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NorthWestern Energy

Remedial Action Plan

Aberdeen Former Manufactured Gas Plant Site

Stage 1 Coal Tar Recovery Project

Aberdeen, South Dakota

June 2011

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Aberdeen, South Dakota

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Figures

Licensed Professional Engineer Affirmation

I attest that this document – **NorthWestern Energy Remedial Action Plan** for the **Aberdeen, SD Former Manufactured Gas Plant Site** was prepared under my direction or reviewed by me, and to the best of my knowledge and belief, the work described in the report has been designed or completed in accordance with the Administrative Rules and Codified Laws of South Dakota, and generally accepted engineering practices, and the information presented is accurate and complete.

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2. Introduction and Purpose

This Remedial Action Plan (RAP) presents a systematic approach to remediation of the NorthWestern Energy (NWE) property (Site), located in Brown County, and within the community of Aberdeen, South Dakota (Figure 1) that was the site of historic Manufactured Gas Plant (MGP) operations with historical releases of MGP-related wastes. This RAP provides both rationale and context to aid regulatory agencies in understanding how the proposed approach will achieve the specific objectives outlined in the Remedial Alternatives Evaluation (RAE) (ARCADIS, 2010) while being compliant with applicable regulations.

In addition to providing a narrative description of the proposed remedial approach, this document discusses assumptions inherently necessary to formulate this proposed approach and the relationship of this RAP with other supporting technical documents. Furthermore, this document provides narrative support to the Basis of Design used to guide development of the proposed remedial action, the package of design drawings and the listing of specifications supporting the engineering design. A companion purpose of this RAP is to aid in developing subcontracting documents and to provide explanation and clarity to subcontractors in formulating responses to requests for proposals for specific work elements described herein.

Remedial action experience has demonstrated the importance of developing and implementing an internally consistent set of work activities that collectively form a systematic plan to achieve all of the desired goals in a holistic manner. An optimum remedial approach is sufficiently detailed to comprehensively address all of the site-specific requirements necessary for goal attainment while incorporating some flexibility to accommodate incrementally beneficial modifications to the plan, which are both welcomed and inevitable. We believe this plan contains these attributes. Whereas flexibility to any plan is necessary and desirable, change must also be managed within the context of achieving the overall purpose and goals of the remedial action. It is NWE's intent to invoke a "Management of Change" process during bid proposal evaluation and remedial action to assess suggested modifications to the approach described herein to ensure that, in total, benefits to safety, schedule, and operational efficiency are achieved versus only transitory benefits that are quickly cancelled by unintended consequences in later activities.

Further, a program to assess and approve "Field Design Changes" will be employed. Consistent with this approach, NWE will also employ the "Observational Approach" during remedial action and will evaluate benefits associated with incremental changes to planned activities depending on specific conditions that are encountered or develop over time. By adopting this proven approach, ARCADIS and NWE believe an optimally safe, efficient and cost-effective remedial program can be implemented.

It is important to also understand what this document does not discuss, specifically an analysis of remedial alternatives and the basis for their selection or screening from further consideration, which was presented in the RAE (ARCADIS, 2010). Although narrative may be included to provide context and a general basis for selection of a particular approach or component, this document intentionally does not provide a comprehensive reanalysis of all possible approaches or components with specific justification for the screening of non-viable or suboptimal alternatives. Importantly though, as noted above, this RAP presents a remedial approach replete with proven design elements consistent with the assumptions, design constraints, and guiding general engineering and scientific principles that results in a safe, efficient, and cost-effective remedial plan.

This document will emphasize the installation of one component of the remedial action plan consisting of the construction of passive collection galleries for the recovery of subsurface, drainable coal tar dense, non-aqueous phase liquid (DNAPL). An addendum to this RAP will be developed during the 2011-2012 period describing the infrastructure components to support extraction of coal tar DNAPL from the subsurface and the temporary storage of coal tar DNAPL while awaiting transport off-site for beneficial use and/or disposal and the operational procedures necessary to complete this work element.

The proposed program presented herein comprises a comprehensive, systematic, and multi-year remedial effort. The proposed duration of this program, as will be discussed, is tailored to provide for safe and optimal design, installation and operation of this remedial action, including the design, installation and operation of the supporting infrastructure components. Whereas it is believed that work in the outlying years will consist essentially of the approaches described for the 2011-related construction work, it is also NWE’s desire to progressively learn and improve upon work activities as specific on-site experience and operational information is gained. As discussed above, through a combination of the “Observational Method” and “Management of Change” procedures, improvements to the design, construction and operation of the collection galleries and other support effort may be employed. Materially significant changes to design, construction and operation of the remedial action components or processes will be communicated to the South Dakota Department of Environment and Natural Resources (SD DENR).

3. Remedial Action Objectives

A basic discussion of specific remedial goals is presented to place into context the purpose and intent of the remedial approaches described herein. Whereas it is not the purpose of this RAP to exhaustively review the regulations that pertain to this remedial action, a brief discussion of the remedial action objectives may aid the reader in understanding the underpinnings of this proposed remedial action.

3.1 Remediation Action Objectives

As outlined in the Remedial Alternatives Evaluation (ARCADIS, 2010), remedial action objectives for this effort center on addressing environmental impacts by focusing on the passive collection of drainable coal tar DNAPL present under and around the Site. The positioning and installation of the collection galleries to be emplaced within the Site (Stage 1) is the particular focus of this document, but as discussed with SD DENR, additional collection galleries are planned for construction and operation on affected adjacent properties (Stage 2) within the next three years. The objective of this collection effort is for mass removal of the coal tar DNAPL to help lessen the gravity-induced lateral migration of the coal tar. The positioning of the collection galleries will be targeted within coal tar DNAPL bodies or near distal ends of coal tar DNAPL bodies. This combination of positions is designed to both remove mobile coal tar DNAPL from the subsurface and minimize its potential to migrate into non-impacted areas. Documentation of the efficacy of the collection galleries will be the volume of coal tar DNAPL captured and extracted for beneficial use and/or disposal. Additionally, monitoring wells will be used to measure coal tar-related constituents present in groundwater in areas around the coal tar DNAPL bodies.

The collection galleries will be operated with coal tar DNAPL extracted and transported off-site for beneficial use and/or disposal until such time as the rate of DNAPL collection declines to levels determined to allow for cessation of operations (Section 9).

3.2 Description of the Overall Remedial Approach to be Employed

The basic process to be employed to accomplish the remedial objectives involves the installation of a series of trenches, backfilled with porous media, placed in areas known or projected to have potentially migrating coal tar DNAPL. To ensure effective and safe collection gallery construction, after appropriate identification and delineation of any utilities or other subsurface features, a shallow trench will be excavated to identify any subsurface obstructions, such as old concrete building foundations along the designed collection gallery alignments. This shallow trench will be backfilled as the investigations are completed. Identification of major subsurface obstructions may require the local repositioning of a collection gallery, or removal of the obstruction. Excavated material may be disposed off-site in the event this is determined to be required or otherwise desired.

Construction of the collection galleries will be accomplished by the use of industry-standard trenching and backfilling equipment that will excavate a nominally 24-inch wide trench down to the low permeability glacial till stratum upon which coal tar DNAPL has collected in overlying more permeable strata; a depth of up to 42 feet below ground surface. The trench will be emplaced into the top of the glacial till unit, extending up to five feet below the top of the till. The base of the excavated trench will be appropriately sloped at a nominally two degree angle to redirect intercepted coal tar DNAPL to a designed low point within the trench, facilitating recovery of the DNAPL from a collection point. A slotted pipe will be emplaced during trench construction on the bottom of the trench to facilitate lateral migration of the coal tar DNAPL within the confines of the trench walls to the low point for collection. Upon the pooling of the DNAPL at this low point, the DNAPL will be periodically withdrawn to the surface and transferred to storage tanks pending transportation off-site.

As the trench is excavated and the subsurface soil removed to the surface, granular backfill will be placed in the trench to replace excavated material. This porous backfill material will contribute to the migration of nearby coal tar DNAPL to the trench. The comparatively high density of the coal tar DNAPL relative to the groundwater will cause the DNAPL to flow through the permeable horizon in which it is currently confined toward the backfilled trench. Upon encountering the trench, the DNAPL will migrate vertically downward within the porous backfill and collect on the base of the trench. The DNAPL will then pool on the base of the trench and enter into the slotted conveyance pipe for enhanced lateral migration within the trench confines to a topographic low point. It is at this point a vertical riser pipe will be positioned to allow for withdrawal of the DNAPL from the trench. Withdrawal is currently presumed to consist of periodic pumping with the removed DNAPL stored in an above-ground storage tank.

The soils excavated during trench emplacement will be initially left in windrows along the trench. Any drainable water from the windrowed trench spoils will be contained through the use of lateral ditches and/or berms and directed back into the trench. It is anticipated that only the alluvial sand portion of the trench spoils will require dewatering; however, this material will be mixed with overlying soils. These overlying soils, including a silty clay horizon, exhibit a moisture content lower than its liquid limit suggesting it has the capacity to take up free moisture from the saturated alluvium beneath it.

The windrowed trench spoils will then be relocated to an on-site engineered treatment pad. Within the treatment pad, the trench spoils will be allowed to further dewater with the drainable water collected in a lined retention pond. The water will be treated to remove suspended solids and organic compounds in preparation for appropriate treatment prior to discharge to the municipal sanitary sewer system, consistent with current practice for the treatment of coal tar-impacted groundwater collected from beneath the City of Aberdeen Booster Station west of the Site. The soil will then be stabilized with the use of dry wheat straw; the efficacy of which was proven during the nearby Moccasin Creek remedial effort completed in 2007. Upon consumption of potentially drainable water by the straw the soil-straw mixture will be loaded into highway-compatible trucks and transported to the Brown County Landfill for disposal.

Upon completion of the project, impacted areas of the Site will be restored and revegetated, as necessary. As noted above, the overall remedial action will be performed in phases and consist of a multi-year effort. Therefore, the potential reuse of the excavated soil treatment area is being considered for future trench spoils and may be left in place until completion of all stages of the remedial action at this site. Alternatively, the treatment area and associated ditches and ponds will be reclaimed and the areas reseeded. In any event, at the end of collection gallery construction when the treatment pad area is no longer needed the facility will be reclaimed and the Site restored.

3.3 Management of Potential Air Emissions

The potential for particulate emissions during the collection gallery and associated construction activities is anticipated to be low. The soil excavated during trench construction will be initially moist and will remain relatively wet during windrowing, stabilization, and loading in preparation for off-site transport. The presumed primary source of possible particulate emissions will be the on-site haul roads. When necessary, as documented by the observation of visible dust, on-site haul roads will be wetted to reduce dust generation.

The majority of the soil excavated during collection gallery construction will be non-impacted material. Further, the concurrent backfilling of the collection gallery trench will minimize or eliminate off-gas emissions from subsurface DNAPL. However, it is likely that some coal tar impacted soil present in the windrowed material will release off-gas emissions. A primary element of this remedial action will be protection of workers and local residents from exposure to adverse levels of toxic emissions and appropriately limiting releases of nuisance odors. Based on prior testing, it is likely that benzene will be the primary compound of concern. Site-specific monitoring to ensure protectiveness to workers will be conducted, and air emissions monitoring at the fenceline will also be performed to help ensure protectiveness to local residents.

Prior testing also indicates that it is likely that the primary malodorous compound will be naphthalene. Naphthalene has an odor threshold (the concentration at which it may be smelled) that is far below the acceptable human health risk exposure concentration due to its toxicity. The anticipated “nuisance level concentration” of naphthalene, which is roughly two to three times its odor threshold, is also far below the regulatory permitted exposure concentration due to its toxicity. In anticipation of potential off-gas emissions, engineering controls will be applied including covering of gaseous-emitting soil with physical barriers such as foams, tactifying hydromulch, non-impacted soil, and/or plastic sheeting. The companion Site-Specific Health and Safety Plan will describe monitoring approaches directed at measuring gaseous concentrations within the atmosphere to ensure protectiveness to workers and the public.

It should be understood that transitory odors will likely be periodically released during collection gallery construction, on-site transportation, stabilization, storage, and loading for off-site disposal. NWE will endeavor, when necessary, to employ mitigative measures to limit nuisance odor impacts to the community. Some transitory odor impacts are, nonetheless, possible. However, the total duration of collection gallery construction and subsequent handling of excavated soil will only last perhaps two to three weeks, minimizing the overall nuisance impact to the community.

3.4 Compliance with Brown County Landfill Disposal Requirements

Soils excavated during collection gallery construction are anticipated to be disposed at the Brown County Landfill. Historically, MGP-impacted soils, sediments or waste were regulated as hazardous if they exhibited a hazardous waste characteristic. On April 21, 2000, a court decision (Association of Battery Recyclers Inc. vs. United States Environmental Protection Agency - April 21, 2000) vacated the use of the Toxicity Characteristic Leaching Procedure (TCLP) test to determine if, under federal law, MGP waste and contaminated soils exhibited a characteristic of hazardous waste. The United States Environmental Protection Agency (USEPA) has not challenged the decision and has clarified its position in a letter to Vectren Corporation, dated October

19, 2000, and a memo to USEPA Senior Resource Conservation and Recovery Act (RCRA) personnel. These documents acknowledge that the TCLP test cannot be used to determine if MGP waste, contaminated soil, or contaminated sediment exhibits a characteristic of a hazardous waste and since these materials typically do not exhibit any other hazardous characteristic, they will unlikely be classified as a hazardous waste under the federally administered program. Consequently, the excavated soil is exempted from toxicity testing and only requires sufficient stabilization to pass the Paint Filter Test documenting retention of potentially drainable water.

The efficacy of dry wheat straw to sufficiently attenuate drainable water to comply with the required Paint Filter Test was demonstrated for the saturated sediments excavated from Moccasin Creek during the 2007 remedial action. The use of wheat straw is consistent with NWE's desire to beneficially use locally available material. Further, shredded wood fragments, derived from the Brown County Landfill will also be examined for possible use as a water attenuating reagent, for example, to be placed on the beds of on-road transport trucks and for placement on top of the loaded soil to absorb water released from the soil upon agitation during highway transport.

Based on review of the current Brown County Landfill permit, ARCADIS anticipates that the stabilized trench spoils will be classified as petroleum-contaminated soils and therefore managed as a nonhazardous material (to be used as a cover material) in accordance with their operating permit.

3.5 Construction Water Management

During trench construction, ditches and/or berms will be positioned on either side of the windrowed trench spoils so as to confine and direct decant water and runoff. This water will be allowed to re-infiltrate and will be pumped to the treatment pad water collection area as needed to maintain adequate capacity in the ditches and minimize wet surface conditions in and near the work area. Surface features, including siltation curtains and straw bale filter dikes will also limit both run-off and run-on of and into the work areas. Spent bag filters and granular activated carbon will be disposed as nonhazardous waste with the stabilized, excavated soil at Brown County Landfill.

3.6 Minimization of Adverse Impacts to Community

NWE is committed to minimizing adverse impacts to the community throughout the duration of this project. This section discusses specific operational and design approaches for areas of typical community concern.

3.6.1 Duration and Hours of Operation

The remedial action described herein will be of a short duration of only about two months. Further, essentially all work will be confined to the fenced, NWE property. The project is slated to start in early September of 2011 with completion in mid-November 2011. Typical daily active operations will be conducted from 8 am to about 6 pm, Monday through Friday, and Saturdays as needed. Sunday work, absence an unanticipated event, is not planned except for equipment maintenance and site housekeeping. From time to time, on weekends and prior to or after normal work hours equipment maintenance or other relatively quiet site activities might be performed. In accordance with Aberdeen City Code Section 19-102, noisy work activities will not be conducted between the hours of 10:00 pm CDT and 7:00 am CDT.

The remedial action described herein will employ relatively large industry standard excavation and soil handling equipment. This equipment will emit noise, which is one reason for constraining operational hours from nominally 8 am to 6 pm. Importantly though, it is through the use of this relatively large equipment that allows the remedial action to be completed and also completed within a relatively short duration.

3.6.2 Site Traffic

The primary truck traffic will involve transportation of granular backfill and straw to the Site and stabilized soil to the Brown County Landfill. Over the course of a typical work day approximately 20 truck-trips will be conducted to and from the Brown County Landfill with an approximately similar number of truck-trips required for transportation of granular fill to be used for collection gallery installation. Approximately ten truck-trips per day will be conducted to bring in construction material for on-site road construction and other infrastructure, such as the excavated soil treatment pad. If the infrastructure is reclaimed after completion of the collection galleries a few additional truck-trips per day to the Brown County Landfill may be conducted at the end of the remedial effort. In summary, a comparatively modest number of truck-trips are planned and over a relatively short duration helping to minimize adverse impact to the local community.

At the beginning and end of the construction phase, approximately ten truck trips will be required to deliver and demobilize the relatively large, but modularized trenching and support equipment.

Site traffic will consist of appropriately licensed on-road haulage trucks that will be loaded to conform to State transportation and local road weight restrictions. Specific efforts will be made to ensure that impacted soil is confined to the truck and not lost en route to the Brown County Landfill. However, in the event of rain, trucks may pick up clods of non-impacted mud on their tires from the Site's work areas; clods that are then lost when the truck accelerates down a city street. As NWE has historically done during remedial actions within the Aberdeen community, a street sweeper will be employed from time to time, as necessary, to collect and remove accumulated dirt, especially along 1st Avenue NE between the Site entrance and Dakota Street.

Although as noted a relatively small number of truck-trips are planned to and from the site, it is likely that some additional wear and tear will ensue to 1st Avenue NE. Upon completion of the remedial action NWE will work with the appropriate City of Aberdeen representatives to repair and/or replace any portions of 1st Avenue NE adversely deteriorated by normal site traffic. Photos will be taken before and after the construction to determine whether any damage was caused by the project.

The anticipated route from the Site to Brown County Landfill will be as follows:

- Exit the gate on the west side of the Site;
- take 1st Avenue NE two blocks west;
- turn left (south) onto Dakota Street;
- go seven blocks to 6th Avenue South;
- turn right (west) onto 6th Avenue South (Route 12) and drive approximately eight miles;
- turn right (north) on to 379th Avenue;
- drive 1.5 miles and arrive at Brown County Landfill.

Truck travel routes will be coordinated and confirmed with the City of Aberdeen Public Works Department, so as to be compliant with Aberdeen City Code Sections 24-186 through 24-195, which specify that trucks within the City shall operate on streets over which truck travel is permitted.

3.6.3 Control of Site Emissions

Particulate emissions are projected to be limited due to the wet nature of the excavated material. As necessary, water will be periodically sprayed onto on-site roads and other areas generating visible dusting. This water may be augmented with a wetting agent such as calcium chloride.

Off-gas emissions will be constrained by a combination of physical control measures including, for example, suppressant foam, hydromulch, covering with non-impacted soil, and/or plastic sheeting.

3.6.4 Adverse Visual Impacts

NWE is sensitive to the concern as to the potential adverse visual impact stemming from remedial operations, and this concern is demonstrated by the well maintained site that will be undergoing this remedial action. While there is an existing bike path running along a portion of the west property line, the Site is generally not within the direct view of the community, but rather tucked away in an area surrounded by railroad lines, undeveloped property, and commercial and municipal properties including two large water storage tanks. Nonetheless, NWE wishes to note that design and operational efforts will be conducted so as to minimize any adverse visual impact. Importantly, as previously noted this will be a short duration operation. Construction materials brought on site will be quickly used to form a soil treatment pad. Straw bales will be positioned as is safe and practicable to help limit the overall view of the Site. Further, excavated soil stockpiles will be kept to a height of only a few to several feet helping to limit their visibility from off-site.

The trench equipment to be employed is relatively large and will be readily apparent. NWE would suggest though that rather than an “adverse” sight, this equipment might rather prove to be quite “fascinating” to the local public.

4. Relationship to Other Documents

4.1 Basis of Design

The Basis of Design describes the assumptions and other parameters used to guide and constrain the engineering design and overall development of this RAP. Justification for each specific assumption or basis is provided. In certain cases, it is acknowledged that various design parameters could be selected for use in this program. ARCADIS has attempted to use parameters that are reasonable in the sense that they provide a suitable degree of protectiveness for the specific challenge under consideration. ARCADIS wishes to emphasize that simply always selecting the “biggest” or most “extreme” parameter or device is not necessarily the most safe, practical, efficient, or cost-effective alternative. Applying proven industry standard risk management practices allowed establishment of the parameters and assumptions necessary for development of a feasible remedial program.

4.2 Health and Safety Plan

Safety is the top priority for all of NWE’s operations. The companion Site-Specific Health and Safety Plan supporting this remedial action will describe the measures and standard operating procedures to implement this remedial program in a safe and regulatorily compliant manner. Air monitoring procedures will also be detailed in this plan.

4.3 Engineering Drawings and Specifications Package

The engineering drawings typically specify details of each remedial construction component and associated construction tasks. A companion specification package will provide specific requirements and descriptions for completing the various construction activities related to contracts, regulatory compliance, specific methods, equipment, and materials to be used, documentation of quality and quantity, and the criteria for measuring completion. Whereas these documents provide visual and narrative details for individual elements of the remedial components, this RAP provides the narrative discussing the context for these individual activities, the basis for the plan submitted herein, and the collective implementation of the remedial plan.

4.4 Sampling and Analysis Plan

The approaches to sampling and air monitoring and the analytical procedures to quantify the characteristics of interest will be defined within a forthcoming Sampling and Analysis Plan. This work plan describes the media to be sampled during the course of the remediation and how analytical data will be used to provide for a safe, regulatorily compliant, and productive operation.

4.5 Operations and Maintenance Plan

Upon installation of the collection galleries and of the associated surface infrastructure, ongoing operation and maintenance of the collection galleries installed in 2011 and in the outlying years will be performed. This effort will center on the extraction and storage of coal tar DNAPL in preparation for beneficial use or disposal. Upon development of the design of the supporting infrastructure system to be completed in 2011 and 2012 an Operations and Maintenance Plan will be developed and submitted to SD DENR.

5. Summary of Previous Investigations and Conceptual Site Model

Several phased investigations have been conducted at the Site and surrounding areas to identify and characterize environmental impacts that are associated with the Aberdeen former MGP operations and result in over twenty years of investigation and interim remedial actions. These investigations and regulatory directives are summarized in the RAE (ARCADIS, 2010), with the exception of a remedial design investigation conducted in October-November 2010. That scope of work was designated as a Phase 3 of Tier 2 assessment, which aimed to (a) complete the characterization of soil geology and coal tar distribution impact using Tar-specific Green Screening Tool (TarGOST®), (b) characterize site hydrogeology by installing coal tar recovery wells in areas where collection galleries were targeted, and (c) obtain geotechnical data through the use of a cone penetrometer and soil samples (ARCADIS, 2011).

In aggregate, these investigations have provided information to allow formulation of a site conceptual model to help explain the current distribution of coal tar DNAPL and how these factors support the proposed remedial action as summarized in the RAE (ARCADIS, 2010). Coal tar DNAPL, having a density greater than the ambient groundwater beneath the Site, migrated essentially vertically downward through both the vadose zone and below the phreatic surface. Upon contacting comparatively low permeability clay horizons within a glacial till stratum present at a depth of approximately 30 feet below ground surface, the coal tar DNAPL began to migrate laterally driven by hydrodynamic influences of the vertically migrating column of DNAPL and topographic expression of the erosional surface of the glacial till stratum. Recent groundwater monitoring data suggest that much of this migration has ceased as no discernable further migration has been observed in the past several years of site investigation. Based on the current distribution of the coal tar DNAPL, it is suspected that overland flow via ditches or perhaps pipes may have played a role as to the location at which the coal tar was released to the ambient environment and is the primary explanation for the presence of coal tar DNAPL away from the Site. It is the presence of this more distal coal tar DNAPL that requires remedial action on properties adjacent to or away from the Site.

The observation that the glacial till acts as a physical barrier to the further vertical migration of coal tar DNAPL and the ensuing lateral migration, at least in some locations, was the basis for selection of strategically positioned collection galleries as the optimum remedial approach involving the mass removal of coal tar DNAPL and prevention of further lateral migration of this DNAPL.

6. Remedial Activities

The narrative describing the remedial activities for the NorthWestern Energy MGP Site follows an industry standard and logical organization. This organization consists of a temporal presentation of all construction tasks associated with the project and address the efforts in establishing site control and a safe and productive base of operation to support the remediation; the activities directly related to collection gallery installation, local transport, stabilization, loading for off-site transport followed by disposal of the excavated soil; and activities related to site restoration and revegetation followed by removal of mobile and stationary equipment and potentially of the supporting infrastructure.

6.1 Mobilization

Site mobilization and preparation activities will be initiated following receipt of authorization to proceed by NWE. The following general mobilization and site preparation activities will be conducted:

- Development of local, temporary power via generator(s).
- Documenting existing site conditions, including determining the location of aboveground and underground utilities, equipment, and structures, as necessary to implement the RAP activities.
- Mobilizing manpower, equipment, services, and materials to the Site, as necessary to implement the RAP activities.
- Constructing support areas including, but not limited to, excavated soil dewatering, stabilization, and load-out areas; onsite storage areas for construction materials and straw; and equipment, material, and personnel decontamination areas.
- Installing temporary fencing in select areas to demarcate exclusion and support zones.
- Constructing site access roads, ditches, retention pond, berms and straw bale filter dikes, siltation fencing, and other erosion control devices.
- Setting up office/work trailers and portable sanitary facilities.
- Topographic surveying and staking of the proposed trench locations

The first activity will be coordination with the State of South Dakota One Call who will provide for approval of proposed excavation locations, for example, to locate the trace of the collection galleries, ditches, and other subsurface engineered elements. Given the apparent relative smoothness of the field to be used for the base of operations, it is believed that an office and work trailer may be directly delivered to the Site and erected prior to major road construction. The single office/work trailer will be erected as shown in Figure 2. Due to the limited site staff and the short duration of this remedial effort one trailer is anticipated to be sufficient for the remedial subcontractor, NWE and technical support staff, worker break and lunch areas. This positioning of the trailer will facilitate isolation of the “support zone” (an area not requiring any specific personal protection equipment (PPE), such as hard hats or hearing protection) from the “exclusion zone” (the area where remedial field efforts are underway and that require PPE). Further, it will facilitate Site control and security, especially during non-working hours. Concurrent with delivery of the office and worker trailer, lavatory, bottled water, and waste collection services will begin. Personal protective equipment (PPE), as detailed in the Health and Safety Plan, will also be delivered, examined, and stored in a support trailer for on-going use. A project sign will be erected to identify the Site entrance. Office supplies and support equipment, such as a combined copier/scanner machine will be acquired along with site radios. Due to the limited electrical demand and the short duration of the remedial effort, electrical power with be provided by a generator. This will obviate the need to construct a specific power drop and for the construction of utility corridors. The use of diesel pumps to locally convey water and for treatment will also negate the need for access to electrical power provided by a distribution drop.

Real time site-wide communications are vital to help maximize safety and productivity. Direct personal communications will be augmented by the use of site radios which will allow workers to communicate, even in the presence of relatively noisy equipment. Other modes of communications will include hand signals, signs, and flags. Traffic control will be maintained by temporary placement of security fencing and/or traffic barrels or cones. Cellular phones and cellular equipped laptop computers will be used to communicate with off-site project personnel and for emergency communications.

Upon erection of office trailers and delivery of heavy equipment, site security will be established through the use of contractor personnel or subcontracted security guards. A security guard will require all employees, vendors, and visitors to register. This will provide documentation as to the people on-site and also ensure that all visitors are appropriately informed as to the safety procedures for the site prior to participating in any site tours. All site visitors will be required to abide by the provisions outlined in the

Site-Specific Health and Safety Plan, including the donning of appropriate PPE if entering the established exclusion zone or contamination reduction zone. The security staff will also guard the Site during non-working hours and on weekends. This site security will continue until demobilization activities are completed at the end of the project.

Whereas initially only a few workers will be present on-site, upon erection of the trailer and the pending delivery of heavy equipment and other site supplies, the majority of the site workers will arrive. Upon their arrival a project kickoff meeting will be convened. This meeting will emphasize the safety aspects of the remedial action to be completed. The average total number of people on-site will be less than twenty, on any given day, and will consist of NWE representatives, oversight contractors, remedial action construction subcontractors, various support subcontractors and vendors, and SD DENR and City of Aberdeen staff. This will require parking for up to nominally twenty vehicles. An employee parking lot will be constructed as shown on Figure 2. This parking area will consist of a mowed area which will then be covered with pea gravel. This area will be routinely maintained by grading and replacement of gravel to fill in potholes as they develop. A smooth, compacted walkway will also be developed to ensure a safe walking path to the office and work trailer.

Whereas the work is scheduled to continue into November 2011, provisions for snow and ice removal have been incorporated into this RAP. It is anticipated that during the course of this remedial action, as currently scheduled, snow removal might be necessary. Snow removal may be performed on the main Site access road and the access roads into the Site by a motor grader. Snow removal around more confined areas, such as the parking lot and modular water treatment system will be performed either by hand or through the use of snow blowers or a Bobcat-type excavator. As necessary, to maximize safety, the use of ice melting reagents to remove ice may be employed on roadways, the parking lot, and walkways.

Because the Site consists of a clear and open field, no clearing and grubbing will be necessary. Consequently, industry standard orange-colored construction security fencing can be immediately erected around the support areas connected to the perimeter fencing. Placards noting restricted access to the fenced areas will also be posted. It is estimated that approximately 2,000 linear feet of temporary security fencing and siltation fencing will be erected. The siltation fencing will be erected within the security fencing to limit the release of stormwater runoff bearing suspended sediment. The proposed locations of the security fence and siltation fencing are shown on Figure 2.

Prevention of off-site suspended solids transport in stormwater run-off will be augmented through the use of physical engineering controls, for example, ditches, diversion berms, and straw bale dikes. Water leaving non-impacted portions of the Site will be directed off-site to the extent possible, allowing an emphasis on control of water which will have contacted impacted portions of the Site.

Generally concurrent with the erection of security fencing and siltation fencing will be construction of site access roads, parking lots, equipment parking and maintenance areas, and contaminant reduction zone where workers can doff contaminated clothing and other PPE prior to fully entering the "support zone".

The modest number and size of mobile equipment on-site will nonetheless require an on-site fuel supply. A fuel tanker truck will be subcontracted and placed on-site to facilitate refueling of equipment. As the fuel within this tanker truck is depleted another full tanker truck will be brought to the Site providing for a continuous and self-contained mobile fuel supply. Although not anticipated, any fuel that is spilled or leaks onto the ground from the tanker truck during the normal course of re-fueling will be quickly removed and the impacted soil disposed with the soil waste stream at the Brown County Landfill.

Upon completion of the mobilization phase, workers will have been educated in terms of site safety. The office/worker support trailer will have been erected and will be fully functional in terms of office supplies and equipment communications, power, water, outside lavatories, and vendor support services. Site security will have been established. Security fencing and siltation fencing which will collectively limit site access and prevent off-site release of sediments in stormwater run-off will have been erected. Other stormwater control features will direct non-impacted water away from the Site and areas of remedial activity. Equipment will have been delivered and site roads and other support areas will have been constructed.

The general base of operations is depicted on Figure 2.

6.2 Site Preparation

6.2.1 Remedial Action Equipment Fleet and Work Staff

The exact fleet assembled to perform the remedial action associated with construction of the collection galleries and subsequent handling of the excavated soil and its local transport, stabilization, and loading for off-site transport will be a function of the constructor's preference for use of certain equipment types and sizes as well as equipment availability. In general, for the purposes of this RAP, the equipment fleet for this remedial work is expected to consist of the following:

- Industry standard trencher capable of excavating to depths up to 45 feet below ground surface
- One (1) – 235 Class Caterpillar Hydraulic Excavator
- One (1) 20-ton 769 Class Caterpillar Off Road Truck
- One (1) Forklift (for off loading of various supplies)
- One (1) Farm tractor (designed for handling of large straw bales)
- One (1) Wheeled front end loader 966 Class Caterpillar (for handling of wood chips and stabilized soil)
- One (1) Motor Grader (for periodic road grading)
- One (1) Water wagon (for periodic use in watering of site access roads)
- One (1) Street Sweeper (for periodic use in cleaning non-contaminated mud from local city streets)
- One (1) Bobcat excavator (for general site use)

At this time it is undetermined if excavated windrowed soil will be transported to the treatment pad area through the use of a hydraulic excavator and an off-road truck or the use of a wheeled front loader. A hydraulic excavator will be employed at the treatment pad area for mixing of the sediment and the straw and for subsequent loading of the stabilized material into on-road hauling trucks.

One air monitoring "rover" along with one sampler will perform construction oversight matters. As noted above, from time to time, senior project contractor staff will be on-site along with NWE, SD DENR, and City of Aberdeen staff.

6.2.2 Construction of the Treatment Area and Delivery of Soil Amendments

A trench spoil treatment area will be designed to accommodate nominally one day of production for each of the three unit operations to be conducted at the Site. These unit activities consist of passive dewatering; mixing of straw; and off-loading into on-road hauling trucks. This requires a footprint of approximately 16,000 square feet. The treatment area will be constructed by initial grading of the field surface and installation of a 60-mil High Density Polyethylene (HDPE) liner. Topsoil removed during this initial grading will be used for berming around the perimeter of the treatment area to help control surface water drainage and to preserve this topsoil for replacement back onto the treatment area upon completion of the project. The liner will be overlain by six inches of coarse sand or rock. The coarse sand/rock will, in turn, be overlain by a woven geotextile, which will be overlain by nominally six inches of minus two-inch stone layer. These layers will provide an impermeable liner at the base overlain by protective granular earthen material that will facilitate drainage of water away from the treatment area, thereby preventing standing water from developing on the basal liner. The treatment area will have a perimeter collection ditch along its down-sloping edge. The collected water will be treated prior to release to the municipal sanitary sewer (Section 5.9).

Acknowledging the importance of the treatment area, NWE reserves the right to allow construction contractors to increase the size of the treatment area, if the contractor determines that such an increase would aid operational efficiency sufficient to provide for increased safety benefits or cost savings.

Bench-scale testing documented the efficacy of wheat straw as a drying reagent to adequately attenuate water within sediment during the 2007 Moccasin Creek remediation project. This testing suggested that mixing the sediment with about three percent, by weight, wheat straw having an initial moisture content of 12 percent, by weight, will allow the stabilized sediment to pass the Paint Filter Test. Wheat straw will also be used for this project, which is estimated to require about 95 tons of wheat straw. Given that each “large round” bale of straw weighs about 500 pounds, a total of 380 bales will be required, with each straw bale stabilizing about 8 tons of excavated soil. Assuming a treatment rate of 300 tons per day, about 36 bales of straw will be required per day. Assuming that 20 bales of straw can be delivered per truck load, two truckloads of straw will be required per day. By double stacking the bales to help limit the visibility of the site operations, an area 75 feet square will be required for stockpiling. The treatment pad area is shown on Figure 2.

6.2.3 Site Access Road Development

Access road construction will begin with plan development showing the trace of the collection galleries and the route of excavated trench spoils to the treatment pad, as well as the path to be taken by a front end loader to bring granular backfill to the trenching equipment.

The trencher will work from a leveled and well graded twenty-foot wide zone centered on the trace of the collection gallery installation line. Excavated soil will be windrowed as appropriate as the trencher advances down the trace. A wheeled front end loader will deliver granular media for backfilling the excavation. As appropriate and necessary, either the wheeled front end loader will deliver windrowed trench spoils to the treatment area or a hydraulic excavator will load an off-road truck which will then deliver the soil to the treatment area.

Due to the short duration of the project, and relatively limited on-site traffic required during construction, access roads will be constructed from the site entrance to the support trailer and treatment pad areas, and from the trench work areas to the stockpile areas. The design of the roads will consist of placing gravel on the existing surface and replacing it on an as-needed basis.

Consistent with the “Observational Approach” discussed previously, the design of the access roads will be adapted to site conditions. The flat and open terrain present at the Site will facilitate positioning and operation of the trencher and support equipment.

6.3 Pre-Excavation

To ensure efficient construction, before trenching equipment mobilization a shallow excavation program will be conducted along the trace of the collection galleries. A narrow soil profile will be excavated to a depth of approximately six feet below ground surface to identify shallow subsurface obstructions (e.g., building foundations, inactive utility lines). The excavated material will then be immediately backfilled into the excavation. Inactive gas and sanitary sewer lines that are encountered during the pre-trenching activities will be cut and capped. Rubble, cobbles, and other potential obstructions to trenching will be removed. The pre-trenched areas will be backfilled with the excavated soil.

6.4 Trenching

Prior to undertaking the trenching, the planned alignment of the trench will be surveyed and stationed. The stationing will be in 100-foot increments and should be used as primary reference during construction and quality control testing. In addition, the elevation of each station should be established and recorded on the station survey stakes so that correlation with boring data may be made during trench excavation. The collection galleries will be constructed to the lines, grades and cross-sections as indicated on the design drawings.

The exact depth to be trenched and the associated slope angle of the base of the trench will be developed for each collection gallery and conveyed and discussed with the contractor. As necessary, positioning of the trencher will be determined by the use of survey monuments and/or a Geographic Positioning System (GPS). The overall approach for each collection gallery will be thoroughly discussed to ensure that full and complete understanding of the design elements of the trench are understood and can be completed. Discussions will also be conducted as to understanding where excavated soil will be windrowed and when and how it will be transported to the treatment area. Upon determining that all support features are available and operational, trenching will be initiated.

As the trenching progresses, air monitoring will be performed along with air emissions suppression efforts, such as application of foam and/or hydromulch. As is necessary and appropriate, windrowed excavated soil will be removed and transported to the treatment area.

6.5 Air Emissions Control and Monitoring

As discussed above, NWE is committed to completing this remedial action while protecting workers and residents from exposure to adverse toxic emissions and preventing, to the extent practicable, exposure of residents to malodorous/nuisance odor emissions. Real time monitoring of benzene will be conducted along with monitoring for malodorous emissions. Air emission suppression efforts will be conducted as necessary, including the use of multiple forms of control to help appropriately constrain emissions. Stockpiled material will be covered as necessary with plastic sheeting, suppressant foams, and/or hydromulch to help limit emissions. Particulate emissions are not considered to be a significant challenge during the installation of the collection galleries as the excavated material will be wet. Also as noted, application of water from a spray truck will be employed as necessary to prevent visible dust generation on site roads. This water may be augmented with calcium chloride to provide longevity to dust suppression efforts.

6.6 Access Road Removal and Reuse

At this time access roads may be allowed to remain after installation of the collection galleries as these roads can also be incorporated into ongoing site operations. The site roads would likely only be removed from NWE property at the end of the operation of the collection galleries.

6.7 Trench Spoil Staging and Stabilization

Trench spoils will be transported either via wheeled front end loader or hydraulic excavator and off-haul truck to the treatment pad. There, the soil will be placed and allowed to initially dewater, with the drainable water collected in a perimeter ditch/retention pond. After nominally one day of dewatering the excavated soil will be placed on an adjacent portion of the treatment area into a nominally one-foot thick vertical “lift” of soil. The wheat straw, initially in the form of bales, will be “unrolled” from round bales onto the treatment area or shredded and distributed onto the soil. After straw placement, another lift of soil may be placed over the soil/straw layer to be followed by placement of additional straw. In this manner a multi-layer soil/straw lift will be developed. Multiple lifts of soil and straw will be available to ensure productivity at the treatment area and facilitate the adsorption of potentially drainable water in the soil. After allowing the straw to absorb freely released pore water for approximately one day, a hydraulic excavator will rake the soil and straw admixture into a stack. The mixing effect of this action will facilitate additional contact between the water-bearing soil and the straw, aiding in water absorption. After being allowed to react for a period for approximately one additional day, the stacks will be consolidated with other stacks into a soil-straw stockpile. A thin residual lift of stabilized soils will be left on the treatment pad to prevent the unintentional excavation into the granular material and underlying liner. The stabilized soil stockpile will be loaded out into on-road haul trucks for transport to the Brown County landfill for disposal. Trucks entering and leaving the landfill will be weighed to determine the weight of the total mass of soil and straw (and, if present, other material) disposed. By determining the number of bales of straw used and their average weight, the total tonnage of soil disposed can be calculated for reporting purposes.

One day of production capacity of the trencher will be designed for each stage of the treatment process: initial dewatering; straw mixing and; stacking and off-loading into on-road haul trucks. This allows time for potentially drainable water to be attenuated without requiring an excessively large area for stockpiling and minimizing the air emissions emanating from straw-bearing soil.

Under essentially steady state conditions, soil would arrive on “day one” and allowed to be dewatered. During “day two” the sediment would be treated with straw and mixed into small stacks. During day three it would be consolidated with other companion stacks and stockpiled for disposal.

6.8 Wastewater Treatment System

A treatment system will be established in the treatment pad area to handle decanted water and runoff from the trench spoils as they undergo stabilization and stockpiling. Wastewater will be pumped from a collection sump through one of two bag filter units (configured as primary and spare), and through appropriately sized hose through granular activated carbon (GAC) and/or organoclay columns. The spare bag filtration unit can be brought on-line to allow uninterrupted operation of the treatment system during filter bag change out in the primary unit. The primary and spare bag filter units are anticipated to use 50-micron filter bags for suspended solids removal during normal operation, however, the most effective and appropriate filter bag micron rating will be determined in the field. Water exiting the GAC and/or organoclay columns will be conveyed through 4-inch-diameter hose to a discharge point that is agreeable to the city, likely a sanitary sewer manhole near the intersection of 1st Avenue NE and Jackson Street.

6.9 Treated Soil Loadout

The stockpiled soil-straw mixture will be loaded into nominally 20-ton capacity on-road haul trucks with a hydraulic excavator. During load out, a small amount of straw will first be placed into the bed of the truck to facilitate complete and clean load discharge upon tipping at the landfill and to help soak up any water released from the sediment-straw admixture during transport to the landfill. Clean and complete discharge of the load is especially important when handling wet soil with an air temperature of less than 32 degree Fahrenheit (freezing conditions); a condition that may be encountered during this remediation.

A criterion for acceptance of the soil at the Brown County Landfill is passage of the Paint Filter Test, a passive, one standard gravity unit of acceleration drainage test. The soil being transported within the highway truck will be exposed to accelerations exceeding one standard gravity unit. In the event these accelerations cause the release of water from the stabilized soil, this released water will tend to pool on the surface of the soil load. This pooling can cause an initial “splash” of water to result upon tipping the truck bed at the landfill. Therefore, a coating of straw or wood chips will be placed on top of the loaded soil prior to the trucks leaving the treatment area for the landfill. The presence of the straw or wood chips will help consume any water that is released from the soil load during transport, minimizing the potential for this splashing issue from occurring.

The soil loading approach has been designed to obviate the need for continuous tire washing and subsequent tire inspection. The treatment pad soil loading area will be divided from the truck loading zone by security fencing over which a hydraulic excavator may reach. Trucks will back up to this security fence and into a position to be loaded by a hydraulic excavator located in the treatment pad stockpile area. The excavator will then systematically load the truck. It is likely that, from time to time, soil adhering to the excavator bucket will become dislodged and falls outside the confines of the truck bed onto the ground. The area immediately surrounding the loading area will be covered by plastic sheeting, which in turn will be covered with wood chips. A shovel-wielding laborer will watch for soil falling from the excavator bucket onto the wood chips covered plastic sheeting. When safe to do so, the worker will then shovel the dropped soil back over the security fence and into the treatment pad where it can later be loaded into a truck. The net result of this process is that the on-road hauling trucks are always driving on “clean” wood chips and plastic sheeting and do not encounter impacted soils that might adhere to their tires and require washing prior to leaving the Site. The absence of any soil adhering to the tire precludes the need for tire washing and inspection and disposal of the associated tire washdown water.

6.10 Transportation Control

Once the on-road trucks are appropriately loaded and covered, the trucks will depart the Site via 1st Avenue NE and continue on to the Brown County Landfill located 14 miles west of the Site. Truck travel routes will be coordinated with the City of Aberdeen Public Works Department, so as to be compliant with Aberdeen City Code Sections 24-186 through 24-195, which specify that trucks within the City shall operate on streets over which truck travel is permitted.

Once entering the landfill, the trucks will pass over a truck scale to obtain a loaded weight ticket and will be instructed as to where to tip. Prior arrangements will be made with the landfill to document passage of the Paint Filter Test for the soil shipped. Further, agreement will be reached as to calculating the tonnage of soil disposed through the use of a daily tare weight for each truck used in soil transportation to the landfill. Establishing this tare weight may occur after the first tip of the day although other approaches may be used. It is also possible that periodically, after tipping, trucks will be loaded with wood chips present at the landfill for transport and use at the Site.

6.11 Site Restoration and Revegetation

Upon completion of the remedial activities, impacted areas of the Site will be restored to essentially their pre-remedial condition or to conditions acceptable to NWE. These activities include backfilling of temporary ditches and sumps, replacement and grading of topsoil, installation of COIR rolls, and seeding and mulching of the disturbed areas. Erosion and sedimentation controls (e.g., staked hay bales and silt fences) installed prior to construction will be removed.

If necessary, access roads will be constructed to the collection gallery sump locations to facilitate pumping directly into tanker trucks or portable tanks, if needed. All disturbed areas that are not required for the anticipated Stage 2 (off-site) collection gallery construction will be restored to their prior condition or better. The treatment pad and other project support areas may be left essentially as is through completion of the Stage 2 construction. Because the Stage 1 construction is expected to be completed in early winter, the COIR rolls will be used to minimize erosion until seeding, fertilizing and mulching can be completed the following spring.

6.12 Demobilization

This unit series of activities can be thought of as the reverse of the initial mobilization activities. Upon construction of all of the targeted collection galleries the trencher and other heavy equipment which is no longer required at the Site will be decontaminated by steam pressure washers and transported off-site. The wastewater treatment system will be dismantled after all equipment has been decontaminated.

As discussed, it is possible, indeed likely, that the roads and treatment area and associated ditches and retention ponds will be maintained for future use as additional collection galleries are constructed in off-site areas.

Unused straw will be used as part of the site restoration and revegetation effort. Impacted areas of the Site will be graded and returned to more or less their original topographic contours or as acceptable to NWE.

Lastly, the site security fence and will be removed along with the office trailer. Site security will be suspended and the last site workers will depart the Site. Siltation fencing will be removed upon confirmation that any revegetated areas have been established.

During the demobilization efforts coordination with NWE will be maintained to complete any "punchlist" items that need to be completed. The timing for site demobilization during early winter does not provide for site revegetation efforts. Consequently, NWE will coordinate with a local landscaper and/or nursery to complete final site restoration and revegetation efforts in the spring.

7. Construction Quality Assurance

7.1 Project Meetings

7.1.1 Project Kick-Off Meeting

A project kick-off meeting will be held on the first day of the remediation activities (following arrival of the majority of the site workers). The primary objectives of the meeting are to:

- Review the HASP;
- Coordinate site activities with project-related personnel;
- Review the location for the proposed collection galleries and the supporting facilities; and
- Identify treatment areas for equipment, materials, and decontamination zones.

Additionally, a safety discussion related to operation and working around the relatively large trenching excavator will be completed to ensure proper and complete communications and also areas in which the operator has limited view of workers and equipment.

Prior to any actual trenching, a “dry-run” will be performed to assess whether each and every aspect of safety has been considered and optimized.

ARCADIS’ onsite representatives and project manager, NWE’s project manager, and a representative from the SD DENR, as they wish, are anticipated to participate in the project kick-off meeting.

7.1.2 Daily Site-Safety/Coordination Meetings

The daily meetings will be attended by the remediation contractor and their subcontractors as appropriate, ARCADIS’ onsite project manager and onsite personnel, the NWE on-site representative (when applicable), and other necessary parties to discuss the day-to-day operations, daily schedule, health and safety issues, contractor coordination issues, and general project status.

7.1.3 Weekly Progress Meetings

Weekly progress meetings with the NWE / ARCADIS project team will be held at the Site to discuss issues including, but not limited to, project status, schedule, scope of work, proposed deviation for the Work Plan, and overall project implementation. A conference line will be established to facilitate participation by key project personnel, client personnel, and regulatory personnel who may desire to attend some or all of the weekly meetings.

7.2 Analytical Data and Field Instrument Readings

Several sources of data will need to be managed both during the course of this project and after its completion, including the following:

- Total Petroleum Hydrocarbons – Diesel Range Organics and Gasoline Range Organics (one for every 1,000 tons of treated soil);
- Paint Filter Test data for individual lots of treated soil;
- Air emissions sample data, including:
    - Hand held device air emissions analytical data reporting, and
    - Fenceline perimeter air emission analytical data reporting
- Wastewater sampling, if necessary to meet the conditions of the municipal wastewater discharge permit.

These data will be administered by a scientist at the Site who will assemble and report on these statistics as they become available. These data will be reported in a daily project report and will become part of the administrative record documenting compliance with the various project-related criteria. The Paint Filter testing will be performed on-site using approved methodologies and instrumentation. The air emissions data will be from a combination of on-site and off-site testing.

Additional QA/QC testing and oversight will be performed to ensure that construction methods and materials comply with the specifications required within the bid documents provided to the subcontractors.

7.3 Accordance with Specifications

NWE and/or an ARCADIS representative will be on-site throughout the duration of the construction to ensure accordance with design drawings and project specifications. Deviations from specified construction elements and materials will require approval from NWE and ARCADIS. Requested contractor submittals (for example, documentation on the source and gradation of aggregate, strength of geotextiles, ratings for pumps and wastewater treatment equipment) will be reviewed by ARCADIS and documentation of approval will be made prior to use.

Following the completion of remedial construction, a punch list will be developed and provided to the contractor to ensure full accordance with all project specifications, including restoration of the Site.

7.4 Contingency Plans

An effective RAP carefully, systematically and comprehensively describes the approaches and procedures to be followed in achieving a safe and cost effective process that meets remedial objectives. While sufficiently detailed to fully describe the process, an optimum remedial action plan also incorporates sufficient flexibility to accommodate inevitable changes in conditions as well as addressing responses to potential upsets. As previously discussed, NWE and ARCADIS will fully utilize the power of the “Observation Approach” and the “Management of Change” processes as part of the adaption, modification, or implementation of new procedures in addressing these new or upset conditions.

This subsection discusses the procedures used to address these possible changed conditions and upset conditions. In spite of careful planning and preparation specific contingencies are proposed in the following subsections.

7.4.1 Off Gas Emissions

In the remediation of any MGP site one must concentrate on understanding and appropriately limiting off-gas emissions, including both toxic and malodorous gasses. This remedial action does not involve excavation of a massive open pit that can freely and adversely emit toxic and malodorous gasses. In fact, it was, in part, concern as to specifically limiting off-gas emissions that contributed to the selection of the remedial alternative to be implemented. It also must be noted that in the case of malodorous, but non-toxic emissions, that the short duration of the excavation effort, limited to perhaps two weeks will also help limit total adverse impact to the community.

However, as impacted soils will inevitably be brought to the surface during trenching, it is likely that some off-gassing from the excavated soils will occur. As noted, real time monitoring of toxic and malodorous emissions will be performed. In the event that off-gas concentrations reach actionable levels, for example, from the windrowed excavated soil, physical barriers will be emplaced to constrain emissions. These physical barriers may consist of, for example, plastic sheeting, hydromulch, and/or gas suppressant foams. Further, it is likely that only the relatively small portion of the excavated soil that was in contact with the subsurface coal tar DNAPL will emit off-gasses. As safe and practicable, the other, non-emitting excavated soil may be used to cover the degassing soil. Similarly, upon relocation of the soil to the treatment area, comparatively clean soil can be used to cover degassing soil.

7.4.2 Unstable Excavated Soil

The excavated soil will have variable water content and may show similar variability in strength and its ability to provide for adequate self-support when placed in windrows. In the event that soils with high water content cannot be self-supported in windrows, immediate relocation to the treatment area for stockpiling and dewatering will be considered. Further, the use of dry straw at the excavated trench along with perhaps other drying agents, such as Portland cement will be considered. These drying agents would be placed to allow for rapid initial mixing and stabilization of the excavated sediment. Alternatively, if adverse sediment slump is noted, soil berms could be constructed to physically limit the lateral slumping of the excavated sediment. Upon excavation and relocation of the trench spoils to the treatment area, the temporary berms will be reclaimed (also relocated to the treatment area for stabilization and off-site disposal). It is important to note that only a few hundred tons of soil will be excavated per day aiding in the control of problematically low strength material in the event that it is encountered at all.

7.4.3 Excessive Water in Excavated Soil and/or Rainfall

The water control and retention design components of this project assume all of the soil is fully saturated upon excavation and will undergo a relatively high degree of dewatering helping to minimize unexpectedly high water release issues. However, it is possible that locally excessive water releases might be encountered; an event that could coincide with heavy precipitation. In the event that these two low probability events occur coincidently, various water control measures can be implemented. As necessary, larger ditches and/or retention ponds can be constructed as well as an increase in the rate of water treatment for that water that has been collected. Importantly, the dimensions of the ditches and water retention ponds to be constructed are comparatively small and can be materially increased quickly. Further, soil berms can be quickly erected to form dam-like features that in conjunction with straw bale filter dikes can retain or help direct water to control features. If a major storm event is predicted, site operations can be modified to accommodate this event.

7.4.4 Spills

Diesel fuel will be used to power mobile equipment and generators. A mobile tanker truck will likely be positioned within an appropriately bermed and lined storage unit. A Spill Prevention Countermeasures and Control (SPCC) Plan will be prepared and appropriate spill response equipment and materials will be in place to address any unlikely event of release of fuel.

8. Schedule

The timing for this remedial action has been deliberately targeted to be performed after heavy summer rains allowing for a safe efficient remedial operation to be instituted and completed. This program will be completed in mid-November, prior to the onset of severe and sustained winter conditions. This time period also follows the local combining of wheat, producing a large supply of wheat straw for use as a drying reagent to be available.

A Gantt chart is provided as Figure 3, depicting the specific work activities that must be completed, the durations projected for each activity, and the relationship of each activity to preceding and successive work activities. This schedule follows, to the extent practicable, the order of the discussion of this RAP. Importantly, given a September 19, 2011 mobilization date, this schedule projects that remedial action can be completed by November 14, 2011.

8.1 Project Timeline

The Stage 1 collection gallery construction represents only one component of the integrated and comprehensive slate of remedial activities to be performed in phases over the course of the next several years. In summary, in 2011 about 40 percent of the targeted collection galleries will be installed. In 2012 the coal tar DNAPL handling infrastructure will be designed and constructed. It is planned that coal tar DNAPL will be collected from the first phase set of collection galleries to compare actual coal tar DNAPL volume and its rate of collection relative to prior modeling and other estimated predictions. If the collection galleries perform as expected, design and construction of the Stage 2 (off-site) collection galleries (modified as necessary and optimal based on the performance of the first phase galleries), would take place in 2013. Their supporting infrastructure would be designed and installed in 2014. Full scale collection and beneficial use and/or disposal of the coal tar DNAPL will proceed until cessation criteria (Section 9) are achieved. The operation of the collection galleries would be expected to continue for the next few to several years. Upon reaching the cessation criteria for gallery performance, the collection gallery infrastructure would be removed and the galleries would be closed in-place. Groundwater monitoring would continue during this time.

If Stage 1 collection gallery performance is less than expected (or potentially vastly better than expected) a reanalysis of the collection gallery design, positioning, and operation would be conducted to determine how to accommodate or overcome performance limitations that were being observed. These results would be captured and reported to stakeholders as part of the Management of Change procedure.

8.2 Production Monitoring

A critical aspect of successful project management will be understanding the periodic production (daily, weekly, monthly and project to date) and how these production data relate to maintaining or improving upon the overall project schedule. Among the production and inventory control items requiring monitoring are:

- Daily linear footage of collection gallery installed
- Daily consumption of wheat straw
- Daily soil volume delivered to the landfill (based on tabulation of scale tickets)
- Daily estimate of the volume of water treated and discharged
- Air emissions control data reporting and tabulation
- Delivery of wheat straw

Daily production records will be generated by collating a variety of information derived from the operators of the trenching excavator, hydraulic excavators, off-road hauling truck drivers, landfill scale tickets, and other site workers. The goal of this reconciliation effort will be to determine how much soil was excavated from the collection galleries. This will be done through the use of truck load counts and, at least initially, of an assumed truck load factor (an estimate of the average tons of soil loaded into each off-road truck) and/or estimates as to the tonnage transported via front end loader. Data will be compared with truck scale tickets adjusted to reflect the tonnage of straw and wood chips added to the sediment. Through this process, an estimate can be made of the daily soil excavation, stabilization, and transport to the landfill with the data being used to optimize production schedules. Data will be reported on a daily basis with adjustments to estimated production based on landfill scale ticket data as is possible, for example, when a discrete lot of soil, consisting of a known number of off-road truck loads, straw, and wood chips is fully transported to the landfill.

9. Initial Operational Maintenance Activities

Remedial Action Work Plans typically include some discussion of ongoing operation and maintenance, especially for multi-year efforts such as will be performed at the Aberdeen MGP Site. In this specific case though, due to the forthcoming design, construction, and operation of the collection galleries starting after installation of the galleries described herein, discussion of an Operations and Maintenance (O&M) Plan will focus on only those activities related to monitoring the collection of coal tar DNAPL within the subsurface collection galleries. To be clear, after the exact positioning and final, as-built configuration of the collection galleries are determined during the 2011 effort described herein, design of the supporting infrastructure (pumps, pipes, storage tanks, access roads, and other features) will be completed in the late-2011 to mid-2012 timeframe. As part of this design effort, an O&M Plan will be developed to achieve the on-going safe and effective removal and temporary storage of the collected coal tar DNAPL at the surface and its off-site transportation for beneficial use and/or disposal. This O&M Plan will also discuss contingency approaches to aid in subsurface coal tar DNAPL removal. Whereas it is believed that a passive mode of collection will achieve a desired degree and rate of coal tar DNAPL collection, a “quasi-active” mode, entailing the periodic pumping of coal tar DNAPL and water from the collection galleries, will also be discussed addressing the operation specific requirements for water treatment and disposition.

After completion of the collection galleries in late 2011, during the ensuing winter months periodic measurements will be performed within riser pipes to measure the depth of coal tar DNAPL and thereby help evaluate the volume and rate of accumulation of coal tar DNAPL (see Section 8.2). Importantly, a design component of the collection galleries is designing sufficient storage volume to accommodate coal tar DNAPL collection to occur over the course of months without impeding the rate of collection of the coal tar DNAPL. This design feature is to allow for coal tar DNAPL to collect during brutal winter months without the specific need for operation or hindering the rate of coal tar DNAPL collection. The measured thickness of the coal tar DNAPL will be assessed to determine performance of the collection gallery and how the measured performance compares to predicted estimates. These data will aid in determining the design and operational schedule to be constructed and implemented starting in the spring of 2012.

During these periodic site visits, observations of the surface expression of the collection galleries will be made to determine any adverse settlement or other indications of adverse behavior. Additionally, the presence of any detectable adverse odor emissions emanating from the collection galleries or the riser pipes will be assessed.

9.1 Periodic Post-Construction Inspections of Restored Conditions

Short term O&M will include periodic inspection of site conditions following demobilization. The purposes of such inspections will be to verify that suitable vegetative growth becomes established throughout the restored areas and identify areas of excessive erosion or settlement

Minimal site restoration will be completed during project demobilization due to the onset of winter. A site restoration inspection will begin in the spring of 2012, with specific restoration tasks identified as may be required to close out project permits and return the site to functional use. It is anticipated that much of the site operations area will be used for construction of off-site collection galleries in 2013 and therefore may be left in place. Additionally, construction of coal tar DNAPL handling infrastructure, including subsurface pipelines, aboveground storage tanks and site roads will factor into decisions regarding on-site restoration.

9.2 DNAPL and Water-Level Measurements

Following construction of each collection gallery, periodic monitoring of DNAPL and groundwater levels within and surrounding the trench will be conducted. The purpose of the monitoring will be to assess fluctuations in DNAPL thicknesses and groundwater levels as a function of time, and to see how these parameters respond to system changes (e.g., removal of DNAPL and/or groundwater from the trench sumps). These data will be useful in determining an appropriate DNAPL removal frequency and schedule.

Monitoring will be conducted on a daily basis for the first two weeks following construction of the collection galleries. Note that not all of the wells/piezometers proposed for monitoring may be available for these initial monitoring events; monitoring at new piezometers will be initiated as soon as possible following their installation, and the new piezometer and collection gallery network will be presented in the forthcoming O&M Plan . Based on the rate of DNAPL collection in the sumps and surrounding piezometers, the monitoring frequency may be reduced following the initial two weeks of operation. However, the monitoring frequency during the initial month will not be less than once per week. Following the first month of operation, the monitoring frequency may be reduced again for monitoring through the first year of operation.

However, the monitoring frequency during the first year will not be less than once per month. Following the initial 12 months of monitoring, a long-term monitoring schedule will be established based on the DNAPL collection rate observed over the first year of operation, and the planned DNAPL removal schedule (see Section 8.3). Proposed minimum DNAPL monitoring frequencies for the first year following trench installation are summarized in the following table.

Time Period Following Installation	Minimum Monitoring Frequency
First two weeks	Daily
Week 3 through first month	Weekly
Month 2 through month 12	Monthly
Following first 12 months	To be determined based on observed DNAPL collection rates during the initial 12 months of DNAPL collection

Monitoring procedures will be as follows:

1. Measure and record the depth to water using and oil/water interface meter.
2. Continue to lower the oil/water interface probe down the well to the top of DNAPL surface or the bottom of the well. If DNAPL is detected, record the depth to the top of the DNAPL surface and remove the oil/water interface meter from the well.
3. Lower a weighted measuring tape to the well bottom and record the total well depth.
4. Remove the weighted measuring tape from the well and record the DNAPL thickness (DNAPL will coat the weighted measuring tape) and observations, if any.

9.3 DNAPL and Groundwater Collection, Treatment, and Disposal

DNAPL will be periodically removed from the collection trenches on a schedule to be determined based on the results of the DNAPL monitoring. An attempt will be made to maintain the level of accumulated DNAPL within the trench to below the top of the geological confining layer at the downgradient end the trench. The actual depth of the excavated trench will be used to determine the total “storage” capacity of the trench and, based on postulated or actual volume of coal tar DNAPL collected, to help determine the timing of coal tar DNAPL extraction and the volume of required removal of coal tar DNAPL from the trench to maintain an adequate “freeboard” within the collection gallery trench base.

Initially, DNAPL removal from the trenches will be performed manually. When DNAPL levels reach the targeted thickness, a pump will be lowered to near the bottom of the sump, and DNAPL will be pumped into a trailer-mounted container at the ground surface. The discharge will be monitored and the pump will be turned off when the discharge has visibly turned from DNAPL to water (or a DNAPL/water mixture). The amount of DNAPL recovered will be measured and recorded, and then the recovered product will be transported to and pumped into an on-site, stainless steel storage tank. When the DNAPL storage tank nears capacity, DNAPL will be pumped into an on-road tanker truck and transported off-site for beneficial use and/or disposal. Alternatively, depending on the volume and rate of DNAPL accumulation in the galleries (and the need for any treatment, as further discussed below), DNAPL could potentially be pumped directly from the collection gallery sumps into tanker trucks for off-site shipment.

It is likely that during the course of collection gallery operation that some extraneous water will collect within the above-ground storage tank and physically separate from the coal tar DNAPL. The coal tar DNAPL will be tapped from the base of the tank so as to help eliminate incorporation of any of this free standing water from the coal tar DNAPL to be transported off-site for beneficial use and/or disposal. As necessary, the free standing water blanket will be removed by various approaches from the tank and then either treated on-site and released to the municipal sanitary sewer and/or transported off-site for disposal.

Additionally, NWE is currently assessing a proprietary treatment approach to help separate “emulsified” water from the coal tar DNAPL, enhancing the heat content (the British Thermal Unit or “BTU” content) of the dewatered coal tar. The extracted water will be treated on-site or alternatively removed off-site for disposal. Further, an assessment is being made as to the cost benefits of adding in diesel fuel to the coal tar DNAPL to enhance the BTU content aiding in its beneficial use as a secondary fuel source.

An automated pumping and collection system may be installed as part of the construction of supporting infrastructure for the Stage 1 collection galleries in 2012, depending on the DNAPL production rates and other results from the initial year of operation. In addition, as further discussed in Section 9, pumping of groundwater from the trench to enhance DNAPL collection may also be considered in the future.

10. Evaluation of Passive Operation, Potential Quasi-Active Operation, and System Cessation

The total volume of coal tar DNAPL to be collected is subject to several factors that are, at the current time, less than fully understood. Two factors, including degree of release of coal tar DNAPL from zones of impacted soil and the lateral distance of the migration of the coal tar DNAPL to the collection gallery are especially important with the latter factor having sufficient potential variability to overwhelm all other potential factors, even when combined to their reasonable maximum limits.

10.1 Proposed Operational Approach

After installation of the Stage 1 collection galleries and initial O&M, design for supporting infrastructure will be performed with construction anticipated in 2012. Data from six months of passive operation will be collected and compared to baseline performance criteria. Once the passive criteria are evaluated, an attempt to augment passive flow with some limited removal of groundwater from the collection trench via active pumping, i.e. "quasi-active operation," may be conducted to determine if inducing some hydrologic gradient would improve/increase coal tar DNAPL collection. If this approach succeeds, this approach would be considered for future collection gallery operation. For the reasons discussed in the RAE (ARCADIS, 2010), a continuous "pump and treat" approach is not being contemplated for operation of this system.

If success criteria are not met through passive or quasi-active operation, installation of additional collection galleries would be reconsidered, with alternative use of a well network or other approach. Lack of performance would suggest that an alternative approach should be considered, including a NAPL mobility evaluation to determine whether a monitoring approach would be more appropriate.

10.2 System Cessation Evaluation

NWE and ARCADIS believe that the passive collection galleries will intercept, collect and concentrate the coal tar DNAPL allowing safe and efficient extraction to the surface for beneficial use and/or disposal. Continual extraction of coal tar DNAPL from the subsurface will cause sufficient mass removal to slow and then ultimately eliminate lateral migration of the coal tar DNAPL to the collection galleries. This process will be documented by the decreased rate of coal tar DNAPL collection over time from a specific collection gallery. Eventually, the rate of coal tar DNAPL collection will decline to the point that continued operation of the collection gallery is no longer aiding in materially significant mass removal of coal tar DNAPL from the subsurface. This condition will allow cessation of operation of the collection gallery. Conditions that allow for cessation of collection gallery operation document an achievement of success of this remedial action. The documented absence of flow of coal tar DNAPL into the collection gallery also demonstrates the absence of any further lateral migration of the coal tar DNAPL in the area adjacent to the collection gallery. The absence of lateral migration of the residual coal tar DNAPL should prevent any migration away from the current location and into formerly non-impacted areas.

Hydrologic modeling of the migration of the coal tar DNAPL into the collection gallery suggests that the bulk of the DNAPL will be collected in a period of a few years of operation. Once the initial “pulse” of coal tar DNAPL is collected a gradual and continuous decline in the rate of DNAPL collection is predicted. As this rate of collection declines, the incremental volume of DNAPL collected during a given period of time, for example one year, relative to the total volume of coal tar DNAPL collected over the life of the collection gallery will become insignificant. NWE proposes that this level will occur when the rate of collection is less than 20 percent of the maximum rate that is measured or predicted based on modeling. For example, if coal tar is collected at a rate of 100 gallons per unit time for a specific gallery, once that sustained rate over a similar duration declined to less than 20 gallons, gallery operation would cease. Practically, it is likely that an additional period of time, for example, one year, would be “added” onto the operational period to confirm the sustained decline in the rate of coal tar DNAPL collection.

A further basis for this proposed cessation criterion is the results of the modeling that suggest that once there is a material decline in the rate of coal tar DNAPL collection, it is unlikely that the rate will ever be reestablished to its prior satisfactory rate of collection and is consistent with removal of all of the readily drainable DNAPL in the area of the collection gallery of interest. To be clear, there will be some residual coal tar DNAPL remaining in the subsurface and it is not an intent of the collection gallery approach to quantitatively remove “all” coal tar DNAPL. However, as noted above, the remedial goal is to passively remove sufficient coal tar DNAPL to negate further lateral migration of any residual coal tar DNAPL.

As also noted, NWE and ARCADIS believe that the collection gallery approach will “work” and further will position collection galleries, as is safe and practicable, in those areas known or postulated to contain significant coal tar DNAPL bodies. However, it is possible that a particular collection gallery may exhibit a limited volume of coal tar

DNAPL recovery, either over some limited time period or over the operational life of the gallery. Given that other collection galleries are collecting coal tar DNAPL at rates commensurate with expectations and modeling predictions, the absence of coal tar DNAPL migration into a gallery suggests the lack of any materially significant lateral movement. Importantly, documentation of the absence of significant collection of coal tar DNAPL and limited lateral migration distances are very positive outcomes that suggest that the DNAPL present in the subsurface simply is not mobile in this location. This outcome is consistent with the remedial goal to support gallery operation cessation. It is important to note, the goal of this remedial action is to collect coal tar DNAPL, and there is no intent to rush to simply shutdown gallery operation when materially significant volumes of coal tar DNAPL are being collected. Similarly though, at some rate of DNAPL collection, the risks of operation and maintenance outweigh the benefits of limited DNAPL removal. It is under these conditions that a rate of coal tar collection less than 20 percent of the projected removal rate would support cessation of gallery operation. Importantly, the absence of any significant migration or the absent potential for migration would support a monitoring-based approach to document remedial success.

Whereas a passive mode of coal tar DNAPL collection is proposed, from time to time and for specific galleries a "quasi-active" mode of operation may be considered for evaluation as enhancing the rate of coal tar DNAPL collection. The "quasi-active" mode of operation conceptually involves the pumping of both coal tar DNAPL and the extraction of water pooled within the collection gallery, essentially resulting in the "dewatering" of the gallery. This is thought to help induce active water and DNAPL flow to the gallery aiding in the rate of coal tar collection within the gallery. The extracted water will be discharged back into the ground through infiltration piping, or appropriately treated and released upon communications with the local wastewater treatment plant. An evaluation of the data will provide insight to the risks (for example, introducing particulates into the collection gallery collection system and "blinding" its ability to recover DNAPL), and benefits (increased DNAPL recovery) to this approach. If specific benefits accrue from this process, and its implementation is practicable, its incorporation into the operational process will be considered.

10.3 Basis for Decisions During Collection Gallery Operations

Under a "Base Case" Scenario, it is planned that collection galleries will be installed and operated until such time as cessation criteria are achieved. As noted, after several years of operation it is anticipated that the rate of coal tar DNAPL collection will be less than 20 percent of the maximum rate that is initially measured or predicted based on modeling. However, if it is found that initially a very much lower rate of DNAPL is achieved, Management of Change efforts will be initiated, supported by the Observational Method of responses to these changes. When the rate of coal tar DNAPL collection falls below a level of about 20 percent of the postulated level, based on modeling or other modes of estimation, a “quasi-active” mode of operation may be undertaken. This process, described above may be employed to help stimulate the rate of coal tar DNAPL migration to the collection gallery by inducing groundwater flow by temporarily creating a hydrologic gradient directed toward the collection gallery. If this process demonstrates cost effective and practicable beneficial enhancement to the rate of coal tar DNAPL collection incorporation of this process into the standard operational procedure to this specific collection gallery will be considered. If neither passive nor “quasi-active” modes of operation achieve an acceptable rate of coal tar DNAPL collection after a period of two years, consideration, per the above discussions, as to cessation of this gallery will be undertaken. Again, with a well designed and operated collection gallery the absence of coal tar DNAPL collection will document the absence of any migrating coal tar DNAPL and the potential for migration to currently non-impacted areas.

Any apparently unique geological or other factors that seemingly impede the coal tar DNAPL collection rate will be assessed relative to future collection gallery design and/or operation, with efforts to overcome or otherwise mitigate this heretofore unrecognized factor.

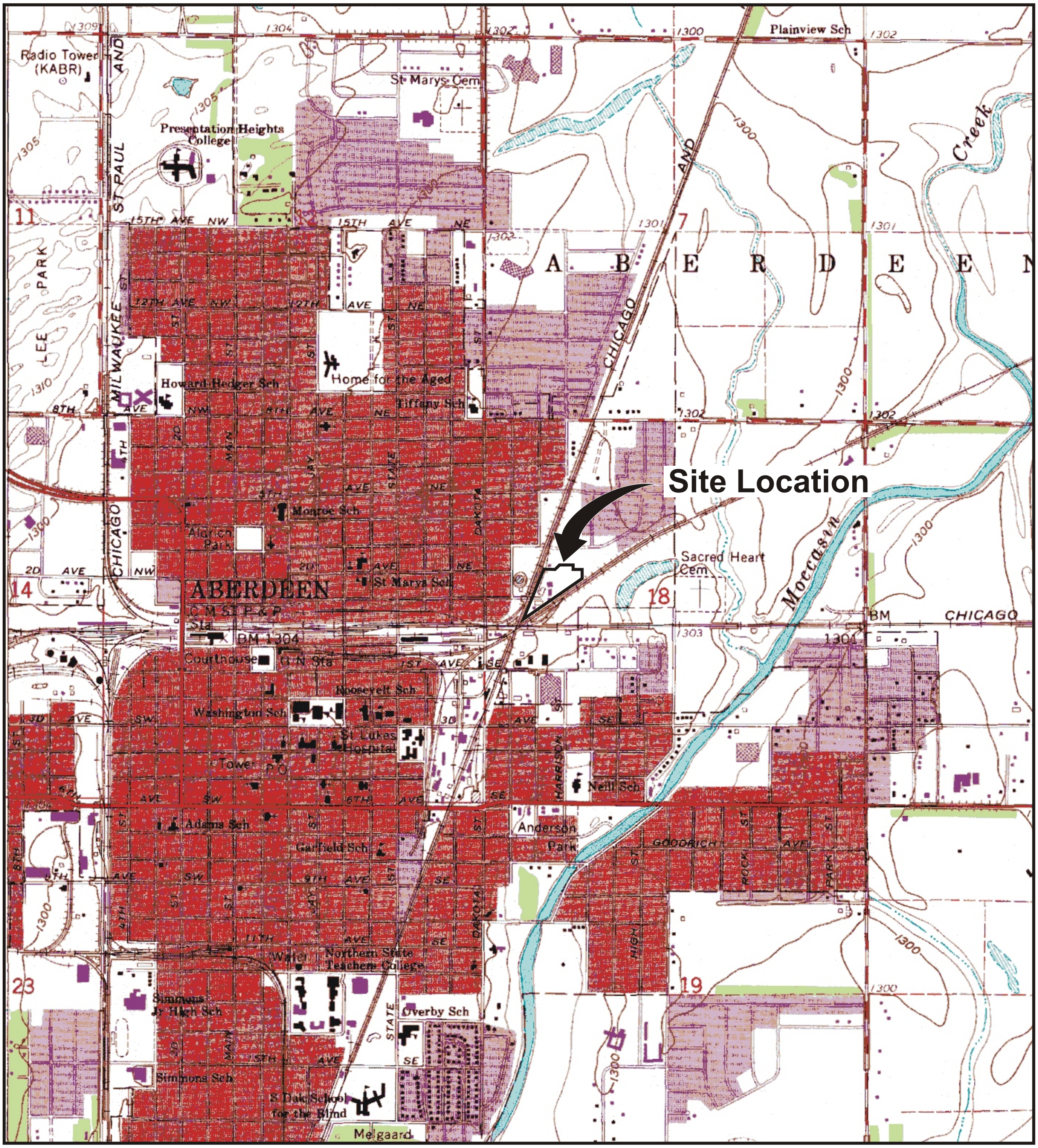
Based on gallery-specific information and response, the use of collector wells or a well network will also be considered. Further, as noted, from time to time the periodic “quasi-active” mode of gallery operation will be considered. In the event these approaches show materially significant benefits and are not hampered by currently unforeseen factors, these approaches may be incorporated into future remedial efforts.

A flow chart depicting the proposed approach and decision points for system evaluation is included as Figure 4. This depiction also notes specific durations associated with the various decision points. Importantly, these durations will start several months after the Stage 1 collection galleries have been installed. For example, the collection galleries to be installed during the first construction phase will be completed in the October/November timeframe of 2011 and will undergo periodic monitoring to assess the accumulation of coal tar DNAPL during the spring months of 2012. After installation of the surface infrastructure that will support extraction and measurement of the extracted coal tar DNAPL, the timing of the duration for the first decision point (the six month period) will begin. Assuming that this is in the April 2012 time period, the six month period will end in late September 2012. It will be at this point that a decision will be made as to collection gallery performance. Practically, the performance of the collection gallery will be continually assessed during the course of 2012 and any issues as to the lack of (or alternatively acceptable or even superior) performance will be well established. If performance is not meeting expectations, a nominally three month period of “quasi-active” operation may be performed, notionally during the September through November 2012 time period. The quasi-active mode of operation will continue as weather allows until the winter shutdown. The data collected during the course of 2012, as well as ongoing monitoring-based data, will be assessed to determine the course of action in 2013, as well as design and installation of the Stage 2 collection galleries. Whereas it is expected that the collection galleries will all perform acceptably, it is possible that substandard rates of coal tar DNAPL collection may necessitate a re-analysis of the proposed approach. This reassessment could include the use of collector wells or a well network. Ultimately, all decision paths will lead to sustained monitoring to establish acceptable immobilization of the coal tar DNAPL. As discussed in Section 7, the proposed multiyear installation allows sufficient time to fully assess data and to formulate the optimal approach moving forward. The timing and basis for cessation of monitoring will be determined in future discussions with stakeholders.

11. References

ARCADIS US, Inc. 2010. Remedial Alternatives Evaluation. April 27, 2010.

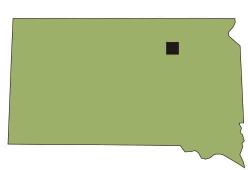
ARCADIS US, Inc. 2011. Report for Phase 3 of Tier 2 Assessment. March 4, 2011.



REFERENCE: BASE MAP USGS 7.5 MIN. QUAD., ABERDEEN EAST, SOUTH DAKOTA, 1960, PHOTOREVISED 1978.

2000' 0 2000'

Approximate Scale: 1" = 2000'



Area Location

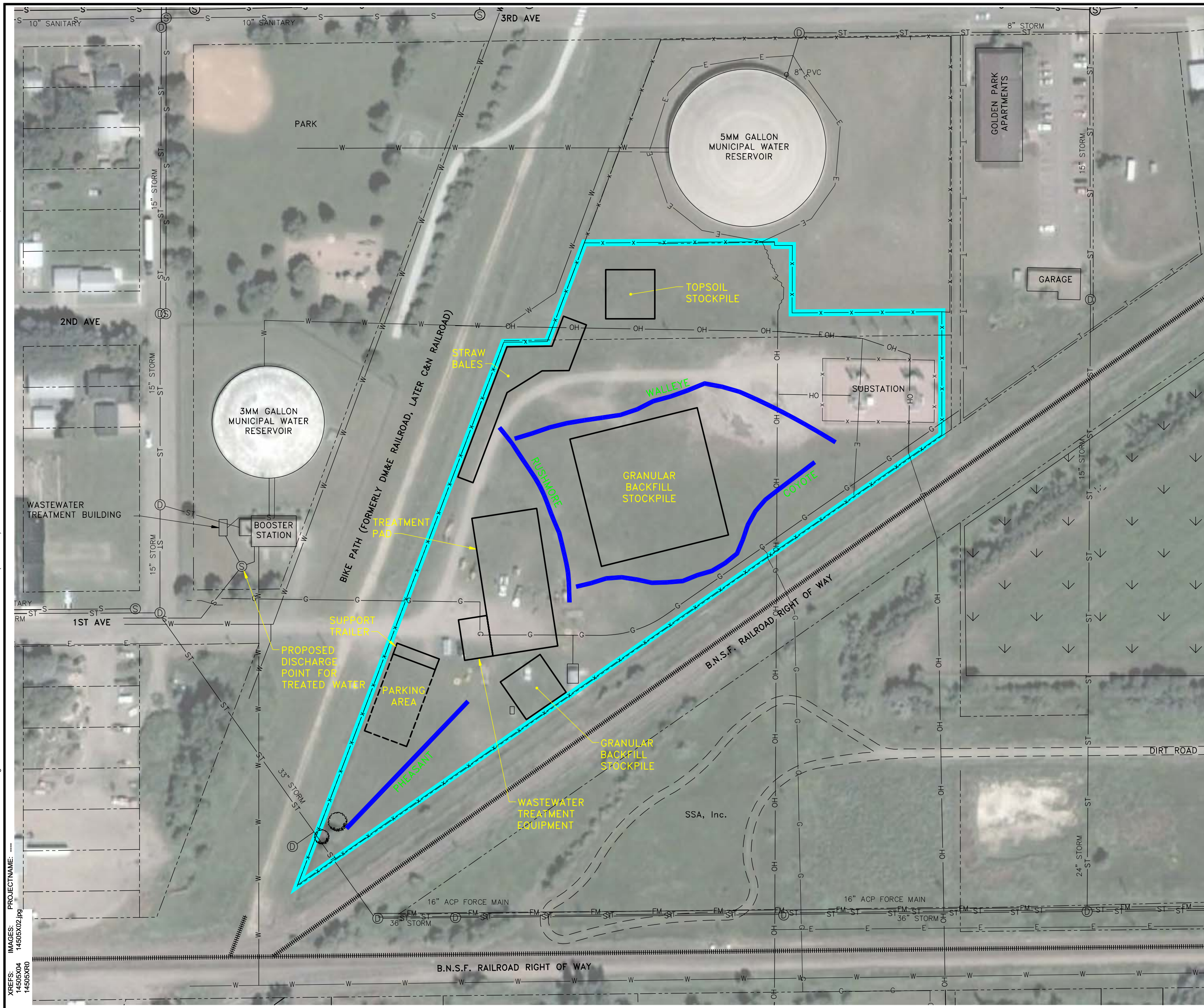
NORTHWESTERN ENERGY
FORMER MANUFACTURED GAS PLANT SITE
ABERDEEN, SOUTH DAKOTA

SITE LOCATION MAP

ARCADIS

FIGURE
1

02/10/09 SYRACUSE, NY-ENV/CAD-DJH
B0014505/0000/04000/CDR/14505N01 CDR



LEGEND:

- PROPERTY BOUNDARY
- FENCE
- RAILROAD TRACKS
- NATURAL GAS
- OVERHEAD ELECTRIC
- QWEST COMMUNICATIONS LINE
- CITY WATER
- FORCEMAIN
- SANITARY SEWER
- STORM SEWER
- COLLECTION GALLERY

NOTE:

FINAL POSITIONING OF COLLECTION GALLERIES IS SUBJECT TO CHANGE.

0 60' 120'
GRAPHIC SCALE

NORTHWESTERN ENERGY
ABERDEEN, SOUTH DAKOTA
FORMER MANUFACTURED GAS PLANT SITE

SITE DEVELOPMENT PLAN

ARCADIS

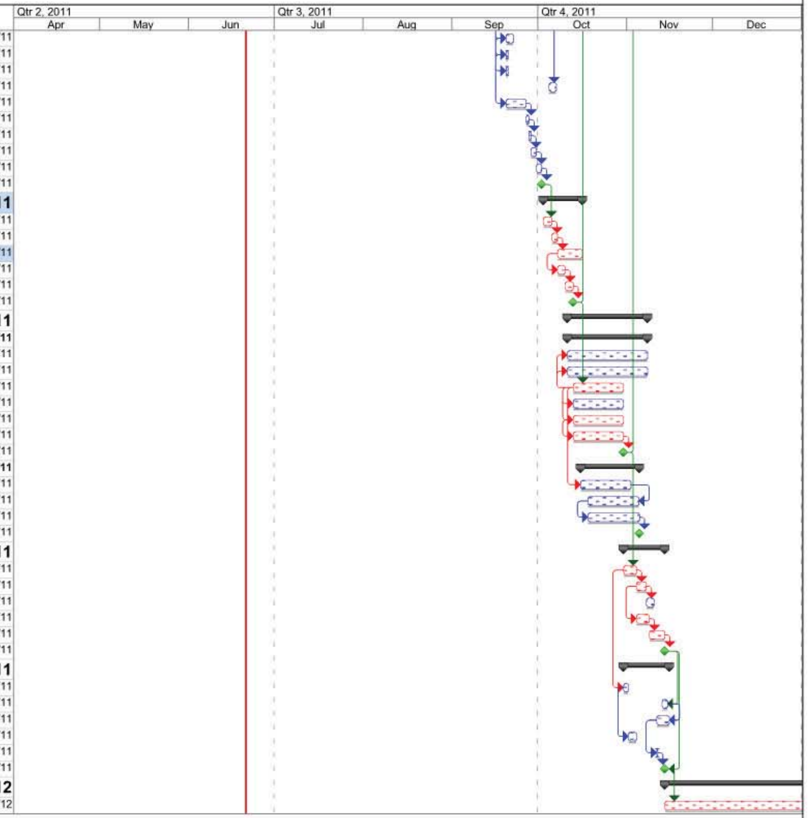
FIGURE **2**

CITY: SYRACUSE DIV/GROUP: 141/ENV DB: AGS N SMITHGALL A. SAMIOS LD: PIC: PM: TM: LYR:ON=*;OFF=*REF*
G:\ENVCAD\SYRACUSE\ACT\B0014505\0000\04400\DWG\14505G01.dwg LAYOUT: 2 SAVED: 6/22/2011 4:09 PM ACADVER: 18.0S (LMS TECH) PAGESETUP: ---- PLOTSTYLETABLE: PLTFULL.CTB PLOTTED: 6/22/2011 4:09 PM BY: SAMIOS, ALEX
XREFS: 14505X04 14505XR0 IMAGES: 14505X02.jpg PROJECTNAME: ---

Aberdeen MGP Stage 1 Remedial Construction

NorthWestern Energy

ID	% Complete	Task Name	Duration	Start	Finish
80	0%	Start Vendor Services (water, lavatories, waste collection)	3 days	Mon 9/19/11	Thu 9/22/11
81	0%	Purchase Site Radios, Printer	1 day	Mon 9/19/11	Tue 9/20/11
82	0%	Purchase Office Supplies	1 day	Mon 9/19/11	Tue 9/20/11
83	0%	Deliver Personal Protective Equipment	3 days	Tue 10/4/11	Fri 10/7/11
84	0%	Deliver Trenching Equipment and related Heavy Equipment	8 days	Mon 9/19/11	Mon 9/26/11
85	0%	Equipment Laydown Area	1 day	Tue 9/27/11	Tue 9/27/11
86	0%	Delivery of Wastewater Pretreatment Unit	1 day	Tue 9/27/11	Wed 9/28/11
87	0%	Assembly of Wastewater Pretreatment Unit	2 days	Wed 9/28/11	Fri 9/30/11
88	0%	Shakedown and Testing of Wastewater Pretreatment System	2 days	Fri 9/30/11	Sun 10/2/11
89	0%	Mobilization Complete	0 days	Sun 10/2/11	Sun 10/2/11
90	**0%**	**Construction of Support Facilities**	**15.5 days**	**Mon 10/3/11**	**Sun 10/16/11**
91	0%	Set up field office / work trailer	3 days	Mon 10/3/11	Wed 10/5/11
92	0%	Consruct parking area	2 days	Thu 10/6/11	Fri 10/7/11
93	0%	Construction of Soil Stockpile Area and Dewatering Pad (MGP Site)	10 days	Fri 10/7/11	Sun 10/16/11
94	0%	Erection of Siltation Fencing (MGP Site)	3 days	Fri 10/7/11	Mon 10/10/11
95	0%	Construction of Treated Soil Stockpile Area	3 days	Mon 10/10/11	Thu 10/13/11
96	0%	Construction of Support Facilities Complete	0 days	Thu 10/13/11	Thu 10/13/11
97	**0%**	**Recovery Trench Construction**	**31.5 days**	**Tue 10/11/11**	**Tue 11/8/11**
98	**0%**	**Trench Construction**	**31.5 days**	**Tue 10/11/11**	**Tue 11/8/11**
99	0%	Delivery of wheat straw	20 days	Tue 10/11/11	Tue 11/8/11
100	0%	Delivery of trench backfill material	20 days	Tue 10/11/11	Tue 11/8/11
101	0%	One-Pass Trench Construction	20 days	Thu 10/13/11	Sun 10/30/11
102	0%	Waste Characterization	20 days	Thu 10/13/11	Sun 10/30/11
103	0%	Implement Roving Air Monitoring Program	20 days	Thu 10/13/11	Sun 10/30/11
104	0%	Dust/Vapor Control	20 days	Thu 10/13/11	Sun 10/30/11
105	0%	Trench Construction Complete	0 days	Sun 10/30/11	Sun 10/30/11
106	**0%**	**Soil Treatment**	**23.25 days**	**Sat 10/15/11**	**Sat 11/5/11**
107	0%	Trench Spoil Stabilization	20 days	Sat 10/15/11	Wed 11/2/11
108	0%	Transportation and Disposal of Treated Soil to Landfill Cell	20 days	Tue 10/18/11	Sat 11/5/11
109	0%	Street Surface Washing	20 days	Tue 10/18/11	Sat 11/5/11
110	0%	Soil Treatment Complete	0 days	Sat 11/5/11	Sat 11/5/11
111	**0%**	**Preliminary Restoration and Post-Construction Surveying**	**16 days**	**Mon 10/31/11**	**Mon 11/14/11**
112	0%	Transportation and Disposal of Staging Area and Access Road Materials to Landfill	5 days	Mon 10/31/11	Fri 11/4/11
113	0%	Preliminary Restoration of Trench Areas	4 days	Fri 11/4/11	Mon 11/7/11
114	0%	Preliminary Restoration of MGP Site Support Areas	3 days	Tue 11/8/11	Thu 11/10/11
115	0%	Post-Construction Surveying of Trenches, Wells, Piping	5 days	Fri 11/4/11	Tue 11/8/11
116	0%	Completion of Client Punchlist Items	6 days	Tue 11/8/11	Mon 11/14/11
117	0%	Preliminary Restoration Complete	0 days	Mon 11/14/11	Mon 11/14/11
118	**0%**	**Demobilization**	**18 days**	**Mon 10/31/11**	**Tue 11/15/11**
119	0%	Removal of Contact Construction and Decant Water Pretreatment System	2 days	Mon 10/31/11	Tue 11/1/11
120	0%	Decontamination of Equipment	2 days	Sun 11/13/11	Tue 11/15/11
121	0%	Shipment of Equipment Offsite	5 days	Fri 11/11/11	Tue 11/15/11
122	0%	Demobilization of Site Support Facilities	3 days	Tue 11/1/11	Fri 11/4/11
123	0%	Dismantle Site Sign	0.5 days	Fri 11/11/11	Fri 11/11/11
124	0%	Demobilization Complete	0 days	Mon 11/14/11	Mon 11/14/11
125	**0%**	**Administrative Completion of Remedial Construction**	**48 days**	**Mon 11/14/11**	**Wed 1/4/12**
126	0%	Final Closeout of Subcontracts with Final Payments and Final Billings	48 days	Mon 11/14/11	Wed 1/4/12



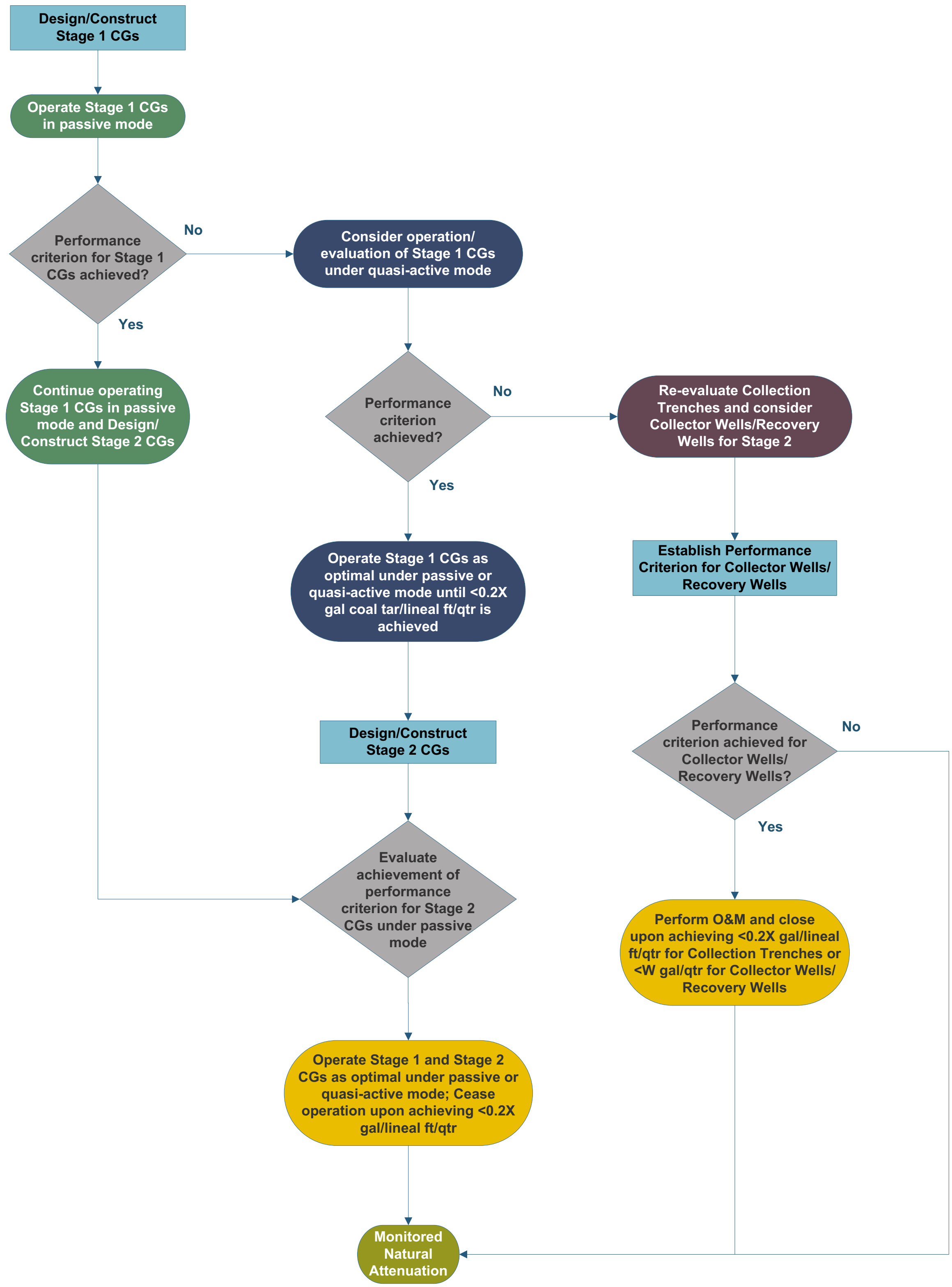
Project: Aberdeen MGP Project 2010B
Start date: Sun 1/1/06
Duration: 1061 days

Task	Critical Task Progress	Rolled Up Task	Rolled Up Progress	PTask
Task Progress	Milestone	Rolled Up Critical Task	Split	Task Progress
Critical Task	Summary	Rolled Up Milestone	External Tasks	Critical Task

NORTHWESTERN ENERGY
FORMER MANUFACTURED GAS PLANT SITE
ABERDEEN, SOUTH DAKOTA

PROJECT SCHEDULE

ARCADIS | 3



NOTES:

CGs: Collection Galleries

ft: foot

gal: gallons

Performance Criterion: X gallons coal tar/lineal foot/quarter
[Proposed minimum criterion of X = 3.5 gallons coal tar/linear/quarter, based on 50% of the "average rate" of projected coal tar inflow over a 5-year period.
Proposed cessation criterion of 0.2X, which equates to 10% of the targeted average rate of collection.]

qtr: quarters

Stage 1: 1,200 lineal feet on-site

Stage 2: 1,800 lineal feet off-site

NORTHWESTERN ENERGY
FORMER MANUFACTURED GAS PLANT SITE
ABERDEEN, SOUTH DAKOTA

REMEDIAL DESIGN AND OPERATION DECISION TREE

ARCADIS
Infrastructure · Water · Environment · Buildings

FIGURE
4