Corrective Action Plan Addendum

Gasoline Fueling Station – Royal Farms #96
500 Mechanics Valley Road
North East, Cecil County, Maryland 21901

OCP Case No. 2011-0729-CE
MDE Facility No. 13326

AEC Project Number: 05-056 RF096

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ADVANTAGE ENVIRONMENTAL CONSULTANTS, LLC

Corrective Action Plan Addendum

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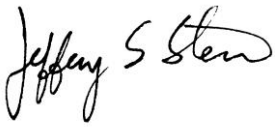

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TABLE OF CONTENTS

1.0 INTRODUCTION

Advantage Environmental Consultants, LLC (AEC) has prepared this Corrective Action Plan (CAP) Addendum for the Royal Farms Gasoline Fueling Station No. 96, located at 500 Mechanics Valley Road in North East, Maryland (i.e., the "Site"). This addendum is intended to satisfy certain requirements set forth in the *Settlement Agreement and Administrative Consent Order* entered into between The Maryland Department of the Environment (MDE) and Two Farms, Inc. t/a Royal Farms.

The purpose of the CAP Addendum will be to provide specific and measureable remedial goals for the Site and propose deadlines in the form of completion dates, submission dates, and/or schedules for investigative and remedial work and reporting thereon.

2.0 SITE SPECIFIC REMEDIAL GOALS

Remedial activities will be considered complete when the remedial goals, defined below, are achieved.

2.1 Groundwater

Groundwater or Dissolved Phase Hydrocarbon (DPH) remediation is a Site goal due to the potential for direct dermal contact, inhalation, and/or the ingestion of petroleum impacted groundwater from on- and off-site potable wells. The MDE Oil Control Program (OCP) *Maryland Environmental Assessment Technology for Leaking Underground Storage Tanks* (MEAT) guidance document revised February 2003 indicates that once it has been determined that DPH remediation is a site goal, DPH should be remediated based upon either the MDE Standards (Generic Numeric Cleanup Standards for Groundwater and Soil - Interim Final Guidance Update No. 2.1 - June 2008) or the achievement of the following three OCP specific objectives:

1. Prevent contamination migration
2. Remove all risks posed by the release
3. Demonstrate that an asymptotic trend in dissolved-phase contamination has been established

The remediation goals for groundwater at this site have been developed and selected based on the achievement of a combination of the MDE Standards and the three OCP-specific objectives listed above. The following is a discussion of these objectives.

2.1.1 Prevention of Contaminant Migration

Remedial actions to date have resulted in the recovery of significant quantities of liquid phase hydrocarbon (LPH), DPH and adsorbed phase hydrocarbons (APH), which has caused a reduction of subsurface hydrocarbon source mass. This source reduction will be the main driver in preventing contaminant migration. In order to ascertain if the groundwater plume is expanding, stable or shrinking, historical groundwater quality monitoring data will be evaluated using the Mann-Kendall protocol. The evaluation will occur as part of the groundwater quality asymptotic trend analysis as discussed below.

2.1.2 Identification of Risks Posed by the Release

AEC evaluated potential impacts of exposure to petroleum hydrocarbons to a human receptor under a residential land use scenario for the offsite residences and a commercial land use scenario for the onsite property. The following presents the background used to evaluate potential impacts of exposure to a human receptor.

Various exposure pathways exist for a human receptor to contact chemicals of concern (COCs). The COCs for the Site include benzene, toluene, ethylbenzene, and total

xylenes (BTEX), methyl tert-butyl ether (MTBE) and naphthalene. The most critical factors for exposure to COCs from petroleum hydrocarbon impact are listed below:

- Source for the COCs to be released to the environment (Underground Storage tank [UST] or piping failure);
- Mechanism or medium for transport of COCs (air, groundwater and/or soil);
- Potential human exposure or contact with the contaminated medium (exposure
- point); and
- Human intake routes (ingestion, inhalation, or dermal contact).

There must be a complete pathway including a past or present release and a subsequent route of exposure for a human receptor. If one of the four elements listed above does not exist, then the exposure pathway is incomplete.

At this site, the primary source is from the UST equipment failure. Since groundwater is used as a potable water source in the site vicinity, groundwater is a medium for transport of COCs for direct dermal contact, inhalation, and/or ingestion. Groundwater generated vapor inhalation risk to off-site structures is not thought to be a concern based on the lack of significant dissolved phase VOCs on the down gradient portion of the Site. Vapor inhalation risk to the Site building has not been assessed. However, this risk to the Site building is possible based on the identification of historic LPH and elevated DPH levels within proximity to the northeastern side of the structure. Prior to modifying or developing cleanup goals for this media as necessary, indoor air quality testing of the on-site structure will be performed. Dermal contact and/or ingestion of impacted soil is unlikely as the entire site area is paved with asphalt, gravel or concrete and soil impact is greatest at or near the water table which ranges from approximately 7 to 14 feet below ground surface (bgs). With the exception of construction excavation work, no complete dermal contact, inhalation, and/or ingestion of impacted soil exposure pathway is anticipated.

Based on the results of the packer testing and groundwater sampling activities performed from January 22 to January 31, 2013 (Packer Testing Report dated March 13, 2013) AEC has surmised that there is limited connectivity, if any, between the surficial and bedrock aquifers at the Site. As such, AEC has developed separate surficial and bedrock aquifer groundwater remedial goals. These goals are described as follows.

2.1.2.1 Bedrock Aquifer Groundwater Remedial Goals

The bedrock aquifer remedial goals for groundwater will be the achievement of the MDE Type 1 and Type 2 aquifer cleanup standards (Generic Numeric Cleanup Standards for Groundwater and Soil - Interim Final Guidance Update No. 2.1 - June 2008) summarized below.

Bedrock Aquifer Groundwater Cleanup Standards
Gasoline Fueling Station – Royal Farms # 96
500 Mechanics Valley Road
North East, Cecil County, Maryland

Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE	Naphthalene
5	1,000	700	10,000	20	0.7

BTEX, MTBE, and Naphthalene standards in micrograms per liter (ug/l).

It should be noted that these goals have already been achieved based on the recent groundwater quality results as documented in the Packer Testing Report dated March 13, 2013. These goals will continue to be tracked using a portion of the current bedrock aquifer monitoring well network (MW-10D and MW-13D) on the down gradient portion of the site.

2.1.2.2 Surficial Aquifer Groundwater Remedial Goals

The surficial aquifer remedial goals for groundwater will be the achievement of asymptotic levels in the COC concentrations, or the bedrock aquifer DPH remedial goals summarized above. Once either of these conditions is observed, a rebound evaluation will be performed as discussed below.

2.1.3 Asymptotic Level Evaluation

In order to statistically evaluate the data for the purpose of determining the existence of a trend (i.e., COC concentrations are increasing, decreasing, or stable over time) the individual monitoring well COC concentration data will be evaluated using the Mann-Kendall non-parametric statistical method. The Mann-Kendall procedure is applicable to evaluate the COC data since missing values are allowed and the data need not conform to any particular distribution. Also, the Mann-Kendall procedure can be used for data sets that include irregular sampling intervals, data below the detection limit, and trace or missing data. The method is used to test the null hypotheses of no trend against the alternative hypotheses of either a decreasing or increasing trend in a time-series data set. The outcome of the procedure depends on the ranking of individual data points and not the overall magnitude of the data points. This evaluation will be conducted on a quarterly basis and presented in the scheduled progress reports.

2.1.4 Rebound Evaluation

Once asymptotic DPH levels are achieved, remediation system operation will be suspended in order to perform a rebound evaluation. The evaluation will be performed on select representative wells, which will be sampled monthly for the first 6 months then quarterly for the remainder of the rebound test (estimated to take 12 months). The well

selection will be made after consultation with the MDE. AEC proposes using the following techniques to analyze DPH rebound following the suspension of remediation activities at the Site.

The rebound response in wells will be based on a normalization process. This process uses the mean of the initial pre-remediation COC concentration (C_0) data set for a particular well, which when divided into a rebound concentration C, results in a number between 0 and 1. Using the C/C_0 concentration ratio allows direct comparison of rebound response between monitoring locations with different initial concentrations. Thus, at time 0, C/C_0 is 1.00, at which time the remediation system was activated. The initial concentration C_0 can be calculated as the mean of the historical data collected prior to remediation startup.

Performing the normalization process on a particular well with C_0 as the mean of the pre-remediation contaminant concentrations and C as the post remediation COC concentration, the following three potential rebound responses are possible:

- Case A – Rapid Rebound Criterion, defined as the normalized COC concentration increasing to greater than or equal to 75 percent of the pre-remediation COC levels within the planned rebound test period;

- Case B – Gradual Rebound Criterion, defined as the normalized COC concentration increasing to greater than or equal to 25 percent but less than 75 percent of the pre-remediation COC levels within the planned rebound test period; and,

- Case C Little-to-No Rebound Criterion, defined as the normalized COC concentration remaining less than 25 percent of the pre-remediation COC levels for the planned rebound test period.

The decision to restart the remediation system, allow additional time for further rebound evaluation, proceed into an in-situ chemical oxidation (ISCO), monitored natural attenuation or enhanced bioremediation polishing approach, or closure of the regulatory case will be based on the following criteria: If the mean normalized COC concentration from the representative wells is greater than 0.75 C_0 (Rapid Rebound Criterion-Case A) after a period of three months, then the rebound test will be terminated and remediation will be restarted. If the ongoing data evaluation shows that the Rapid Rebound Criterion is not met, then the rebound test will continue for three additional months (six months total). It is important to note that the observed rebound responses could vary from well to well, and more than one type of response could be observed at different wells. After completion of the rebound test the data will be evaluated to determine if the observed response meets the Gradual Rebound Criterion (Case B) or the Little-to-No Rebound Criterion (Case C). If the Gradual Rebound Criterion (25 to 75 percent rebound) is met, then the rebound test data will be evaluated to determine whether a system restart is needed or if it can remain in standby for an additional three month period of time. If the Little-to-No Rebound Criterion is met, then the system will remain in standby mode for an additional three month period of time so that COC trends can be verified.

If less than 25 percent of the pre-remediation contaminant levels are observed for the planned rebound test, as determined by an average taken from the select monitoring wells for a period of 12 months, DPH remediation will be considered to be completed to the maximum extent possible.

2.2 Liquid Phase Hydrocarbon

LPH has not been detected in any of the on-site monitoring wells since at least December 10, 2012. As mentioned above, once asymptotic DPH levels are achieved, the remediation system operation will be suspended in order to perform a rebound evaluation. If LPH is not detected at greater that a sheen in any of the on-site monitoring wells for a period of six months following the suspension of system operation, LPH will be considered to be removed to the maximum extent possible. If LPH is detected at greater than a sheen, focused groundwater extraction will be conducted in that area.

2.3 Soil

Since the majority of soil impact resides in the smear zone and is more reflective of groundwater conditions as opposed to vadose zone soil conditions, the MDE Standards (Generic Numeric Cleanup Standards for Groundwater and Soil - Interim Final Guidance Update No. 2.1 - June 2008) may not be applicable. However, for the purposes of this CAP Addendum, AEC will utilize the MDE non-residential soil standards as summarized below:

Soil Cleanup Standards
Gasoline Fueling Station – Royal Farms # 96
500 Mechanics Valley Road
North East, Cecil County, Maryland

Benzene	Toluene	Ethylbenzene	Total Xylenes	MTBE	Naphthalene
5.20E+04	8.20E+07	1.20E+08	2.00E+08	7.20E+06	2.00E+07

BTEX, MTBE, and Naphthalene values in ug/kg

A subsurface investigation will be necessary to verify whether soil remediation goals have been met. A work plan detailing specific procedures for the subsurface investigation will be submitted under separate cover when it has been determined that the remediation system has reached asymptotic levels.

2.4 Contingency Plans

In the event that proposed remedial goals cannot be achieved, a contingency plan will be activated. The plan will be based on site specific conditions and may include actions such as the use of ISCO, monitored natural attenuation or enhanced bioremediation as

supplemental remediation technologies. The contingency plan will be developed in consultation with the MDE.

3.0 ESTIMATED REMEDIATION COMPLETION SCHEDULE

The following is the anticipated schedule for completion of the remediation effort at the Site using the proposed approach:

Estimated Remediation Completion Schedule
Gasoline Fueling Station – Royal Farms # 96
500 Mechanics Valley Road
North East, Cecil County, Maryland

Activity	**Estimated Date of Completion**
Perform IAQ Evaluation of On-Site Structure	April 2013
Asymptotic Level/Achievement of Groundwater, LPH and Soil Remediation Goals Observed	June 2014
Begin Trial Shutdown and Start Rebound Evaluation	June 2014
Complete Rebound Evaluation	June 2015
Perform ISCO and or/ Enhanced Bioremediation Pilot Study (if necessary)	To be determined

Quarterly groundwater monitoring and System O&M will continue in accordance with current schedules. Schedules for additional investigative and remedial work and associated reporting will be provided as necessary.