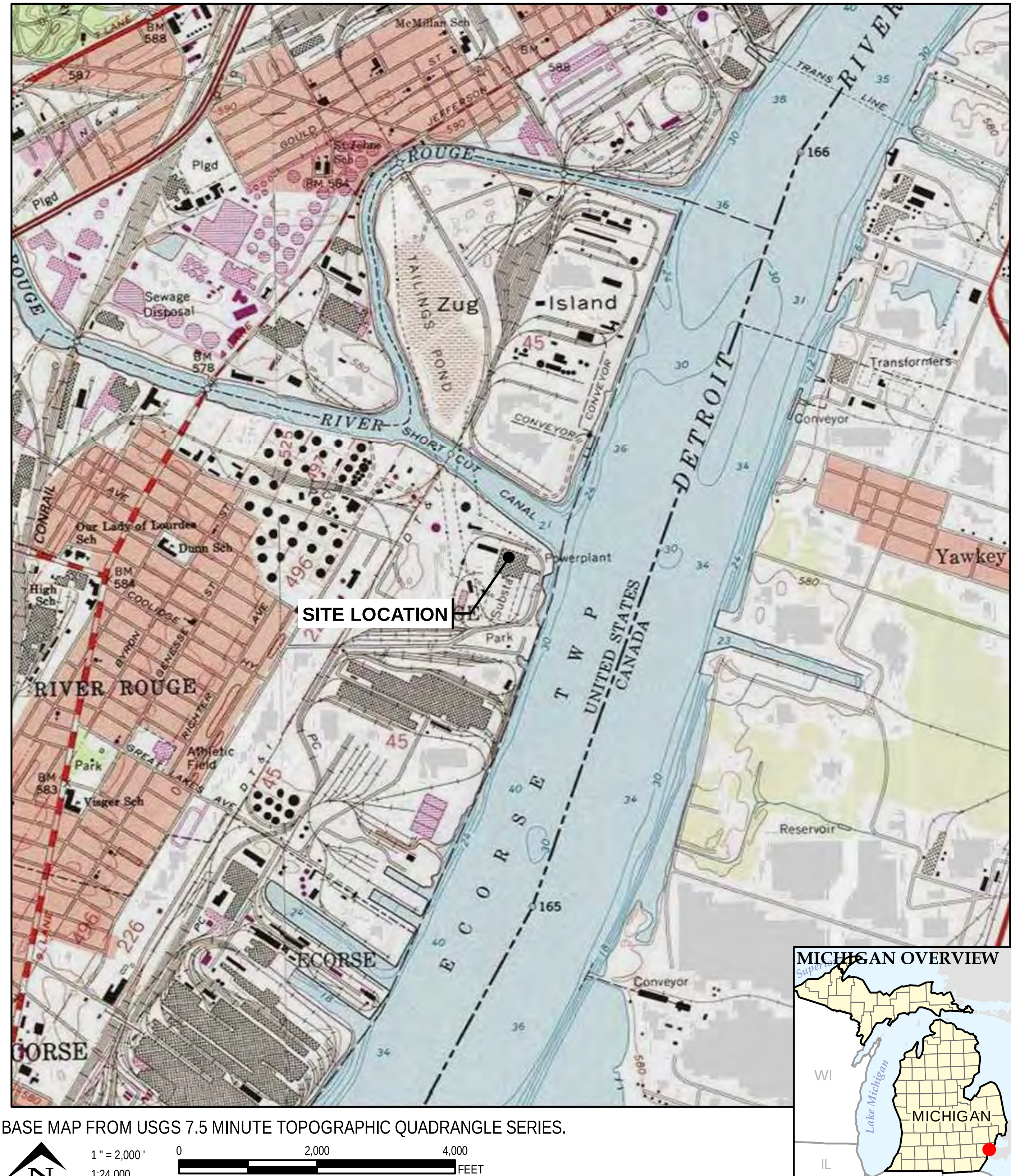
USEPA. July 2018. 40 CFR Part 257. Hazardous and Solid Waste Management System: Disposal of Coal Combustion Residuals From Electric Utilities; Amendments to the National Minimum Criteria (Phase One, Part One); Final Rule. 83 Federal Register 146 (July 30, 2018), pp. 36435-36456 (83 FR 36435).

Figures



BASE MAP FROM USGS 7.5 MINUTE TOPOGRAPHIC QUADRANGLE SERIES.

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1 " = 2,000 '
1:24,000

0 2,000 4,000 FEET

TRC

1540 Eisenhower Place
Ann Arbor, MI 48108-3284
Phone: 734.971.7080

TRC - GIS

PROJECT:

DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:

SITE LOCATION MAP

DRAWN BY:	J. PAPEZ
CHECKED BY:	S HOLMSTROM
APPROVED BY:	V. BUENING
DATE:	OCTOBER 2017
PROJ. NO.:	265996.0005
FILE:	265996-SLMMB.mxd

FIGURE 1

LEGEND

- DOWNGRADIENT MONITORING WELLS
- MONITORING WELLS (STATIC WATER LEVEL ONLY)
- BACKGROUND MONITORING WELL
- MONITORING POINT
- EXTRACTION WELL

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.

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1 " = 300 '
1:3,600

PROJECT:
DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:
MONITORING NETWORK AND SITE PLAN

DRAWN BY:	B. DEEGAN	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		**FIGURE 2**
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2019		

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FILE NO.: 265996-0005-030.mxd

TRC - GIS

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Plot Date: 1/2/2019, 16:16:10 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-030.mxd

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- GROUNDWATER CONTOUR (.25' INTERVAL, DASHED WHERE INFERRED)
- (575.25) ELEVATION FT (NAVD 88)
- INFERRED GROUNDWATER FLOW DIRECTION

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION NOT GROUNDWATER ELEVATION.

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1 " = 300 '

1:3,600

PROJECT:

DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:

GROUNDWATER POTENTIOMETRIC SURFACE MAP SEPTEMBER 2017

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING	**FIGURE 3**	
DATE:	JANUARY 2018		

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FILE NO.: 265996-0005-025.mxd

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Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-025.mxd

LEGEND

- MONITORING POINT
- UPPERMOST AQUIFER MONITORING WELLS
- BEDROCK MONITORING WELL
- EXTRACTION WELL
- GROUNDWATER CONTOUR (1' INTERVAL, DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION
- (575.25) ELEVATION FT (NAVD 88)

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION NOT GROUNDWATER ELEVATION.

N

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1 " = 300 '

1:3,600

PROJECT:

DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:

GROUNDWATER POTENTIOMETRIC SURFACE MAP
APRIL 2018

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		
APPROVED BY:	V. BUENING		**FIGURE 4**
DATE:	JANUARY 2019		

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FILE NO.: 265996-0005-028.mxd

TRC - GIS

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Plot Date: 1/2/2019, 16:28:34 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
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LEGEND

- COMPLIANCE WELLS
- MONITORING POINT
- NATURE AND EXTENT WELLS
- EXTRACTION WELL
- GROUNDWATER CONTOUR (2' INTERVAL, DASHED WHERE INFERRED)
- INFERRED GROUNDWATER FLOW DIRECTION
- (575.25) ELEVATION FT (NAVD 88)

NOTES

1. BASE MAP IMAGERY FROM ESRI/MICROSOFT, "WORLD IMAGERY", WEB BASEMAP SERVICE LAYER.
2. WELL LOCATIONS SURVEYED BY BMJ ENGINEERS AND SURVEYORS INC. IN JUNE 2016 & JUNE 2017.
3. GROUNDWATER ELEVATIONS DISPLAYED IN FEET RELATIVE TO NORTH AMERICAN VERTICAL DATUM OF 1988.
4. ELEVATION REPRESENTATIVE OF BOTTOM ASH BASIN SURFACE WATER ELEVATION NOT GROUNDWATER ELEVATION.

N

0 300 600 Feet

1 " = 300 '

1:3,600

PROJECT:

DTE ELECTRIC COMPANY
RIVER ROUGE POWER PLANT BOTTOM ASH BASIN
1 BELANGER PARK DRIVE
RIVER ROUGE, MICHIGAN

TITLE:

GROUNDWATER POTENTIOMETRIC SURFACE MAP
OCTOBER 2018

DRAWN BY:	S. MAJOR	PROJ NO.:	265996.0005.0000
CHECKED BY:	C. SCIESZKA		**FIGURE 5**
APPROVED BY:	V. BUENING		
DATE:	JANUARY 2019		

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FILE NO.: 265996-0005-032.mxd

TRC - GIS

Coordinate System: NAD 1983 StatePlane Michigan South FIPS 2113 Feet Intl (Foot)
Map Rotation: 0

Plot Date: 1/28/2019, 15:23:42 PM by SMAJOR -- LAYOUT: ANSI B(11"x17")
Path: E:\DTE\CCR_Sites\2017_265996\265996-0005-032.mxd