# 1.0 INTRODUCTION

This Corrective Measures Implementation Plan (CMIP) was prepared by American Geosciences, Inc., (AGI) for the development and implementation of corrective measures selected to address on-site and off-site groundwater impacts that originated from the MotivePower (MP) facility located at 4600 Apple Street, Boise, Idaho. The original CMIP was submitted December 2001 as Appendix E-3 of the 2001-2002 Permit application. This document has been updated based on the current site conditions.

The CMIP presents the corrective measures, trigger conditions, and contingency measures for the dissolved constituent plume. The objectives for remedial actions at the MP facility are based on the requirements of the Idaho Department of Environmental Quality (IDEQ) and are summarized as follows:

- Prevent the spread of contaminants from the facility to downgradient receptors and reduce the concentration of contaminants on-site.

- Prevent further degradation of the currently unaffected portions of the aquifer.

- Monitor the current level of exposure to residents in order to support the Risk Assessment and apply active remediation in the event that it is determined the risk is above acceptable levels.

The risk assessment indicates that the current and potential future risks to human health and the environment are within acceptable risk-based levels for areas of the dissolved constituent plume. However, MP's overall remedial goal is to return "usable" groundwaters to their maximum beneficial use as specified under Idaho's Ground Water Quality Rule (IDAPA 58.01.11), wherever practicable, within a timeframe that is reasonable given the particular circumstances of the MP dissolved constituent plume. Therefore, specific media cleanup objectives, in addition to the risk-based trigger levels (RBTLs[1]), were established throughout the dissolved constituent plume to meet this expectation. The final remedies are designed to control surface and subsurface sources of impacted groundwater. In determining appropriate and protective media cleanup objectives for groundwater remedies, MP, in conjunction with the IDEQ, considered the use, value, and vulnerability of the groundwater resource, and potential pathways that could result in human or ecological exposure to dissolved constituents in or from groundwater.

The corrective measures specified in this document consist of a combination of engineering controls, institutional controls, monitored natural attenuation (MNA), and active remedial measures. Contingency measures are also identified in the event that the corrective measures do not meet the RBTLs.

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[1] RBTLs are risk-based trigger levels which are values or concentrations used to indicate when corrective action may be necessary to address potential risks. The RBTLs were established as part of the risk assessment process.

The CMIP is supported by the conclusions of the current risk assessment that the current and potential future risks to human health and the environment are within acceptable risk-based levels for areas within the dissolved constituent plume. In addition, the long-term groundwater monitoring data presented demonstrate that the processes associated with natural attenuation of volatile organic compounds (VOCs) are occurring at the site, and, therefore, natural attenuation is a viable remedial alternative in combination with other active remedial measures that will be used to meet the overall remedial goals. The remaining chapters of this CMIP provide a summary of the following:

- Site Description that includes facility operations, regulatory background, general hydrogeology, and site characterization activities.

- Risk Evaluation and Corrective Measures Studies that includes the solute transport modeling, Risk Assessment, and *in situ* bioremediation.

- Corrective Measures to be implemented plume-wide and in specific areas of the dissolved constituent plume, including periodic injection of nutrients and other amendments to promote enhanced bioremediation of site-related constituents

- Conclusions and Recommendations.

# 2.0 SITE DESCRIPTION

The MP facility is located at 4600 Apple Street in Boise, Ada County, Idaho as shown on Figure 1 (Site Location Map), and occupies approximately 47 acres of land. The MP plant is a locomotive manufacturing and remanufacturing operation.

## 2.1 Facility Operations and Regulatory Background

In 1969, Morrison-Knudsen Company (MK), the former owner of the MP property, commenced operations at the facility. Operations included heavy equipment repair and locomotive remanufacturing. Various solvents were used for cleaning parts and equipment during the repair and remanufacturing process. Wastewater, which was generated from the equipment cleaning process containing solvents, was discharged to two, in-ground wastewater separation basins that were connected via overflow-decant structures to buried drain fields near the Small Paint Shop and the Locomotive Shop. Wastewater treatment activities included settlement and skimming of petroleum products. The treated wastewater was decanted into overflow pipes that emptied into each respective drain field. This wastewater treatment system was in operation until 1984.

The buried drain fields were closed as Resource Conservation and Recovery Act (RCRA) regulated waste management units (WMUs) on July 18, 1988, and certified closed on August 11, 1988, in accordance with applicable regulations. At that time an asphalt cap was constructed over the Locomotive Shop Basin and a non-regulated Waste Disposal Trench located in the southeastern portion of the facility. This asphalt cap and a pre-existing asphalt cap overlying the Paint Shop Basin, which is located in the central portion of the facility, are designed to minimize infiltration of rainwater and the migration of hazardous constituents to groundwater from the closed WMUs. The locations of the closed WMUs are depicted on Figure 2 (Facility Drawing).

Since 1984, MP has conducted extensive environmental sampling and hydrogeologic characterization studies of the facility. Numerous soil borings were advanced and wells installed, and chemical and physical testing was conducted to characterize the subsurface conditions and to develop an effective groundwater monitoring program (GWMP) for the site.

The interim status groundwater monitoring that was performed prior to 1991 revealed the migration of dissolved-phase chlorinated VOCs to the uppermost groundwater aquifer (A-Zone) beneath the closed Paint Shop Basin WMU. As a result, on-site recovery and treatment of shallow A-Zone groundwater was initiated at the MP facility in October 1990 to minimize impacts to groundwater in off-site areas.

Beginning in 1990, MP began installing an extensive network of on- and off-site groundwater monitoring wells to monitor and/or recover and treat impacted shallow A-Zone groundwater, to monitor the

movement of the shallow plume of dissolved constituents, and to monitor deeper groundwater zones. The GWMP revealed that dissolved VOC constituents from the closed WMUs migrated across three distinct geographic benches, namely the Sunrise Terrace, the Whitney Terrace, and the Boise Terrace.

In response to the off-site VOC constituents detected in the shallow A-Zone, MP voluntarily completed a considerable amount of investigation work to evaluate the potential risk to human health and the environment and the extent and potential source(s) of the plume. Chemical fate and transport modeling work was also conducted to evaluate the future migration potential of constituents of interest in the A-Zone. The results of the modeling activities were presented in a report entitled, *Phase II Solute Transport Modeling of the A-Zone at the Morrison-Knudsen Boise Locomotive operations site, Boise, Idaho*, May 1996 by Dr. Dale R. Ralston, (Solute Transport Model) and are summarized in Section 3.1 of this document.

MP completed a human health risk assessment, based on the U.S. EPA guidelines, in 1996 and later updated the assessment in December 2001. The Risk Assessment was presented in a report entitled, Risk *Assessment for MotivePower Apple Street Facility in Boise, Idaho*, December 2001 by Risk Assessment & Management Group, Inc. (Risk Assessment) and is summarized in Section 3.2 of this document. The groundwater standards in the Risk Assessment were again updated in December 2011 due to changes by the U.S. Environmental Protection Agency in the risk assessment process. The revisions to the groundwater standards are presented in *Groundwater Standards Revisions*, December 2011 by The Mahfood Group (Appendix E-1 to Section E of Permit Application).

On January 18, 1991, the Idaho Department of Health and Welfare (IDHW, now IDEQ) issued a RCRA Post-Closure Permit for management of the WMUs at the facility. The Permit was revised in September 1996, renewed in 2002, and MP presently operates under this Permit. In general, the Permit requires closure cap maintenance, financial assurance, remediation of the groundwater contamination plume, and groundwater monitoring.

## 2.2 General Hydrogeology

The MP facility is located in Boise, Idaho and is situated within a sequence of alluvial terraces south of the Boise River. The named terraces ascending above the Boise River include the Boise Terrace gravel, the Whitney Terrace gravel, the Sunrise Terrace gravel, and the Gowen Terrace gravel. The site is located on the Sunrise Terrace gravel. The Sunrise Terrace gravel is primarily composed of coarse gravel and cobbles within a coarse sand matrix and is approximately 50 to 65 feet thick. Two geologic units occur under the MP facility: the Snake River Group and the Idaho Group. The Snake River Group includes the terrace deposits and Holocene alluvium that are in the vicinity of the MP facility. The Idaho Group underlies the Snake River Group and is composed primarily of lacustrine and fluvial sediments (fine-grained sands, silt, and clay). The top of bedrock is approximately 825 feet below ground surface (bgs).

Several hydrogeologic zones are recognized to exist at the MP facility:

- Perched water - shallow, highly localized and discontinuous perched layers within the vadose zone occurs at variable depths from ground surface down to approximately 75 feet bgs.

- A-Zone –which occurs from approximately 0 to 100 feet bgs.

- B-Zone – which occurs from approximately 100 to 170 feet bgs.

- C-Zone – which occurs from approximately 240 to 280 feet bgs.

The A-Zone, as defined in the report entitled, *Pre-Design Investigation Report, MotivePower Apple Street Facility, Boise, Idaho,* August 15, 2001 (Pre-Design Report), extends from the ground surface to a depth of approximately 100 feet below ground surface and includes the entire thickness of the Sunrise Terrace gravel and the upper Idaho Group deposits. Shallower, discontinuous perched layers may also exist within the unsaturated soils above the A-Zone (i.e., less than approximately 75 feet bgs). Three discernable lithologic units were identified within the A-Zone and include (from shallowest to deepest) a 15-foot thick light brown silty sand to sandy silt layer (interpreted as a loess deposit), a sandy gravel and cobble deposit (terrace gravel) ranging in thickness from approximately 8 feet to 50 feet, and a light brown to brown, fine to coarse-grained sand interbedded with numerous thin, discontinuous silt and clay layers. The interbedded silt and clay layers are significant lithologic features within the lower portion of the sand unit in the A-Zone because a groundwater-bearing zone associated with the interbedded silt and clay layers often occurs at a depth of approximately 75 to 80 feet bgs, depending upon location. Figure 3 (A-Zone Potentiometric Surface Map, Semi-Annual Groundwater Report, October 2011) presents groundwater elevation contours for the A-Zone.

The B-Zone is defined to extend from the base of the A-Zone to approximately 170 feet bgs beneath the MP facility. Based on the B-Zone well logs, the B-Zone lithology is similar to the lower portion of the A-Zone. The B-Zone is unconsolidated and generally consists predominantly of sand interbedded with silt and clay layers that occur at various depths. The heterogeneity of the interbedded sand, silt, and clay layers is a significant geologic characteristic of the B-Zone. The uppermost zone of saturation in the B-Zone occurs at depths ranging from roughly 135 to 170 feet bgs. Generally, the B-Zone refers to a specific depth interval rather than one consistent water-bearing unit located beneath the site. Multiple, perched water layers have been encountered within the B-Zone beneath the MP site.

The C-Zone reportedly extends from the base of the B-Zone to a depth of approximately 280 feet bgs. The C-Zone is unconsolidated and consists predominantly of sand interbedded with discontinuous clay layers that occur between various depth intervals. In general, the heterogeneity of the C-Zone lithology is similar to the lower portion of the A-Zone and the entire B-Zone. The upper-most zone of saturation in

the C-Zone occurs at a depth of approximately 240 feet bgs and is continuous, both vertically and horizontally, beneath the entire MP property.

## 2.3 Site Characterization Activities

Ongoing groundwater monitoring in A-Zone wells has been performed since 1984. A detailed discussion of groundwater monitoring and on-site corrective actions that include wells located in the A-Zone are contained in reports entitled Semi-Annual Report of A-Zone Corrective Action and B-Zone Compliance Monitoring which have been prepared on behalf of MP and submitted to IDEQ since 1991.

Installation of off-site monitoring wells began in 1990, and groundwater monitoring, pilot testing, enhanced bioremediation activities, etc. has continued to the present. This work also included a survey of water wells located in the area of the impacted groundwater, which is summarized in Section 3.2 of this document. The results of other off-site groundwater investigation work have been summarized in previous off-site investigation reports.

Data sets from quarterly groundwater monitoring performed in 1995 and in the latter half of 1999/early half of 2000 were used for the purpose of initially evaluating VOC concentration trends and natural attenuation processes within the dissolved constituent plume. During both of these periods, referred to hereafter as 1995 and 2000, quarterly monitoring was performed in most, if not all, A-Zone monitoring wells that were installed throughout the area at that time. Subsequently, quarterly and semi-annual groundwater monitoring was conducted. The laboratory reports are included in the Semi-Annual Reports of A-Zone Corrective Action and B-Zone Compliance Monitoring and are maintained in the permanent operating record at the MP facility and are on file at IDEQ.

A Pre-Design Investigation was conducted in the A-Zone (0-100 ft bgs). The purpose of this work was to collect additional hydrogeologic and chemical data to support the design of *in situ* chemical oxidation for use as a source area treatment technology. During this investigation, observation wells were installed to allow collection of these data. However, these wells are not routinely monitored as part of the quarterly monitoring program. An *in situ* chemical oxidation pilot study began in December 2000. The *in situ* chemical oxidation pilot program resulted in an overall reduction in concentration of VOCs in the test area. However, site-wide implementation of this program was not conducted because of technical reasons and was found to be extremely cost-prohibitive. Therefore, enhanced bioremediation was evaluated and pilot tests conducted. It was found to be suitable for the site and was implemented. Additional information is provided in Chapter 3.0.

## 2.4 Extent and Stability of the Dissolved Constituent Plume

As described, groundwater monitoring data was collected on a quarterly and semi-annual basis from on- and off-site wells. The tabulated data and sample collection details are included in the Semi-Annual Reports of A-Zone Corrective Action and B-Zone Compliance Monitoring (Semi-annual Reports) and are provided in Appendix E-6 of the Permit application.

Drawings depicting the extent of 1,1-DCE were prepared for each Semi-annual Report. Initially, the drawings were prepared using isoconcentrations of 1 ug/l, 10 ug/l, and 100 ug/l. Subsequently, the GPS and RAC values of 7 ug/l and 35 ug/l were used, along with a 100 ug/l isoconcentration.

Each of the drawings depicts a constituent plume extending longitudinally in the direction of groundwater flow (Figure 3). The most recent 1,1-DCE isoconcentration map is provided as Figure 4 (1,1-DCE Isoconcentration Map, Groundwater Monitoring Report, October 2011. The horizontal extent of area with concentrations above the GPS of 7 ug/l and the value of 100 ug/l is reduced when compared to earlier data.

- In comparing the drawings from 1995, 2000, 2005, and 2010, for 1,1-DCE as shown on Figure 5, the horizontal extent of area with concentrations above the GPS of 7 ug/l has changed as described below.

- 1995 – Area of 3,783,456 square feet.

- 2000 – Area of 3,226,204 square feet.

- 2005 – Area of 4,537,159 square feet.

- 2010 – Area of 2,689,936 square feet.

In 1995, the 1,1-DCE plume extended off-site into Area 4 (to MW-38A) and laterally to OW-SS8A (west) and MW-31A (east). In 2000, the area was slightly smaller, extending close to MW-38A and somewhat narrower than the extent in 1995. The plume appears to have expanded in 2005, extending close to Area 4 wells MW-40A (5.1 ug/l) and MW-37A (2.6 ug/l), although it has since reduced in size to the area between MW-35A (32.3 ug/l) and MW-38A (5.67 ug/l).

Although not shown on Figure 5, the concentrations of 1,1-DCE above 100 ug/l has greatly decreased. In 1995, the area of the plume with concentrations above 100 ug/l extended from the facility off-site into Area 3 to MW-30AA and MW-28A. In 2010, only one well (RW-3) had a concentration of 1,1-DCE greater than 100 ug/l.

# 3.0 RISK EVALUATION AND CORRECTIVE MEASURES STUDIES

In addition to the site characterization activities described in Section 2.3, various evaluations were conducted to evaluate the need for and potential effectiveness of corrective measures at the site. These evaluations include the following:

- Solute Transport Model.
- Risk Assessment.
- Natural Attenuation Evaluation.
- *In situ* Chemical Oxidation Pilot Study.
- *In situ* Bioremediation Pilot Study and Implementation.

The following sections provide a brief summary of the objectives and conclusions of these evaluations.

## 3.1 Solute Transport Model

A Solute Transport Model was developed to evaluate future migration potential of constituents in the A-Zone (Ralston, 1996). The model was believed to be conservative, and has proven to be since corrective measures were implemented, given the current constituent concentrations in groundwater. The model was detailed in a previous report and the 2001 CMIP, and therefore not discussed in this document.

## 3.2 Risk Assessment

A Risk Assessment was conducted in 1996, updated in 2001, and again in 2011 as per U.S. EPA guidance. For the purposes of the Risk Assessment, the groundwater plume was divided into four areas (Areas 1 through 4). Each of these four areas was characterized by similarities in the factors that affect public health risk. In addition, an updated well inventory was prepared as part of the current RCRA Part B renewal application.

The land use in Areas 1 and 2 overlying the Sunrise Bench has typically been commercial or industrial. MP is supplied by the plant production well (45/WW-1) which is 401 feet deep and is primarily screened in the shallow regional aquifer. Other commercial and industrial properties located in Area 2 are supplied by public supply wells which are also screened in the deeper regional aquifer.

Areas 3 and 4 overlying the Whitney and Boise Terraces, are the nearest residential areas hydraulically downgradient of Areas 1 and 2. The A-Zone groundwater is currently not used as a source of potable water in the portions of Areas 3 and 4 that are impacted by the dissolved constituent plume. Areas 3 and 4 are supplied almost exclusively by a public water supply, which derives water from the deeper regional aquifer. However, A-Zone groundwater is a potential, but unlikely source of potable water. The only potential development in Areas 3 and 4 would be small quantities for localized irrigation of residential property. Further uses (commercial, industrial, public water supply, etc.) are limited because the area is within an area designated as the Southeast Boise Groundwater Management Area which restricts the use of groundwater.

The Risk Assessment was based, in part on, a Solute Transport Model. The modeling results were used to estimate the maximum time-averaged future concentrations corresponding to the exposure duration for each receptor. These concentrations were then combined with conservative exposure factors established by the USEPA to estimate the risk and hazard index in the final Risk Assessment.

In Area 1 the RBTLs are protective of on-site workers that may be exposed to VOCs in the groundwater via an inhalation pathway; in Area 2 the RBTLs are protective of off-site workers that may be exposed to VOCs in the groundwater via an inhalation pathway; in Area 3 the RBTLS are protective of resident children that may be exposed to VOCs in the groundwater via an inhalation pathway; and in Area 4 the RBTLs are based upon the MCLs, which are published standards for protection of residents that may be exposed to VOCs from the groundwater via an ingestion, dermal, and inhalation pathway.

The cumulative individual excess lifetime cancer risk for each receptor in Areas 1 through 4 was calculated to be within the acceptable value of $1 \times 10^{-5}$ or one in 100,000 excess cancer risk. The hazard index (HI), which quantifies non-carcinogenic effects, was also calculated at the same risk level of $1 \times 10^{-5}$ for all receptors. Analytical results have verified the HI (calculated as less than one) is within the acceptable risk range for this project.

The potential for risks to wildlife, crops, vegetation, and physical structures caused by exposure to dissolved constituents was also evaluated through fate and transport modeling and Risk Assessment. The impacted area is considered not to contain any endangered species or other sensitive habitats. The Idaho Fish and Game Commission and the U.S. Fish and Wildlife Commission agreed that detrimental impacts to wildlife are not anticipated, and that additional ecological studies/work were not necessary.

### 3.3 Natural Attenuation Evaluation

Monitored Natural Attenuation (MNA) was evaluated and summarized in *Monitored Natural Attenuation Report*, August 2001. The data presented in this MNA evaluation strongly suggested that the processes associated with natural attenuation of VOCs are occurring at the site and that natural attenuation is a

viable remedial alternative, especially when combined with the historically utilized active remedial methods of source area chemical oxidation and enhanced bioremediation.

### 3.4 *In situ* Chemical Oxidation Pilot Study

An *In situ* Chemical Oxidation Pilot Study was initiated in December 2000 in accordance with the IDEQ approved Work Plan submitted in November 2000. The purpose of the Pilot Study was to evaluate the effectiveness of *in situ* chemical oxidation as a potential corrective measure for reducing concentrations of on-site constituents in the A-Zone. As mentioned, the *in situ* chemical oxidation pilot program resulted in an overall reduction in concentration of VOCs in the test area. However, site-wide implementation of an *in situ* chemical oxidation injection program was found to have technical limitations and would be extremely cost-prohibitive. Therefore, enhanced bioremediation was evaluated and implemented as it was found to be both effective and cost efficient.

### 3.5 *In situ* Bioremediation

During September 2002, AGI conducted pilot testing to assess the feasibility of using food-grade vegetable oil (VegOil) along with various amendments to treat residual chlorinated impacts present in groundwater. The results of this initial VegOil pilot study, which was completed in 2003, indicated that the use of vegetable oil to enhance bioremediation of site-related impacts may be feasible at the site. However, clogging of the interstices of the aquifer matrix associated with the use of a high concentration vegetable oil solution severely restricted the radius of influence developed during the initial pilot test. Therefore, a supplemental pilot study was initiated in December 2003 to evaluate the effectiveness of a low concentration, highly emulsified vegetable oil solution.

In December 2004, AGI collected pre-injection data from the on-site and off-site pilot test wells and completed injection of the low concentration, highly emulsified VegOil mixture into each test area. The results of the supplemental pilot study indicated that injection of the low concentration, highly emulsified vegetable oil solution was enhancing reductive dechlorination in both the on-site and off-site test areas. Furthermore, the radius of influence and treatment efficiency developed through the substrate mixture and injection methodology used in the supplemental pilot testing was adequate for full-scale application in selected portions of the impacted plume.

A full-scale application of bioremediation, using VegOil injection in a network of new and existing on-site (Area 1) and off-site (Area 3) wells, was performed in August 2005. At the time, it was anticipated that additional injection of VegOil in two to four years would be necessary. Bioremediation performance monitoring was conducted in conjunction with the permit-required corrective action monitoring program (CAMP) and will continue until the Remedial Action Criteria (RACs) are met in groundwater Areas 1 and 3.

The in-situ enhanced bioremediation program implemented in 2009 was designed to supplement and accelerate the on-going subsurface anaerobic microbial activities at the site. The supplemental bioremediation injection included a two-step process. First, VegOil was injected, and then an anaerobic microbial culture (i.e., *Dehalococcoides ethenogenes*) was injected approximately two weeks after the VegOil injection during May and June 2009.

The injection of VegOil has been successful. Specifically, the area of the plume has decreased.

# 4.0 CORRECTIVE MEASURES

Proposed corrective measures for the site consist of a combination of active treatment, engineering controls, institutional controls, and monitored natural attenuation (MNA). Contingency measures are also identified in the event that a specified trigger condition is exceeded. The following sections provide a description of the plume-wide corrective measures, area-specific corrective measures, and area specific contingency measures selected for addressing the A-Zone constituent plume associated with the closed WMUs at the MP facility.

## 4.1 Plume-wide Corrective Measures

Plume-wide and area-specific corrective measures are being taken to limit potential exposure to contaminants and reduce the concentration of constituents in groundwater impacted by the closed WMUs at the MP facility. These measures apply to Areas 1, 2, 3, and 4 as identified in the Risk Assessment.

### 4.1.1 *Plume-wide Alternative Sources of Water*

No residences are currently using the A-Zone groundwater as a source of potable water within the identified limits of the impacted plume. In the future, if it is determined that a potential source of potable water may become impacted above MCLs due to the plume associated with the closed WMUs at the MP facility, connection to a public water supply will be provided at no cost to the affected user to replace the potable water well.

### 4.1.2 *Plume-wide Monitored Natural Attenuation*

MNA was selected as an element of the corrective measures for the long-term reduction of A-Zone impacts. The evaluation of natural attenuation within the constituent plume associated with the closed WMUs suggests that the processes associated with MNA are occurring at the site and that natural attenuation is a viable remedial alternative.

MNA will be implemented as a primary corrective measure in areas of the constituent plume where the Risk Assessment indicates that there is no unacceptable risk. Additional corrective measures have been implemented either in the same area or an adjacent area to adequately control the migration of constituents and protect human health and the environment. MNA has been implemented as the primary corrective measure in Areas 2 and 4. MNA will be implemented as a secondary or follow up corrective measure to address residual impacts in Areas 1 and 3 once remedial action criteria have been met.

MP is using a long-term monitoring plan to monitor the plume over time and to verify that natural attenuation is occurring at rates sufficient to attain site-specific remediation objectives. MP's long-term

monitoring plan will be used to evaluate long-term behavior of the plume, verify that exposure to contaminants is limited, verify that natural attenuation breakdown products do not pose unacceptable risks, determine actual (rather than predicted) attenuation rates for refining predictions of remediation time frame, and to document when site-specific remediation objectives have been attained.

## 4.2 Area 1 Corrective Measures and Contingency Measures

Area 1 consists of the MotivePower facility portion of the Sunrise Terrace. The Risk Assessment conducted for the MP facility determined that the calculated current risk and anticipated future risk is within the acceptable lifetime cancer risk for Area 1 receptors (i.e., on-site workers that may be exposed to VOCs in the groundwater via an inhalation pathway).

Existing corrective measures, including asphalt caps over the WMUs and enhanced bioremediation, were implemented in conjunction with closure of the WMUs at the site to limit migration of constituents of concern. The primary goals of the corrective measures in this area are to adequately control the off-site migration of contaminants in accordance with IDAPA 58.01.05.008 (40 CRF §264.100(e)).

In addition to the previously described plume-wide corrective measures, the following corrective measures and contingency measures were selected to address Area 1 impacts and are described below.

### 4.2.1 *Area 1 Asphalt Cap Maintenance*

WMUs at the MP facility are closed and are in the post-closure care period. The post-closure care period officially began on July 13, 1988. MP will maintain the closed WMUs during the post-closure care period, and will be responsible for the following inspections and maintenance activities:

- Maintaining the integrity and effectiveness of the covers.
- Maintaining the security of the facility.
- Preventing run-on and run-off from eroding or otherwise damaging the covers.
- Protecting and maintaining the surveyed benchmarks.

### 4.2.2 *Area 1 In-situ Enhanced Bioremediation*

A full-scale application of bioremediation, using VegOil injection in a network of new and existing on-site (Area 1) and off-site (Area 3) wells, was performed in August 2005. The application was effective, and a second, modified application was implemented in 2009. The *in-situ* enhanced bioremediation implemented in 2009 was designed to supplement and accelerate the on-going subsurface anaerobic

microbial activities. In a two-step process, VegOil was injected, and then an anaerobic microbial culture (i.e., *Dehalococcoides ethenogenes*) was injected approximately two weeks later. The enhanced bioremediation is reducing contaminant concentrations.

#### 4.2.3 *Area 1 Contingency Measures*

Contingency measures will be implemented in Area 1 if groundwater concentrations detected in any single Area 1 monitoring well exceeds the Area 1 RBTLs in a monitoring event. In the event that an exceedance is verified, as specified in the Permit within 60 days of receiving the verification sample results, a work plan will be submitted to the IDEQ specifying the measures to be implemented to reduce risk to less than $1 \times 10^{-5}$ carcinogenic risk and on-carcinogenic hazard index of 1.0. Within 120 days of receiving approval of the work plan from the IDEQ, MP will initiate implementation of the work plan. The current default contingency measure for Area 1 is pump and treat.

### 4.3 Area 2 Corrective Measures

Area 2 consists of the off-site commercial and industrial portions of the Sunrise Terrace. The Risk Assessment conducted for the MP facility determined that the calculated current risk and anticipated future risk are within the acceptable lifetime cancer risk value of $1 \times 10^{-5}$ and hazard index value of 1.0 for Area 2 receptors (i.e., with off-site workers that may be exposed to VOCs in the groundwater via an inhalation pathway).

MNA along with Area 1 remedial action to reduce constituent migration into Area 2 have been selected as the corrective measures for Area 2 to protect human health and the environment in accordance with IDAPA 58.01.05.008 (40 CRF §264.100(e)).

#### 4.3.1 *Area 2 Monitored Natural Attenuation*

MNA was selected as the corrective measure for Area 2. As summarized in Section 3.3, the evaluation of natural attenuation within the constituent plume associated with the closed WMUs suggests that the processes associated with MNA are occurring at the site and that natural attenuation is a viable remedial alternative. Existing and proposed Area 1 corrective measures are intended to reduce the migration of constituents into Area 2 thereby improving the potential effectiveness of MNA in this area.

#### 4.3.2 *Area 2 Contingency Measures*

Soil venting or enhanced bioremediation were selected as the likely contingency measure for reducing risk to less than $1 \times 10^{-5}$ carcinogenic risk factor and non-carcinogenic hazard index of 1.0 in Area 2. Soil venting through the extraction of soil vapor would limit the potential for inhalation of impacted vapors and reduce risk in the area.

## 4.4 Area 3 Corrective Measures

Area 3 consists of the off-site industrial and residential portions of the Whitney Terrace. The Risk Assessment conducted for the MP facility determined that the calculated current risk and anticipated future risk are within the acceptable lifetime cancer risk value of $1 \times 10^{-5}$ and hazard index value of 1.0 for Area 3 receptors (i.e., resident children that may be exposed to VOCs in the groundwater via an inhalation pathway).

In addition to the previously described plume-wide corrective measures, corrective measures will be implemented where necessary in Area 3 to protect human health and the environment in accordance with IDAPA 58.01.05.008 (40 CRF §264.100(e)).

### 4.4.1 *Area 3 Enhanced Bioremediation*

As described in Section 4.2.3, bioremediation activities were conducted in Area 3. Contaminant concentrations have decreased in Area 3 over time as discussed in Section 2.4. The area of the plume has decreased from approximately 3 million square feet in 2000 to 2.6 million square feet in 2010.

### *4.4.2 Area 3 Contingency Measures*

Additional VegOil injection (enhanced bioremediation) was selected as the primary remedial measure for reducing risk to less than $1 \times 10^{-5}$ carcinogenic risk factor and non-carcinogenic hazard index of 1.0 in Area 3. If RBTLs are exceeded in this Area, a contingency measure will be determined and a work plan submitted in accordance with the Permit.

## 4.5 Area 4 Corrective Measures

Area 4 is located in the Boise Terrace and includes mostly residential areas north of the New York Canal. In Area 4, the RBTLs are based upon MCLs. However, A-Zone groundwater is not currently used as a potable water source in the affected portions of the aquifer in Area 4.

MNA and remedial action as necessary to reduce constituent migration into Area 4 were selected as the corrective measures for Area 4. These measures are described below.

### *4.5.1 Area 4 Contingency Measures*

Contingency measures will be implemented in Area 4 where necessary to protect human health and the environment in accordance with the Part B Permit and IDAPA 58.01.05.008 (40 CRF §264.100e).

Permeable reactive barrier (PRB) technology was selected as the likely contingency measure for addressing groundwater impacts in Area 4. Because advancements in remediation technologies during the Permit period are likely, a review of additional remedial technologies that may be better suited for Area 4 will also be performed in the event a contingency is necessary.

# 5.0 CONCLUSIONS AND RECOMMENDATIONS

The selected corrective measures and contingency measures are intended to address on-site and off-site groundwater impacts identified at the MP facility by reducing the concentration of site related constituents in A-Zone groundwater, controlling migration of the plume, limiting potential exposure pathways, and protecting unaffected portions of the aquifer.

## 5.1 Conclusions

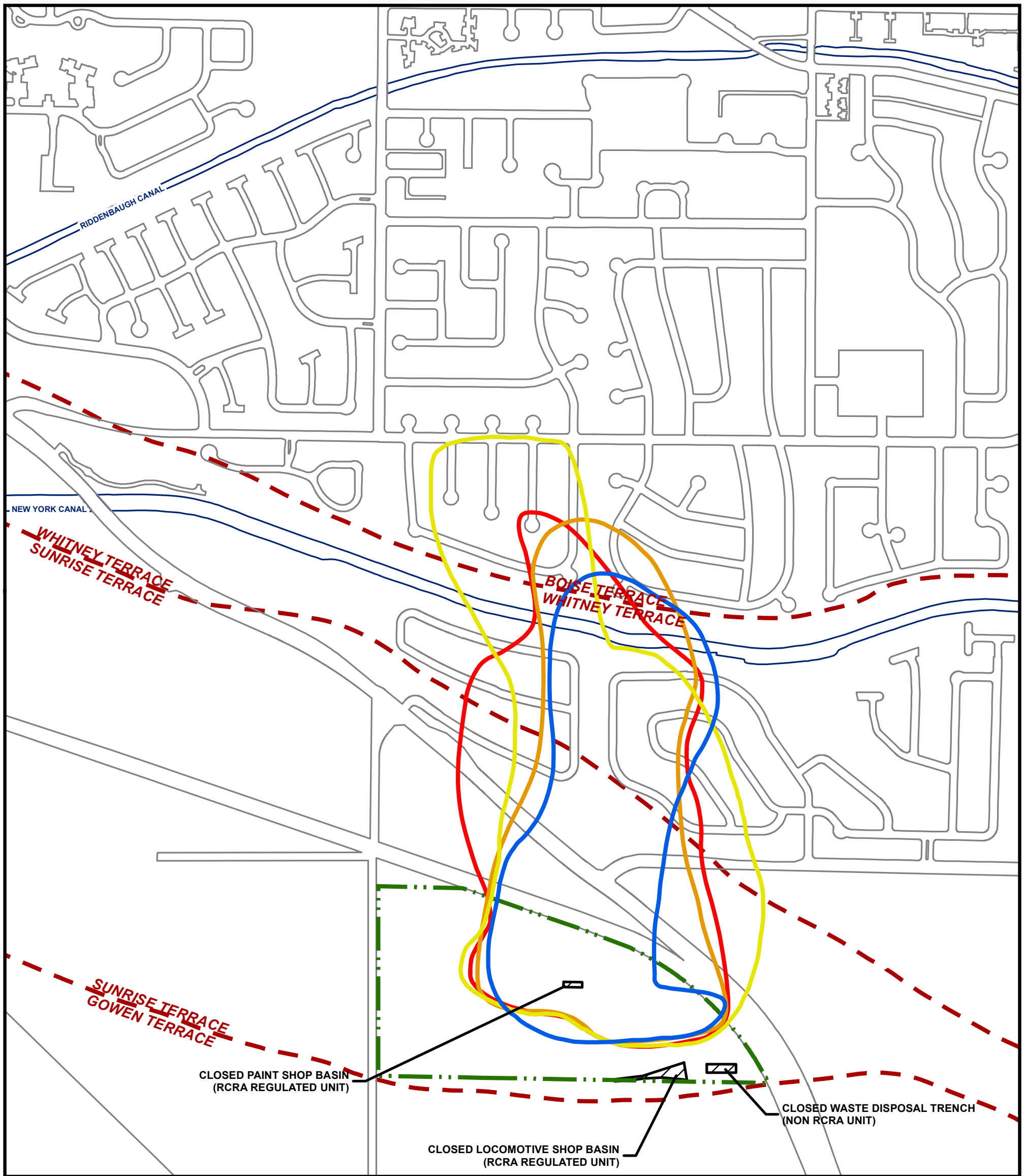
Based on the evaluations conducted, the selected corrective measures and contingencies will meet the established objectives for the MP facility which include:

- Minimize the spread of contaminants from the facility to downgradient receptors and reduce the concentration of contaminants on-site.
- Prevent further degradation of the currently unaffected portions of the aquifer.
- Monitor the current level of exposure to residents in order to support the final Risk Assessment and apply active remediation in the event that it is determined the risk is above acceptable levels.

The conclusions of the Risk Assessment were that the current and potential future risks are within acceptable levels for all areas of the plume based on worst-case exposure scenarios. The data presented in the natural attenuation evaluation suggests that the processes associated with natural attenuation of VOCs are occurring at the site and that natural attenuation is a viable remedial alternative when completed with active remedial measures. The use of corrective measures along with MNA provide an effective approach for addressing the groundwater impacts associated with the closed WMUs at the MP facility.

## 5.2 Recommendations

MotivePower proposes inclusion of the corrective measures and contingency measures described in this CMIP in the 2012 RCRA Post-Closure Permit.




N

0 300 600 1,200

Feet

**LEGEND**

APPROXIMATE SITE BOUNDARY

APPROXIMATE EDGE OF TERRACE

FORMER DISPOSAL AREAS

**EXTENT OF DISSOLVED 1,1-DCE GREATER THAN 7 ug/l**

1995 (3,783,456 $FT^2$)

2000 (3,226,204 $FT^2$)

2005 (4,537,159 $FT^2$)

2010 (2,689,936 $FT^2$)

PORTIONS OF THIS FIGURE ARE PRESENTED IN COLOR. THEREFORE BLACK AND WHITE COPIES MAY NOT DEPICT ALL INFORMATION AS PRESENTED ON THE ORIGINAL DOCUMENT.

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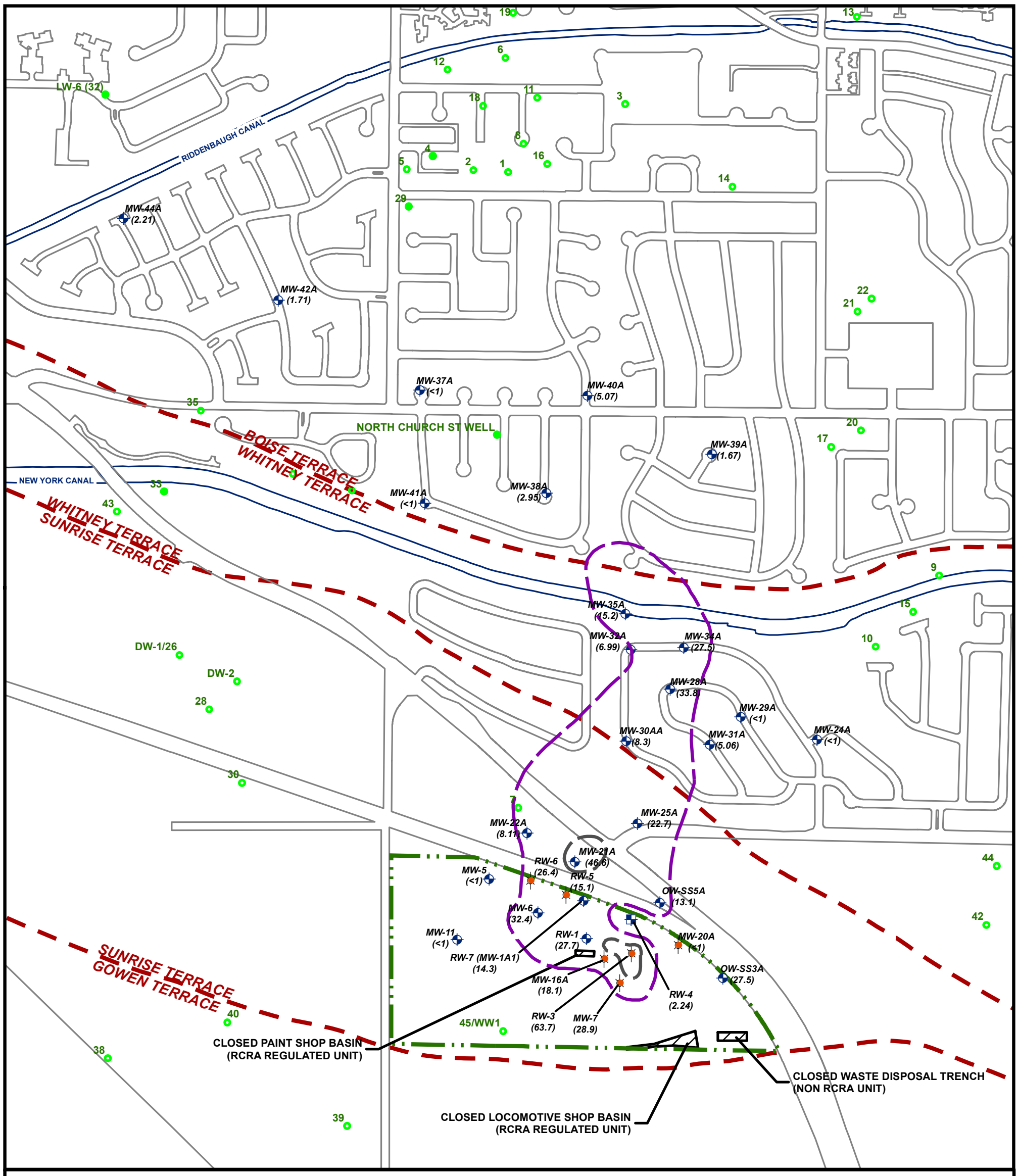
FIGURE 5

1,1-DICHLOROETHENE
ISOCONCENTRATIONS

American Geosciences, Inc.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CURRENT DATE | 11/21/2011 |
| 1 | BAS | PREPARED ORIGINAL DRAWING | 11/21/11 | WTN | 11/21/11 | WTN | 11/21/11 | ARCMAP MXD | FIGURE 5 (1,1-DCE ISOCONS) |
| NO | DRN | REVISION | DATE | CHKD | DATE | APP | DATE | AGI PROJ NO | 0008-015 |




N

0 300 600 1,200
Feet

**LEGEND**

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE EDGE OF TERRACE
- FORMER DISPOSAL AREAS
- WATER WELL
- WATER WELL (ABANDONED)
- A-ZONE MONITORING WELL
- A-ZONE INJECTION/RECOVERY/MONITORING WELL
- A-ZONE RECOVERY/MONITORING WELL
- *(18.1)* 1,1-DCE[1] CONCENTRATION IN ug/l[2]
- DISSOLVED 1,1-DCE (RAC[3])
- DISSOLVED 1,1-DCE (GPS[4])

**FOOTNOTES:**
(1) 1,1-DICHLOROETHENE
(2) MICROGRAMS PER LITER
(3) REMEDIAL ACTION CRITERION (35 ug/l)
(4) GROUNDWATER PROTECTION STANDARD (7 ug/l)

PORTIONS OF THIS FIGURE ARE PRESENTED IN COLOR. THEREFORE BLACK AND WHITE COPIES MAY NOT DEPICT ALL INFORMATION AS PRESENTED ON THE ORIGINAL DOCUMENT.

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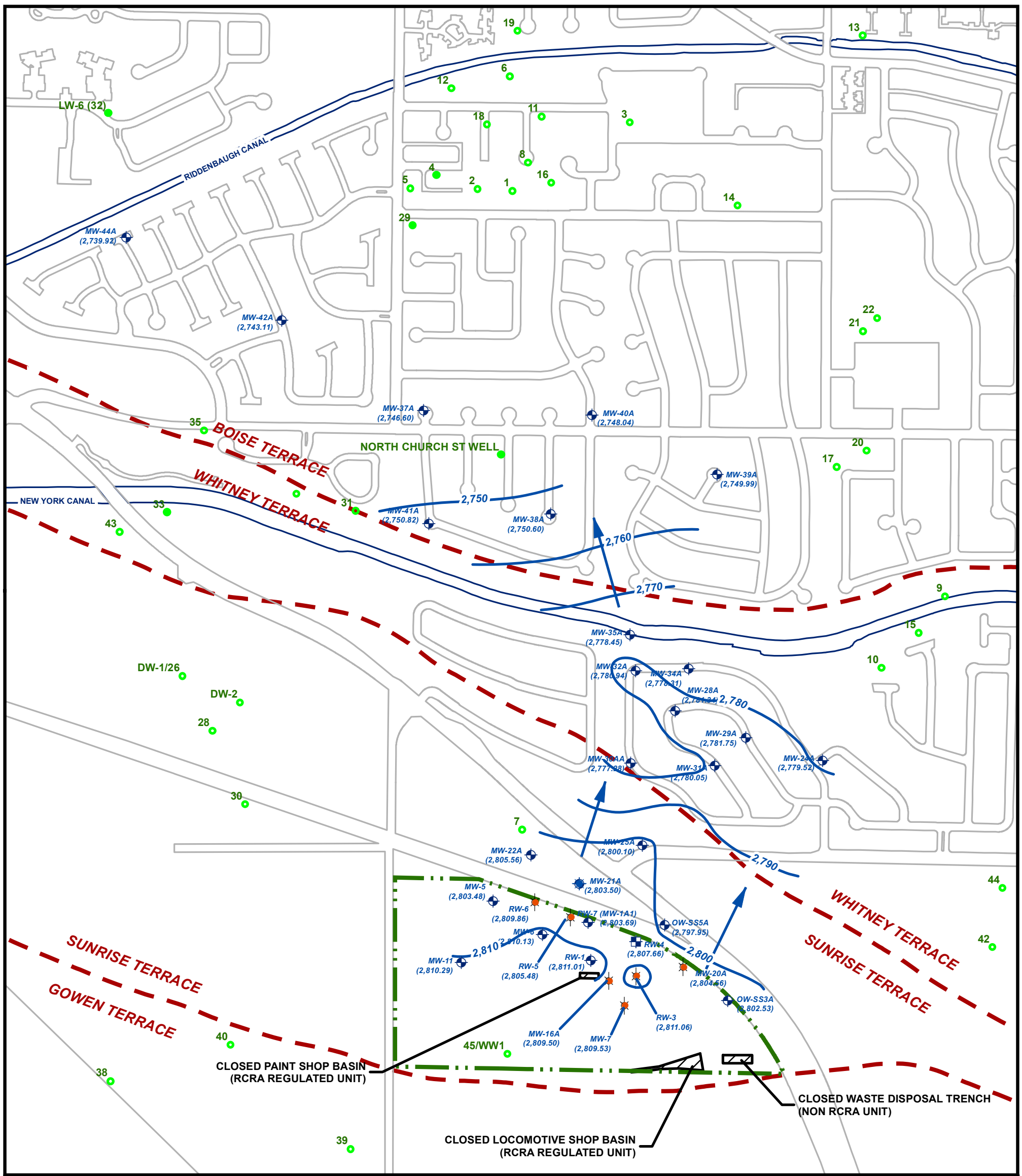
FIGURE 4

1,1-DICHLOROETHENE
ISOCONCENTRATIONS
A-ZONE - OCTOBER 2011

American Geosciences, Inc.

| NO | DRN | REVISION | DATE | CHKD | DATE | APP | DATE | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CURRENT DATE | 11/21/2011 |
| 1 | BAS | PREPARED ORIGINAL DRAWING | 11/21/11 | WTN | 11/21/11 | WTN | 11/21/11 | ARCMAP MXD | FIGURE 4 (1,1-DCE ISOCONS-RCMIP) |
| | | | | | | | | AGI PROJ NO | 0008-015 |




## LEGEND

- APPROXIMATE SITE BOUNDARY
- APPROXIMATE EDGE OF TERRACE
- FORMER DISPOSAL AREAS
- WATER WELL
- WATER WELL (ABANDONED)
- MONITORING WELL
- INJECTION/MONITORING WELL
- RECOVERY/MONITORING WELL
- INJECTION/RECOVERY/MONITORING WELL
- GROUNDWATER ELEVATION CONTOUR[1]
- FLOW DIRECTION[1]
- (2,809.53) GROUNDWATER ELEVATION IN FEET

N

0 300 600 1,200
Feet

[1]GROUNDWATER ELEVATION CONTOURS AND FLOW DIRECTION ARE BASED ON GROUNDWATER ELEVATIONS MEASURED IN LABELED MONITORING WELLS IN OCTOBER 2011.

PORTIONS OF THIS FIGURE ARE PRESENTED IN COLOR. THEREFORE BLACK AND WHITE COPIES MAY NOT DEPICT ALL INFORMATION AS PRESENTED ON THE ORIGINAL DOCUMENT.

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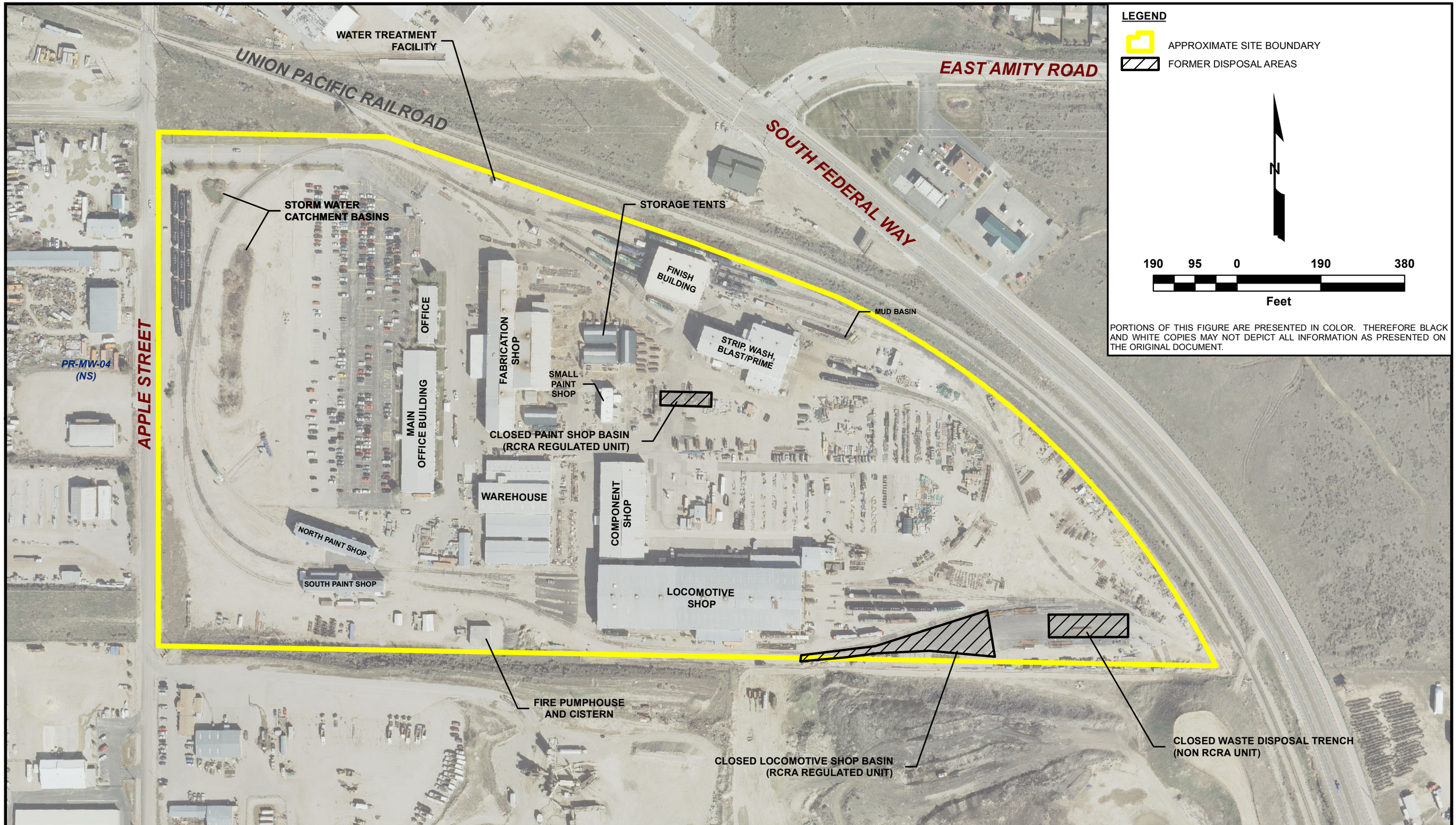
FIGURE 3

A-ZONE POTENTIOMETRIC SURFACE MAP
OCTOBER 2011

American Geosciences, Inc.

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | CURRENT DATE | 12/02/2011 |
| 1 | BAS | PREPARED ORIGINAL DRAWING | 12/02/11 | WTN | 12/02/11 | WTN | 12/02/11 | ARCMAP MXD | FIGURE 3 (A ZONE POT MAP-RCMIP) |
| NO | DRN | REVISION | DATE | CHKD | DATE | APP | DATE | AGI PROJ NO | 0008-015 |




| NO | DRN | DATE | REVISION | CHKD | DATE | APP | DATE |
|---|---|---|---|---|---|---|---|
| 0 | BAS | 09/09/11 | CREATED FIGURE IN ARCMAP | WTN | 09/12/11 | WTN | 09/12/11 |

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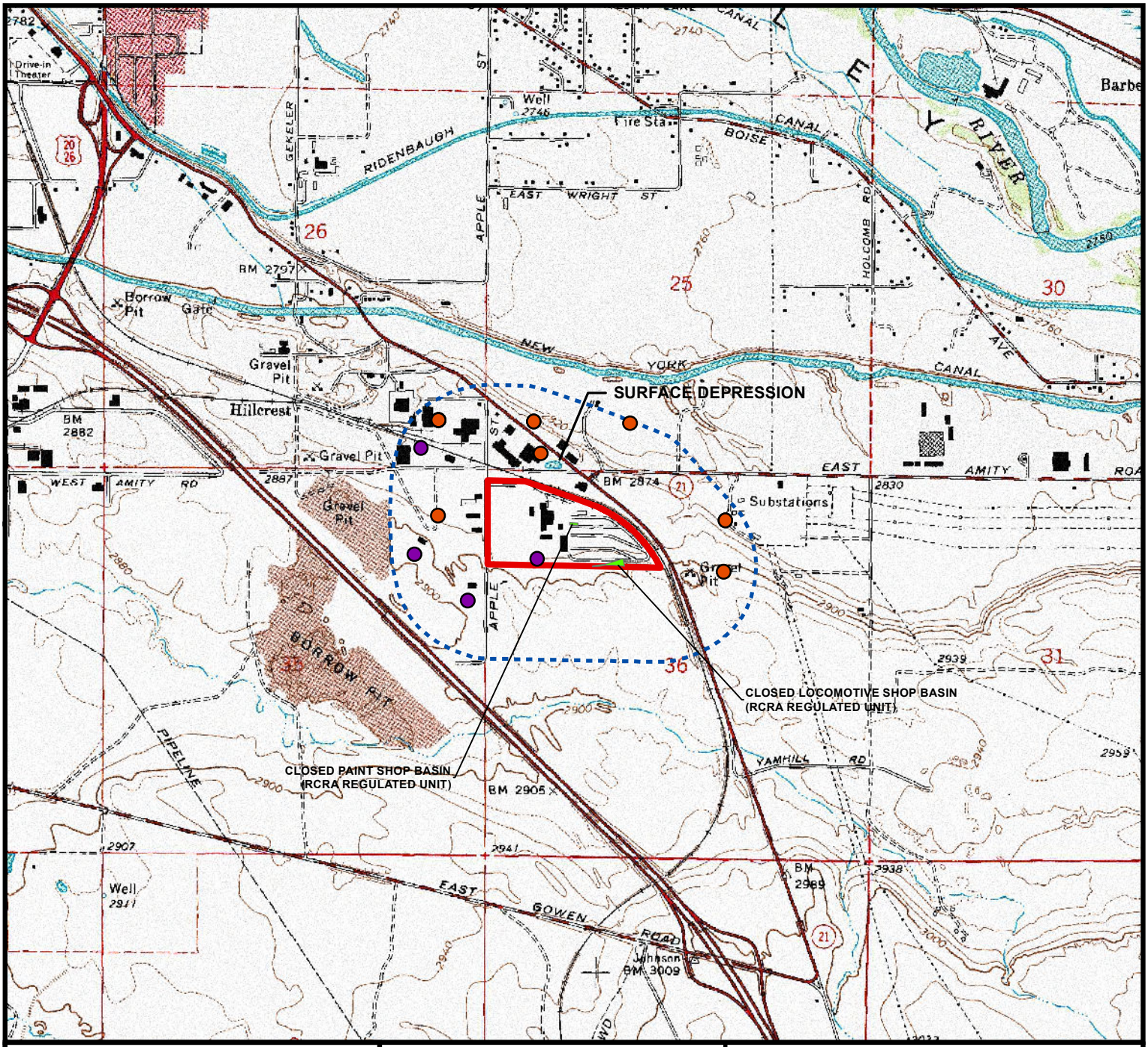
CURRENT DATE 08/15/2011 | ARCMAP MXD | FIGURE 2 (FACILITY DRAWING-RCMIP)

American Geosciences, Inc.

FIGURE A2

FACILITY DRAWING

AGI PROJ NO. 0008-015 | REVISION 0



QUADRANGLE LOCATION

REFERENCE
"DIGITAL RASTER GRAPHIC MOSAIC OF ADA COUNTY, IDAHO", U.S. DEPARTMENT OF AGRICULTURE, NATURAL RESOURCES CONSERVATION SERVICE, 2002. QUADRANGLE LOCATION REFERENCES THE BOISE SOUTH, IDAHO. USGS 7.5-MINUTE QUADRANGLE DATED 1972 (PHOTOREVISED 1976)

## LEGEND

- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- RCRA REGULATED UNIT
- QUARTER-MILE RADIUS OF FACILITY

**DRINKING WATER WELLS**

- IDWR-IDENTIFIED WELL[1]
- OTHER KNOWN WELL[2]

FOOTNOTES:
[1]WELL IDENTIFIED FROM THE IDAHO DEPARTMENT OF WATER RESOURCES DATABASE.
[2]WELL IDENTIFIED BASED ON KNOWLEDGE OF FACILITY AREA.

N

0.5 0.25 0 0.5
Miles

WABTEC - MOTIVEPOWER
BOISE, IDAHO
EPA ID. EDD980976831

FIGURE 1

SITE LOCATION MAP

| NO | DRN | DATE | REVISION | CHK | DATE | APP | DATE |
|---|---|---|---|---|---|---|---|
| 0 | BAS | 09/07/11 | SETUP IN ARCMAP | | | | |

| | |
|---|---|
| CURRENT DATE | 09/16/2011 |
| ARCMAP MXD | FIGURE 1 (SITE LOCATION MAP-RCIMP) |
| AGI PROJ NO | 0008-018 |

AGI American Geosciences, Inc.