Remedial Action Summary for the

Hazelwood Interim Storage Site Property

FUSRAP North St. Louis County Sites, St. Louis, Missouri

Revision 1

August 7, 2013

1.0 INTRODUCTION/BACKGROUND

This Remedial Action Summary (RAS) covers work that was conducted by Shaw Environmental & Infrastructure, Inc. (or Shaw Environmental, Inc.) (Shaw) and predecessor company Stone & Webster, Inc. (Stone & Webster) as part of the Formerly Utilized Sites Remedial Action Program (FUSRAP). At the North St. Louis County Sites (NORCO), the FUSRAP has been administered by the U.S. Army Corps of Engineers (USACE), St. Louis District in accordance with the following:

- 1. the Record of Decision for the North St. Louis County Sites, St. Louis, Missouri (ROD) (USACE, 2005) (for remedial actions [RAs] in accordance with the specified environmental remedy and Remediation Goals [RGs] for the NORCO), or
- 2. the Engineering Evaluation/Cost Analysis (EE/CA) for the Hazelwood Interim Storage Site (HISS), St. Louis, Missouri (EE/CA) (USACE, 1998) (for removal actions performed prior to publication of the ROD in accordance with specific cleanup requirements).

This RAS pertains to the Hazelwood Interim Storage Site (HISS) property generally located northeast of the St. Louis Airport Site (SLAPS) and west of Interstate 170 at 9170 Latty Avenue in Hazelwood, Missouri. The property is bounded by the Latty Avenue right-of-way (ROW) to the north; Futura Coatings Company property (Futura) to the west; VP-40A: East – Tract 3 to the south; VP-02(L) to the east; and NSC (Undesignated) property to the southeast (see Figure 1). The combined Futura and HISS property is owned by Jarboe Realty & Investments Company. The property was leased by Futura Coatings Company in the late 1970s, and the western portion was developed into a manufacturing facility. The property was eventually split into two parcels: HISS and Futura. For RAS reporting purposes, the west parcel and southwestern portion of the east parcel is defined as the Futura property and is covered under a separate RAS. The remaining majority of the east parcel is defined as the HISS property, which is delineated by the "Subject RAS Area Boundary" (see Figure 1). Until April 30, 2012, a portion of the HISS property was leased by the owners to the USACE for FUSRAP activities.

Uranium-bearing residues that had been stored at the SLAPS were moved to the property in 1966. From the mid-1960s to the mid-1970s, the residues were processed and shipped by various private entities to an out-of-state location. Twelve to eighteen inches of soil were reportedly excavated and removed from the HISS property as part of this residue removal effort.

During the 1970s and 1980s, radiologically contaminated soils from the HISS and surrounding properties were excavated by the Futura property owner and the U.S. Department of Energy, and stockpiled at the HISS. These activities are summarized in the EE/CA (USACE, 1998) and are outside of the scope of this RAS. Quantities of excavated soil and other materials discussed throughout this report do not include the amounts associated with these historical excavation activities.

Remediation of in-situ contaminated soils along the path of the planned rail spur and subsequent construction of rail bed and track along the east side of the property occurred around 1999. During 2000 and 2001, approximately 32,600 cubic yards of radiologically contaminated soils from four stockpiles (including the Railroad Spur Spoil Piles A and B, the Main Storage Pile, and the Supplemental Storage Pile) located at the HISS (generated by the earlier cleanup activities and removal actions were removed from the property and subsequently shipped to out-of-state licensed disposal facilities. These removal actions performed by others under the EE/CA (USACE, 1998) are also outside the scope of this RAS.

This RAS addresses removal actions and RAs performed at the HISS property from 2001 to 2011 by Shaw and Stone & Webster for all accessible soils with radiological contamination above the respective EE/CA cleanup criteria (USACE, 1998) or ROD RGs (USACE, 2005) (see Figures 1 through 2F). Unless otherwise indicated, detailed discussion included in this RAS pertains only to the RAs performed from 2008 to 2011. Statistics and quantities, other than insitu excavation quantities, for RAs performed from 2008 through 2011 represent combined activities for both Futura and HISS. Separate accounting of this information by individual property was not maintained during this period.

2.0 REMEDIAL DESIGN

The remedial designs associated with the HISS property were described in the following documents:

• Work Description for the Planned Utility Support to Complete Futura Coatings Pump Pad Soil Removal and Backfill, FUSRAP St. Louis Airport Site, St. Louis, Missouri (Stone & Webster, 2000). This document addressed the remediation of radiologically contaminated soils in an approximate 20-foot by 25-foot area near the northeast corner of Futura Building 2/3 to provide a clean area for construction of a pump pad and pumping equipment, to be installed by others (see Keyed Note 1 on Figure 1). The work was specified according to cleanup requirements defined in the EE/CA (USACE, 1998), prior to the issuance of the ROD (USACE, 2005).

- Hazelwood Interim Storage Site Loadout Operations Plan, Appendix E to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri (LOP) (Shaw, 2007a; Shaw 2008a). This document addressed the construction of a contaminated soil stockpile management area and haul road, as well as operation of loadout activities for staging and loading contaminated materials from Futura, HISS, and nearby Vicinity Properties (VPs) into rail cars on the HISS rail spur (later removed) (see Keyed Note 5 on Figure 1).
- Vicinity Properties Futura, HISS, and 40A: East Tract 3, Remedial Design/Remedial Action Work Description, Supplement No. 5 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri (Supplement No. 5 RD/RAWD) (Shaw, 2007b). This document addressed the remediation of Futura, a majority of HISS (excluding the Load-Out Facility), and VP-40A: East Tract 3, in accordance with the ROD-specified environmental remedy and RGs (see Keyed Note 3 on Figure 1).
- HISS Load-Out Facility and VP-06(L) Tract 1, Remedial Design/Remedial Action Work Description, Supplement No. 12 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri (Supplement No. 12 RD/RAWD) (Shaw, 2010a). This document addressed the remediation of the remainder of HISS and portions of VP-40A: East Tract 3 and VP-02(L) associated with the HISS Load-Out Facility, in accordance with the ROD-specified environmental remedy and RGs (see Keyed Note 4 on Figure 1).

The RD/RAWDs (Shaw 2007b; Shaw 2010a) are supplements to the *FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri* (RAWP) (Shaw, 2006). The RD/RAWDs and the RAWP were prepared and initially implemented by Shaw under the Kansas City Total Environmental Restoration Contract (TERC) Number DACW41-98-D-9006. Beginning October 1, 2010, Shaw continued remediation work under a new contract vehicle, Kansas City Pre-Placed Remedial Action Contract (PRAC) Number W912DQ-10-D-3007. As directed by the USACE, TERC program level documents referenced within the RD/RAWDs and the RAWP were to be utilized under the PRAC for the continuation of the work. The RD/RAWDs were also based on information contained in the *Pre-Design Investigation Summary Report for Hazelwood Interim Storage Site and Futura, St. Louis, Missouri* (PDIR) (USACE, 2006), as well as on additional input from the USACE.

During the construction period, the following Field Work Variances (FWVs) to the RD/RAWDs (Shaw, 2007b; Shaw, 2010a) were issued:

- FWV-174 (October 28, 2008) (Shaw, 2007b): Incorporated restoration plans for a dock ramp structure located on the west side of Futura Building 2/3 and updated or clarified certain aspects of the design pertaining to water management and remediation of non-radiological contaminants.
- FWV-179 (September 1, 2009) (Shaw, 2007b): Revised the design approach to eliminate the upstream rock check dam from the tributary pump-around configuration.
- FWV-187 (January 18, 2010) (Shaw, 2007b): Incorporated the as-built/restoration information for the immediate Coldwater Creek tributary area of VP-40A: East Tract 3.
- FWV-177 (March 2, 2010) (Shaw, 2007b): Incorporated details of RAs at additional areas of the northern portions of Futura and HISS and updated water management aspects of the design and reference citations.
- FWV-193 (June 15, 2010) (Shaw, 2007b): Provided restoration details of the tributary area and updated revegetation notes.
- FWV-195 (June 16, 2010) (Shaw, 2007b): Incorporated the as-built restoration information for the area east of the Coldwater Creek tributary on VP-40A: East Tract 3.
- FWV-192 (July 26, 2010) (Shaw, 2007b): Provided design information for removal of a portion of the track at the north end of the HISS spur to facilitate construction equipment and contaminated material movement.
- FWV-199 (October 14, 2010) (Shaw, 2007b): Provided restoration details for the Futura Building 1 entrance stoop.
- FWV-200 (February 15, 2011) (Shaw, 2010a): Reduced the planned excavation area (EA) on the Undesignated NSC-owned property south of VP-02(L).
- FWV-202 (December 15, 2011) (Shaw, 2007b): Removed previously planned EAs on VP-40A: East Tract 3 and updated the haul routes.

The remediation of soils in the HISS area was expected to affect 20,350 square meters of area and result in the removal of an estimated 28,336 bank cubic yards (bcy) of contaminated material (primarily soil and vegetation) to be loaded out at the HISS Load-out Facility and the SLAPS, based on the combined RD/RAWDs (Shaw 2007b; Shaw, 2010a). Accessible contaminated soils were limited by the Latty Avenue pavement.

The EAs depicted in the RD/RAWDs (Shaw 2007b; Shaw 2010a) represented a conceptual approach to the design of survey units (SUs) for the final status survey (FSS) and were intended to be points of reference for use during the RA. The final boundaries of the SUs (see Figures 2A through 2F) were defined at the onset of the FSS. These boundaries differ from those illustrated in the RD/RAWDs because of the actual extent of contamination above the ROD RGs (USACE, 2005) and the sequence of work dictated by site conditions. Specific SU designations mentioned in the RAS and on Figures 2A through 2F represent the as-built SUs designated by health physics personnel during the course of the RA. The remedial designs specified by the RD/RAWDs were based on excavations depths varying from 1 foot below ground surface (bgs) on the southern portions of the HISS up to 11 feet bgs along portions of the east HISS property line. The design also included material and performance requirements associated with backfilling as specified in Sections 4.15 and 4.16 of the RAWP (Shaw, 2006a) and on the RD/RAWDs plan drawings.

The RD/RAWDs (Shaw 2007b; Shaw, 2010a) also included provisions for potential removal and replacement of some of the site utilities. These provisions included removal and replacement (together with use of a temporary pump-around system) of a public sanitary sewer that crossed the property.

3.0 CHRONOLOGY OF EVENTS

Table 3 presents a chronologic summary of events significant to the removal actions and RAs at the HISS property. See Section 2.0 for a list of the various FWVs issued during the construction period.

TABLE 3. CHRONOLOGY OF SIGNIFICANT EVENTS AT HISS

Date Complete	Event			
October 2, 1998	Published Engineering Evaluation/Cost Analysis (EE/CA) for the			
	Hazelwood Interim Storage Site (HISS), St. Louis, Missouri			
	(USACE, 1998).			
December 15, 2000	Published Work Description for Planned Utility Support to Complete			
	Futura Coatings Pump Pad Soil Removal and Backfill, FUSRAP			
	St. Louis Airport Site, St. Louis, Missouri (Stone & Webster, 2000).			
January 4, 2001	Started excavation of Futura pump pad area (see Keyed Note 1 on			
	Figure 1).			
February 22, 2001	Completed removal action and restoration of the Futura pump pad area			

	(see Keyed Note 1 on Figure 1).			
June 27, 2001	Published Planned Utility Support to Complete Futura Coatings Pump Pad Soil Removal and Backfill, Removal Action Summary, Berkeley, Missouri (Futura Pump Pad removal action summary) (Stone & Webster, 2001) (see Keyed Note 1 on Figure 1).			
May 1, 2003	Published Feasibility Study for the St. Louis North County Site (FS) (USACE, 2003a).			
September 2, 2005	Signed Record of Decision for the North St. Louis County Sites, St. Louis, Missouri (USACE, 2005).			
November 30, 2006	Published FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Rev. 0 (Shaw, 2006).			
January 29, 2007	Published Hazelwood Interim Storage Site Loadout Operations Plan, Appendix E to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Rev. 0 (Shaw, 2007a).			
October 25, 2007	Published Vicinity Properties Futura, HISS, and 40A: East – Tract 3, Remedial Design/Remedial Action Work Description, Supplement No. 5 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Rev. B.			
December 6, 2007	Published Vicinity Properties Futura, HISS, and 40A: East – Tract 3, Remedial Design/Remedial Action Work Description, Supplement No. 5 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Rev. 0 (Shaw, 2007b).			
January 17, 2008	Started excavation beginning with SU-3A (see Figures 2D and 2E).			
August 26, 2008	Published Hazelwood Interim Storage Site Loadout Operations Plan, Appendix E to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Rev. 1 (Shaw, 2008a).			
September 9, 2010	Published HISS Load-Out Facility and VP-06(L) - Tract 1, Remedial Design/Remedial Action Work Description, Supplement No. 12 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Rev. B.			
October 13, 2010	Published HISS Load-Out Facility and VP-06(L) - Tract 1, Remedial Design/Remedial Action Work Description, Supplement No. 12 to the FUSRAP Remedial Action Work Plan for the North St. Louis County			

	Sites, St. Louis, Missouri, Rev. 0. (Shaw, 2010a).		
April 28, 2011	Completed HISS rail spur disassembly.		
September 21, 2011	Received final (verbal) backfill authorization from the USACE for SU-12G) (see Figure 2A). (Completion of RA at the HISS property.)		
September 21, 2011	Completed replacement of private and Metropolitan St. Louis Sewer District (MSD) sanitary sewers.		
September 21, 2011	Performed final inspection of the restored areas of private and MSD sanitary sewers by the MSD inspector. (MSD approval letter received on December 2, 2011 [see Attachment 1]).		
October 4, 2011	Performed final inspection of restored gravel and south drainage swale area of HISS east of Futura Building 4 by Shaw, the USACE, and the property owner.		
October 11, 2011	Completed final grading/resurfacing restoration at the HISS property (except for localized touch-up grading).		
October 11, 2011	Demobilized from the HISS property.		
November 9, 2011	Performed final inspection of restored areas of HISS grass-vegetated areas by Shaw, the USACE, and the property owner.		
December 27, 2011	Completed fencing restoration at the Futura and HISS properties (excluding north end).		
January 23, 2012	Performed final inspection of restored areas of HISS/Futura fencing by Shaw, the USACE, and the property owner.		
February 9, 2012	Performed final inspection of restored areas of the north gravel area and the HISS barn by Shaw, the USACE, and the property owner.		

The remediation of the HISS property is part of a much larger overall project for the NORCO. When all actions specified in the scope of the ROD (USACE, 2005) are completed, a final closeout report will be developed. This project-level RAS will support the closeout Post-Remedial Action report.

4.0 DESCRIPTION OF CONSTRUCTION ACTIVITIES

4.1 Health and Safety

Public and worker health and safety are the highest priorities for the St. Louis District FUSRAP Sites. For RAs performed during or after 2007 at the HISS property, the USACE followed the safety requirements of the U.S. Occupational Safety and Health Administration's (OSHA) Code

of Federal Regulations (CFR) - Safety and Health Regulations for Construction 29 CFR 1926 (OSHA, 2008) and the radiation safety requirements of the Department of the Army (DA) Pamphlet 385-24, The Army Radiation Safety Program (DA, 2007). The USACE also followed the requirements of the 2003 Engineer Manual (EM) 385-1-1, Safety and Health Requirements Manual (USACE, 2003b) for work performed under Shaw's TERC (prior to October 1, 2010), and of the revised 2008 EM385-1-1 (USACE, 2008), for Shaw work performed thereafter under the PRAC. Removal actions performed during 2001 and 2003 were conducted in accordance with safety and health requirements applicable at the time of these activities.

Project-specific health and safety requirements for construction and remediation activities were specified in the *Site Safety and Health Plan, FUSRAP St. Louis Airport Site/St. Louis Downtown Site, St. Louis, Missouri* (Shaw, 2004) for Shaw work performed under the TERC (prior to October 1, 2010) and in the *Accident Prevention Plan, St. Louis FUSRAP Sites, St. Louis, Missouri* (Shaw, 2010b) for Shaw work performed thereafter under the PRAC.

Personal protective equipment (PPE) was required for on-site personnel. The determination of appropriate PPE was made prior to the work effort, and the PPE level was adjusted when necessary to ensure the proper protection of workers at all times. Construction safety permits, such as excavation permits, were secured prior to the performance of work that required a permit.

Approximately 80,317 craft hours were expended by Shaw to perform the removal actions and RAs, including site staging and post-remediation maintenance, at the Futura and HISS properties from approximately January 2001 to December 2011. One OSHA-recordable injury incident occurred in 2010 associated with relocation of fuel tanks on the HISS property. There were no OSHA lost workdays or other substantial health and safety problems during the remediation activities.

During the periods when removal actions and RAs were being performed, continuous air monitoring was conducted at the Futura and HISS work areas and particulate samples were collected as follows:

Dates(s) Number of Particulate Air Samples Collected

January 2001 to February 2001 16 (plus 26 lapel air samples)

October 2003 0 (brief, approximately 3-day activity)

January 2008 to September 2011 2,845

The particulate samples were analyzed for gross alpha and beta concentrations at the USACE HISS Laboratory on a gas flow proportional counter. The analytical results were evaluated by the Shaw Radiation Protection Group to determine the occupational exposure of workers and to assess and control dose to the public. The results were compared to the limits found in Appendix B, Tables 1 and 2, of the U.S. Nuclear Regulatory Commission's (NRC) *Standards for Protection Against Radiation* (10 CFR 20) (NRC, 2007), and adjustments to the applied engineering controls were made accordingly to maintain radiological contaminant concentrations below the allowable limits with a sufficient factor of safety. Based on review of the data, the results were found to be within the required limits.

4.2 Mobilization and Site Preparation

Removal actions and RAs performed prior to 2008 included site preparation to establish supporting facilities that were utilized during much of the later remediation effort. The following items constructed or installed on the property included:

- 1. Perimeter fencing and support facility structures
- 2. Potable water and electrical utilities
- 3. A rail spur track and adjoining load-out area
- 4. A contaminated soil stockpile management area

Mobilization and site preparation activities for the 2008 through 2011 RA were as follows:

- 1. A civil survey of the location, including utilities and structures and a photo and/or video log, was conducted to document original conditions.
- 2. Utilities in the area were investigated and located.
- 3. Excavation boundaries were located by civil survey.
- 4. Safety, erosion, and surface-water controls were installed as required.
- 5. Security/barricade controls, including radiological warning rope, signage, and construction fence were established as required.
- 6. Excavation equipment was mobilized to the site.

4.3 Excavation

From 2008 through 2011, excavation was conducted by Shaw in 53 partial SUs located primarily at the HISS property. Portions of these SUs were also located at the adjoining Futura, VP-40A:

East – Tract 3, and VP-02(L) properties. Excavations performed on these adjoining properties were generally conducted concurrently with the excavation of the adjoining HISS SUs. The asbuilt EAs and associated SUs are shown on Figures 2A through 2F. The sequence of remediation activities for each area excavated under the RD/RAWDs (Shaw, 2007b; Shaw, 2010a) was generally as follows:

- 1. Excavation within the work area was conducted to the planned depth and with the required controls. Excavated materials were removed and transported either to the HISS or the SLAPS Load-Out Facility to be either loaded directly into railcars and transported to the approved disposal facility, or stockpiled for future load-out.
- 2. Gamma walkover surveys and soil sampling at biased locations within the excavations were performed by Shaw Radiation Protection Technicians to guide the excavation and identify areas of elevated radiological activity and locations of contaminated soil exhibiting radiological activity beyond the ROD RGs (USACE, 2005).
- 3. As necessary, excavation continued when information from radiological surveys and soil sampling indicated the presence of contaminated soil with activity levels above the ROD RGs.
- 4. Steps 2 and 3 were repeated until walkover surveys and soil sampling results showed that the ROD RGs were attained and the excavation was completed.
- 5. After completing an excavation, Shaw performed a civil survey of the excavation limits and depth prior to the FSS sampling performed by the USACE Verification Contractor. In addition, a preferential pathway analysis was performed by Shaw upon completion of the excavation of each SU and samples were collected if necessary.
- 6. Upon completion of the site excavations, Shaw performed a final gamma walkover survey; the survey and soil sampling test results were sent to the USACE with a request for a FSS.
- 7. The USACE Verification Contractor performed a FSS in accordance with the *FUSRAP* Final Status Survey Plan for the St. Louis North County Vicinity Properties, St. Louis, Missouri (USACE, 1999) consisting of gamma walkover surveys, soil sampling at locations defined by a systematic grid, and soil sampling at biased locations within the limits of the excavation in order to confirm whether the ROD RGs had been met in accordance with the Multi-Agency Radiation Survey and Site Investigation Manual (NRC, et al., 2000).

- 8. If the FSS and/or preferential pathway evaluation results indicated that ROD RGs had not been met, Steps 2 through 7 were repeated until subsequent FSS identified that the remaining soil samples met the ROD RGs.
- 9. After the FSS results indicated that the ROD RGs had been met, a final civil survey was performed to document sample locations and final excavation contours just prior to placement of approved backfill material upon receipt of backfill approval from the USACE.
- 10. At the completion of the backfill operations, safety, erosion, surface-water, contamination reduction zone, and traffic controls were removed, and the remediated locations were released after satisfactory inspection.

A 10-inch diameter vitrified clay pipe (VCP) sanitary sewer owned and maintained by the MSD crosses the HISS property near the east property line, running in a north-south orientation. During remedial activities along a 200-foot segment of the sanitary sewer, radiological contamination in excess of ROD RGs (USACE, 2005) was identified in soils beneath the utility on the northern portion of the site. The results of sampling and analysis of material collected in 2011 from the interior of the MSD and private manholes located along or connecting to the MSD sewer near the HISS property indicated the presence of radiological contamination in excess of ROD RGs in several manholes, including MSD manholes 10K1-017S and 10K1-018S, and private (Futura) manhole 10K1-070S located on the HISS property (see Figures 2A and 2F). Based on the results of the manhole investigation and observation of contamination extents in soils around the 10-inch VCP, it was determined that replacement of manholes 10K1-017S and 10K1-070S and adjoining sewer line segments was required (see Section 4.5.5). Approximately 635 linear feet of MSD sewer line and approximately 75 linear feet of private sewer line that adjoined the contaminated manholes were also removed and replaced. In subsequent negotiation with the MSD, manhole 10K1-018S was removed without replacement.

Remediation along the shared Futura/HISS boundary was sequenced to fully remediate corridors to allow for construction of a replacement water main at the Futura property while leaving the existing water main in service. This required excavation in a less efficient piecemeal manner to minimize service interruption. Other portions of sewer utilities were removed and replaced at or near their original locations as needed to facilitate excavation. These areas are shown on Figures 2A through 2F.

Prior to remediation, a network of 13 shallow and deep ground-water monitoring wells were constructed by others on the Futura and HISS properties. These wells were routinely monitored

by the USACE to evaluate ground-water impacts from contamination present on these properties. During the course of remediation, seven wells on HISS were abandoned and removed in accordance with corresponding scopes of work or well abandonment details, and in accordance with MDNR requirements (Shaw, 2007c; Shaw, 2008b; Shaw, 2011a; Shaw, 2011b), as indicated on Figures 2A through 2F. A replacement well was installed near the former location of well HISS-06. The reconfigured monitoring well network is situated around the Futura property perimeter to facilitate continued monitoring of ground-water in the area.

An additional remediation effort was performed by Shaw to address an apparent property owner-associated oil spill that occurred on the Futura property in October 2003 (Shaw, 2012a). At the USACE's direction, Shaw mobilized to the site and excavated and removed approximately 31 bey of contaminated soil and oil-containing materials. The materials were hauled to the SLAPS and subsequently shipped to US Ecology, Inc. (formerly Envirosafe Services of Idaho, Inc.) in Grand View, Idaho (see Keyed Note 2 on Figure 1).

4.4 Material Handling and Transport/Disposal

At the onset of RA at the HISS property in 2007, an earthen containment structure was constructed according to the LOP (Shaw 2007a; Shaw 2008a) at the location shown on Figure 1. To form the containment structure, the existing ground surface was graded to form a level earthen floor area; polyethylene-covered earthen berms comprised of the on-site soils formed the containment. An approximate 280-foot long haul road, constructed of clean crushed rock and engineered geogrid, was installed to connect the existing gravel lot area near Latty Avenue to the containment area. After its original construction, the configuration of the containment area was periodically modified to accommodate surrounding remedial activities at the HISS. From 2007 to 2011, contaminated materials excavated from HISS, Futura, and multiple other North County VPs were hauled to the containment area and staged to be loaded into railcars at the adjoining HISS rail spur for subsequent shipment to the approved disposal facilities.

Excavated contaminated soil was transported to either the HISS Load-out Facility or the SLAPS where it was sampled in order to verify that it complied with the U.S. Department of Transportation (DOT) requirements. Heavy construction equipment was used to excavate, transport, and load the soil into gondola railcars.

Approximately 22,200 square meters of ground surface area were affected by remediation activities, and about 53,800 in-situ cubic yards of radiologically contaminated soil were removed from the HISS property. The FS (USACE, 2003a) included an estimated in-situ excavation volume of 20,872 bcy. (The location of the original delineation boundaries between the Futura

and HISS properties contained in the FS varies slightly from the delineation boundary used for RAS reporting purposes. For this comparison between the FS-reported and actual excavation quantities, the boundaries are assumed to be identical. This boundary line differs from the true legal property [parcel] boundary that separates the properties, as depicted in the Figures.) The actual remediated volume was approximately 32,935 bcy, or 158 percent, greater than the FS-estimated volume. Based on the FS, the depth of contamination ranged from 0 to 6 feet bgs on the HISS property, with minimal contamination on the approximate southern fourth of the site. The actual depth of contamination encountered in the HISS property exceeded 6 feet bgs in many places. Based on this analysis, the required remediation quantity appeared to be significantly underestimated in the FS for the HISS property. This disparity may be mostly attributable to an underestimation of the vertical extent of contamination on the HISS property. Based on the FS, the distribution of soil sampling locations on the HISS property appears to have been constrained by the presence of the contaminated material stockpiles that existed at the site during the remedial investigation, which may have also contributed to an inaccurate characterization of the contamination extents.

Approximately 103,530 loose cubic yards of excavated waste materials and construction debris (including pavement, trees, fencing, ties, utilities, and miscellaneous debris) from the combined Futura and HISS properties as a result of RA were shipped to US Ecology Idaho, Inc. In addition, approximately 2,020 loose cubic yards of excavated waste materials that exhibited activity in excess of the US Ecology Idaho, Inc. waste acceptance criteria limit for total activity were shipped to EnergySolutions, Inc. in Clive, Utah. Waste acceptance criteria approved by US Ecology Idaho, Inc. and EnergySolutions, Inc., along with the soil characterization, were used to determine the appropriate disposal facility. All waste materials were shipped by rail in accordance with requirements of the DOT regulations as specified in 49 CFR *Transportation* (DOT, 2007).

Approximately 1,200 loose cubic meters (1,570 loose cubic yards) of crushed limestone material imported to the HISS property for construction of the HISS rail spur and load-out area was excavated for re-use as backfill on the Futura property. *The Integrated Survey Plan for Consolidated Materials, Crushate, Overburden, Equipment and Materials* (USACE, 2003c) was utilized for performing FSS on the re-use material. The material released for re-use was used as backfill in the general area of the SU-13E excavation located between Futura Buildings 1 and 2/3.

Excavation at the Futura and HISS properties required significant construction water management operations. Approximately 5,569,900 gallons of construction water were handled

from the excavations for the combined sites during 2008 through 2011, and were discharged to Coldwater Creek or its tributary in accordance with the existing ROD applicable or relevant and appropriate requirements (USACE, 2005). Approximately 3,875,195 gallons of construction water were collected from the Futura and HISS excavations, treated, and discharged to the MSD sanitary sewer during 2008 through 2011 in accordance with the MSD *Letter of Authorization for Excavation Water Discharges* (MSD, 2001; MSD, 2006; MSD, 2008; MSD, 2010). During this period of activity, there were two exceedances of the daily discharge limit for selenium associated with discharges to the MSD sanitary sewer. Additionally, there was one exceedance of the daily maximum and monthly maximum discharge limit for polychlorinated biphenyls associated with a discharge through an un-named pumping outfall to a surface water course. The appropriate notifications were made in regard to these exceedances.

4.5 Restoration

Restoration information for the excavation conducted for the Futura pump pad in 2001 (see Keyed Note 1 on Figure 1) was presented in the Futura Pump Pad removal action summary (Stone & Webster, 2001). The excavation was backfilled with flowable fill, limestone fines, and soil. The backfilled area was subsequently re-excavated as part of the RAs performed under the Supplement No. 5 RD/RAWD (Shaw, 2007b). Restoration of the HISS following the 2008 through 2011 RA was performed in accordance with required construction specifications included in the RD/RAWDs (Shaw, 2007b; Shaw, 2010a). Drawings depicting the overall asbuilt restoration conditions for the EAs, site utilities, and fencing are included in USACE ENG Form 4025R Submittal Number 0099 (Shaw, 2013) (see Attachment 2).

4.5.1 Backfill and Compaction

The backfill and compaction of the remediated areas were performed by Shaw upon receipt of backfill authorization from the USACE in accordance with construction specifications included in the RD/RAWDs (Shaw, 2007b; Shaw, 2010a). Most areas at the HISS property were backfilled with 1-inch minus crushed rock to finished grade for rock surfaced areas, or to specified subgrade elevations to accommodate installation of grass-vegetated surfacing. Large-sized (approximately 3- to 12-inch) crushed stone material was used as bridging material for initial backfill in areas exhibiting soft soil conditions. The majority of the HISS property south of the HISS barn was further backfilled with 18 inches of soil over the 1-inch minus subgrade to facilitate restoration with grass vegetative cover. All backfill materials used on the property were imported from the Ft. Belle Quarry in St. Louis County, Missouri.

4.5.2 Vegetation

The majority of the HISS property (from approximately 50 feet south of the HISS barn and southward) was restored with grass vegetative cover. After final grading, the areas were fertilized and seeded with the prescribed concentration and grass seed mixture, and mulched with straw or biodegradable fiber mats. The straw and fiber mats protected the surface soil from erosion during the initial period of germination, while fertilizers were added to promote growth and establishment of grass vegetative cover. During germination and initial growth, the grass vegetation was watered to accelerate and promote healthy growth and prevent dehydration.

4.5.3 Fencing

Approximately 1,950 linear feet of 7-foot and 3.5-foot chain link fencing was restored around the western, southern, and eastern sides of the HISS property. Corner and gate fence posts were set in concrete; line posts were driven directly into the restored ground surface. All posts were installed to a nominal 30- to 40-inches bgs. The property owner will complete the installation of fencing along the northern end of the HISS property. Details of the installation of new fencing are included in USACE ENG Form 4025R Submittal Number 0049 (Shaw, 2011c).

4.5.4 New Well Installation

A new well, HISS-06A, was installed near the former HISS-06 by the northwest corner of the HISS property to monitor the shallow aquifer Hydrostratigraphic Zone (HZ)-A, in accordance with the specified scope of work (Shaw, 2011a). The well was installed to a depth of approximately 20 feet bgs according to the new well installation records (Shaw, 2011d).

4.5.5 Utilities

Various utilities were removed for remediation, and the active utilities were replaced upon completion of work. The majority of the affected utilities were re-installed to their approximate original location/routing as indicated on Figures 2A through 2F, except as otherwise noted.

Approximately 635 linear feet of MSD's 10-inch diameter VCP sanitary sewer and one associated manhole structure were replaced with polyvinyl chloride (PVC) pipe and a new precast concrete manhole along the east side of the HISS. The MSD sewer construction was performed in accordance with approved MSD Project No. 002913500. An additional 90 linear feet of PVC sewer pipe and one manhole for two private sanitary sewer connections for the adjoining Futura and VP-02(L) properties were removed and replaced with new PVC sewer pipe and precast manhole structure in conjunction with the MSD sewer replacement. Details of the installation of these sanitary sewers are included in USACE ENG Form 4025R Submittal Numbers 0032, 0032A, and 0073 (Shaw, 2011e; Shaw, 2011f; Shaw, 2012b).

Approximately 80 linear feet of 6-inch diameter PVC private sanitary sewer that serves the Futura facilities was also removed and replaced to facilitate excavation on both the Futura and HISS properties.

4.6 Final Inspection

Final inspections of the completed RA were conducted by the Shaw Contractor Quality Control System Manager Representative, the USACE Quality Assurance (QA) Representative, and the property owner for the various segments of remediated areas on the dates as listed in Table 3. These final inspections provided closure for the remediation activities at the HISS property and are documented on final inspection forms retained in Shaw's Project Records and included in Attachment 1. The RA is complete for accessible soils on the HISS property. The remediated HISS property has been released to the property owner after final inspection and approval by the USACE and the property owner.

5.0 CONSTRUCTION AND ANALYTICAL QUALITY CONTROL

Quality checks were provided on multiple levels as part of the RAs completed at the HISS property. The USACE, as lead agency for the response actions, provided QA oversight of its contractors during construction activities.

The Missouri Department of Natural Resources (MDNR) conducted site visits to observe and document the status of the RAs and to ensure the conduction of environmental monitoring and the prevention of contaminant migration. Also, the MDNR collected samples and reviewed documentation, independently of the USACE, to verify results and ensure that ROD RGs (USACE, 2005) were being met. The U.S. Environmental Protection Agency and MDNR regulatory oversight of construction and sampling activities provided an additional level of QA/Quality Control (QC) to the response actions at HISS.

Shaw provided QC of its activities during construction, and used chain-of-custody procedures for all investigation, monitoring, sample collection, and laboratory analysis conducted as specified in the Sampling and Analysis Guide for the St. Louis Sites, St. Louis, Missouri (USACE, 2000). Quality Assurance/Quality Control requirements were specified in the Contractor Quality Control Plan, St. Louis FUSRAP Sites, St. Louis, Missouri (CQCP) (Shaw, 2007d) for Shaw work performed prior to October 1, 2010 under the TERC, and in the Contractor Quality Control Plan, St. Louis FUSRAP Sites, St. Louis, Missouri (CQCP) (Shaw, 2010c) for Shaw work performed thereafter under the PRAC. The goal of both CQCPs was to verify that the remedial and construction activities were conducted in accordance with the specified requirements. The RAWP (Shaw, 2006) specifies overall requirements and procedures by which RAs at the

NORCO sites will be performed. The RD/RAWDs (Shaw, 2007b; Shaw 2010a) describe the specific elements of the planned remediation activities required for Futura and HISS. The objectives to meet the goal as set forth in these CQCPs were met and are summarized as follows:

- The guidelines and requirements as presented in the RAWP, RD/RAWDs, and CQCPs were followed.
- Control elements used to prevent the spread of contamination during the excavation efforts, as specified in the RAWP and RD/RAWDs, were successfully implemented and documented in the Shaw Contractor Daily Reports.
- The three-phase control process was performed, where applicable, to ensure that remedial and construction activities were performed in accordance with applicable specifications and requirements presented in the RAWP, RD/RAWDs, and the CQCPs.
- Remedial design variances that occurred during the remedial and/or construction
 activities and the effects of the variances upon the system design and/or performance
 were evaluated. Design variances were documented and authorized by FWVs prepared by
 Shaw, and reviewed and approved by the USACE. Approved FWVs are retained in the
 project files for the NORCO.
- Documentation (including Preparatory, Initial, and Follow-up Inspections; Excavation As-built drawings; Contractor Daily Reports; Preferential Pathway Evaluations and sampling; FSS; and Final Inspections) was prepared and maintained during and after construction/remediation activities to demonstrate that the RAWP, RD/RAWDs, and CQCPs requirements were met.

For the work performed in 2008 through 2011, verification of the achievement of ROD RGs (USACE, 2005) was provided by the USACE Verification Contractor. These efforts as outlined in Section 4.3 provided independent third-party verification of RGs and provided additional guidance in attaining RGs when confirmation sampling indicated that the RGs had not been met. During the remediation process, the USACE Verification Contractor demonstrated strict compliance to the sampling QA/QC requirements as set forth in the SAG (USACE, 2000).

6.0 OPERATIONS AND MAINTENANCE ACTIVITIES

The USACE remediated the accessible soils from the HISS property, including portions within the Latty Avenue ROW, and successfully achieved the ROD-specified RGs (USACE, 2005) in support of unlimited use and unrestricted exposure for the accessible area of the subject property.

No soils exhibiting elevated radiological activity in excess of ROD RGs remain on portions of the property.

The ROD (USACE, 2005) requires that response action monitoring of ground water (Unit 2 of HZ-A and Unit 4 of HZ-C), surface water, and sediment continues during the response actions for the remaining NORCO sites to ensure that these response actions do not impact ground water or surface water. Response action monitoring of shallow (HZ-A) and deep (HZ-C) wells may continue for up to two years after completion of RAs at the NORCO sites. At completion of remediation, a network of five ground-water monitoring wells remains in place, generally situated around the perimeter of the Futura property, to monitor the impact associated with remaining contamination on that property. Results of response-action monitoring will be used to ensure remedy protectiveness and determine whether long-term monitoring will be required. Therefore, the USACE will continue to monitor ground water at the NORCO sites as specified in the ROD.

7.0 OBSERVATIONS AND LESSONS LEARNED

Contaminated soils were encountered significantly beyond the estimated extent of contamination reported in the PDIR (USACE, 2006). The actual areal extent of contaminated soil requiring removal was approximately 10 percent greater than the extent estimated in the PDIR. The actual areal extent of contamination expanded more northward across the HISS property than what was estimated in the PDIR. The actual depth of contamination generally surpassed the estimated contamination extent by at least 50 percent. The actual maximum depth of excavation was 15.5 feet bgs located in SU-20B.

Based on review of historical topographic maps and earlier site investigation reports, it appears that drainage channels may have crossed the northern portion of the HISS property at one time. Remnants of these drainage channels may have been encountered during excavation of SUs-10A, -14A, -19A, -19C, and -19D. The lateral and vertical extent of actual excavation in these areas was significantly greater than the planned excavation extents based on the pre-design investigation and supplemental site investigation data. This experience emphasizes the importance of considering the impact of historical site features, during the planning of RAs, on the dispersion and transport of contaminants.

The lateral and vertical extent of contamination along portions of the east side of the HISS property also appears to have been affected by the presence of the MSD sanitary sewer line, including the backfilled installation trench. Radiologically contaminated soil was encountered at or below the elevation of the sewer pipe primarily in the northern portion of the property. Based

on the estimated extent of contamination reported in the PDIR (USACE, 2006), the planned depth of excavation along the east side of the HISS property was expected to remain above the sewer pipe.

Remediation progress was significantly affected by the presence of several utilities on the Futura and HISS properties. Existing water lines were present along most of the Futura property that required additional coordination effort. Very limited records were available that documented the location and routing of the various existing water lines. This necessitated additional coordination and extensive field effort to locate the actual routing of the utility services. During excavation around a portion of the system near an existing fire hydrant, pipe fittings failed, resulting in a water main break and temporary interruption of service as well as localized flooding of the excavation. Investigation of the incident revealed that there were deficiencies in the original piping construction. As a result of this incident, precautions were taken to limit future excavation to stay a sufficient distance away from the active water lines to account for possible construction deficiencies. Following installation of the new lines, the existing water lines were removed from service and dismantled as needed to facilitate excavation along the existing line routes.

While RAs were in progress for the HISS property and adjoining VP-02(L) and VP-40A: East – Tract 3 properties, radiological contamination was identified on the interior surfaces of several MSD and private sanitary sewer manhole structures previously mentioned in Sections 4.3 and 4.5.5. The investigation phase which addresses the environmental issues of a property should take into consideration the potential for contamination to be present on or within all features that exist on the property. The discovery of contamination during the remedial phase of work may result in delays to allow for planning of additional corrective measures, or rework of previously remediated areas.

Two flash-flooding events of nearby Coldwater Creek and an adjoining tributary occurred in September 2008 and June 2011, inundating portions of the Futura and HISS properties, including the EAs, the HISS barn field support facility, and equipment used by site RA operations. The majority of the inundated EAs were undergoing final status survey by Shaw or the USACE verification contractor at the time of the events, or may have been only marginally affected because of the relatively higher elevation of their locations. Evidence of releases of radiological contamination from the excavations was not observed, based on radiological walkover surveys, visual inspection, and knowledge of excavation completion status. The HISS load-out and stockpile areas were located in areas of higher elevations, and therefore were not subject to flooding. Following the 2008 event, site operations were coordinated to routinely stage the

majority of equipment in areas of the site with higher elevation above the anticipated flood elevation.

The restoration of reasonable grades to promote adequate drainage was difficult due to the existing level topography around the Futura property. These restoration efforts required a balance between providing adequate surface drainage for the property owner and limiting the extent of improvements to the property.

Remediation of the Futura and HISS properties was conducted concurrently with the other ongoing activities on each of the properties. Planning for remedial activities on the properties required coordination with manufacturing operations on the Futura property, and with the stockpiling and load-out functions on the HISS property.

8.0 CONTACT INFORMATION

For the U.S. Government – Project Management:

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For the U.S. Government – Construction Management:

Remedial Action Contract Numbers: DACW41-98-D-9006 and W912DQ-10-D-3007 Primary Contact Name and Title: Jacob Prebianca, USACE Construction Manager

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Phone Number: 314.895.2266

For the State of Missouri Government – Missouri Department of Natural Resources

Primary Contact Name and Title: Daniel Carey, Environmental Specialist

Address: P.O. Box 176, Jefferson City, Missouri 65102

Phone Number: 573.751.3907

For the Remedial Action Contractor:

Primary Contact Name and Title: A. Neil DeYong, PMP, Project Manager

Company Name: Shaw Environmental & Infrastructure, Inc.

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Phone Number: 314.895.2100

For the Property Owner - First Industrial Realty Trust, Jarboe Realty & Investment Co.:

Primary Contact Name: Rodney Jarboe

Address: 9200 Latty Avenue, Berkeley, Missouri 63134

Phone Number: 314.524.2040

9.0 REFERENCES

Department of the Army, 2007, Pamphlet 385-24, *The Army Radiation Safety Program*, Headquarters, Department of the Army, Washington D.C., August 24, http://www.apd.army.mil/pdffiles/p385_24.pdf (May 2012).

Metropolitan St. Louis Sewer District, 2001, Letter from Bruce H. Litzinger addressed to Sharon R. Cotner, Department of the Army, Corps of Engineers, *Letter of Authorization for Excavation Water Discharges*, St. Louis, Missouri, July 23.

Metropolitan St. Louis Sewer District, 2006, Letter from Roland A. Biehl addressed to Sharon R. Cotner, Department of the Army, Corps of Engineers, *Extension of Special Discharge*, St. Louis, Missouri, June 19.

Metropolitan St. Louis Sewer District, 2008, Letter from Steve Grace addressed to Sharon R. Cotner, Department of the Army, Corps of Engineers, *Extension of Special Discharge*, St. Louis, Missouri, May 22.

Metropolitan St. Louis Sewer District, 2010, Letter from Steve Grace addressed to Sharon R. Cotner, Department of the Army, Corps of Engineers, *Extension of Special Discharge*, St. Louis, Missouri, May 10.

Shaw Environmental, Inc., 2004, Site Safety and Health Plan, FUSRAP St. Louis Airport Site/St. Louis Downtown Site, St. Louis, Missouri, Revision 0, Overland Park, Kansas, December.

Shaw Environmental, Inc., 2006, FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Revision 0, Hazelwood, Missouri, November 30.

Shaw Environmental, Inc. 2007a, *Hazelwood Interim Storage Site Loadout Operations Plan, Appendix E to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri*, Revision 0, Hazelwood, Missouri, January 29.

Shaw Environmental, Inc., 2007b, Vicinity Properties Futura, HISS, and 40A: East – Tract 3, Remedial Design/Remedial Action Work Description, Supplement No. 5 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Revision 0, Hazelwood, Missouri, December 6, including FWV-174, FWV-177, FWV-179, FWV-187, FWV-192, FWV-193, FWV-195, FWV-199, and FWV-202.

Shaw Environmental, Inc., 2007c, Scope of Work, Well Abandonment, Vicinity Properties (VPs) 40A: East – Tract 3, Hazelwood Interim Storage Site (HISS), and Futura Coatings (Futura), Berkeley, Missouri, Revision 0, Hazelwood, Missouri, December 19.

Shaw Environmental, Inc., 2007d, Contractor Quality Control Plan, St. Louis FUSRAP Sites, St. Louis, Missouri, Revision 1, Hazelwood, Missouri, December 19.

Shaw Environmental, Inc. 2008a, *Hazelwood Interim Storage Site Loadout Operations Plan, Appendix E to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri*, Revision 1, Hazelwood, Missouri, August 26.

Shaw Environmental, Inc., 2008b, Well Abandonment Details, HISS-01, HISS-05D, HISS-06, HISS-09, and HISS-16, Hazelwood Interim Storage Site and Futura Coatings, Inc., Properties, Revision 0, Hazelwood, Missouri, March 27.

Shaw Environmental & Infrastructure, Inc., 2010a, HISS Load-Out Facility and VP-06(L)- Tract 1, Remedial Design/Remedial Action Work Description, Supplement No. 12 to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, St. Louis, Missouri, Revision 0, Hazelwood, Missouri, October 13, including FWV-200.

Shaw Environmental & Infrastructure, Inc., 2010b, *Accident Prevention Plan, St. Louis FUSRAP Sites, St. Louis, Missouri*, Revision 0, Hazelwood, Missouri, October 1

Shaw Environmental & Infrastructure, Inc., 2010c, Contractor Quality Control Plan, St. Louis FUSRAP Sites, St. Louis, Missouri, Revision 0, Hazelwood, Missouri, October 1.

Shaw Environmental & Infrastructure, Inc., 2011a, Scope of Work for Well Abandonment and Well Installation, Hazelwood Interim Storage Site Property, FUSRAP North St. Louis County Sites, St. Louis, Missouri, Revision 0 dated January 25, 2011, ENG Form 4025R Submittal #0019, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, January 25.

Shaw Environmental & Infrastructure, Inc., 2011b, Addendum 1 (dated 2.15.2011) - Section 1.0 Revision to the Scope of Work for Well Abandonment and Well Installation, Hazelwood Interim Storage Site Property, FUSRAP North St. Louis County Sites, St. Louis. Missouri, Revision 0 dated January 25, 2011 and Addendum 2 (dated 2.15.2011) - Well Abandonment Details to the Scope of Work for Well Abandonment and Well Installation, Hazelwood Interim Storage Site Property, FUSRAP North St. Louis County Sites, St. Louis. Missouri, Revision 0 dated January 25, 2011, ENG Form 4025R Submittal #0022, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, February 16.

Shaw Environmental & Infrastructure, Inc., 2011c, Clarification Notes resolving differences between initial and revised work scope, 1 page. Statement of Work for Fencing, Futura and HISS Vicinity Properties, FUSRAP North St. Louis County Sites, St. Louis, Missouri, Shaw Environmental & Infrastructure, Inc., August 4, 2011. Drawing Number 2 (Sheet 2 of 6): Revised Site Plan, Futura and HISS Vicinity Properties, Drawing Number 123438-B153, Revision 1 dated October 11, 2011. Drawing 3A (Sheet 3 of 6): Revised Plan Details, Futura and HISS Vicinity Properties, Drawing Number 123438-B153, Revision 1 dated October 11, 2011. Drawing 3B (Sheet 4 of 6): Revised Plan Details, Futura and HISS Vicinity Properties, Drawing Number 123438-B153, Revision 1 dated October 11, 2011, ENG Form 4025R Submittal #0049, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, November 30.

Shaw Environmental & Infrastructure, Inc., 2011d, Letter dated April 14, 2011 from Mr. A. Neil DeYong, Project Manager, to Ms. Maggie Benningfield, Alternate Contracting Officer's Representative, U.S. Army Corps of Engineers, St. Louis District, FUSRAP Construction

Offices, Re: Well Installation Record for HISS-06A, FUSRAP North St. Louis County Sites, St. Louis, Missouri, Transmittal Letter No. 139817-SEIPR-0059, Hazelwood, Missouri.

Shaw Environmental & Infrastructure, Inc., 2011e, Work Detail for the Metropolitan St. Louis Sewer District Sanitary Sewer Replacement at the Hazelwood Interim Storage Site Property, FUSRAP North St. Louis County Sites, St. Louis, Missouri, July 28, 2011, ENG Form 4025R Submittal #0032, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, August 1.

Shaw Environmental & Infrastructure, Inc., 2011f, Revised Work Detail for the Metropolitan St. Louis Sewer District Sanitary Sewer Replacement at the Hazelwood Interim Storage Site Property, FUSRAP North St. Louis County Sites, St. Louis, Missouri, August 17, 2011, ENG Form 4025R Submittal #0032A, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, August 17.

Shaw Environmental & Infrastructure, Inc., 2012a, E-mail correspondence dated January 9, 2012 from Michael McGavock to KC_PRAC, regarding Futura historical 2003 remediation documentation, January 9.

Shaw Environmental & Infrastructure, Inc., 2012b, *HISS Sanitary Sewer Materials Submittal*, ENG Form 4025R Submittal #0073, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, May 24.

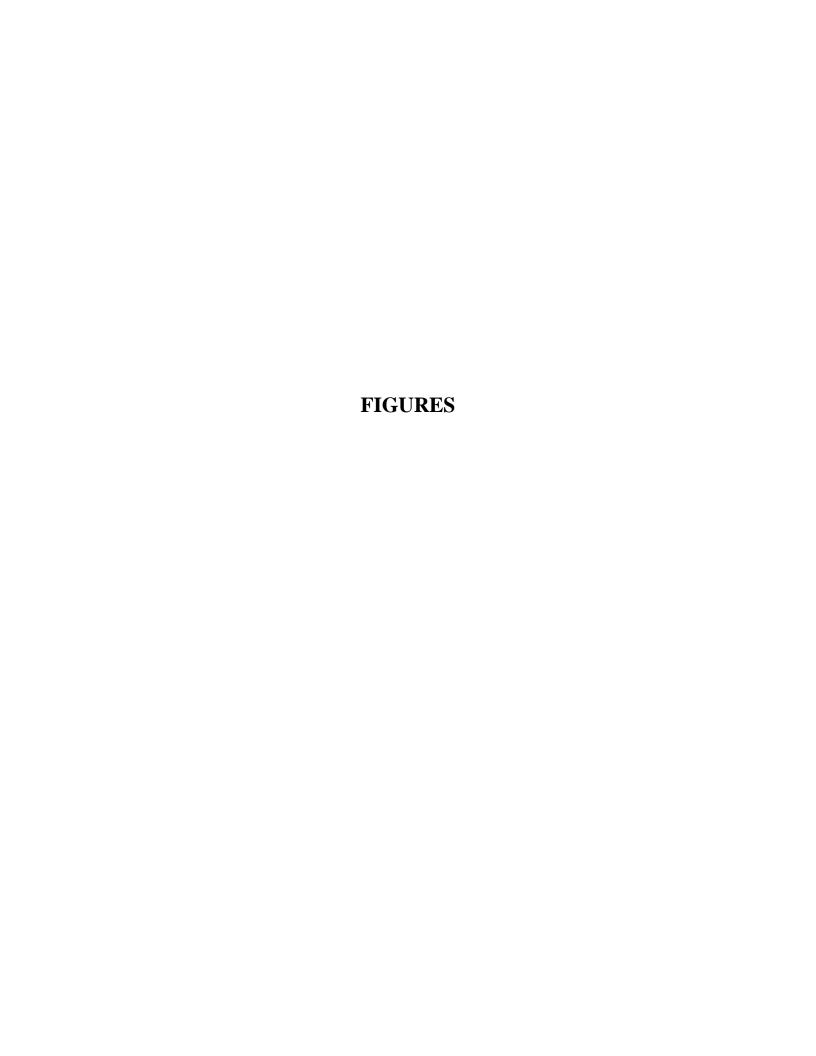
Shaw Environmental & Infrastructure, Inc., 2013, Drawing Numbers 1 through 6, As-built Restoration, Futura and HISS, FUSRAP North St. Louis County Sites, St. Louis, Missouri, Shaw Environmental and Infrastructure, Inc., Revision 0, dated May 2, 2013, Drawing File 123438B242 (6 sheets), ENG Form 4025R Submittal #0099, to the U.S. Army Corps of Engineers, St. Louis District, Hazelwood, Missouri, May 2.

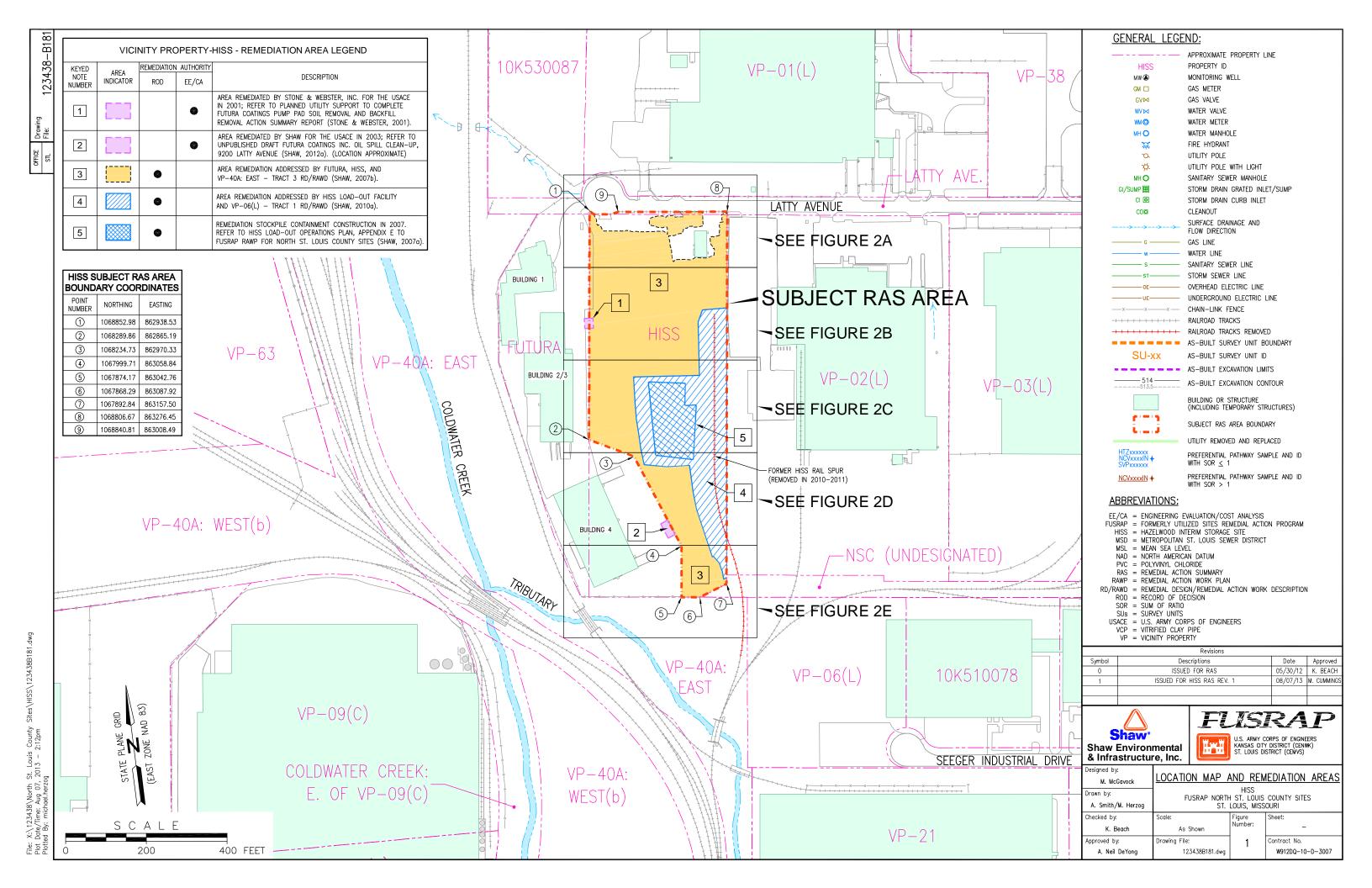
Stone & Webster Environmental Technology & Services, 2000, Work Description for the Planned Utility Support to Complete Futura Coatings Pump Pad Soil Removal and Backfill, FUSRAP St. Louis Airport Site, St. Louis, Missouri, Revision 0, Saint Ann, Missouri, December 15.

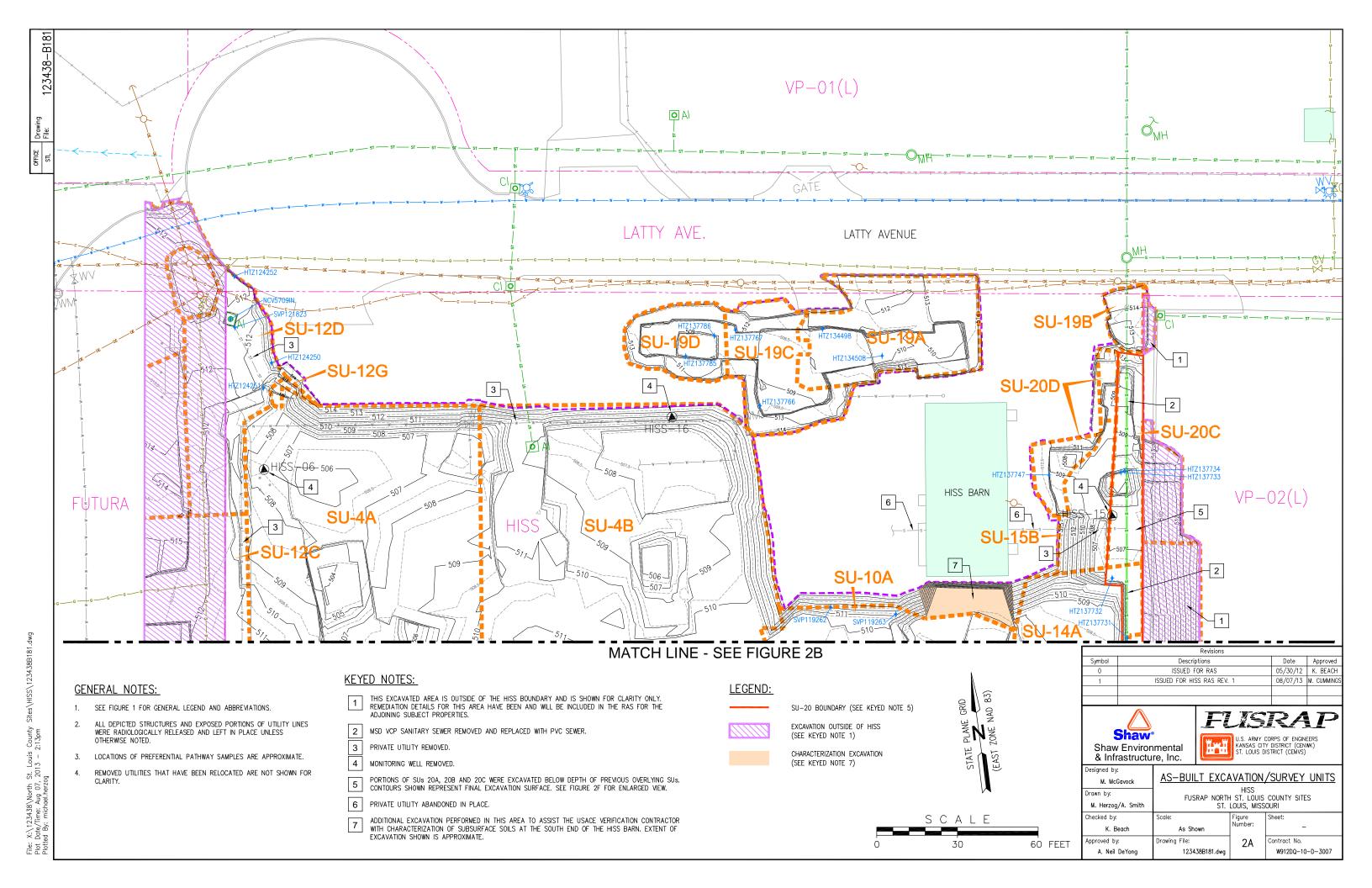
Stone & Webster, Inc., 2001, Planned Utility Support to Complete Futura Coatings Pump Pad Soil Removal and Backfill, Removal Action Summary, Berkeley, Missouri, Revision 0, June 27.

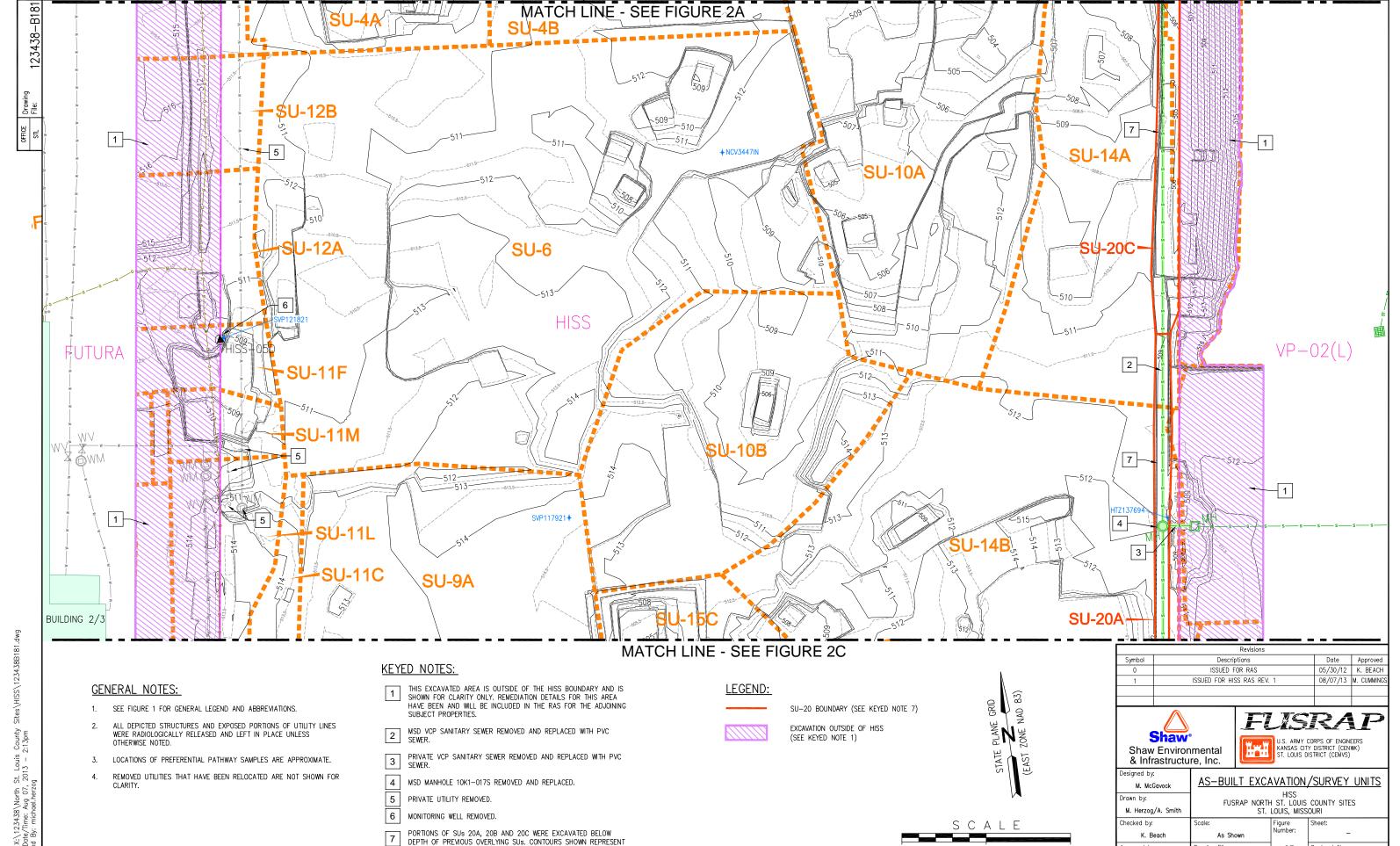
- U.S. Army Corps of Engineers, 1998, Engineering Evaluation/Cost Analysis (EE/CA) for the Hazelwood Interim Storage Site (HISS), St. Louis, Missouri, Final, Formerly Utilized Sites Remedial Action Program, St. Louis District Office, St. Louis, Missouri, October.
- U.S. Army Corps of Engineers, St. Louis District Office, 1999, FUSRAP Final Status Survey Plan for the St. Louis North County Vicinity Properties, St. Louis, Missouri, Final, St. Louis, Missouri, November.
- U.S. Army Corps of Engineers, St. Louis District, 2000, Sampling and Analysis Guide for the St. Louis Sites, St. Louis, Missouri, Formerly Utilized Sites Remedial Action Program, Final, St. Louis, Missouri, September.

- U.S. Army Corps of Engineers, 2003a, Feasibility Study for the St. Louis North County Site, Volumes I and II, Berkeley, Missouri, May 1.
- U.S. Army Corps of Engineers, 2003b, *Safety and Health Requirements Manual*, Engineer Manual 385-1-1, Department of the Army, Washington, D.C., November 3.
- U.S. Army Corps of Engineers, 2003c, *Integrated Survey Plan for Consolidated Materials*, *Crushate, Overburden, Equipment and Materials*, Final, Formerly Utilized Sites Remedial Action Program, St. Louis District Office, St. Louis, Missouri, September 22.
- U.S. Army Corps of Engineers, 2005, *Record of Decision for the North St. Louis County Sites, St. Louis, Missouri*, Formerly Utilized Sites Remedial Action Program, St. Louis District Office, St. Louis, Missouri, September 2.
- U.S. Army Corps of Engineers, 2006, *Pre-Design Investigation Summary Report for Hazelwood Interim Storage Site and Futura, St. Louis, Missouri*, Revision 0, Formerly Utilized Sites Remedial Action Program, St. Louis District Office, St. Louis, Missouri, December 6.
- U.S. Army Corps of Engineers, 2008, *Safety and Health Requirements Manual*, Engineer Manual 385-1-1, Department of the Army, Washington, D.C., November 15.
- U.S. Department of Transportation, 2007, Code of Federal Regulations, Title 49, *Transportation*, Revised October 1, U.S. Government Printing Office, Washington, D.C. http://ecfr.gpoaccess.gov/cgi/t/text/text-idx?c=ecfr&tpl=/ecfrbrowse/Title49/49tab_02.tpl (May 2012).
- U.S. Nuclear Regulatory Commission, U.S. Environmental Protection Agency, U.S. Department of Energy, and U.S. Department of Defense, 2000, *Multi-Agency Radiation Survey and Site Investigation Manual*, NUREG-1575, EPA 402-R-97-016, DOE/EH-0624, Revision 1, including August 2002 updates, U.S. Nuclear Regulatory Commission, Washington, D.C, http://www.epa.gov/rpdweb00/marssim (May 2012).
- U. S. Nuclear Regulatory Commission, 2007, Code of Federal Regulations, Title 10, Code of Federal Regulations, Part 20, Standards for Protection Against Radiation, Appendix B-- Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage, Revised October 19, Office of the Federal Register, Washington, DC, http://www.nrc.gov/reading-rm/doc-collections/cfr/part020/full-text.html> (May 2012).
- U.S. Occupational Safety and Health Administration, 2008, Code of Federal Regulations, *Title* 29, *Labor*, *Part 1926*, *Safety and Health Regulations for Construction*, U.S. Government Printing Office, Washington, D.C., Revised January 1, http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10593 (May 2012)









FINAL EXCAVATION SURFACE. SEE FIGURE 2F FOR ENLARGED VIEW.

Contract No.

W912DQ-10-D-3007

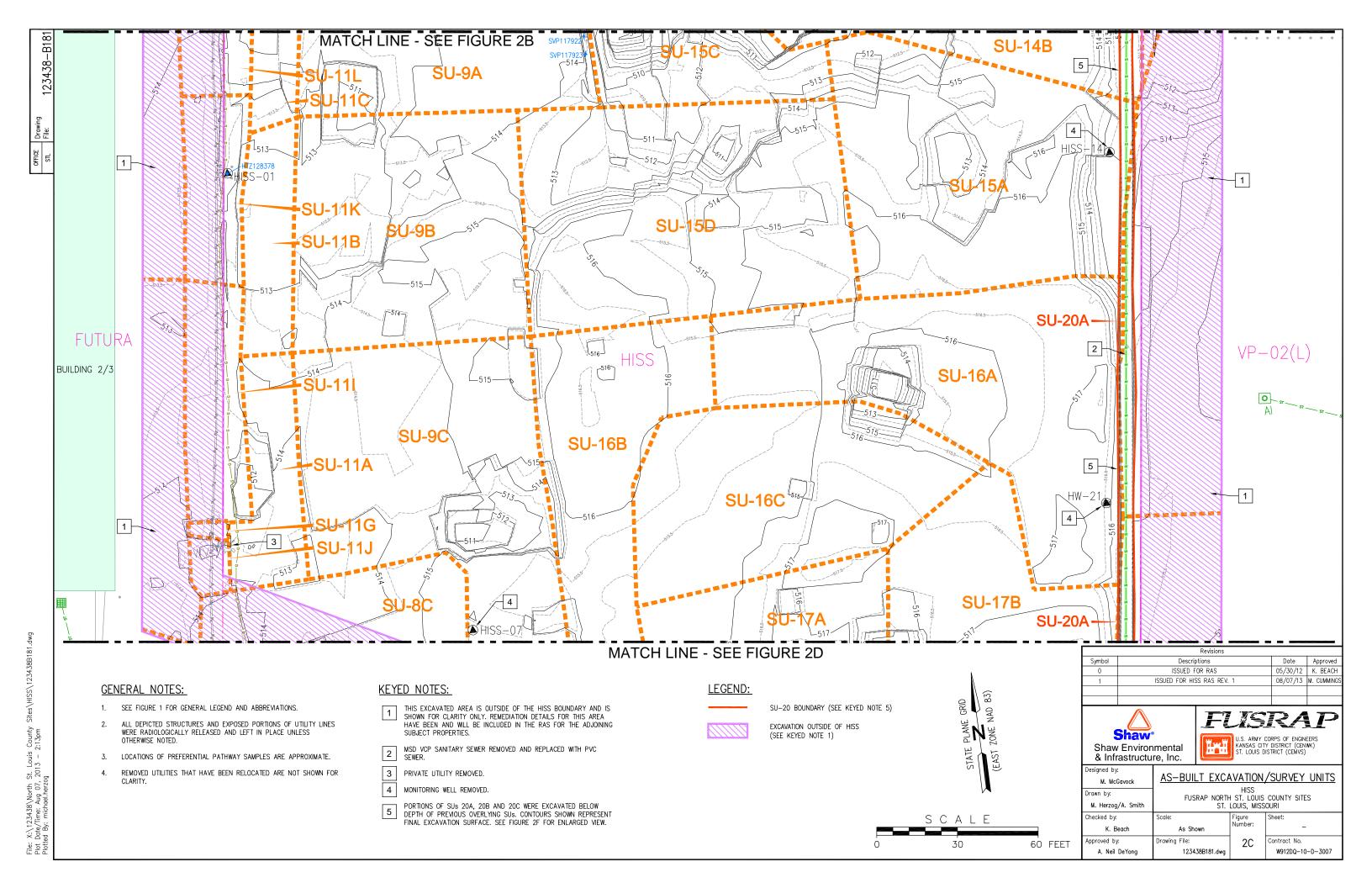
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Approved by:

A. Neil DeYong

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& Infrastructure, Inc.

AS-BUILT EXCAVATION/SURVEY UNITS

HISS FUSRAP NORTH ST. LOUIS COUNTY SITES ST. LOUIS, MISSOURI

Contract No.

W912DQ-10-D-3007

Figure Number:

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2D

esigned by:

Orawn by:

Checked by:

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SCALE

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M. Herzog/A. Smith

M. Cummings Approved by:

A. Neil DeYong

MSD MANHOLE 10K1-018S REMOVED.

PRIVATE PVC SANITARY SEWER REMOVED AND REPLACED.

PRIVATE SANITARY SEWER MANHOLE 10K1-070S REMOVED AND

ABANDONED PRIVATE SANITARY MANHOLE REMNANT REMOVED.

PORTIONS OF SUS 20A, 20B AND 20C WERE EXCAVATED BELOW DEPTH OF PREVIOUS OVERLYING SUS. CONTOURS SHOWN REPRESENT FINAL EXCAVATION SURFACE. SEE FIGURE 2F FOR ENLARGED VIEW.

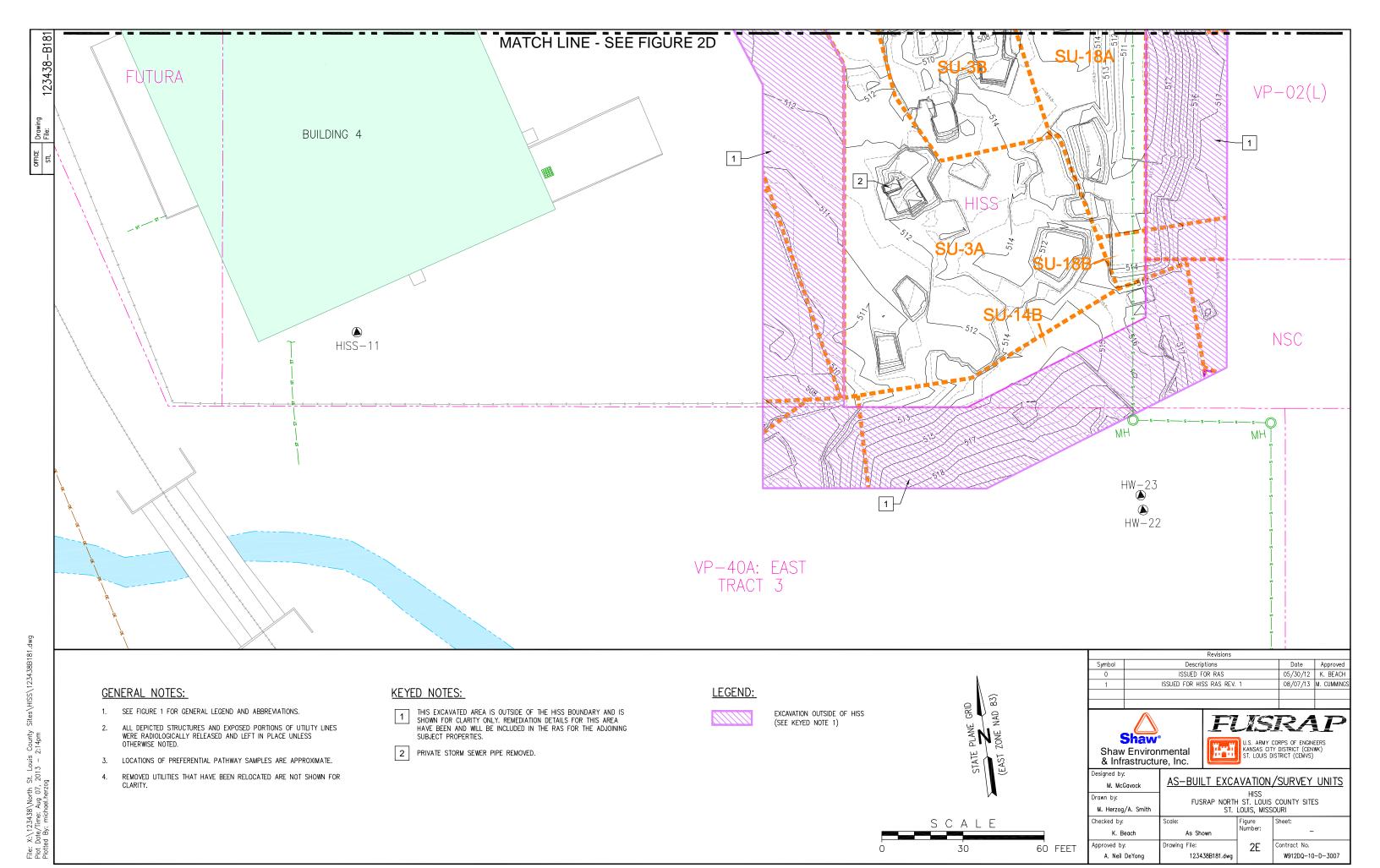
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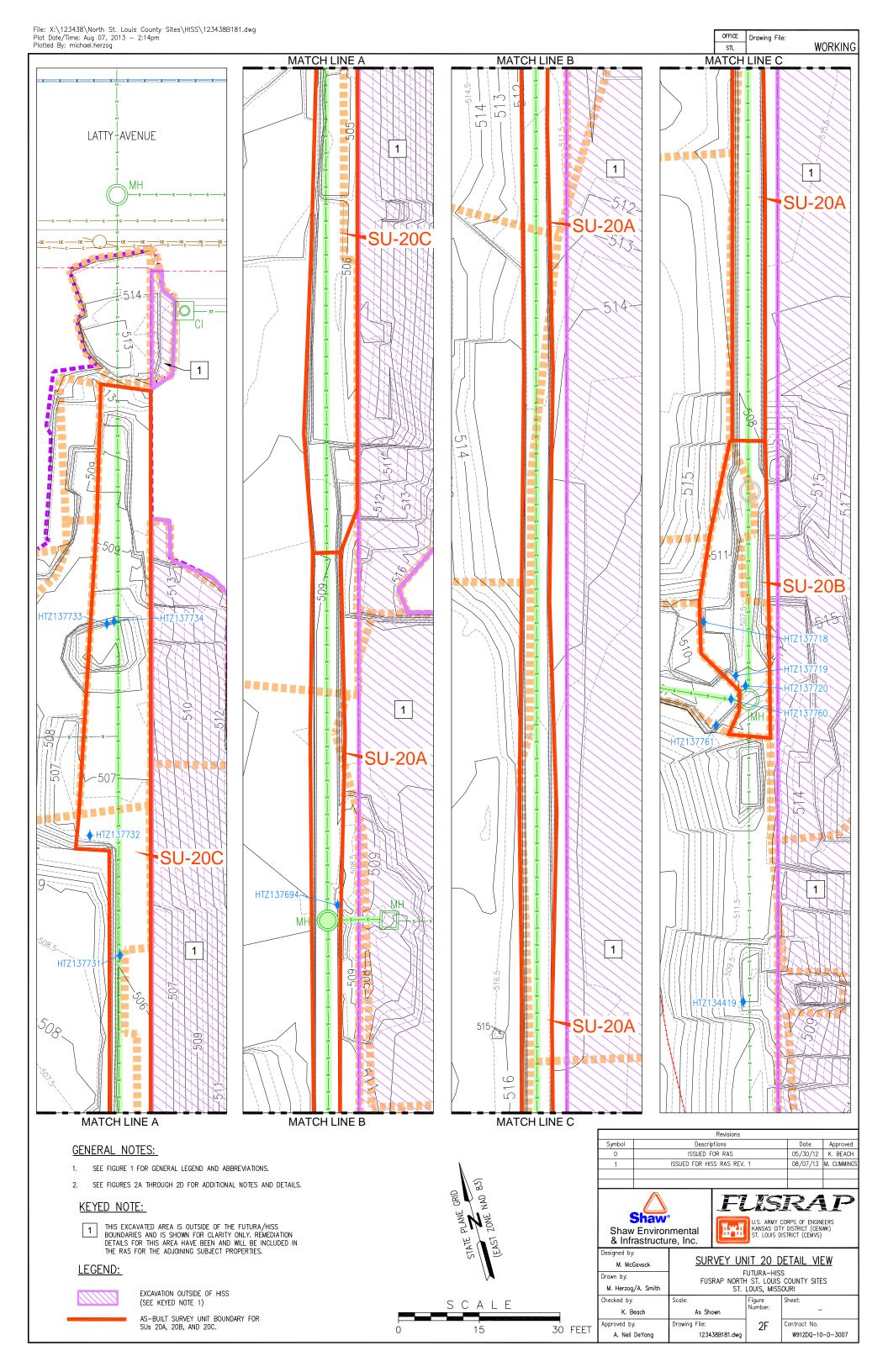
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REPLACED.

LOCATIONS OF PREFERENTIAL PATHWAY SAMPLES ARE APPROXIMATE.

REMOVED UTILITIES THAT HAVE BEEN RELOCATED ARE NOT SHOWN FOR





ATTACHMENT 1

Final Inspection Records

October 4, 2011	Futura Restoration East of Futura Buildings (2 pages)
November 9, 2011	HISS/Futura Grass Restoration and Futura Buildings 1, 2/3, and 4 Gutters (2 pages)
December 2, 2011	MSD Construction Approval Letter (1 page)
January 23, 2012	HISS/Futura Fencing (2 pages)
February 9, 2012	Futura Restoration North Gravel Area and HISS Barn (2 pages)

Shaw Shaw Environmental, Inc.		Contract No: W912DQ-10-D-3007					
		Task Order No. 001					
Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO		Inspection Date: 10/04/2011					
Feature of Work: Futura Restoration East of Futura Buildings		Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, APP; CQCP, Restoration Details, Futura, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis, Missouri Dated (1/24/2011).					
Final Inspection	Yes	No	N/A	Remarks			
1. Has all work been completed according to specifications set forth in the Statement of Work for Restoration of Futura Properties East of Futura Buildings as delineated in Restoration Details, Futura, HISS, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis Missouri. Dated 1/24/2011	х			All work has been completed at the gravel areas to the south and to the east of the Futura Buildings to the gravel/soil interface and up to and including the gravel drainage swales. All work has been completed per the USACE approved restoration drawings Dated 1/24/2011.			
2. Have all required inspections been completed?	Х			Yes. All required inspections have been performed on gravel areas to the south and to the east of the Futura Buildings to the gravel/soil interface and up to and including the gravel drainage swales. All areas are inspected and ready for turn over to Futura Porperty owners.			
3. Do the final restoration materials comply with the restoration drawings?	X			Yes. Final restoration materials for the gravel areas to the south and to the east of the Futura Buildings to the gravel/soil interface and up to and including the gravel drainage swales comply with the restoration drawings dated 1/24/2011.			
4. Have all utilities on the East side of Futura buildings been properly restored?	х			Yes. All utilities that were disturbed during remediation are properly restored for the property owner's use.			
5. Have all required submittals been submitted to USACE?	х			Yes. All submittals have been submitted to the USACE for the work that has taken place areas being inspected on this date. Final as-built drawings will be submitted to the USACE once all restoration has been completed.			
6. Has property restoration been approved per Futura Representative?	X			Yes. Final inspection of the gravel areas to the south and to the east of the Futura Buildings to the gravel/soil interface and up to and including the gravel drainage swales were inspected with a Futura Properties Representative on 10/04/2011. The signature below indicates that the property owner accepts work as satisfactorily complete.			
Personnel in attendance include:				*			
Mr. Jarboe, Futura Property Owner Matt Otzenberger, USACE QA Scott Weaver, Shaw QC Tony Bryant, Shaw Operations Manager		· · · · · · · · · · · · · · · · · · ·					

Shaw Shaw Environmental, Inc.		Contract No: W912DQ-10-D-3007 Task Order No. 001					
Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO	Inspection Date: 10/04/2011						
Feature of Work: Futura Restoration East of Futura Buildings	Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, APP; CQCP, Restoration Details, Futura, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis, Missouri Dated (1/24/2011).						
Final Inspection	Yes	No	N/A	Remarks			

Futura Property Owner

Date: 10-4-2011

USACE Representative

Date: 10/4/11

Shaw COCSM or Designee

Date: 10-41-11

Cont	ract No:	W912	DQ-10-D-3007			
Task	Task Order No. 001 Inspection Date: 11/9/2011 Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, APP; CQCP, Restoration Details, Futura, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis, Missouri Dated (1/24/2011).					
Inspe						
North and 4 Descri Work Detail						
Yes	No	N/A	Remarks			
х			Yes. All work has been competed for the grass restoration and building gutters at HISS/Futura properties. All work has been completed per the USACE approved restoration drawings Dated 1/24/2011.			
X			Yes. All required inspections have been performed on the grass areas and the building gutters. All areas are inspected and ready for turn over to Futura Porperty owners.			
X			Yes. Final restoration materials for all grass areas and the building gutters comply with the restoration drawings dated 1/24/2011.			
Х			Yes. All utilities that were disturbed during remediation activities are properly restored for the property owner's use.			
X			Yes. All submittals have been submitted to the USACE for the work that has taken place at the areas being inspected on this date. Final as-built drawings will be submitted to the USACE once all restoration has been completed.			
$ _{\rm X} $			Yes. Final inspection of all grass areas and the building gutters were inspected with a Futura Properties Representative on 11/09/2011. The signature below indicates that the property owner			
	Yes X X X	Inspection Date of the state of	Specifications / Reference North St. Louis Court and 40A: East Tract of Description, Supplem Work Plan for the Note Details, Futura, and County Sites St. Louis X			

Shaw Shaw Environmental, Inc.	Contract No: W912DQ-10-D-3007 Task Order No. 001						
Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO	Inspection Date: 11/9/2011						
Feature of Work: HISS/Futura Grass Restoration and Futura Buildings 1, 2/3, and 4 Gutters.	Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, APP; CQCP, Restoration Details, Futura, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis, Missouri Dated (1/24/2011).						
Final Inspection	Yes	No	N/A	Remarks			

Futura Property Owner

Date: 11/9/204

USACE Representative

Date: 11/9/2011

Shaw CQCSM or Designee

Date: //- 9-//



Metropolitan St. Louis Sewer District

2350 Market Street St. Louis, MO 63103-2555 (314) 768-6200

December 2, 2011

U.S. Army Corps of Engineers, St. Louis District c/o Margaret Benningfield 110 James S McDonnell Blvd Hazelwood, MO 63042

RE:

LATTY 2300' W OF HAZELWOOD (SOIL REMEDIATION PROJECT - US ARMY CORPS

OF ENGINEERS) Latty & Hazelwood 9170 Latty Ave

MSD Reference No. P-0029135-00

Sanitary Permit #C-23079

Construction is approved of 628 lineal feet of sanitary sewers and appurtenances.

Dear Ms. Benningfield:

The Metropolitan St. Louis Sewer District has completed its inspection of the sewer construction authorized by the reference permit(s) and finds that said construction is in accordance with the plans and specifications on file with MSD. Consequently, MSD hereby approves said construction as permitted. The referenced project will be accepted for operation and maintenance by the District.

Sincerely,

Brian Dunn Division Inspector

BD/jmb

pc:

Francis Wienstroer

Shaw Environmental Inc. St. Louis County Public Works St. Louis County Planning

City of Hazelwood-Attn: City Engineer

Permit Division

Bill Hargrove/Dedication w/attachments

Billing Division Construction

	Contr	act No:	W912	DQ-10-D-3007			
Shaw Shaw Environmental, Inc. Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO		Task Order No. 001 Inspection Date: 01/45/2012					
Final Inspection	Yes	No	N/A	Remarks			
1. Has all work been completed according to specifications set forth in the Statement of Work for fencing for Futura and HISS Vicinity Properties. FUSRAP North St. Louis County Sites, St. Louis, Missouri?	X			Yes. All work has been completed for the fencing installation at Futura/HISS properties. All work has been completed per the USACE approved fencing drawings Dated 8/4/2011.			
2. Have all required inspections been completed?	X			Yes. All required inspections have been performed on the installed fencing. A preparatory, initial, and final inspection has been performed by Shaw. All required inspections have been performed and approved by the City of Hazelwood for the installed fence. All fencing has been inspected and is ready for turn over to Futura Property owners.			
3. Do the fencing materials used comply with the specified fencing materials?				Yes. All materials used for the fencing at HISS/Futura comply with the USACE approved Statement of Work for Fencing, dated 8/4/2011.			
4. Are all utilities still intact where the fencing has been installed?	X			Yes. No utilities were disturbed for the installation of fencing at HISS/Futura.			
5. Have all required submittals been submitted to USACE?		X		No. A final fencing submittal will be submitted to the USACE for all materials that were used. Final as-built drawings will be submitted to the USACE after all property has been turned over the property owner.			
6. Has the fencing restoration been approved per Futura Representative?	x			Yes. Final inspection of all fencing was inspected with a Futura Properties Representative on 01/23/2012. The signature below indicates that the property owner accepts work as satisfactorily complete.			
Personnel in attendance include: Mr. Jarboe, Futura Property Owner							
Maggie Benningfield, USACE ACOR Tony Bryant, Shaw Operations Manager Scott Weaver, Shaw QC							

Shaw Shaw Environmental, Inc.	Contract No: W912DQ-10-D-3007 Task Order No. 001						
Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO	Inspection Date: 01/45/2014						
Feature of Work: HISS/Futura Fencing	Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites; Statement of Work for Fencing, Futura and HISS Vicinity Properties FUSRAP North St. Louis County Sites, St. Louis, Missouri. (Dated 08/04/2011)						
Final Inspection	Yes	No	N/A	Remarks			

Futura Property Owner

Jodny Donbu

Date: 1/23/2012

USACE Representative

M Benning file

Date: 1/23/2012

Shaw CQCSM or Designee

Date: 1/23/2012

Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO	Task Order No. 001 Inspection Date: 02/09/2012						
Feature of Work: Futura Restoration North Gravel area and HISS Barn.	Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, APP; CQCP, Restoration Details, Futura, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis, Missouri Dated (1/24/2011).						
Final Inspection	Yes	No	N/A	Remarks			

1.	Has all work been completed according to specifications set forth in the Statement of Work for Restoration of Futura Properties at the North Gravel Portion and the HISS barn as delineated in Restoration Details, Futura, HISS, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis Missouri. Dated 1/24/2011?	X	All work has been completed as specified at the north gravel area of HISS/Futura Property per the USACE approved restoration drawings Dated 1/24/2011. All work has been completed and ready for turn over to the property owner with the addition of the HISS barn on this date.
2.	Have all required inspections been completed?	X	Yes. All required inspections have been performed on the north gravel areas of HISS Futura Property including the HISS barn. All areas are inspected and ready for turn over to Futura Porperty owners.
3.	Do the final restoration materials comply with the restoration drawings?	X	Yes. Final restoration materials for the North gravel areas comply with the restoration drawings dated 1/24/2011.
4.	Have all utilities at the North Side gravel area been properly restored?	X	Yes. All utilities that were disturbed for remediation work to take place have been restored in the north gravel area. All utility services that were owned by the USACE in the HISS barn have been removed from service.
5.	Have all required submittals been submitted to USACE?	X	Yes. All submittals have been submitted to the USACE for the work that took place in the areas being inspected on this date. Final as-built drawings will be submitted to the USACE at a later date.
6.	Has property restoration been approved per Futura Representative?	Х	Yes. Final inspection of the north gravel areas and the HISS barn were inspected with a Futura Properties Representative on 02/09/2012. The signature below indicates that the property owner accepts work as satisfactorily complete.

Personnel in attendance include:

Mr. Jarboe, Futura Property Owner Maggie Benningfield, USACE ACOR Scott Weaver, Shaw QC Tony Bryant, Shaw Operations Manager

Shaw Shaw Environmental, Inc.	Contract No: W912DQ-10-D-3007 Task Order No. 001						
Location: FUSRAP/SLAPS and North County VPs-St. Louis, MO	Inspection Date: 02/09/2012						
Feature of Work: Futura Restoration North Gravel area and HISS Barn.	Specifications / References: FUSRAP Remedial Action Work Plan for the North St. Louis County Sites (Rev. 0); Vicinity Properties Futura, HISS, and 40A: East Tract 3 Remedial Design/Remedial Action Work Description, Supplement No. 5 (Rev.0) to the FUSRAP Remedial Action Work Plan for the North St. Louis County Sites, APP; CQCP, Restoration Details, Futura, and VP-40A: East-Tract 3 FUSRAP North St. Louis County Sites St. Louis, Missouri Dated (1/24/2011).						
Final Inspection	Yes	No	N/A	Remarks			

The below signature represents acceptance of all work completed for HISS/Futura North Gravel area including the HISS Barn.

Futura Property Owner

Date: 49/2

USACE Representative

ate: 2/

Shaw COCSM or Designee

Date: 2/9/2012

ATTACHMENT 2

As-Built Restoration Drawings, Futura and HISS

