ASSESSMENT OF CORRECTIVE MEASURES REPORT

San Miguel Electric Cooperative, Inc.
Christine, Atascosa County, Texas

Issued: 11 September 2019

Prepared for: San Miguel Electric Cooperative, Inc.

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GSI
ENVIRONMENTAL

ASSESSMENT OF CORRECTIVE MEASURES REPORT

San Miguel Electric Cooperative, Inc.
Christine, Atascosa County, Texas

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TABLE OF CONTENTS

Tables

Figures

1.0 INTRODUCTION

GSI Environmental Inc. (GSI) has prepared this Assessment of Corrective Measures (ACM) Report on behalf of San Miguel Electric Cooperative, Inc. (San Miguel). The purpose of this ACM Report is to evaluate and compare possible remedies that could be used to address potential groundwater impacts at the San Miguel Electric Plant (the San Miguel Plant or Plant) located near Christine, Atascosa County, Texas.

The Plant has three units used for the ongoing management of Coal Combustion Residuals (CCR) and that are subject to requirements in 40 Code of Federal Regulations (CFR) Part 257, Subpart D (herein, "the CCR Rule"): two surface impoundments (Ash Ponds and Equalization Pond) and one landfill (Ash Pile) (Figure 1). Based on the results of ongoing groundwater monitoring at the Plant, groundwater quality is impacted by the Ash Ponds and the Equalization Pond. Specifically, one or more Appendix IV constituents are present in groundwater downgradient of these impoundments at concentrations representing a statistically significant increase (SSI) above applicable groundwater protection standards (GWPS).

This ACM Report was prepared in accordance with the requirements specified under § 257.96 of the CCR Rule. This Report considers monitoring and assessment data collected through August 2019.

The objective of this ACM Report is to identify and evaluate potential corrective measures to address the groundwater impacts observed downgradient of the Equalization Pond and Ash Ponds, according to the following requirements outlined in § 257.96(c) of the CCR Rule:

1. 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;

2. The time required to begin and complete the remedy; and

3. The institutional requirements, such as state or local permit requirements or other environmental or public health requirements that may substantially affect implementation of the remedy(s).

This ACM Report serves as the initial step in developing a corrective action plan at the Plant. As mentioned above, and pursuant to § 257.95(g)(1) of the CCR Rule, San Miguel is currently performing environmental investigations to characterize the nature and extent of the groundwater impacts originating from the CCR units. Results from these ongoing investigations, together with the findings of this ACM Report and public input, will guide selection and implementation of the final remedy according to § 257.97 and § 257.98 of the CCR Rule.

2.0 SITE BACKGROUND & CURRENT CONDITIONS

2.1 Site Overview

The San Miguel Plant is located in south-central Atascosa County in Christine, Texas. Surrounding land use include the San Miquel Lignite Mine, reclaimed mine areas, and a cattle ranch (herein, the Peeler Ranch). The Plant produces 391 net megawatts of electricity across 42 South Texas counties, enough to power 78,000 homes during peak demand.

The Plant has three units used for the ongoing management of CCR that are subject to CCR Rule requirements: two surface impoundments (Ash Ponds and Equalization Pond) and one landfill (Ash Pile) (Figure 1):

Equalization Pond: The Equalization Pond is located on the eastern boundary of the Plant property and is a bermed impoundment; its western berm is shared with a freshwater storage pond. The Equalization Pond receives flue gas desulfurization scrubber wastewater (a spent limestone slurry) and treated sewage wastewater from the San Miguel Plant.

Ash Ponds: Ash Water Transport Ponds A and B (Ash Ponds) are located along the southern boundary of the site and east of the Yard Drainage Retention Pond. The Ash Ponds are bermed impoundments, with the northern (uphill) berm at or near natural grade. The two Ash Ponds are separated by a central ‘splitter-dike,’ with Ash Pond A on the north and Ash Pond B on the south. There is a connecting weir between the two ponds. The Ash Ponds receive bottom ash transport water, boiler blowdown, cooling tower blowdown, boiler feedwater treatment wastewater, and also stormwater runoff from a limited portion of the site. In addition, the Ash Ponds receive wastewater from the Equalization Pond as needed to manage the water level in the Equalization Pond, and periodic makeup water from the Yard Drainage Retention Pond.

Ash Pile: The Ash Pile is located northwest of the Plant and east of the Lignite Storage Pile, and has an area of approximately one acre. CCR materials are collected from the Ash Pile, typically on a daily basis, and predominantly transported to mine areas undergoing reclamation.

2.2 Conceptual Site Model

2.2.1 Geology & Hydrogeology

Shallow geologic units at the San Miguel Plant consist of unconsolidated Eocene age sediments of the Jackson Group, with Quaternary alluvium present along surface drainages. The Jackson Group sediments typically comprise surficial and shallow stiff clays overlying a shallow silty to clayey water-bearing sand. This sand, which is generally continuous across the Plant site, is designated as “Unit 22.” Unit 22 meets the definition of an “uppermost aquifer” at the Plant site based on the CCR Rules (§ 257.53), and is therefore the focus of San Miguel’s groundwater monitoring under the CCR Rules and of this ACM process.

Unit 22 is a green-gray fine-grained sand unit. In the immediate Plant area, the upper contact of Unit 22 varies from 5 to 30 ft below ground surface (bgs) and has a thickness ranging from 5 to 25 ft. Unit 22 overlies a layer of clay with an observed thickness of at least 30 ft in most locations. Unit 22 locally dips to the southeast at approximately 45 feet per mile, and so becomes considerably deeper as one moves farther from the Plant. More detailed descriptions of these surficial units are available in the Geologic Atlas of Texas (Crystal City-Eagle Pass Sheet, Bureau of Economic Geology, 1976).

2.2.2 Hydrologic Setting

The Plant is located on a topographic high located northeast of the confluence of multiple small streams. Souse Creek runs along the southern and eastern plant boundaries, and is joined by Caballitos Creek and other unnamed streams before flowing to the northeast to join La Parita Creek.

Groundwater within the uppermost aquifer generally flows to the east across the site (Figure 2). A hydrologic high in the northwest corner of the site, however, causes a localized south and southwesterly groundwater flow component in the western portion of the Plant. Groundwater exists under semi-confined conditions, with depth to the potentiometric surface in monitoring wells varying from 1.4 to 75.4 ft bgs based on the August 2019 static water level survey. The average hydraulic gradient encountered on the plant property in August 2019 was 0.008 ft/ft, as measured between well pairs SP-6/EP-37 and SP-34/AP-31.

2.2.3 Potential Receptors

Based on a search for water supply wells in the immediate vicinity of the Plant performed by GSI (GSI, 2019c), there is no evidence that there is any public or private use of Unit 22 for water supply.

There are multiple local water supply wells owned and operated by San Miguel and on the Peeler Ranch. Based on current information, however, all of these wells utilize the Carrizo Sands, which is an aquifer present at depths of greater than 3000 ft bgs in the vicinity of the Plant. Given the difference in depth between the Carrizo Sands and Unit 22, and the presence of several thick confining zones between the two sand strata, there is no reasonable potential for groundwater in Unit 22 to have affected the quality of the locally used groundwater.

All of the identified water supply wells in the vicinity of the Plant are approximately 0.5 miles or more from the Plant boundary, with the exception of a San Miguel well on the Plant itself. This Plant well is also the only identified public water supply well in the area, and is completed in the Carrizo Sands at a reported depth of 3625 ft bgs.

There are no residential areas in the vicinity of the Plant, with the exception of the Peeler Ranch headquarters, which includes some limited employee housing, and is located approximately 0.5 miles to the north of the Plant. Based on current data, this would be unlikely to be reached by any groundwater impacts from CCR units at the Plant (Figure 2).

There is currently no evidence to suggest that Unit 22 impacts may be communicating with surface water or otherwise be potentially affecting ecologic receptors. If the current groundwater investigations identify any such communication, then this information will be incorporated into the ACM and remedy selection process.

In summary, GSI has not identified any complete exposure pathways to the Unit 22 groundwater impacts under investigation.

2.3 Groundwater Monitoring

The groundwater monitoring well network at the San Miguel Plant consists of 31 monitoring wells installed between July 2015 and October 2016 (AECOM, 2018; ERM, 2017) (Figure 1). The well network consists of: nine monitoring wells for the Equalization Pond, 11 monitoring wells for the Ash Ponds, five monitoring wells for the Ash Pile, and six groundwater observation wells. The wells are screened in Unit 22 and located upgradient and downgradient of the three CCR units (Equalization Pond, Ash Ponds, and Ash Pile). Pursuant to § 257.91(c)(1) of the CCR Rule, each CCR unit has a minimum of one upgradient and three downgradient wells.

Pursuant to § 257.94 and § 257.95 of the CCR Rule, semi-annual detection and/or assessment monitoring continues to be conducted at the CCR units. Previous groundwater monitoring activities are described further in the 2018 Annual Groundwater Monitoring Report (GSI, 2019a). Recent assessment monitoring has identified groundwater impacts by two of the three CCR units: the Ash Ponds and the Equalization Pond. Groundwater concentrations of Appendix IV constituents were observed at levels that represented a statistically significant increase above GWPS in areas south of the Ash Ponds and southeast and east of the Equalization Pond. This is consistent with the general direction of groundwater flow beneath these CCR units.

A statistical evaluation of the 2018 groundwater data was prepared by Power Engineers, Inc. (Power) (Power, 2019). Pursuant to § 257.95(d)(2) and (h) of the CCR Rule, background Upper Tolerance Limits and GWPS were established for Appendix IV constituents for the Equalization Pond and Ash Ponds (Power, 2019). Statistically significant increases (SSIs) above the GWPS were identified at several downgradient wells at the Equalization Pond and Ash Ponds (Power, 2019). Power identified the following SSIs based on sampling results through September 2018:

- Ash Ponds – Mercury at AP-32, AP-33, AP-34, and AP-35
- Ash Ponds – Radium 226 & 228 at AP-32, AP-33, and AP-35
- Equalization Pond – Radium 226 & 228 at EP-34
- Equalization Pond – Lithium at EP-36 and -37

An alternative source demonstration (ASD) report was issued on 15 April 2019 (GSI, 2019b). Findings of the ASD concluded that lithium concentrations vary naturally in groundwater beneath the San Miguel Plant, and that this range of concentrations is consistent with or higher than those concentrations observed in monitoring wells downgradient of the Equalization Pond. When this variation in upgradient lithium concentrations is considered, then concentrations observed in downgradient wells no longer constitute an SSI above GWPS for lithium. The remaining SSIs for mercury and radium 226 & 228, however, continue to be evaluated based on recent groundwater monitoring activities.

2.4 Supplemental Groundwater Investigation

Pursuant to § 257.95(g)(1) of the CCR Rule, GSI is currently investigating the nature and extent of groundwater impacts downgradient of the Ash Ponds and Equalization Pond. The initial phase of the groundwater investigation was conducted in April 2019. During this event, ten temporary wells were installed and sampled in the area immediately surrounding the Plant (Figures 1 and 2). This investigation was a screening effort, intended to evaluate the presence and extent of impacts downgradient of the Plant.

Based on the findings of the initial phase, 21 permanent Unit 22 monitoring wells were installed in the areas surrounding the Plant (Figure 1). Although sampling and analytical work is still in progress, preliminary findings suggest that groundwater impacts from CCR Units are likely generally localized to the vicinity of the Plant. As additional data from this work become available, these findings will be incorporated into the remedy selection process.

3.0 GROUNDWATER CORRECTIVE MEASURES ALTERNATIVES

3.1 Objectives of Groundwater Corrective Measures

The CCR Rule, as well as relevant USEPA guidance (e.g., USEPA, 1994, 2016), provide information on the criteria that should be used to evaluate, compare, and select one or more remedies for implementation. Specifically, sections § 257.96(c) and § 257.97(b) and (c) of the CCR Rule list requirements and evaluation criteria for remedies. As overarching requirements, § 257.97(b) states that any selected remedy must achieve the following:

1. Be protective of human health and the environment;
2. Attain the groundwater protection standard as specified pursuant to § 257.95(h);
3. Control the source(s) of releases so as to reduce or eliminate, to the maximum extent feasible, further releases of constituents in appendix IV to this part into the environment;
4. Remove from the environment as much of the contaminated material that was released from the CCR unit as is feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems;
5. Comply with standards for management of wastes as specified in § 257.98(d).

Sections § 257.96(c) and § 257.97(c) of the CCR Rule provide further detail on how to assess corrective measures and how potential remedies should be evaluated, including how readily and quickly the remedy could be implemented and how effective the remedy would be in achieving the applicable GWPS. Based on these sections and on relevant guidance, GSI has identified the following criteria for use in evaluating each of the possible remedies:

- **Implementability**
  - Time required to begin remedy implementation
  - Time required to complete the remedy
  - Regulatory permits and approvals that may be required for implementation to proceed
  - Type and degree of operations and maintenance and monitoring that would be required
  - Degree of difficulty in implementing the remedy
  - Availability of resources and expertise required for remedy implementation

- **Short Term Effectiveness**
  - Degree that the remedy would control any immediate high risks to human health or the environment, such as unusually high toxicity or explosive characteristics.

- Magnitude of risks to human health and the environment during initial remedy implementation, for example risks associated with construction equipment and transportation of soils, and risks of causing cross-media impacts.

- **Long Term Effectiveness**
  - Potential for the remedy to achieve the GWPS
  - Long term reliability of the remedy
  - Degree to which the remedy uses treatment technologies
  - Degree to which the remedy would remove contaminated material released from the CCR unit from the environment
  - Likelihood of the need for remedy replacement before the cleanup objectives are achieved
  - Degree to which waste management practices required under the remedy comply with RCRA requirements
  - Degree to which the remedy would address risks to human health or the environment over the long term
  - Likely magnitude of residual risks remaining after the remedy is concluded

- **Control of the Source and of the Potential for Future Releases**
  - Degree to which the remedy would reduce or eliminate further releases from the CCR Units

- **Community Concerns**
  - Degree to which the remedy addresses known concerns within the community affected by the release.

3.2 Potential Groundwater Corrective Measures

GSI has compiled a short list of candidate corrective measures, which are listed below and are evaluated against the above criteria in Table 1. These approaches represent available technologies for reducing or eliminating risk from metals-impacted groundwater and were selected for further evaluation based on site-specific conditions at the San Miguel Plant. These corrective measures are discussed in more detail in Sections 3.2.1 through 3.2.8.

- No Action
- Institutional Controls
- Monitored Natural Attenuation (MNA)
- Phytoremediation (Hydraulic Control)
- *In situ* Redox Alteration/Manipulation
- Slurry/Barrier Walls
- Permeable Reactive Barriers (PRBs)
- Groundwater Extraction and Treatment (Hydraulic Control)

With the exception of the No Action remedies, source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102 of the CCR Rules.

3.2.1 *No Action*

For this option, no corrective action is taken to remove, control, mitigate or minimize exposure to impacted media. This option is not under consideration, but serves as a baseline approach for comparison to other corrective measure options.

3.2.2 *Institutional Controls*

Institutional controls are non-engineered approaches such as administrative and legal controls that reduce exposure to contamination by limiting land or resource use and/or guiding public behavior.

3.2.3 *Monitored Natural Attenuation (MNA)*

Technology Description: MNA is an *in situ* naturally-occurring collection of processes, requiring no human intervention, that reduces the mass and movement of mobile contaminants. These processes are coupled with regular observations (monitoring) to confirm that attenuation processes are continuing to have the desired effect, and that the risks posed by the impacted groundwater have not changed. MNA includes a wide range of natural processes, but the major mechanisms by which metals are attenuated in the subsurface are sorption-desorption, dilution-dispersion, and precipitation-coprecipitation-dissolution (Spreng and Goswami, 2011). The effectiveness of MNA depends on the type and concentration of contaminants and the biological and physico-chemical properties of the setting.

Advantages: Mainly requiring a network of monitoring wells, MNA is generally less invasive and disruptive than active or *ex situ* remedial approaches. MNA has a smaller environmental footprint than most active measures, and safety and exposure concerns for personnel during implementation are minimal and readily controlled. USEPA has established a protocol to implement MNA for inorganics that uses a tiered approach to demonstrate whether metals attenuation is occurring in groundwater (USEPA, 2015). As with MNA effectiveness demonstrations, this approach relies upon multiple lines of evidence, including decreasing metals concentrations/mass over time, geochemical and hydrogeological data, and laboratory microcosm and/or field evidence supporting the potential for these attenuation mechanisms.

Disadvantages: MNA requires detailed site characterization and may require a longer timeframe to achieve remedial goals than more active remedies. It is therefore best suited to sites where a shorter remedial timeframe is not required, based on the absence of public exposures or other factors. Long-term monitoring, which can be costly, is required to track the extent of mass removal (e.g., immobilization) and/or concentration declines. MNA is best suited for sites with low contaminant mass flux over time. Evaluation is required to ensure that that changes in groundwater chemistry do not occur that could result in remobilization of metals.

3.2.4 *Phytoremediation*

Technology Description: Phytoremediation is the use of plants to degrade, contain, or remove contaminants in or from the environment. It has been demonstrated to be potentially effective in the remediation of pesticides, metals, volatile organic compounds, and radionuclides (Blaylock & Huang, 2000). Contaminant removal mechanisms include: i) immobilization by the plant (phytostabilization), sorption by the plant roots (phytoextraction, mostly applicable to metals, metalloids, and radionuclides), absorption by plants and release into the atmosphere (phytovolatilization), destruction within plant tissues (phytodegradation), adsorption and precipitation into plants' biomass (phytofiltration or rhizofiltration) and hydraulic control using trees as natural pumps during transpiration (Favas et al., 2014). The effectiveness of such systems depend strongly on site-specific conditions such as:

- Depth of impacted water – typically depths must be reachable by tree root systems, or supplemental pumping and irrigation will be required.
- Water quality – more saline waters require salt-tolerant plants, which limits the potential selection of tree species.
- Climate – challenging climates, such as those with hot, dry summers or long, very cold winters, may also limit the potential selection of tree species to those sufficiently hardy to tolerate such conditions.

One example of a patented engineered phytoremediation system is the TreeWell® system (Applied Natural Sciences, 2019). Popular trees for phytoremediation of metals include willow and poplar trees (Liu et al., 2013).

Advantages: Phytoremediation approaches provide an alternative to conventional groundwater extraction systems in shallow aquifers. The network of trees can act as individual pumps, extracting water from the water-bearing zone through the root system, and releasing it through evapotranspiration. As a result, this approach can ameliorate the need for water handling and treatment.

Disadvantages: Phytoremediation is generally limited to shallow groundwater depths (typically < 20 ft bgs), since the tree roots must be capable of reaching the water-bearing zone. Otherwise, phytoremediation requires irrigation pumping, which can offset many of the advantages of this approach. The TreeWell® system, however, claims to extend the depth of possible implementation through patented means of forcing tree roots to grow to greater depths. In addition, phytoremediation may be limited by high contaminant or salt concentrations, which can be toxic or detrimental to growth for some plant species. This technology is only effective at sites that are well suited for plant growth, and treatment performance can be impacted by seasonal effects (*e.g.,* extreme low and high temperature, drought conditions). It can also require a large planting area for larger systems, and requires regular maintenance after planting, including tree pruning and replacement.

3.2.5 *In situ Redox Alteration*

Technology Description: *In situ* redox alteration (ISRA) has been applied for the treatment of dissolved metals by creating a treatment zone in the subsurface. Typically, this is based on the injection of oxidizing or reducing agents to generate a treatment zone that is favorable for metals immobilization. As redox-sensitive metals migrate through this treatment zone, they are immobilized via complexation and precipitation reactions with native metal species that become available under the redox-altered conditions. The treatment efficiency of this technology requires a detailed understanding of subsurface conditions, including the groundwater velocity, oxidation-reduction potential, hydraulic conductivity, and constituents present. Treatability studies are typically necessary prior to full-scale implementation to confirm feasibility and effectiveness of redox manipulation under site-specific conditions.

Advantages: Once the treatment zone has been established, ISRA typically does not require further pumping or above-ground treatment, although periodic re-injection of chemical reagents may be required. Overall, this tends to result in low operating and maintenance (O&M) costs. Also, it is not depth limited, and therefore can potentially treat contaminated groundwater inaccessible by excavation (trench-based) treatment technologies.

Disadvantages: Limitations include operational risks related to handling of reagents and the potential for plugging of the groundwater zone, depletion of dissolved oxygen, and unintended mobilization of certain metals (e.g., arsenic). Regular groundwater monitoring is required to confirm that conditions favorable for metals immobilization are maintained throughout the treatment zone.

3.2.6 *Slurry/Barrier Walls*

Technology Description: Slurry/barrier walls are hydraulic barriers designed to impede and/or divert impacted groundwater away from downgradient receptors and/or towards groundwater recovery systems. They usually consist of an excavated trench filled with a slurry of low permeability materials (typically including bentonite clay and/or cement). Physical barriers such as sheet piling can also be used for shallow aquifers.

Advantages: This technology has been in use for decades, and is well understood. Equipment and expertise are readily available, and it is accepted by regulators.

Disadvantages: This technology does not treat or destroy contaminants, but simply acts as a physical barrier. It must be accompanied by groundwater extraction to avoid accumulation of groundwater on the upgradient side of the barrier. Installation requires significant preparation (possibly including regulatory permitting) and can be very disruptive to the surface. Like other excavation-related construction projects, is accompanied by significant safety risks. It is also possible for the barrier materials to break down and become more permeable over time, which may mandate replacement or supplementation of the barrier.

3.2.7 *Permeable Reactive Barriers (PRBs)*

Technology Description: A PRB involves placement of a reactive media in the subsurface across the flow path of a contaminated groundwater plume. The movement of the contaminant through the reactive material brings about a reaction that degrades or immobilizes contaminants. Reactive media that have been used in the lab- and field-scale systems for the immobilization of metals and radionuclides include zerovalent iron, phosphates (e.g., apatite), lime or limestone, ferric hydroxide, and zeolites. PRBs are typically installed as trenches or as a series of overlapping large diameter borings, depending on the depth of installation.

Advantages: PRBs may be more cost-effective than active groundwater extraction systems. Once installed, PRBs require no pumping or above-ground treatment, which can reduce O&M costs. PRBs allow for emplacement of different reactive materials to address a variety of contaminants which differing physical-chemical properties. PRBs may be coupled with slurry walls to provide *in situ* treatment of groundwater passing through a designed hydraulic barrier.

Disadvantages: PRBs are typically installed using excavation equipment, and so are subject to the depth limitations of such equipment. In practice, this typically has limited installation to depths of 30 to 40 ft bgs. Installation as borings can mitigate this depth limitation but does not allow for as much control over the installation process as is possible using excavation. Installation using excavation techniques, as with slurry walls, can be disruptive and create worker safety risks. The performance of PRBs can be affected by seasonal fluctuations in groundwater levels and formation of precipitates on the reactive media that reduce its permeability. Because PRBs are a passive system, treating water that migrates through the treatment zone, cleanup times will be limited by groundwater migration rates.

3.2.8 *Groundwater Extraction and Treatment (Hydraulic Control)*

Technology Description: Under this approach, vertical or horizontal recovery wells are typically installed to extract impacted groundwater. This is not a cleanup *per se*, but rather is performed to limit the migration of impacted groundwater beyond some selected point or boundary (i.e., for hydraulic control). Extracted groundwater must typically be treated by physical (e.g., sorption, filtration, ion exchange) and chemical (*e.g.,* coagulation, precipitation) means.

Advantages: Groundwater extraction is a proven method for achieving hydraulic control of impacted groundwater. Most treatment processes are well understood and are considered highly reliable.

Disadvantages: As mentioned above, this approach does not actually remediate impacted groundwater, but is simply another form of barrier to its migration. Installation of well, piping, power supply, and water treatment systems can be disruptive and costly. Treatment systems require significant operational effort and expertise to maintain. Wells and other system components may deteriorate in performance over time and require replacement. This option requires some means of disposing or reusing treated water.

3.3 Assessment of Groundwater Corrective Measures

Table 1 provides the assessment of potential corrective measures that could be used to address the identified groundwater impacts downgradient of the Ash Ponds and Equalization Pond at and near the San Miguel Plant. Site-specific conditions at the Plant would have a significant impact on the effectiveness, implementability, and timing of candidate technologies. These include, but are not limited to the following factors:

- The uppermost water-bearing unit (Unit 22) extends to depths >50 ft bgs in some areas, which would significantly increase the difficulty of installation for any excavation-related remedies, and is beyond the typical root depth for phytoremediation approaches.
- Although Appendix IV constituents do not appear (based on a preliminary review of off-site data) to have migrated any great distance, the area of groundwater impact is very broad (i.e., the cross-gradient dimension of this impact, from side to side). This would significantly increase the implementation time of hydraulic control or *in situ* treatment systems.
- The property beyond the Plant and Buffer Zone would require landowner concurrence for any activities or installations related to the selected corrective measure. The remedy would also have to be compatible with existing land uses.

Prior to selection of a final remedy or combination of remedies, it will be necessary to substantially complete the investigation of the character and extent of groundwater impacts. Other data needs could include:

- Laboratory geochemical studies to evaluate the reactivity of potential amendments under field conditions (using site groundwater and media);
- Geochemical modeling to assess changes in constituent concentrations under various *in situ* remedy configurations;
- Groundwater flow modeling to evaluate the effect of groundwater flow and/or hydraulic containment under various barrier configurations; and
- Field pilot studies based on results of laboratory treatability studies.

4.0 CONCLUSIONS AND PROJECTED KEY ACTIVITIES

The process of selecting a remedy (or combination of remedies) will begin following submittal of this ACM Report. Progress toward remedy selection will be documented in a semiannual report in accordance with § 257.97(a). A public meeting with interested and affected parties will be scheduled at least 30 days prior to selection of the remedy, as described in § 257.96(e). Upon selection of a final remedy, a final report will be prepared describing the selected remedy based on the requirements outlined in § 257.97(a).

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TABLES

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Table 1. Evaluation Matrix for Potential Groundwater Corrective Measure Alternatives
San Miguel Plant, Atascosa County, Texas

Potential Remedies	Implementability	Short Term Effectiveness	Long Term Effectiveness	Source Control/Control of Potential for Future Releases	Community Concerns
NO ACTION/INSTITUTIONAL CONTROLS					
No Action	**Time required to begin remedy:** No remedy would implemented under this option. **Time required to complete remedy:** No remedy would implemented under this option. **Regulatory Permits & Approvals required:** No permits would be required, as no remedy would be implemented. **Type & Degree of O&M & monitoring required:** No O&M or monitoring are included under this option. **Degree of Difficulty in Implementing Remedy:** No remedy would implemented under this option. **Availability of Resources & Expertise for the Remedy:** Not applicable.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.), and risks of causing cross-media impacts:** None, as no remedy implementation would occur.	**Potential to attain the GWPS:** None **Long-term reliability of the remedy:** This approach would not modify existing conditions, and so would not be reliable. **Degree to which the remedy uses treatment technologies:** None **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None **Likelihood of need for remedy replacement:** No remedy would be implemented, so no replacement would be necessary. **Degree of compliance with RCRA for management of remedy-related wastes:** No remedy-related wastes would be generated. **Degree to which remedy will address risks to human health or the environment over the long term:** None, since no remedy would be implemented. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Identical to current risks.	**Source Control to Reduce or Eliminate Further Releases:** There would be no source control under this approach, and no reduction in the potential for further releases.	**Degree to which the remedy addresses known community concerns:** The "No Action" option would not address community concerns related to contaminated groundwater.
Institutional Controls (ICs)	**Time required to begin remedy:** Remedy would commence upon implementation of source control, which is closure or retrofitting of Ash Ponds and Equalization Ponds. **Time required to complete remedy:** ICs would remain in place until GWPS is achieved for off-site groundwater. The time required would depend on what other corrective actions are used in conjunction with the ICs. **Regulatory Permits & Approvals required:** None **Type & Degree of O&M & monitoring required:** None **Degree of Difficulty in Implementing Remedy:** Administrative aspects of ICs are straightforward, and the primary difficulty in their implementation is related to landowner concurrence. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low risks, as this option does not involve a field component.	**Potential to attain the GWPS:** None, if used independently. ICs will not improve groundwater quality, and therefore would have to be used in conjunction with some other corrective measure. **Long-term reliability of the remedy:** None, if used independently. ICs will not improve groundwater quality, and therefore would have to be used in conjunction with some other corrective measure. **Degree to which the remedy uses treatment technologies:** None **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None **Likelihood of need for remedy replacement:** None. **Degree of compliance with RCRA for management of remedy-related wastes:** No remedy-related wastes would be generated. **Degree to which remedy will address risks to human health or the environment over the long term:** High. ICs can effectively reduce or eliminate potential exposure pathways, thereby reducing potential risks. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Identical to current risks, if used independently. ICs will not improve groundwater quality, and therefore would have to be used in conjunction with some other corrective measure.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** Low, unless utilized in conjunction with another corrective measure.

Table 1. Evaluation Matrix for Potential Groundwater Corrective Measure Alternatives
San Miguel Plant, Atascosa County, Texas

Potential Remedies	Implementability	Short Term Effectiveness	Long Term Effectiveness	Source Control/Control of Potential for Future Releases	Community Concerns
***IN SITU* TECHNOLOGIES**					
Monitored Natural Attenuation (MNA)	**Time required to begin remedy:** Remedy would commence upon implementation of source control, which is closure or retrofitting of Ash Ponds and Equalization Ponds. **Time required to complete remedy:** Timeframe for completion depends on several factors: timing of source control, rates of natural attenuation, and groundwater velocities. At this site, the timeframe would likely exceed 10 years. Fate and transport modeling could provide a more rigorous time to complete estimate. **Regulatory Permits & Approvals required:** None **Type & Degree of O&M & monitoring required:** Long-term monitoring is required to track the effects of mass removal and/or concentration declines. Monitoring frequencies typically decline with remedy implementation time (i.e., quarterly monitoring is used initially, then transitions to semiannually and then annually). Monitoring analytes also tend to transition to a more limited list of key indicator parameters. **Degree of Difficulty in Implementing Remedy:** Generally low degree of difficulty, after completion of source control and site characterization. Special analysis for attenuation factors may be useful as a part of site characterization. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low risks, associated with operation of monitoring well installation equipment, and limited increase in vehicular traffic for well installation, sampling, and closure. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** High, given sufficient time. **Long-term reliability of the remedy:** Generally high once source control has been achieved. Natural processes tend to be reliable in reducing contaminant concentrations over time. **Degree to which the remedy uses treatment technologies:** None **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None to low. MNA would rely primarily on immobilization of the CCR constituents released to the environment rather than removal. **Likelihood of need for remedy replacement:** Low, since the remedy relies on natural processes. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is minimal waste generation associated with this remedy, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** High. Given sufficient time, this remedy can reduce concentrations of groundwater constituents to meet GWPS, such that they do not pose an unacceptable risk to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS. If the requisite mass/concentration decline does not occur, this remedy could be supplemented with more active approaches.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To be determined. San Miguel will hold a public meeting with interested and affected parties at least 30 days prior to selection of the remedy.
Phytoreme-diation (Hydraulic Control)	**Time required to begin remedy:** 3-5 years to plant and establish tree population. **Time required to complete remedy:** Varies from years to decades depending on size of the groundwater plume; trees would need to be maintained until plume size is reduced. **Regulatory Permits & Approvals required:** None **Type & Degree of O&M & monitoring required:** Frequent monitoring and periodic maintenance of trees to ensure successful growth of the trees, particularly during the initial planting phase. **Degree of Difficulty in Implementing Remedy:** Moderate to high; requires substantial effort (deep rooting technology, irrigation pumping) in establishing tree population. Can require large land area for planting for larger systems. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low; exposure of workers to fertilizers or amendments for plant growth. Leaves may fall and reintroduce constituents to the subsurface if not harvested on time. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** Probable; but significant uncertainty associated with plant growth and water uptake rates. **Long-term reliability of the remedy:** Effectiveness of technology seen in long term with minimal effectiveness during the early years of plant growth. **Degree to which the remedy uses treatment technologies:** None **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** Moderate, as the phytoremediation system would act as a natural pumping system, withdrawing CCR constituents from the subsurface with groundwater. **Likelihood of need for remedy replacement:** Replacement of unsuccessful trees during the operating life of the treatment system. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is some waste generation associated with tree planting, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** Significant uncertainty associated with plant growth and water uptake rates. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS. If the requisite mass/concentration decline does not occur, this remedy could be supplemented with more active approaches.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To be determined. San Miguel will hold a public meeting with interested and affected parties at least 30 days prior to selection of the remedy.

Table 1. Evaluation Matrix for Potential Groundwater Corrective Measure Alternatives
San Miguel Plant, Atascosa County, Texas

Potential Remedies	Implementability	Short Term Effectiveness	Long Term Effectiveness	Source Control/Control of Potential for Future Releases	Community Concerns
***IN SITU* TECHNOLOGIES (continued)**					
***In situ* Redox Alteration**	**Time required to begin remedy:** 1-2 years for treatability studies and/or pilot testing, reactant selection, field-scale design, installation of monitoring and injection wells. **Time required to complete remedy:** At least several years. Time to completion is dependent on a number of site-specific conditions, including hydrogeological variability, groundwater velocities, configuration of injection well system, and selected reactant. **Regulatory Permits & Approvals required:** State permit will be required for subsurface injection. **Type & Degree of O&M & monitoring required:** Significant O&M and monitoring requirements. Periodic re-injection of reactant and redevelopment of injection wells. Regular groundwater monitoring for treatment performance evaluation. **Degree of Difficulty in Implementing Remedy:** Moderate, due to challenges in injecting into lower permeability sand strata (i.e., Unit 22) and achieving adequate three-dimensional delivery throughout that unit. In addition, multiple reactants may be required for the various constituents present. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low risks, associated with operation of injection and monitoring well installation equipment, and limited increase in vehicular traffic for reactant injection, well installation, sampling, and closure. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** High, if pervasive delivery of the reactant proved successful. Otherwise, low to moderate. **Long-term reliability of the remedy:** Moderate; primary challenge is pervasive delivery of the reactant throughout Unit 22. Some remobilization of metals is possible. **Degree to which the remedy uses treatment technologies:** *In situ* chemical treatment of metal constituents is a key aspect of the corrective measure. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None to low. ISRA would rely primarily on immobilization of the CCR constituents released to the environment rather than removal. **Likelihood of need for remedy replacement:** Low; some periodic replenishment of reactants will be required over time, and injection wells may possibly require replacement if redevelopment is not successful. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is some potential for chemical waste generation associated with this remedy (e.g., unused or off-spec reagents), and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** If successful (see Potential to Attain the GWPS above), this technique can permanently immobilize metals, removing them from the groundwater, and thereby reducing or eliminating risks associated with those constituents. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS. If the requisite mass/concentration decline does not occur, this remedy could be supplemented with more active approaches.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To be determined. San Miguel will hold a public meeting with interested and affected parties at least 30 days prior to selection of the remedy.
Slurry/ Barrier Walls (with Hydraulic Control)	**Time required to begin remedy:** 2-3 years for groundwater modeling, pumping tests, design, installation of slurry wall, pumping wells, and water piping and treatment systems. **Time required to complete remedy:** Could vary from years to decades depending on area being treated, groundwater flow velocity, and other site-specific factors. **Regulatory Permits & Approvals required:** Possible state permits for surface discharge or subsurface injection, depending on treated water disposition. **Type & Degree of O&M & monitoring required:** High. Redevelopment and replacement of pumping wells, O&M of water treatment system, routine groundwater monitoring upgradient and downgradient of the slurry wall; routine monitoring of water discharge, periodic testing and redevelopment of injection wells, if used. **Degree of Difficulty in Implementing Remedy:** Moderate to high; may require extensive surface disturbance for excavation and construction of slurry wall, in addition to drilling and well installation, piping installation, water treatment system construction, and possibly injection well construction. The installation is subject to depth limitations. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** High; worker safety concerns during drilling, excavation, slurry/barrier installation, increase in vehicular traffic for well installation, sampling, and closure. The risk of causing cross-media impacts is moderate to high, since significant volumes of subsurface material will be brought to the surface. These risks can be mitigated, however, through appropriate management.	**Potential to attain the GWPS:** Moderate, given sufficient time, and assuming implementation hurdles can be overcome. Note that improvements in groundwater quality or hydraulic control will only be observed downgradient of the areas where the slurry wall is installed. **Long-term reliability of the remedy:** Generally high in the areas downgradient of the slurry wall, assuming that the hydraulic control component is adequate to support the slurry wall in maintaining a high degree of groundwater capture. Note that groundwater quality improvements in this downgradient area are typically due to natural attenuation processes (see Monitored Natural Attenuation, above). **Degree to which the remedy uses treatment technologies:** Moderate to high; this technology requires a hydraulic control component with likely subsequent treatment to attain discharge limits. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** Moderate, as the hydraulic control portion of the remedy would withdraw CCR constituents from the subsurface with groundwater. **Likelihood of need for remedy replacement:** Unlikely, unless the slurry wall material degrades over time. Extraction wells in the hydraulic control portion of the system may have to be periodically replaced, if redevelopment programs are not effective. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There may be significant waste generation associated with this remedy, but those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** If the slurry wall and related systems achieve hydraulic and physical containment, then concentrations of groundwater constituent's downgradient of the slurry wall will decline over time to below GWPS, reducing or eliminating risks to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS. If the requisite mass/concentration decline does not occur, this remedy could be supplemented with more active approaches.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To be determined. San Miguel will hold a public meeting with interested and affected parties at least 30 days prior to selection of the remedy.

Table 1. Evaluation Matrix for Potential Groundwater Corrective Measure Alternatives
San Miguel Plant, Atascosa County, Texas

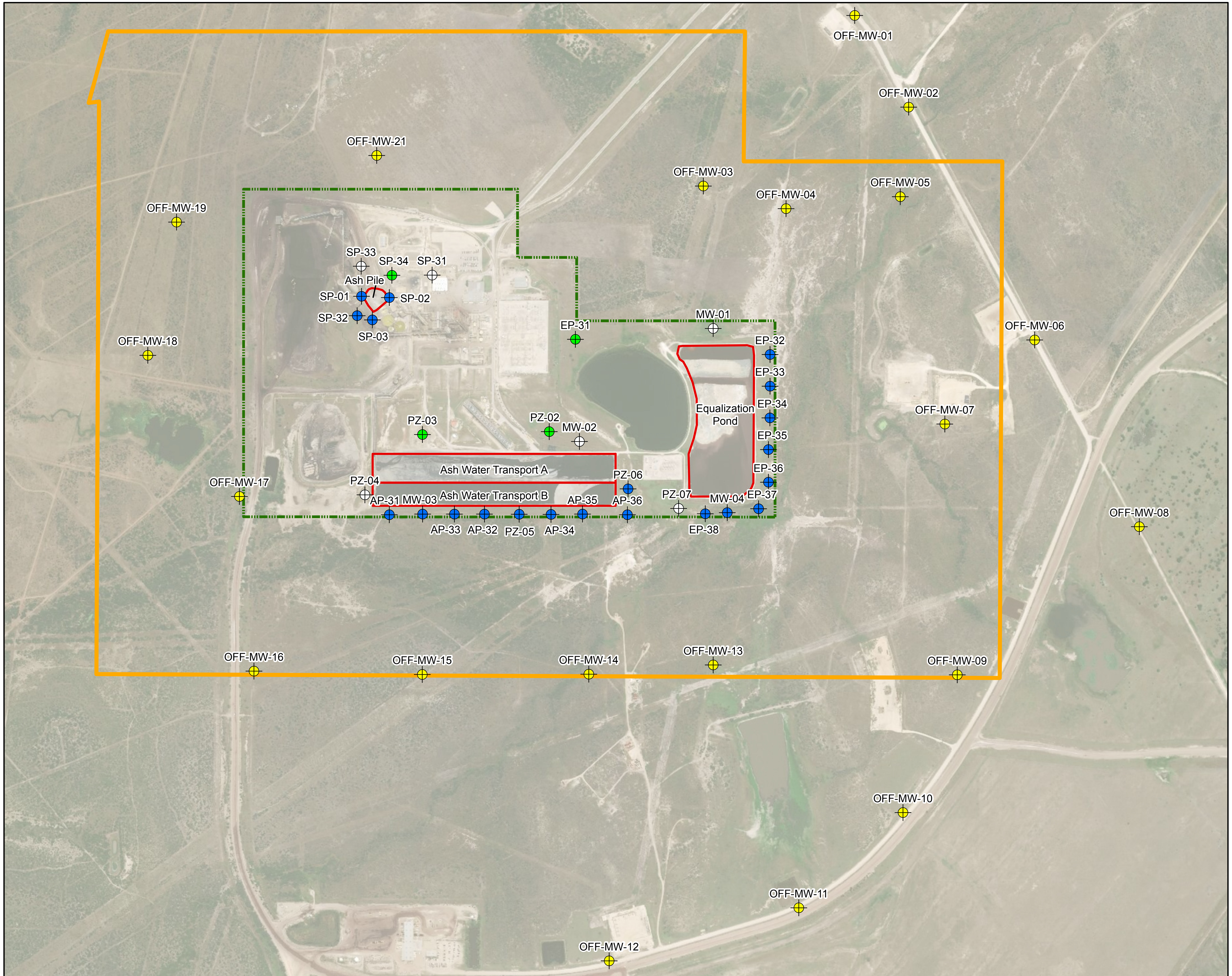
Potential Remedies	Implementability	Short Term Effectiveness	Long Term Effectiveness	Source Control/Control of Potential for Future Releases	Community Concerns
***IN SITU* TECHNOLOGIES (continued)**					
Permeable Reactive Barrier (PRB)	**Time required to begin remedy:** 2-4 years for groundwater modeling, pumping tests, design, installation of PRB, installation of monitoring wells. **Time required to complete remedy:** Could vary from years to decades depending on area being treated, groundwater flow velocity, and other site-specific factors. **Regulatory Permits & Approvals required:** None. **Type & Degree of O&M & monitoring required:** Low to moderate. Routine groundwater monitoring upgradient and downgradient of the PRB. Possible flushing and redevelopment of the PRB if evidence of plugging is observed. **Degree of Difficulty in Implementing Remedy:** Moderate to high; may require extensive surface disturbance for excavation and construction of PRB. The installation is subject to depth limitations. **Availability of Resources & Expertise for the Remedy:** Requires specialty expertise and resources that are generally available, but for which delays may occur pending depending on competition from other installations.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** High; worker safety concerns during PRB installation, slight increase in vehicular traffic for well installation, sampling, and closure. The risk of causing cross-media impacts is moderate to high, since significant volumes of subsurface material will be brought to the surface. These risks can be mitigated, however, through appropriate management.	**Potential to attain the GWPS:** Moderate, as it may be difficult to identify a single reactant media that will address all groundwater constituents. **Long-term reliability of the remedy:** Generally high, as long as there are no changes in groundwater chemistry that could remobilize metals from the PRB media or surrounding portion of the water-bearing zone. **Degree to which the remedy uses treatment technologies:** High, reactant interactions with groundwater constituents is a treatment technology. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None to low. PRBs would rely primarily on immobilization of the CCR constituents released to the environment rather than removal. **Likelihood of need for remedy replacement:** Moderate, as reactive media may need to be replaced /reactivated over time. **Degree of compliance with RCRA for management of remedy-related wastes:** High. There is some potential for chemical waste generation associated with this remedy (e.g., unused or off-spec reactant), as well as significant waste generation associated with construction activities, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** If the PRB is properly installed and the reactant performs as planned, then concentrations of groundwater constituent's downgradient of the PRB will decline over time to below GWPS, reducing or eliminating risks to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS. If the requisite mass/concentration decline does not occur, this remedy could be supplemented with more active approaches.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To be determined. San Miguel will hold a public meeting with interested and affected parties at least 30 days prior to selection of the remedy.
GROUNDWATER EXTRACTION AND TREATMENT					
Pump & Treat (Hydraulic Control)	**Time required to begin remedy:** 2-3 years for groundwater modeling, pumping tests, design, installation of pumping wells, and water piping and treatment systems. **Time required to complete remedy:** Could vary from years to decades depending on area being treated, groundwater flow velocity, and other site-specific factors. **Regulatory Permits & Approvals required:** Possible state permits for surface discharge or subsurface injection, depending on treated water disposition. **Type & Degree of O&M & monitoring required:** High. Redevelopment and replacement of pumping wells, O&M of water treatment system, routine groundwater monitoring upgradient and downgradient of the pumping system; routine monitoring of water discharge, periodic testing and redevelopment of injection wells, if used. **Degree of Difficulty in Implementing Remedy:** Low to moderate, drilling and well installation, piping installation, water treatment system construction, and possibly injection well construction. **Availability of Resources & Expertise for the Remedy:** All resources, services and expertise are readily available.	**Degree of control of any immediate high risks, such as high toxicity or explosive characteristics:** No immediate high risks have been identified associated with groundwater impacts at this site, so this consideration is not relevant. **Magnitude of risks to human health and the environment during remedy implementation (e.g., associated with excavation, transportation, etc.) and risks of causing cross-media impacts:** Low risks, associated with installation of extraction and monitoring wells, and limited increase in vehicular traffic for well installation, sampling, and closure. The risk of causing cross-media impacts is low, since only a small volume of subsurface material would be moved to the surface.	**Potential to attain the GWPS:** Moderate, given sufficient time. Note that improvements in groundwater quality or hydraulic control will only be observed in the areas where the pumping system is installed. **Long-term reliability of the remedy:** Generally high in the areas downgradient of the pumping system, assuming that the hydraulic control component is adequate to maintain a high degree of groundwater capture. **Degree to which the remedy uses treatment technologies:** Moderate to high; this technology likely would require treatment of water to attain discharge limits. **Degree to which the remedy would remove contaminated material released from the CCR unit from the environment:** None **Likelihood of need for remedy replacement:** Extraction wells may have to be periodically replaced, if redevelopment programs are not effective. **Degree of compliance with RCRA for management of remedy-related wastes:** There is minimal waste generation associated with this remedy, and those wastes can be readily managed in accordance with RCRA requirements. **Degree to which remedy will address risks to human health or the environment over the long term:** If pumping system achieves hydraulic containment, then concentrations of groundwater constituent's downgradient of the pumping system will decline over time to below GWPS, reducing or eliminating risks to human health or the environment. **Likely magnitude of residual risks at the conclusion of remedy implementation:** Low. The remedy would continue until groundwater constituents are below GWPS. If the requisite mass/concentration decline does not occur, this remedy could be supplemented with more active approaches.	**Source Control to Reduce or Eliminate Further Releases:** Source control is considered to be fully addressed by the retrofit and closure activities described in § 257.102.	**Degree to which the remedy addresses known community concerns:** To be determined. San Miguel will hold a public meeting with interested and affected parties at least 30 days prior to selection of the remedy.

GSI ENVIRONMENTAL

ASSESSMENT OF CORRECTIVE MEASURES REPORT

San Miguel Electric Cooperative, Inc.
Christine, Atascosa County, Texas

FIGURES



LEGEND

- Off-Site Assessment Well
- Background Monitor Well
- Downgradient Monitor Well
- Groundwater Elevation Observation Well
- Approximate Plant Boundary
- CCR Impoundment/Unit
- Approximate Buffer Zone Boundary

Note

Aerial imagery provided by Esri ArcGIS Online, September 2017.

Feet

0 650 1,300

Projected Coordinate System
Datum: NAD 83
State Plane Texas South Central
Units: Feet

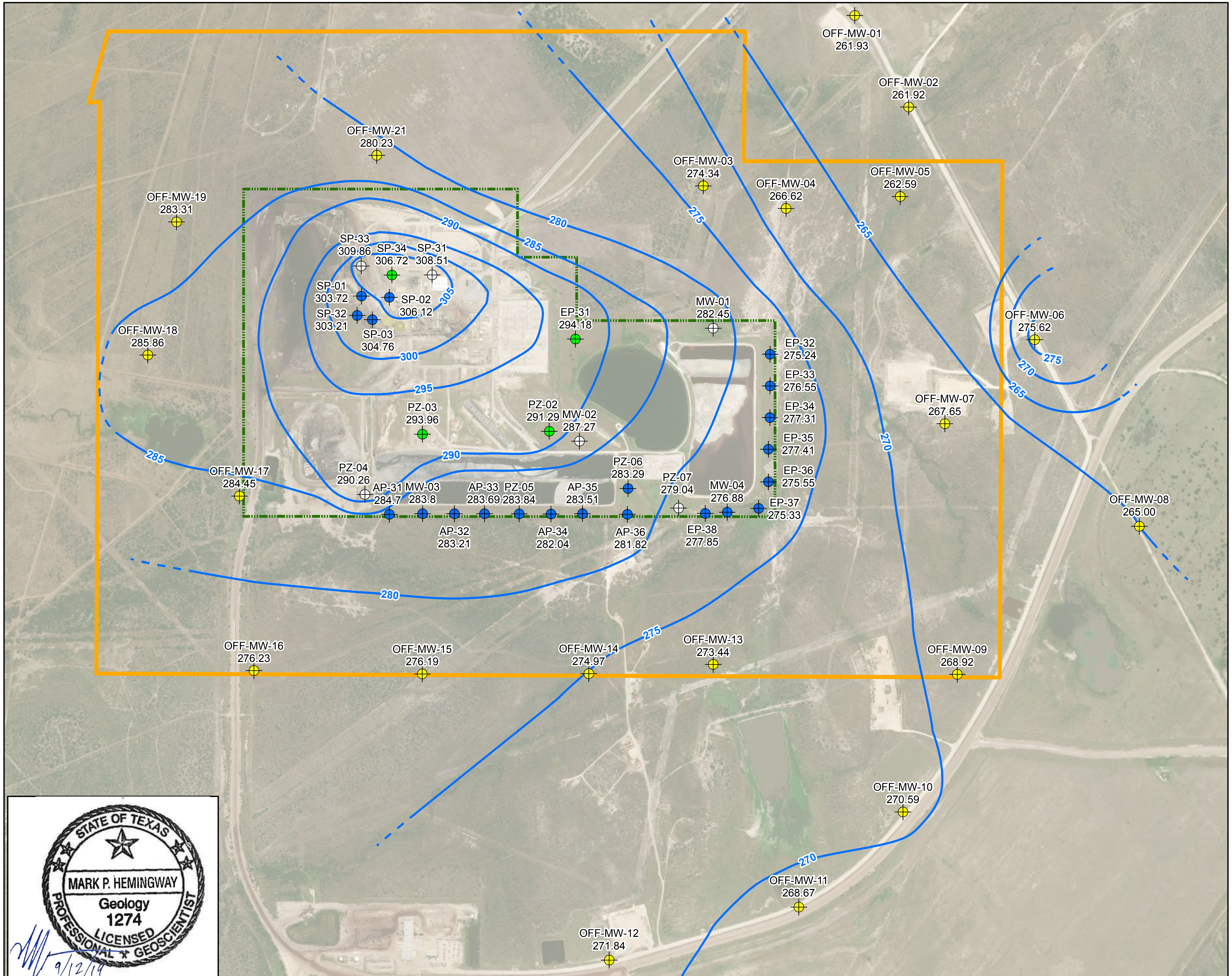
GSI ENVIRONMENTAL

SITE MAP AND MONITORING WELL LOCATIONS

San Miguel Electric Cooperative, Inc. Facility
Atacosa County, Texas

GSI Job No.	5076	Drawn By:	AV
Issued:	12-Sep-2019	Chk'd By:	TMB
Map ID:	**SMEC_OffSiteWells**	Appv'd By:	MPH

FIGURE 1



N

LEGEND

- Off-Site Assessment Well
- Background Monitor Well
- Downgradient Monitor Well
- Groundwater Elevation Observation Well
- Approximate Plant Boundary
- Approximate Buffer Zone Boundary
- Groundwater Potentometric Surface, Dashed where inferred
- 309.86 Groundwater Elevation (ft amsl)

Notes

1) Aerial imagery provided by Esri ArcGIS Online, September 2017.
2) Groundwater elevations from onsite wells are calculated using top of casing elevations reported in "Groundwater Sampling Report – Event 8 – August 2017" (AECOM, 2017). Offsite groundwater elevations are calculated using top of casing elevations surveyed by SMECI personnel in August 2019. All depth to water measurements were collected by GSI Environmental Inc. on August 9, 2019.
3) ft amsl = feet above mean sea level.

Feet
0 500 1,000

Projected Coordinate System
Datum: NAD 83
State Plane Texas South Central
Units: Feet

GSI ENVIRONMENTAL

POTENTIOMETRIC SURFACE - AUGUST 9, 2019

San Miguel Electric Cooperative, Inc. Facility
Atacosa County, Texas

GSI Job No.	5076	Drawn By:	AV
Issued:	12-Sep-2019	Chk'd By:	TMB
Map ID:	**SMEC_GWE_0819**	Appv'd By:	MPH

FIGURE 2