LANDMARK Environmental

Environmental Contingency Plan

Minnesota Veterans Home – Building 17 South
5101 Minnehaha Avenue South
Minneapolis, Minnesota

Prepared for:
Minnesota Department of Administration

April 2016

Landmark Environmental, LLC
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Consultant's Report

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Action Summary

If visible or olfactory evidence of contaminated soil (such as discoloration, presence of oils or tars, chemical odors, vapors, chemical containers, potential asbestos-containing material (ACM), or discernable concentrations of debris or non-native fill material such as ash, glass, or slag), other than previously identified and sampled locations, are observed during drilling, grading, excavation or other earthwork activities related to the project, the following actions will be taken:

1. STOP WORK IMMEDIATELY, SECURE WORKER SAFETY, AND SECURE THE AREA.

2. Contact Landmark Environmental, LLC (Landmark)—or in their absence— Minnesota Pollution Control Agency (MPCA) for further instruction.

   Landmark Staff: Sherry Van Duyn 612-599-9361 (cell) Jerry Mullin 612-810-7979 (cell)

   MPCA Staff: Ed Olson 651-757-2627

   Minnesota Department of Administration: Ryan Allen 651-201-2392

3. Contact MPCA Duty Officer: 651-649-5451

Action Summary for Screening, Sampling, and Excavation of Contaminated Soil

Unless otherwise directed by the MPCA, complete the following:

1. Follow field-screening procedures described in the standard operation procedures (SOPs) described in this Environmental Contingency Plan (ECP) for Excavation Activities and record observations.

2. If evidence of **petroleum-related contamination** is observed, refer to **Appendix A** of this ECP for sampling and excavation action levels and sampling instructions.

3. If evidence of asbestos containing material (ACM) is observed, refer to **Appendix B** for more details

4. If **non-petroleum-related contamination** is observed, refer to **Appendix C** for the number of samples to collect and the **recommended action levels in the following table** for determining when to collect laboratory samples:

Field Screening Action Level	Required Sample Analysis
10 parts per million (ppm) non-methane headspace or greater	Volatile Organic Compounds (VOCs) 8260 (preserved with methanol)
Discoloration or staining	Polynuclear Aromatic Hydrocarbons (PAHs) Method 8270
Potential asbestos-containing material	Refer to **Appendix B—licensed asbestos inspector to perform sampling**
Concentration of debris or chemical containers	PAHs and Resource Conservation and Recovery Act (RCRA) metals. Additional parameters will be determined in consultation with MPCA, depending on type of debris or characteristics of the chemicals in the containers.
Oily material	Polychlorinated biphenyls (PCBs); Diesel Range Organics (DRO).

At a minimum, ***one soil sample will be collected from each excavation area or type of material*** exhibiting potential contamination based on field screening results (showing the greatest impacts). Follow the pertinent SOPs for soil sample collection.

If analytical results indicate presence of contamination above MPCA appropriate risk-based screening concentrations or cleanup goals discussed in Section 4, the excavated contaminated **soil will be stockpiled, covered, and managed** in accordance with procedures described in this ECP and in accordance with the excavation and stockpiling procedures and sampling guidelines published by the MPCA.

SOP For Field Screening Soil Samples

Field screening techniques for soils are as follows: (1) Visual Examination; (2) Odor; and (3) Headspace Measurement. The results of these three screening procedures will be used to screen soil samples for possible contamination.

Visual Examination

Visual examination of the soil sample will include noting any discoloration of the soil or visible oiliness, tar, ash or other non-native soil material.

Odor

The chemical odor will be noted while handling the soil sample. Chemical odor will be described as light, moderate, or strong, and will be appropriately described by type, if evident.

Headspace Measurement

MPCA staff recommends the polyethylene bag headspace method described below as the field procedure for characterization of soil contamination. This procedure is consistent with the MPCA's Risk Based Site Characterization and Sampling Guidance, Working Draft, September 16, 1998, Soil Sample Collection and Analysis Fact Sheet #3.22, July 1996.

1. Use photoionization detectors (PIDs) with 10.2 eV (+/-) or greater lamp source, or flame ionization detectors (FIDs). Perform PID or FID instrument calibration of site and at least daily to yield "total organic vapors" in volume parts per million (ppm) of a benzene equivalent. Follow the manufacturer's instructions for operation, maintenance, and calibration of the instrument. Keep calibration records. MPCA staff reserve the right to request these records.

2. Use a self-sealing quart-size polyethylene freezer bag. Half-fill the bag with the sample to be screened so the volume ratio of soil to air is equal then immediately seal it. Manually break up the soil clumps within the bag. *Note:* Soil collected from a split spoon should be transferred to the bag immediately after opening the split spoon; soil collected from an excavation or soil pile should be collected from freshly exposed surfaces.

3. Allow headspace development for at least 10 minutes. Vigorously shake bags for 15 seconds both at the beginning and end of the headspace development period. Headspace development decreases with temperature. When temperatures are below the operating range of the instrument perform headspace development and analysis in a heated vehicle or building. Record the ambient temperature during headspace screening. *Complete headspace analysis within approximately 20 minutes of sample collection.*

4. Following headspace development introduce the instrument sampling probe through a small opening in the bag to a point about one-half of the headspace depth. Keep the probe free of water droplets and soil particles. (Syringe withdrawal of a headspace sample and injection to an instrument probe or septum-fitting inlet is acceptable; provide the method accuracy is proven by means of test gas standard.)

5. Record the highest meter response. Maximum response usually occurs within about two seconds. Erratic meter response may occur at high organic vapor concentrations or if moisture is present. Note any erratic headspace data.

SOP For Soil Sample Collection

A variety of samplers (split-barrel, split-barrel with brass liners, piston sampler, backhoe, or shovel) may be used to retrieve soil from sampling locations. Depending on the analysis to be conducted on the soil sample, the soil sample will either be sealed within the sampler (e.g., collecting volatile samples) or the soil sample will be transferred to laboratory-supplied containers. The equipment required to transfer the soil from the sampler to the laboratory-supplied sample containers includes: stainless steel spoons or scoops and the appropriate personal protective equipment necessary for collection and handling of soil samples as described in the SSP.

All soil sampling equipment will be carefully cleaned before and during soil sampling. All sampling tools including split-barrels, stainless steel spoons and scoops will be cleaned before use and between samples in the following manner: (1) clean with tap water and TSP, using a brush if necessary to remove particulate matter and films; (2) rinse three times with tap water; and (3) rinse three times

with deionized water. To prevent sample cross-contamination, the sampler will discard the outer pair of sample gloves and put on a new pair between each sample event.

Collecting Volatile and Semivolatile Organic Samples

Collecting Semivolatile Organic Samples

The following procedure applies to the collection of hand-excavated soil samples:

1. Dig to the desired sampling interval, exposing fresh soil surface to sample.
2. Collect a large sample on a shovel or in a bucket auger and bring it to the surface or collect the sample directly from the fresh soil surface.
3. Using a stainless-steel spoon, pack the soil into 4-ounce sample jars.
4. Wipe the jar lip and screw threads to remove soil and provide a good sealing surface, and immediately screw on the lid.
5. Cool the sample to approximately 4°C immediately after collection.

Collecting Volatile Organic Samples

The following procedure applies to the collection of hand-excavated soil samples:

1. Dig to the desired sampling interval, exposing fresh soil surface to sample.
2. Collect a large sample on a shovel or in a bucket auger and bring it to the surface or collect the sample directly from the fresh soil surface.
3. Using a stainless-steel spoon, place 10 grams of soil in a laboratory-provided sample container containing methanol (avoid splashing the methanol).
4. Wipe the jar lip and screw threads to remove soil and provide a good sealing surface, and immediately screw on the lid.
5. Cool the sample to approximately 4°C immediately after collection

Collecting Metals Samples

1. The metals and cyanide soil samples will be collected from hand samples or core barrel samples and placed into a laboratory-supplied, 8-ounce, wide-mouth glass jar.

2. The sample containers will be filled to at least three-quarters full using a stainless steel spoon or scoop.

3. Cool the sample to approximately 4° C immediately after collection.

Sample Storage

Immediately after samples are collected, they will be placed in a cooler containing ice or ice packs. Samples will be kept cold (approximately 4° C) until receipt at the laboratory, where they are to be stored in a refrigerated area. All samples will be kept secured to prevent tampering.

Section 1 Introduction

This ECP was prepared on behalf of the Minnesota Department of Administration (MDA) for the Minnesota Veterans Home Building 17 located at 5101 Minnehaha Avenue South, Minneapolis, Minnesota (Property). The location of the Property is shown on **Figure 1**. The Property is currently owned by MDA. The MDA plans to demolish the southern portions of Building 17 and Building 18 entranceway and replace these buildings with a new 100 bed skilled nursing facility and service tunnel to serve Buildings 6, 17 North (newly constructed Building 21), 17 South (Proposed Building 22) and 19 as shown in **Figure 2**. A portion of the excavated soil will be reused on-site with the majority of the remaining soil transported off-site for reuse. No contamination was observed or detected in analytical sampling from the Phase II Investigation completed in 2014. In addition, the majority of the soil on the northeast side of the new building was previously excavated and managed during the Building 19 Response Actions.

This ECP has been prepared in general accordance with MPCA Voluntary Investigation and Cleanup (VIC) Program procedures and, as included in **Appendix A**, applicable MPCA Petroleum Remediation Guidance Documents.

Section 2 Background and Current Conditions

2.1 Background

The Minnesota Veterans Home campus consists of approximately 51 acres of land that currently is zoned for residential/commercial use and is currently owned by the State of Minnesota and used as a residential nursing home and residential treatment facility. The proposed development includes demolishing the southern portions of Building 17 and Building 18 entranceway and replace these buildings with a new 100 bed skilled nursing facility and service tunnel to serve Buildings 6, 17 North (newly constructed Building 21), and 19. The proposed building will be a 5-story building with a basement in the west and south only, no basement in the north section of the building. The area will be regraded and new sidewalks constructed around the building. Similar to the 100 Bed Nursing Care Facility to the east of Building 17 North (newly constructed Building 19); limestone bedrock is shallow ranging from 1 to 7 feet bgs in the area of Building 17 South. In addition, utilities will be replaced. Select design drawings are included in Appendix E.

2.2 Previous Environmental Reports

The following reports were previously prepared and excerpts are included in **Appendix F**, including analytical data summaries.

- *Phase I Environmental Site Assessment Report* (Phase I ESA Report), *Minnesota Veterans Home, Proposed Building 22, 5101 Minnehaha Avenue south, Minneapolis, Minnesota,* dated May 2014 and prepared by Landmark on behalf of Minnesota Department of Administration.

- *Phase II Environmental Investigation* (Investigation), *Minnesota Veterans Home, Proposed Building 22, 5101 Minnehaha Avenue South, Minneapolis, Minnesota,* dated May 2014 and prepared by Landmark on behalf of Minnesota Department of Administration.

- *Phase II Environmental Investigation Report Addendum* (Investigation Addendum), *Minnesota Veterans Home in Minneapolis, Proposed Building 22,* dated June 17, 2014 and prepared by Landmark on behalf of Minnesota Department of Administration.

- *Pre-Demolition Hazardous Building Material Survey-Minnesota Veterans Home-Building #17 South, 5101 Minnehaha Avenue South, Minneapolis, Minnesota*, dated April 2016 and prepared by Landmark and Applied Environmental Sciences (AES) on behalf of Minnesota Department of Administration.

As listed in the Phase I ESA Report and based upon the records review, Property reconnaissance, interviews, and review of previous investigation data, the following recognized environmental conditions (RECs) were identified for the Property:

- The presence of fill material on Minnesota Veterans Home campus with analytical sample results from previous investigations indicating detected concentrations of chemicals above applicable risk-based screening concentrations.

- Presence of multiple sub-grade structures that may impact construction.

The Investigation addressed the RECs identified in the Phase I ESA Report by evaluating the presence of fill material and determining, based on field screening and laboratory results, if the fill material was impacted by chemicals of concern above applicable risk-based screening criteria.

Landmark completed the field work portion of the Investigation on May 12, 2014, at the locations shown on **Figure 2**. The Investigation focused on assessing soil and characterizing fill material across the Property and assessing the potential for soil vapors associated with the soil and/or groundwater impacts. Landmark planned to collect groundwater samples at two of the Investigation locations; however, groundwater was not encountered during the Investigation above bedrock, which was encountered between 3- and 9.5 feet bgs; therefore, no groundwater samples were collected. Additionally, soil vapor samples were collected during a 2011 Investigation surrounding Building 17 and no elevated VOCs were detected; consequently, soil vapor samples were not collected as part of the Investigation.

Eight borings, labeled LGP-10 through LGP-19, were advanced with a Geoprobe and two hand auger samples (LHA-16 and LHA-20) were advanced next to the buildings at locations that could not be accessed with the Geoprobe. Geoprobe borings were advanced to sampler refusal (weathered bedrock), which ranged in depths between 3- and 9.5 feet bgs for the collection of soil samples. Soil samples were submitted for laboratory analysis to focus on characterizing soil that may be excavated or disturbed during redevelopment. Geoprobe borings were located to provide adequate spatial distribution across the Property.

Based on the results of the Investigation, except for the debris including bricks, broken glass and coal along the east side of Building 17 from 3- to 5 feet bgs at locations LGP-17 and LGP-18, there were no field screening indications of contamination in any of the soil samples collected during the Investigation. All detected RCRA metals and PAHs in soil samples collected during the Investigation were reported at concentrations below the

applicable MPCA Residential Soil Reference Values (RSRVs). Results are summarized in **Appendix F**.

A Pre-Demolition Hazardous Building Materials Survey, which addressed asbestos and PCB-containing caulk as well as an inventory of hazardous building materials for the proposed demolition of the southern portion of Building 17, was also conducted. The ACM Survey and Hazardous Building Materials Survey consisted of a room-by-room assessment of the Property building to locate suspect ACM, peeling paint that tested positive for lead, PCB-containing caulk and hazardous materials that will be removed prior to demolition. A Preliminary Asbestos Survey was completed in 2014 and results from this survey were used in the April 2016 Survey.

Section 3 Responsibilities and Coordination

Field personnel designated as responsible for implementing this ECP will be safety-trained for hazardous waste operations according to the requirements of 29 CFR 1910.120. If requested, the local fire and police department will be provided a copy of the SSP and will be briefed as necessary on the hazards that could be encountered while responding to an emergency at the Property. Emergency contacts will be provided in the SSP.

Oversight responsibilities and contacts are as follows:

Responsibility		Contact Name	Contact Numbers
Current Property Owner/City of Saint Paul			
Minnesota Department of Administration	Project Manager	Ryan Allen	651-201-2392
Environmental Consultant			
Landmark Environmental, LLC 2042 West 98th St. Bloomington, MN 55431	Project Manager	Sherry Van Duyn	952-666-2420 612-599-9361 (cell)
	Field Manager	Jerry Mullin	612-810-7979 (cell), or 952-666-2415
	Safety Manager	Eric Gabrielson	952-666-2416
Regulatory Agency			
Minnesota Pollution Control Agency 520 Lafayette Road North St. Paul, MN 55155	Petroleum Brownfields Program Project Manager	Stacey Van Patten	651-757-2425
	Voluntary Investigation and Cleanup Program Project Manager	Ed Olson	651-757-2627
	Duty Officer		651-649-5451

4.1 Redevelopment Plan

The proposed development includes demolishing the southern portions of Building 17 and Building 18 entranceway and replace these buildings with a new 100 bed skilled nursing facility (proposed Building 22) and service tunnel to serve Buildings 6, 17 North (newly constructed Building 21), and 19 as shown in **Appendix E**. The proposed building will be a 5-story building with a basement in the west and south only. The area will be regraded and new sidewalks constructed around the building. Similar to the 100 Bed Nursing Care Facility to the east of Building 17 North (newly constructed Building 19); limestone bedrock is shallow ranging from 3 to 9.5 feet bgs.

For construction of the Proposed Building 22 (Building 17 South), the planned redevelopment includes excavating an estimated 32,000 cubic yards (cy) of soil; 20,000 cy primarily in the proposed building footprint, 9,000 cy in the proposed tunnel area and 3,000 cy for new utility corridor. It is estimated that a portion of the soil will be fill and a portion native soil, similar to the work at the neighboring 100 Bed Nursing Care Facility. Except for the soil impacted with debris at LGP-17 and LGP-18 from 3- to 5 feet bgs (managed as part of the Building 17 North work), all soil meets the definition of unregulated fill listed in the MPCA Guidance Document entitled, *Best Management Practices for the Off-Site Reuse of Unregulated Fill*, dated February 2012 included in **Appendix D**. Efforts will be made to find another property that will accept this soil. The excavation work is planned to start end of May of 2016. Redevelopment plans are shown in **Appendix E**.

4.2 Chemicals of Concern and Cleanup Goals

Soil excavation will be completed as necessary to demolish and construct the new building as shown in **Appendix E**. The construction for Building 22 is an export site with excavation ranging across the new building footprint to bedrock ranging from 1 to 7 feet bgs. Soil excavated for redevelopment will be managed in accordance with this ECP for either onsite reuse or offsite reuse.

Soil to be reused offsite will meet the definition of unregulated fill as defined in the MPCA's Best Management Practices for the Off-Site Reuse of Unregulated Fill guidance document (**Appendix D**). Soil samples were previously collected during the Phase II Investigation and all samples met the MPCA's Best Management Practices for the Off-Site Reuse of Unregulated Fill guidance. In addition, the soil planned to be excavated for the tunnel and some utilities in between the new Building 22 and Building 6 is clean fill from either onsite or clean fill from offsite that was managed as part of the Building 19 construction.

Groundwater beneath the Property will not be used for any purpose as part of the planned redevelopment. The Property is serviced by municipal water supply. The depth to groundwater was reported as 8 to 13.5 feet below grade and likely represents perched groundwater. Construction dewatering is not anticipated.

Because no contaminated soil was identified during the Phase II Investigation, no additional soil sampling is recommended unless evidence of contamination is observed and then this ECP will be implemented.

4.3 Response Actions

Except for the soil impacted with debris at LGP-17 and LGP-18 from 3- to 5 feet bgs which was properly managed and documented in the Response Action Implementation Report, Minnesota Veterans Home, Building 17 North, prepared by Landmark, dated December 2015, all soil meets the definition of unregulated fill listed in the MPCA's Best Management Practices for the Off-Site Reuse of Unregulated Fill guidance document (**Appendix D**). Therefore, no response actions (RAs) are necessary for the proposed development. However if environmental issues are encountered during the redevelopment, field screening and contingency sampling will be conducted in accordance with this ECP.

Placement of onsite or offsite clean fill material may be required to prepare the Property for redevelopment, including backfilling excavations and possibly for utility excavations. Clean soil from the Property to be reused on other properties as unregulated fill had samples collected and analyzed and field screened as part of the Phase I Investigation. The soil meets the offsite reuse criteria as indicated by analytical data included in Appendix F. No additional sampling for offsite reuse is recommended.

Section 5 Contingency Procedures

Unexpected environmental conditions potentially consist of encountering one or more of the following during response actions or excavation activities: underground storage tanks (USTs), buried debris containing brick, concrete, wood and materials with potential ACM and other hazardous materials or contaminated soils. Procedures for addressing each potential condition are discussed below.

5.1 General Procedures

The MPCA requires the following notification and environmental oversight requirements with regard to the activities covered by this ECP. Based on the results of the previous investigations conducted at the Property, the excavation activities are not expected to encounter unknown USTs or water wells.

5.1.1 Notification Requirements

In the event that any suspected hazardous substances or unexpected environmental issues are encountered during the excavation activities, work in the area shall cease and the work area shall be secured. The contractor shall contact Landmark immediately. A representative of Landmark and/or the contractor shall then contact the MPCA staff assigned to the project as soon as possible, in order to determine or confirm appropriate actions. Identified releases shall also be reported to the Duty Officer within 24 hours.

5.1.2 Ongoing Environmental Oversight Requirements

During the implementation of excavation activities related to the development, a representative of Landmark will be present on-site to inspect and record soil conditions. Soil samples from the excavation will be field screened. For each inspection, excavation and soil sample locations (including field screening samples), will be recorded on an inspection log. These logs will be kept for subsequent submittal to the MPCA VIC Program and the MPCA Petroleum Brownfields Program.

5.1.3 Pre-Excavation Preparation

The excavation contractor shall coordinate a utility meet and will confirm that all existing utilities have been adequately located and marked.

5.1.4 Underground Storage Tanks

In the event an UST is encountered during earthwork, removal of the tank and excavation of petroleum-contaminated soils, including field screening, soil sampling, and storage/disposal of contaminated soil, will be conducted in accordance with MPCA Petroleum Remediation Program Guidance Documents in **Appendix A**.

The contractor will confirm that the underground storage tank (if identified) is isolated from all supply and/or drain piping and that all utilities have been adequately located and marked. To the maximum extent practicable, the contractor will remove and containerize residual tank contents prior to tank excavation. All residual tank contents shall be handled in accordance with MPCA and OSHA requirements. This includes, but is not limited to, use of appropriate DOT, OSHA, and EPA drums and containers, use of appropriate fluid transfer devices, use of suitable absorbent materials, use of appropriate blast shields, and use of non-sparking material handling equipment and hand tools. All laborers handling residual petroleum or hazardous waste products shall be properly trained and in compliance with contractor's SSP.

Any UST will be excavated and removed in a manner that minimizes the potential for incidental spillage of residual tank contents during tank removal. Pending cleaning, scrapping, and/or loading of tank for transportation off-site, all tank components will be placed on impermeable sheeting to prevent incidental soil contamination at the Property.

In the event that field screening discloses evidence of a petroleum or hazardous waste release from the UST, contaminated soil will be placed onto a reinforced polyethylene liner. Contaminated soil will be excavated following the guidance in the MPCA Petroleum Remediation Program Guidance Documents in **Appendix A**. Contaminated soil shall be covered with reinforced polyethylene liner to prevent water from coming in contact with the soil.

5.1.5 Transportation and Disposal

In the event impacted soils are disposed off-site for disposal at a RCRA Subtitle D landfill, the soils will be transported in strict compliance with all applicable local, state, and federal guidelines and regulations. All soil that exceeds the cleanup criteria will be transported off-site and disposed of at appropriately licensed facilities. The end disposition of all impacted soil transported off-site will be documented and reported to the MPCA VIC Program and the MPCA Petroleum Brownfields Program.

5.1.6 Buried Demolition Debris

In the event buried demolition debris with potential ACM is encountered during construction activities, an Asbestos Hazard Emergency Response Act (AHERA) certified and Minnesota Department of Health (MDH) licensed inspector will be present to guide further excavation and

sampling efforts. Subsequent excavation and abatement work will be conducted in accordance with the July 1999 MPCA Asbestos Guidance on Excavation Projects in **Appendix B**.

5.1.7 Hazardous Materials or Contaminated Soils

Hazardous materials and/or additional soils containing hazardous substances may be encountered during excavation activities associated with development. If, based upon visual or olfactory evidence, such materials are encountered; excavation of the impacted area will temporarily cease until Landmark and the MPCA are notified. Specific requirements for the excavation contractor as they relate to contaminated soil excavation may include one or all of the following: temporary erosion controls; run-on and runoff controls; air emission controls; decontamination facilities; notification procedures; temporary contaminated soil stockpile areas; excavation and staging; and contaminated soil disposal. General requirements are described below.

A contaminated materials staging area (CMSA) will be constructed by placing a minimum 10-mil-thick plastic sheet on the ground and constructing a 6-inch-high soil berm around the perimeter. The plastic will extend beyond the perimeter berm to prevent runoff from and run-on to the CMSA. A minimum 10-mil-thick plastic cover will be placed over the CMSA stockpile. The cover will extend beyond the perimeter soil berm and will be secured and maintained.

If chemical containers or other hazardous items are encountered, they will be individually removed and their condition assessed. If the excavated chemical containers are not in good condition (e.g., severe rusting, structural defects, leaking, etc.) or if uncontainerized hazardous substances are encountered, the materials will be transferred to a new drum or overpack that is in satisfactory condition. These containers will meet the appropriate requirements of DOT, OSHA, and EPA regulations for the associated materials.

Intact chemical containers and repacked materials will be transported to the storage area and placed in roll-off boxes. If appropriate, liquid wastes may be bulk-stored in tanks. The roll-off box will be lined to contain leaks, spills, or accumulated precipitation. The roll-off box will be of sufficient capacity to contain 10 percent of the volume of the drums or the volume of the largest container, whichever is greater. The roll-off box will be covered to prevent collection of precipitation.

After contaminated soil (as determined by field screening tests), chemical containers, and hazardous substances have been excavated from the impacted area; the excavation will be extended in shallow lifts for an additional 1-foot (unless groundwater is encountered). Additional soil from this "over-excavation" will be transported to the storage area and stockpiled separately from the contaminated soil.

Soil samples will be analyzed for the appropriate parameters designated by the Landmark field personnel in consultation with the MPCA Petroleum Brownfields Program staff, based upon the

likely source of contamination and field observations, according to the MPCA Risk Base Site Characterization and Sampling Guidance, Section 7, which is included in **Appendix C**. A sampling plan for the stockpiled contaminated soil, the stockpiled clean soil, and any containerized materials will be conducted in accordance with the MPCA requirements, after the material has been excavated and the results of the samples collected during the excavation are available. A plan for managing the stockpiled soil and any containerized materials consistent with approved response actions will be prepared after the results from all of the sampling are available.

Following completion of the "over excavation," the excavation contractor will continue development activities.

5.1.8 Dewatering

During construction and earthwork activities, dewatering may be necessary as "perched" groundwater may be encountered. If dewatering is needed to manage groundwater encountered during redevelopment activities, a water discharge permit may be necessary. The water could be discharged to the sanitary sewer with a permit from Metropolitan Council Environmental Services or to the storm sewer with a National Pollutant Discharge Elimination System permit, depending on the concentrations of any potential contaminants in the groundwater. The quantity of contaminated groundwater potentially requiring discharge will also be directly related to the location and depth of the excavations.

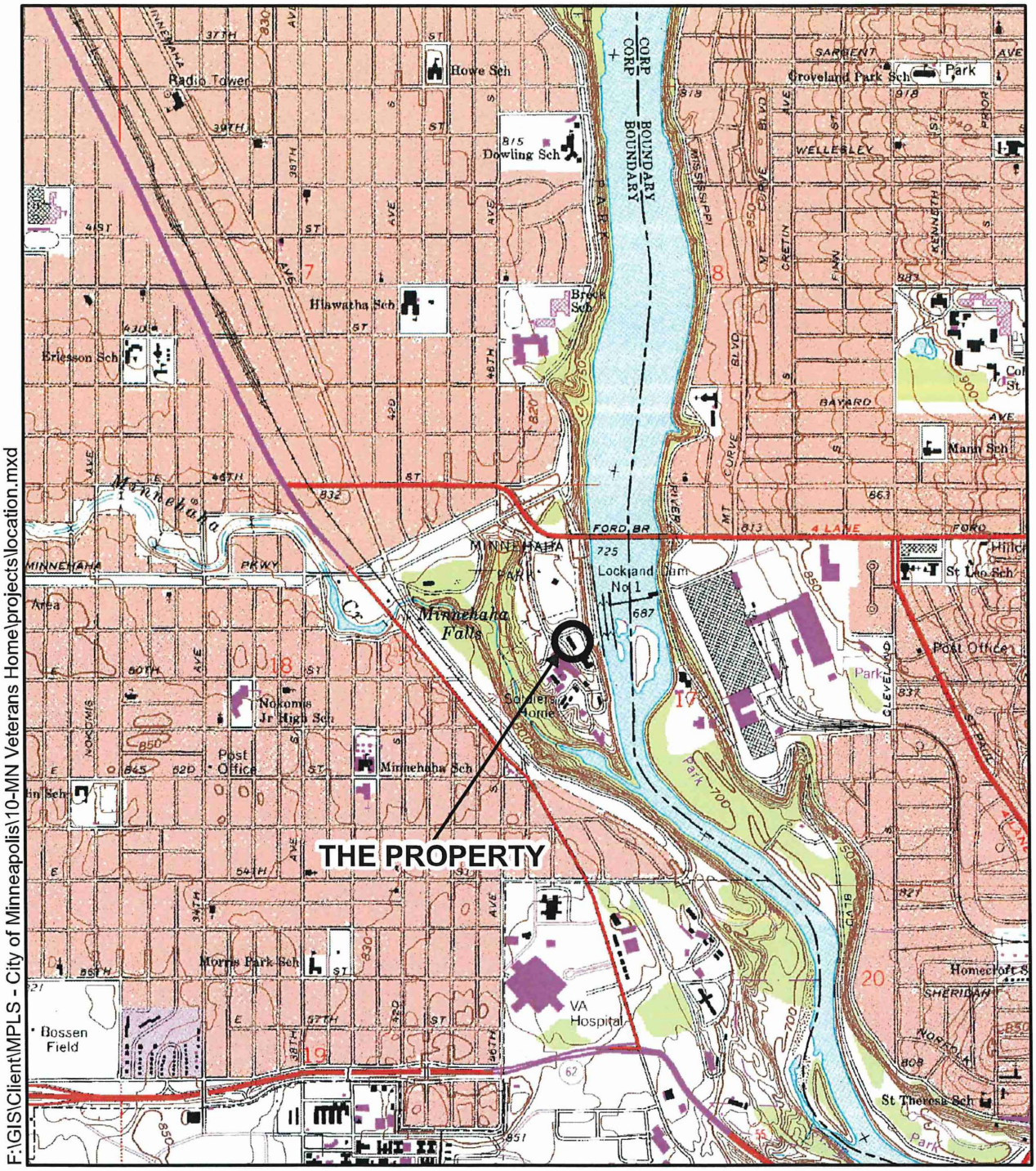
5.1.9 Water Wells

In the event water wells are encountered at the Property during redevelopment activities, a licensed water well driller will be hired to seal the well in accordance with Minnesota Rules Section 4725.3850 Sealing Well and Boring of the Minnesota Rules Chapter 4725 Department of Health, including measuring the length of the well to be sealed, making reasonable efforts (with MDH guidance, if necessary) to remove any obstructions from the well, making proper notifications to the MDH, requesting MDH recommendations on proceeding, ripping or perforating casing if required, and providing responsibility for well abandonment in accordance with Section 4725.3875 Responsibility for Sealing, of the Minnesota Rules Chapter 4725 Department of Health. Any well casing will be removed to a depth of six feet below ground surface to eliminate any obstacles to future development. In addition, well protection (i.e., protective posts or surface mount) will be removed.

Section 6 Reporting

Landmark will inform the MPCA VIC Program staff of environmental issues if they are encountered during the project. If environmental issues are encountered during the redevelopment, documentation and records related to the project will be reported to MPCA VIC Program following completion of construction activities in an Environmental Contingency Implementation Report.

Figures



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Source: St. Paul West, Minnesota Topographic Quadrangle, 7.5-Minute Series

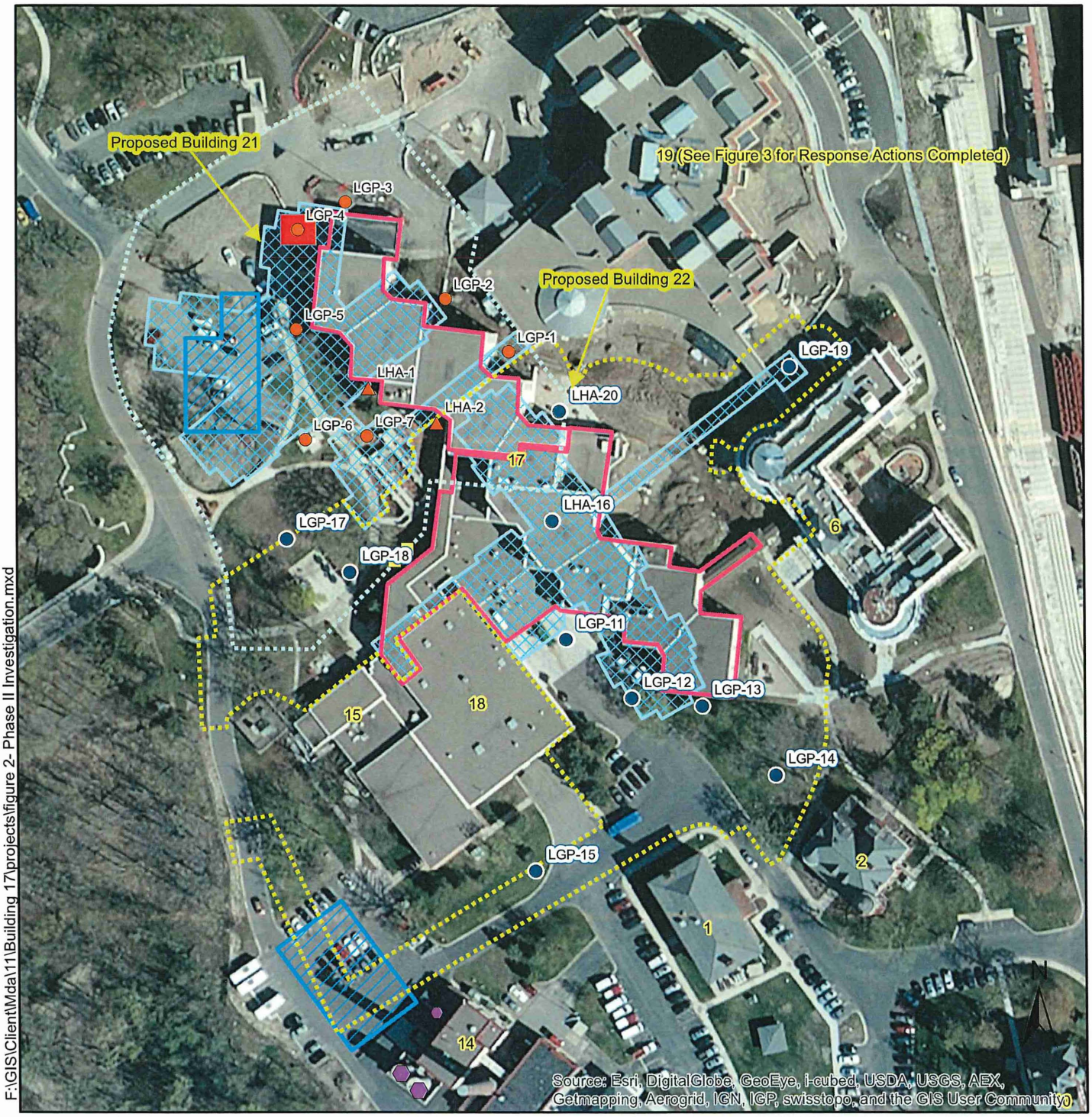
N

2,000 1,000 0 2,000 Feet

FIGURE 1

PROPERTY LOCATION MAP
Minnesota Veterans Home
5101 Minnehaha Avenue South
Minneapolis, Minnesota

LANDMARK ENVIRONMENTAL, LLC



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Legend

- 2014 Geoprobe Boring Location
- Transformers

2011 Phase II Investigation Locations

- Geoprobe Boring
- Hand Auger Boring

Aboveground Storage Tank (AST) Location

- 30,000 Gallon
- 4,000 Gallon

- 1 — Building Number
- Hot Spot Location
- Building 21 (Bldg 17 North) Construction Limits
- Proposed Building 22 (Bldg 17 South) Construction Limits
- Sub-Grade Storm Water Retention Pond
- Building Demolition
- Approximate Proposed Building Footprint

FIGURE 2

PROPERTY LAYOUT MAP AND INVESTIGATION LOCATIONS
Proposed Building #22 (Building 17 South)
5101 Minnehaha Avenue South
Minneapolis, Minnesota

LANDMARK ENVIRONMENTAL, LLC

0 60 120 240 Feet

1 inch = 120 feet

Appendices

Appendix A

Minnesota Pollution Control Agency

Excavation of Petroleum Contaminated Soil and Tank Removal Sampling

Guidance Document 3-01
Petroleum Remediation Program

Excavation of petroleum contaminated soil may be necessary at some petroleum release sites. Excavation removes contaminated soil that poses environmental or health threats. Excavation may also be necessary when storage tanks are installed, removed, or when construction occurs in zones where contamination is present. However, at most sites, petroleum contaminated soil is left in place to degrade over time where risks to potential receptors is determined to be low. This document provides guidance on determining when excavation of petroleum contaminated soil is necessary as a corrective action, sampling requirements, and other related information.

Emergency conditions: If there are vapor impacts, drinking water impacts, the release was a recent spill, or there is a potential unstable condition, immediately contact the State Duty Officer at **651-649-5451 or 1-800-422-0798.**

Reporting requirements: Detection of any amount of contamination in soil or ground water must be reported to the State Duty Officer at **651-649-5451 or 1-800-422-0798** (even if contaminant levels are lower than the action levels shown below).

How to use this document:

- Section I. – provides the requirements for soil sample collection and analysis during underground storage tanks (USTs) removal, whether or not soil excavation will occur.
- Section II. – provides general guidance for excavation of petroleum contaminated soil, whether or not USTs or above ground storage tanks (ASTs) have been installed or removed.
- Section III. – provides specific guidance for management of petroleum contaminated soil during the installation or removal of USTs or ASTs.
- Section IV. – provides guidance when excavating petroleum contaminated soil as a corrective action.

I. Sampling Requirements during UST Removal

Refer to Table 1 for the number and location of samples to be collected.

A. No evidence of contamination is present or further investigation is required during tank removal (no soil removed for treatment)
Samples collected during the removal of tanks that contained gasoline should be analyzed for benzene, ethylbenzene, toluene, total xylenes, and gasoline range organics using the Wisconsin Department of Natural Resources Modified Gasoline Range Organics (GRO) Method. Samples collected during the removal of tanks that contained other petroleum products should be analyzed for diesel range organics using the Wisconsin Department of Natural Resources Modified Diesel Range Organics (DRO) Method.

B. Possible site closure after tank removal with evidence of contamination
Analyze soil samples following the procedures described in Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures.* All analysis requirements in Guidance Document 4-04 must be completed before closure will be considered. If soil is removed for treatment, refer to Section II Part E.

Table 1 – Sampling requirements at UST sites

One tank, any size, in individual tank basin	two samples; one from directly below each end of the tank
More than one tank, less than 10,000 gallons, in a single tank basin	one sample directly below the center of each tank
More than one tank, 10,000 gallons or larger, in a single tank basin	two samples from below each tank; one from directly below each end of the tank
Leaking lines	one sample from below each suspected point of release, or every 20 feet
Dispensers	one sample from below each dispenser which is removed

Any additional samples needed to adequately characterize the excavation.

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II. General Excavation Requirements

A. Excavation prior to a Limited Site Investigation

Except for site-specific situations, contaminated soil should remain in place until a Limited Site Investigation (LSI) has been completed. The identification of risk receptors and the definition of the extent and magnitude of contamination will determine if excavation is appropriate for a site.

Excavation prior to the completion of an LSI is considered a corrective action if any of the following circumstances exists:

1. All contaminated soil (above action levels using Table 2) can be excavated within a maximum of 150 cubic yards of soil providing that ground water is not impacted or likely to become impacted (obtain prior Minnesota Pollution Control Agency (MPCA) approval if you wish to excavate more than 150 cubic yards of soil). See Section B. below for more details.
2. Petroleum saturated soil is present. Use the petroleum sheen test described in Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures* to determine if soil is petroleum saturated.
3. A recent release has occurred. Quick removal of contamination can prevent the expansion of the contamination plume. Obtain MPCA prior approval before proceeding.
4. An obvious high risk situation or the release has occurred in a hydrogeologically sensitive area such as a karst area or a Drinking Water Supply Management Area. Contact the MPCA for site specific guidance. Refer to MPCA Guidance Document 1-01 for more information.
5. Excavation is necessary to facilitate UST or AST installations (see Section III below).

Use the Table 2 below for field excavation criteria.

Table 2 – Headspace (PID) results

Fuel Type in Soil	Field Screening Level
Gasoline and aviation gasoline	Above 40 parts per million (ppm)
Diesel fuel, fuel oil, used or waste oils, jet fuel, kerosene	Visual evidence of contamination, or field screening above 10 ppm.

B. An LSI is necessary if any of the following situations exist

1. Contamination cannot be addressed by the excavation 150 cubic yards or less of soil.
2. Ground water is present in the excavation and has been in contact with either petroleum product or petroleum contaminated soil or ground water contamination is suspected.
3. Contamination intercepts a seasonally high water table (indicated by mottling on the excavation sidewalls) or bedrock.
4. Other impacts are known or suspected (such as discharge of contaminated water to surface waters or utilities, vapor impacts to buildings or utilities, etc.).
5. Situation present in Table 3:

Table 3 – LSI requirements when residual soil contamination remains

Soil Type	Perform LSI if:
Sand/gravel	a. soil above field screening level in Table 2 remains, or b. water table is within 25 feet of the surface and soil analytical result is greater than 1 milligrams/kilograms (mg/kg) GRO/DRO, * or c. soil analytical result greater than 50 mg/kg GRO/DRO remains.
Silt/clay	d. soil above field screening level in Table 2 remains; or e. soil analytical result greater than 100 mg/kg GRO/DRO remains.

* A soil boring is necessary at sites with sandy or silty sand soil (Unified Soil Classification System/American Society for Testing Materials) and where the water table is within 25 feet of the ground surface. The purpose of this boring is to determine whether or not an LSI is necessary. Advance a soil boring directly through each suspected source area (e.g., former tank locations, pump islands, product transfer areas), in the following situations:

- Contamination in soil from the suspected source area excavation is between 1 and 50 mg/kg GRO/DRO; or
- Visual or other evidence of contamination remains in the suspected source area.

Analyze soil samples in accordance with Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures*. If the boring(s) encounters contaminated ground water, an LSI is necessary.

If the boring encounters old contamination that does not intersect the water table and the ground water sample is not contaminated, an LSI may not be necessary.

When an LSI is necessary, the contaminated soil is usually returned to the excavation basin, unless prior MPCA approval has been obtained. MPCA staff may allow exceptions to these situations on a site-specific basis. See Guidance Document 1-01 *Petroleum Remediation Program General Policy* and Guidance Document 4-01 *Soil and Ground Water Assessments Performed during Site Investigations* for additional information.

C. Petroleum saturated soil

In most situations, petroleum saturated soil must be removed. Contact the MPCA for prior written approval to remove and properly manage the petroleum saturated soil. Use the petroleum sheen test described in Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures* to determine if soil is petroleum saturated.

D. Field screening during excavations

All soil samples collected for field screening must be labeled so as to designate type of sample, location of sample, and depth of sample (see below). All excavation soil sample locations must be shown on a map of the excavation.

Use a properly calibrated field instrument to screen excavated soils in accordance with Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures*. As excavation proceeds, collect and field screen soil samples frequently enough to verify the need for soil removal (at least one soil vapor analysis for each 10 cubic yards of soil removed). Label these soil samples with the prefix "R", for "removed" along with the sample depth, and carefully note the sample locations on a scaled map. The field technician should carefully document successive soil vapor readings vertically below the source of release, indicating the location and depth of each sample on a map of the excavation. *Example*: R-1(2'), R-1(4'), R-1 (6'), R-2(4'), etc. Note: R-1 samples are from the same location but successively deeper).

After excavation is complete, screen soil samples from the bottom and sidewalls of the excavation, along removed pipe runs, and beneath removed dispensers. Collect and label sidewall and bottom samples for field screening as discussed in the next section.

E. Sampling requirements following soil removal

After the excavation is complete but before returning any soil to the excavation, collect soil samples for laboratory analysis to document the contamination remaining in place. Also, in order to document the contamination removed, stockpile soils samples must be collected (see Part F, below). All soil samples collected for laboratory analysis must be labeled so as to designate type of sample, location of sample, and depth of sample (see below). All soil sample locations must be shown on a map of the excavation. The map of the excavation must show site features and the two dimensional extent of the final excavation footprint at the ground surface along with final excavation depth contours (using a contour interval of 1 to 2 feet). Collect and analyze soil samples following procedures described in Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures*, according to the following schedule:

1. **Sidewall samples.** Remove at least one foot of exposed soil prior to collecting the sample to ensure the collection of a representative sample. Sidewall samples should be collected at a rate of one sample per 25 lineal feet of sidewall; however, a minimum of 4 sidewall samples (i.e., one from each side) must be collected to document the levels of contamination remaining in place. The sidewall samples should be collected at the depth interval where the highest level of contamination was detected in the removed soil (i.e., "R" samples), typically near the bottom of the excavation. Label all sidewall samples with the prefix "S" for "sidewall", location number, and sample depth (e.g., S1(6'), S2(8'), S3(5'), etc.) and carefully note the sample locations on a map of the excavation.
2. **Bottom samples.** Remove at least one foot of exposed soil prior to collecting the sample to ensure the collection of a representative sample. Collect samples from the bottom of the excavation (i.e., floor of the excavation) at a rate of 1 bottom sample per 100 ft^2 of bottom area, and beneath removed dispensers. Label all bottom samples with the prefix "B", for "bottom", sample location number, and sample depth (e.g., B-1(7'), B-2(14'), B-3(10'), etc.).

   Note: Follow-up laboratory sampling to document remaining contamination is *not* generally required after removing contaminated surface soil as a corrective action (See Section IV, Excavation as Corrective Action).

F. Storage and treatment of petroleum contaminated soil

Store excavated contaminated soil on an impermeable surface, covered with plastic. Anchor the plastic covering in place with clean soil or other suitable material. Remember to obtain local government and MPCA staff approval prior to moving contaminated soil for off-site storage. Storage at land treatment sites must be in accordance with Minn. R. ch. 7037. Improper storage of contaminated soil may result in additional releases to the environment, and a corresponding reduction in Petrofund reimbursement.

Procedures for proper treatment of petroleum contaminated soil are discussed in Guidance Documents 3-03 *Land Treatment of Petroleum Contaminated Soil*, 3-10 *Thermal Treatment of Petroleum Contaminated Soil*, 3-13 *Composting of Petroleum Contaminated Soil*, and 3-17 *Thin Spreading Small Quantities of Petroleum Contaminated Soil.*

1. If less than ten cubic yards of contaminated soil is removed for treatment, soil samples will normally not be necessary if the soil will be land treated (unless the soil is a potential hazardous waste).
2. **Sampling the contaminated soil stockpiles.** Collect and analyze soil samples (grab samples) from representative portions of the excavated soil pile, using the methods described in Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures.* Label these samples with the prefix "SP" for "Stockpile" and location number (e.g., SP-1, SP-2, etc.).

G. Karst conditions

Refer to Guidance Document 4-09 to determine if your site is located in a karst region of the state and for guidance specific to karst terrains.

H. Excavation worksheet

Complete Guidance Document 3-02 *General Excavation Report Worksheet* in all cases where petroleum contamination is encountered during an excavation completed prior to the site investigation [LSI or Remedial Investigation(RI)], even if no soil is removed for off site treatment. If a site investigation is not being performed, promptly submit the *General Excavation Report Worksheet* for MPCA review. If a site investigation is being completed, include the *General Excavation Report Worksheet* as an appendix of Guidance Document 4-06 *Investigation Report Form*. The reporting deadline is ten months from the date you receive the MPCA "Petroleum Storage Tank Release Investigation and Corrective Action" letter. MPCA staff may establish a shorter deadline for high priority sites.

I. Endangering structures

Do not allow excavations to endanger structures, including buildings, roads, utility lines, etc. Excavations must comply with Occupational Safety and Health Administration (OSHA) standards.

J. Soil excavated during development

Petroleum contaminated soil which is excavated during construction or other development activities must be treated and disposed of in accordance with MPCA guidelines (see part F. above). Soil excavated for the sole purpose of development (including the proper management of that soil) is not eligible for Petrofund reimbursement under Minn. Stat. ch. 115C. Contact the MPCA's Petroleum Brownfields Program for assistance in development at petroleum release sites.

If you plan to excavate a site that was previously closed and soil contamination remains, refer to Guidance Document 3-16 *Assessment of Petroleum Contamination at Closed Sites When There is No New Release.*

III. Excavation during Tank Removals or Installations

A. Planning ahead

It is in your best interest to obtain at least two bids on the work before you hire a contractor. By doing this, you will have met the Petrofund bidding requirement should contaminated soil be encountered. Bid forms are available from the Department of Commerce (call 651-215-1775, 1-800-638-0418 or http://www.state.mn.us/portal/mn/jsp/content.do?subchannel=-536883856&id=-536881377&agency=Commerce).

Note: Regulated USTs must be removed by an MPCA-Certified Contractor.

Prior to tank removal, plan ahead for storage of contaminated soil during site work, and treatment of contaminated soil (see Guidance Documents 3-03 *Land Treatment of Petroleum Contaminated Soil*, 3-10 *Thermal Treatment of Petroleum Contaminated Soil*, and 3-13 *Composting of Petroleum Contaminated Soil*). Remember to obtain local government and MPCA staff approval prior to moving contaminated soil for off-site storage.

Arrange for an environmental consultant with an appropriate field instrument to screen and collect soil samples for laboratory analysis during excavation (see Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures*).

B. Installation or removal of underground storage tanks (USTs)

Refer to Attachment A below for a flow chart on managing petroleum contaminated soil during UST removals or installations.

1. **Excavation when new tank systems are being installed.** If the site is **not** a closed petroleum leak site, remove and separate contaminated soil above the field screening levels from those below the screening levels (Table 2), up to the volume allowed by Tables 4A and 4B. Screen soils from around the tanks, removed piping and dispensers. If excavation removed all contamination above the field screening levels listed in Table 2 and ground water is not likely to be impacted, collect analytical sidewall and bottom samples from the tank basin, piping, and dispenser areas.

   Note: If the project site is a closed leak site, refer to Guidance Document 3-16 *Assessment of Petroleum Contamination at Closed Sites.*

   If test pits indicate the volume of contaminated soil exceeds 150 cubic yards, an LSI is necessary. Additional soil removal beyond the volume allowed for the tank install is not necessary at this phase of work.

Table 4 – Allowable contaminated soil removal during new UST installation

Table 4A		Table 4B	
New tank size (gallons)	For each tank to be installed add (yards)	Old tank size (gallons)	For each tank to be removed subtract (yards)
550	30	550	3
1,000	40	1,000	5
2,000	70	2,000	10
3,000	90	3,000	15
4,000	110	4,000	20
5,000	130	5,000	25
6,000	140	6,000	30
8,000	170	8,000	40
10,000	210	10,000	50
12,000	240	12,000	60
15,000	260	15,000	75
20,000	320	20,000	100
25,000	400	25,000	125

Note: For new pipe trenching allow one-third (0.33) cubic yard for every one (1) linear foot of contaminated trench.

Example 1: Two 10,000 gallon tanks are to be installed in the old tank basin, where one 4,000 gallon tank and one 6,000 gallon tank will be removed.

(210 + 210) - (20 + 30) = 370
Up to 370 cubic yards of contaminated soil may be removed.

Example 2: Two 10,000 gallon tanks are to be installed in the old tank basin, where one 4,000 gallon tank and one 6,000 gallon tank will be removed. Test Pits indicate the removal of an additional 130 cubic yards of petroleum contaminated soil would remove all the soil contamination above the soil screening levels in Table 6.1.

(210 + 210) - (20 + 30) + 130 = 500
Up to 500 cubic yards of contaminated soil may be removed.

2. **Excavation of soil at sites where USTs are removed but new tank installation will not occur.**

   If the project site is a closed petroleum leak site, refer to Guidance Document 3-16 *Assessment of Petroleum Contamination at Closed Sites.* For open petroleum leak sites please refer to Section II of this document.

C. Excavation when upgrading, installing, or removing above ground storage tanks (ASTs)

Excavation requirements at AST sites are similar to those required at UST sites. The main difference is that contaminated surface soil at AST sites often occurs at loading and transfer areas, valve locations, piping runs, and from tank releases. Contaminated surface soil can pose a risk to surface water, ground water, and to humans through direct exposure and requires corrective action. Except for site-specific situations, contaminated soil should remain in place until an LSI has been completed. Refer to Section I, Part A. above for exceptions.

This guidance pertains only to AST systems with total capacity of less than 1 million gallons. Facilities with capacities over one million gallons are regulated with site specific permits.

For additional guidance, refer to Guidance Document 4-17 *Frequently Asked Questions (FAQs) about Investigation and Remediation of Above Ground Storage Tank Facilities.*

1. **Excavation when installing or upgrading AST systems.**

   If contaminated soil must be displaced to install or upgrade AST systems, soil must be disposed of in accordance with MPCA regulations.

   If contaminated soil (exceeding action levels shown on Table 2 above) must be removed to complete an AST upgrade or to install a new AST system, you may remove up to two (2) feet of contaminated soil in the following areas:

   a. below the footprint of the new AST containment berm
   b. below pipes, dispenser areas, or loading and transfer areas

   If the contaminated soil encountered during your AST installation or upgrading work appears to pose a human or environmental threat and installation of a new AST system will make these soils inaccessible, removal may be appropriate prior to the completion of an LSI. Obtain prior written approval by the MPCA.

   If contaminated surface soil exists in other areas of the site, removal or other corrective actions will probably be necessary but should wait until an LSI has been conducted. Soil removal prior an LSI may be approved if excavating up to 150 cubic yards completely addresses the release and eliminates the need for an investigation at the site.

2. **Excavation of soil at AST sites at the time of decommissioning.**

   Refer to Section I to determine if excavation alone will adequately address the release, or if an LSI will be required.

D. Sampling requirements during AST upgrades or decommission

1. **Upgrades**: During a tank facility upgrade when there is no visible contamination, verification samples are not required but highly recommended. If removing or moving a tank to a different location on your tank facility as part of your upgrade **sampling is required,** see Table 5 below for sampling requirements.

   Sampling is required if a petroleum release has occurred or visible contamination is present at the tank facility. See Table 5 below for sampling guidance.

2. **Decommissioning:** AST owners and operators must take verification samples when permanently decommissioning a tank(s) and the tank appurtenances to determine if contamination is present, per Minn. R. ch. 7151.8400. See table below for sampling requirements.

Table 5 – AST sampling requirements

Tank size and type	Number of samples	Sample location
Vertical tank less than or equal to 12' diameter	1 sample	2 feet below the tank
Vertical tank greater than 12' diameter	Divide tank diameter by 12' and round up to nearest whole number (see example)	2 feet below the tank
Horizontal tank 10,000 gallons or less	1 sample	2 feet below the center of tank
Horizontal tank greater than 10,000 gallons	2 samples	2 feet below each end of the tank
Transfer Area(s)	1 sample in each area if there is more than one transfer area	2 feet below the loading rack
Piping or Areas of Visible Contamination	Take soil headspace samples 2 feet under the following areas: pipe fittings, joints and any other area where contamination is present or likely to be present. Submit soil samples with a headspace reading greater than zero for laboratory analyses.	
Collect any additional samples that may be needed to adequately characterize the excavation(s).		
Example: 27 foot diameter tank: 27/12 = 2.25. Round up 2.25 to nearest whole number equals 3. 3 soil samples are required.		

Soil Analytical Requirements	
For samples collected from areas with visible or known contamination:	Refer to Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures* for the required analyses.
For verification samples collected from areas with no visible contamination:	Perform the following analyses based on tank content and/or sample location: • Gasoline tank samples must be analyzed for GRO (Gasoline Range Organics) and BTEX (benzene, toluene, ethyl benzene and xylenes). • Other petroleum tank samples must be analyzed for DRO (Diesel Rang organics). • Transfer area samples must be analyzed for GRO, DRO, and BTEX unless gasoline was never stored at the facility, then only DRO is required.

IV. Excavation as Corrective Action

At most sites, contaminated soil is left to degrade in place. However, soil excavation is occasionally appropriate as part of the corrective action (e.g., addressing actual or potential impacts to drinking water, surface waters, vapor impacts, or dermal contact). Excavation is also used as a method to remove petroleum saturated soil. Excavation as a corrective action is typically conducted after a site investigation (LSI or RI) has been completed and Guidance Document 4-06 has been submitted. When soil is excavated as a corrective action after the Site Investigation phase, complete Guidance Document 3-02a *Corrective Action Excavation Report Worksheet.*

A. **Excavation to address free product.** Excavation is sometimes used to address free product in ground water when the product is trapped in the pore spaces of tight sediments. Use the petroleum sheen test described in Guidance Document 4-04 *Soil Sample Collection and Analysis Procedures* to determine if soil is petroleum saturated.

B. **Excavation of contaminated surface soil.** Contaminated surface soil can pose an unacceptable risk because of the potential for dermal contact and for contaminated runoff to surface waters. Surface soil, as defined for this policy, is the uppermost two feet of soil (0-2 feet) that is not covered by an impervious surface. Corrective action is necessary at sites where contaminated surface soil exists.

If excavation is chosen as the corrective action option, contamination from the surface to a depth of two feet should be removed if any of the following criteria is met:

1. soil is visibly contaminated
2. field headspace screening with a photoionization detector (PID) indicate levels of ten ppm or greater
3. petroleum saturated soil exists (as determined using the petroleum sheen test described in Guidance Document 4-04)

For the latter two criteria above, borings should be advanced, as needed, to define the extent of contaminated surface soil. These borings can be completed with a drill rig, portable auger, hand auger, soil probe, or can be hand dug. A sufficient number of soil samples within the upper two feet should be collected to provide an accurate estimate of the volume of soil to be removed. Samples should be screened for organic vapors and petroleum saturation.

Post-excavation soil sampling is not generally required to document contamination remaining in place after contaminated surface soil removal because the extent and magnitude of contamination should have already been defined during the Site Investigation. The area excavated should be backfilled with clean fill. Other options may be considered based on recommendations made in the *Investigation Report Form* or *Corrective Action Design Report*. Please note that soil sampling of the stockpile will likely be required prior to soil treatment approval.

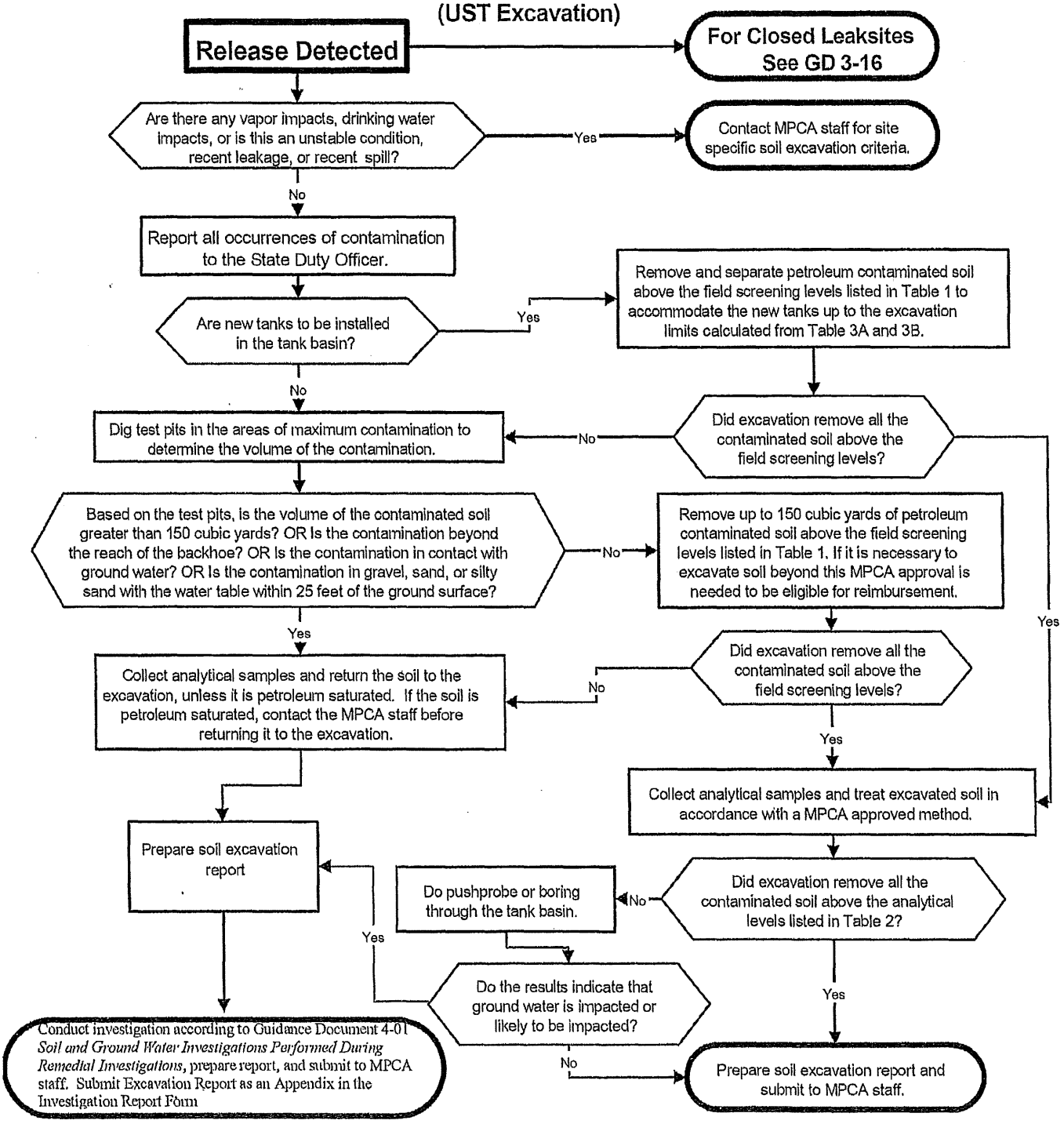
At an active AST facility, site-specific cleanup criteria may be approved if adequate operational controls are in place to manage the risks.

C. **Excavation to address other risk factors.** Excavation of contaminated soil is sometimes used to address risks such as vapors to building or utilities, or as a means of addressing surface water impacts or drinking water impacts. Excavation criteria, such as screening levels or volume of soil removed, will be site specific and should be addressed in the *Corrective Action Design Report*.

Web pages and phone numbers

MPCA staff:	http://www.pca.state.mn.us/pca/staff/index.cfm
MPCA phone:	**651-296-6300 or 1-800-657-3864**
Petroleum Remediation Program Web page:	http://www.pca.state.mn.us/programs/lust_p.html
MPCA Info. Request:	http://www.pca.state.mn.us/about/inforequest.html
MPCA VIC Program:	http://www.pca.state.mn.us/cleanup/vic.html
MPCA Petroleum Brownfields Program:	http://www.pca.state.mn.us/programs/vpic_p.html
Petrofund Web page:	http://www.state.mn.us/cgi-bin/portal/mn/jsp/content.do?id=-536881377&agency=Commerce
Petrofund phone:	**651-215-1775 or 1-800-638-0418**
State Duty Officer:	**651-649-5451 or 1-800-422-0798**

Attachment A
(UST Excavation)



Minnesota Pollution Control Agency

Petroleum Brownfields Program Voluntary Response Action Plans

Guidance Document 5-03
Petroleum Remediation Program

This document describes the process of Response Action Plan (RAP) review and approval by the Minnesota Pollution Control Agency's (MPCA's) Petroleum Brownfields Program. A RAP is a plan for managing petroleum contaminated soil and/or water during construction activities at properties under development. Property owners, purchasers and developers of property where contaminated soil and/or water might be encountered must determine the extent of contamination and its potential effects on the future usage of the property, and propose plans to mitigate these effects (called "response actions").

RAPs should be approved by the MPCA prior to beginning construction or development work at the property. The construction or development should also be completed according to the plan approved or as modified by the MPCA. Failing to (a) obtain RAP approval from the MPCA and/or (b) complete the construction or development accordingly, may violate Minnesota's environmental protection laws.

I. The Process

A. **Enrollment:** In order to obtain RAP approval, an applicant must enroll in the Petroleum Brownfields Program by filling out a Petroleum Brownfields Application (Guidance Document 5-04). Other services provided by the Petroleum Brownfields Program are described in Guidance Document 5-02 Petroleum Brownfields Program.

B. **Consultant:** An applicant to the Petroleum Brownfields Program will need to hire an environmental consultant who is qualified to prepare a RAP and oversee the approved response actions.

C. **Site investigation:** A complete Site Investigation (described in Section II) is required at every site prior to RAP approval.

D. **RAP report:** After a Site Investigation is completed, a RAP Report should be submitted to the Petroleum Brownfields Program. The RAP Report must contain the information described in Section IV below. The response actions proposed in the RAP will depend upon site specific conditions, including but not limited to, the levels of contamination, the depth of contamination, and the planned construction at the site. Response actions are discussed in Section III.

E. **Review:** The Petroleum Brownfields staff assigned to the site will generally review the RAP within 30 days and provide a response (approval, approval with modifications, or rejection of the RAP). Since review times may vary depending upon staff workload, if MPCA technical review of a RAP is necessary for a grant application, the MPCA strongly recommends the RAP Report be submitted a minimum of 45 days prior to application deadlines. Any RAP Report submitted less than 45 days in advance will not be guaranteed a review and response in time to meet those deadlines.

F. **Implementation:** The implementation of the response actions may proceed following written approval of the RAP Report. The MPCA understands that some projects may encounter petroleum contamination that could not have been foreseen. Should the property owner/developer know that temporary work stops are not an option during construction; the property owner/developer could, prior to beginning construction work, enroll in the Petroleum Brownfields Program and submit for MPCA review and approval a Construction Contingency Plan that describes proposed response actions for unforeseen petroleum contamination. If the applicant proceeds with the response actions prior to MPCA approval, the applicant may not be eligible for certain assurances and may need to conduct additional or more extensive response actions.

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II. Site Investigation

Prior to beginning the RAP approval process, a complete Site Investigation that adequately defines the extent and magnitude of the release, must be completed at the site. The Petroleum Brownfields Program utilizes the same guidance documents (Guidance Document 1-01 Petroleum Remediation Program General Policy and other applicable documents) for conducting site investigations as the Petroleum Remediation Program.

The level of additional investigation required at sites undergoing future development will vary depending on the site's past and current use, and level of any prior investigations that may have occurred at the site. Some of the more common scenarios and required levels of investigation are discussed below, however, the applicant may need to discuss with the Petroleum Brownfields staff, what level of additional investigation will be needed.

Scenario 1: A complete Site Investigation was conducted several years ago after all tanks and sources were removed from the property. The investigation led to file closure in the Petroleum Remediation Program and the site was subsequently used as a parking lot. In this scenario, the property developer's consultant would review the Site Investigation Report in the MPCA's closed site file. They would also complete a Phase I Environmental Site Assessment (Phase I) at the property to verify there are not additional or more recent potential sources of contamination.

Scenario 2: A leaking petroleum tank Site Investigation occurred several years ago, but the tanks were not removed or were replaced with new tanks, and the site continued in operation as a gas station. The original investigation led to closure of the leaking petroleum tank site file. In this scenario, the developer's consultant must, at a minimum, conduct a Phase I and Phase II at the property. If an additional release was discovered during this work, they would need to report it to the State Duty Officer and another full Site Investigation would likely be necessary.

Scenario 3: Current leaking petroleum tank site where a complete Site Investigation has not yet occurred. In this scenario, a complete Site Investigation and a Phase I would be required. The Site Investigation and review of the Site Investigation Report could occur under the oversight of the Petroleum Remediation Program, or the site could be enrolled in the Petroleum Brownfields Program for expedited review of the Site Investigation Report.

Scenario 4: Site has had petroleum release(s), unrelated to a tank. A Phase I and a Site Investigation defining the extent and magnitude of the release(s) would be required. The Site Investigation must be conducted in accordance with Petroleum Remediation Program guidance documents.

III. Response Actions

Please note that the general guidelines described in this section are provided to assist you in preparing your RAP. Because every site presents unique conditions and circumstances, developers/property owners should not proceed with implementing these guidelines at their sites without first receiving RAP approval.

The development of petroleum contaminated properties requires the implementation of certain response actions necessary to protect human health and the environment. Response actions that may be required include excavation of petroleum contaminated soil, the use of vapor barriers with vent systems, and/or other engineering controls. Whether petroleum contaminated soil may be re-used onsite, or must be disposed of offsite, depends on the type of development planned for your property. Field screening and confirmation sampling, conducted by a trained professional environmental consultant and following MPCA guidelines, are required at all petroleum contaminated sites.

A. Residential/recreational site

In most cases, excavation of petroleum contaminated soil (PCS) within property boundaries will be required at residential and recreational developments. Table 1 below lists additional response action requirements if complete excavation is not possible or feasible. A RAP for residential developments will most likely require a plan for off-site soil disposal/treatment.

B. Commercial/industrial site

The MPCA staff will generally approve development plans if contaminated soil remains on-site at less than 10 parts per million (ppm) on a Photo Ionization Detector (PID). Additional response actions requirements are listed in Table 1 below. With MPCA approval, PCS may be re-used on-site at many commercial and industrial development sites.

Table 1

Risk scenario	Response action requirement
Site Buildings/Structures	Vapor Barrier required if any measurable contamination remains onsite. *
Site Buildings/Structures	PCS > 50 ppm (PID) will require Vapor Barrier and Vent System or additional soil removal.
Utility Trench	PCS Removal to < 10 ppm (PID); > 10 ppm (PID) requires a vapor barrier in utility trench
Green space	0-4' - Clean soils

Note: If impacted groundwater is present onsite, vapor barriers and passive vent system response actions will be required.

Soil reuse at commercial and industrial developments

For many commercial or industrial developments, time and cost saving measures, such as reusing contaminated soils on-site as controlled fill, can be approved by Petroleum Brownfields Program staff. Table 2 below gives general guidance for on-site petroleum contaminated soil re-use options at commercial and industrial sites.

Table 2

Soil re-use method	Maximum re-use contamination level
Landscape Berms	< 100 ppm (PID) mixed 50/50 with clean fill, with 2 feet of clean cover soils and vegetation
Thin spread Under Newly Constructed Roadways or Parking Surfaces	< 200 ppm (PID)

Note: Contaminated soil re-use is not permitted at residential sites.

Off-site soil treatment/disposal

Any petroleum contaminated soil removed from the site must be treated or disposed of in a method approved by the MPCA. Petroleum contaminated soils transported to an approved landfill must be in compliance with all state and local permits. The applicant must notify MPCA Petroleum Brownfields Program staff when petroleum contaminated soils are initially transported and where soils will be disposed of prior to disposal. Please include all transportation and handling manifests for such soils within the final implementation report.

IV. Response Action Plan (RAP) Report

The RAP Report describes in detail the actions the developer intends to take to address and mitigate the effects of petroleum contaminated soil, surface water and/or ground water at or from the property.

RAP Report Contents: Detailed below are the necessary components of a RAP Report. A RAP Report which does not include these elements will cause delays in review time by the Petroleum Brownfields Program staff. For assistance in determining whether a Phase I, Phase II and/or Site Investigation are necessary, refer back to Section II or discuss with Petroleum Brownfields staff.

A. Introduction, *including:*

- MPCA site identification number
- Property name, address, and spatial data (GD1-03a)
- A brief description of the proposed development

B. Summary of Phase I, *including:*

- Brief description of the current and historical use of the property
- Brief description of the recognized environmental conditions (i.e., sources of contamination/potential contamination)

- Brief description of the surrounding properties and surrounding areas of recognized environmental conditions
- Site location map
- Site map showing: property boundaries, structures and features, and areas of recognized environmental conditions

C. Summary of Phase II, *if completed, including:*

- Discussion of the scope and results of the investigation
- Site map showing: property boundaries, structures and features, areas of recognized environmental conditions and sampling/boring locations
- Isoconcentration map(s)
- Table containing boring analytical results and sample depths

D. Summary of Site Investigation Report or Excavation Report, *if completed, including:*

- Discussion of the scope and results of the investigation
- Site map showing: property boundaries, structures and features, areas of recognized environmental conditions, excavation limits and sampling/boring locations
- Isoconcentration map(s)
- Table with boring analytical results and sample depths

E. Proposed Response Actions, *including:*

- Map showing proposed structures/improvements, current source areas and proposed excavation areas (including: foundations, utilities, landscaping, vapor barriers and venting systems).
- Grading plan (map) showing proposed location and placement of contaminated soil to be re-used onsite (commercial/industrial sites only).
- Detailed written proposal for re-using, treating and/or disposing of any excavated contaminated soil. This proposal should include: plans for field and laboratory sampling, plans for segregating soil based on levels of contamination, onsite re-use options and plans (commercial/industrial sites only), estimated volumes, and treatment/disposal facilities and locations.
- Detailed written proposal for installing any vapor barriers, vent systems or other engineered controls. This proposal should include: detailed description of the system and how it will serve to protect human health, location, and any other details necessary to present the proposal.
- A monitoring plan describing:
  - Type(s) and method(s) of monitoring that will take place during the response actions. Description of screening/sampling methods and equipment, including sampling locations, sampling frequency and analytical parameters.
  - Confirmation sampling: estimated number and locations, and description of methods and procedures.
  - Follow-up monitoring: detailed description of the operation and maintenance of the monitoring system; description of the monitoring methods, procedures and equipment; description of the monitoring locations and analytical parameters.

F. Contingency Plan *(Note: significant changes to the RAP not covered by the Contingency Plan require prior approval by the MPCA):*

- Steps that will be taken if monitoring limits are exceeded or unexpected conditions, wastes or contaminated media are encountered.
- A list of MPCA, county and city staff that will be contacted in the event the contingency plans need to be carried out, or there is unexpected public interest or concern about site activities.

G. Appendices

- Copy of entire Phase I Report
- Copy of entire Phase II Report, if completed
- Copy of Site Investigation Report and/or Excavation Report, if completed
- Investigation and Cleanup Program

V. RAP Implementation Report

Following the completion of the response actions at the site, a RAP Implementation Report must be prepared and submitted to the Petroleum Brownfields staff. This report should be submitted within six months of the date of the RAP Approval Letter. If the development has not been completed by that time, a status report updating the Petroleum Brownfields staff is required. In most cases where properties require long-term monitoring, the site will be referred to the Petroleum Remediation Program for continued management. Upon MPCA approval of the RAP Implementation Report, a RAP Completion letter will be issued. If the implemented response actions resulted in a petroleum tank release site being eligible for closure in accordance with Petroleum Remediation Program guidelines, a Petroleum Tank Release Site File Closure Letter will also be issued.

RAP Implementation Report Contents: Detailed below are the necessary components of a RAP Implementation Report.

A. Introduction, *including:*

- MPCA site identification number
- Property name and address
- Brief summary of the scope and goals of the response actions
- Brief summary of any systems (vapor barrier, vent system, etc.) installed

B. Discussion, *including:*

- Detailed description of, and rationale for, any modifications to the approved response actions made during implementation of the RAP
- Locations and levels of contamination remaining

C. Conclusions/Recommendations, *including:*

- Statement about whether the RAP tasks were completed
- Recommendation (in accordance with Petroleum Remediation Program policy) to either close the MPCA site file, or conduct additional monitoring or remediation
- Recommendations for permanently sealing monitoring and water wells
- Recommendations for post-*remedial* monitoring

D. Figures, *including:*

- Map documenting source area(s) and the extent of excavation(s)
- Map indicating the area of influence of vent systems
- Map showing all confirmation data indicating the sampling locations and detected parameters with concentrations
- Map indicating location(s) of on-site re-use areas

Tables:

- Soil screening data including: location, depth, background level, concentration
- Soil confirmation data including: location, depth, parameter, concentration
- Ground water analytical data (if applicable) including: location, depth, parameter, concentration
- Surface water analytical data (if applicable) including: location, parameter, concentration
- Air monitoring data (if applicable) including: location, background level, concentration

Appendices:

- Manifests for soil disposal
- Boring logs
- Well logs and construction forms
- Minnesota Department of Health well logs and abandonment forms
- Analytical reports

VII. Definitions

Investigation Report: The Petroleum Remediation Program's Guidance Document 4-06 *Investigation Report Form*.

Petroleum Remediation Program: The MPCA program that oversees investigations and cleanups at petroleum tank release sites.

Phase I: A review of the history of a site's ownership, physical features and potential sources of contamination, as well the past and present operations conducted at the property. Also, the report summarizing the findings of the review.

Phase II: On-site investigation conducted to determine if potential contaminant sources are causing an actual release of contaminants to soil, surface water and/or ground water. Also, the report summarizing the findings of the investigation.

Response Actions: Actions taken during property development to address and mitigate the impacts of petroleum contaminated soil, ground water and surface water on human health.

Site Investigation: For purposes of this document, this is a Limited Site Investigation or Remedial Investigation conducted in accordance with the Petroleum Remediation Program's Guidance Document 1-01 *Petroleum Remediation Program General Policy* and other applicable guidance documents.

Thin Spread: For purposes of this document, this is the spreading of contaminated soil on the ground at a maximum thickness of two inches.

Vapor Barrier: A material with a high resistance to vapor movement, used to control condensation or prevent migration of moisture. Can be used to prevent the migration of vapor through walls and floors into buildings.

Vent System: A continuous open passageway to the outside atmosphere for the purpose of removing vapors and gases from structures.

Appendix B

Minnesota Pollution Control Agency Voluntary Investigation and Cleanup

Guidance Document #9

Voluntary Investigation and Cleanup Program Guidance for Investigating and Remediating Asbestos Containing Waste Materials

1.0 Purpose and Introduction

This guidance document summarizes MPCA Voluntary Investigation and Cleanup (VIC) Program requirements associated with investigation and remediation of sites with buried asbestos containing waste materials. Asbestos containing materials are a common waste product encountered at former dumps and within fill at VIC Sites and must be handled in accordance with the appropriate federal and state regulations. The scope of VIC Projects includes threatened or known releases to the environment under the Minnesota Environmental Release and Liability Act (MERLA), and includes releases or threatened releases of buried asbestos containing materials. This guidance is designed to supplement the MPCA VIC Fact Sheet "Asbestos Containing Waste Materials at VIC Sites," the MPCA's Superfund Section's Risk Based Site Evaluation Guidance, other MPCA VIC Guidance Documents pertaining to site investigations and remediation, and the guidance provided through the MPCA's Asbestos Compliance Program (Asbestos Program). This guidance emphasizes the VIC Program's and the Asbestos Program's coordinated role in ensuring that the appropriate regulations are followed, public health and safety are protected, and long term environmental risks are properly managed. Asbestos abatement from buildings and building demolition activities are not within the scope of VIC projects and the MPCA Asbestos Program staff should be contacted for questions related to these activities (see contact information at the end of this document).

2.0 Asbestos Occurrence and Hazards

2.1 Types and Uses of Asbestos Containing Material

Asbestos is a common hazardous substance encountered at abandoned dumps and in fill material. The term "dump" refers broadly to buried mixed municipal waste, refuse and demolition wastes. Abandoned dumps will be discussed in more detail in the soon to be revised VIC Guidance Document #19. Asbestos is a naturally occurring substance comprised of separable fibers and occurs in two different forms as part of two mineral groups– serpentine and amphibole. The U.S. Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) recognize six asbestos minerals: chrysotile (the type of serpentine mineral with long and flexible fibers); and five amphibole minerals (with relatively short brittle fibers), which are actinolite, tremolite, anthophyllite, crocidolite, and amosite asbestos.

Asbestos has been used extensively in industry due to its durability, ability to be woven, and heat resistant properties. The term "Asbestos Containing Material" (ACM) refers to materials that contain at least 1% asbestos. ACM may be found in a variety of building materials including: floor and ceiling tile, floor tile mastic, pipe insulation, adhesives, gaskets, roofing materials, friction products (automobile parts, i.e. in clutches, brakes and transmissions), asbestos cement products (i.e. transite), corrugated ACM paper (referred to sometimes as "air cell"), duct wrap,

and vermiculite (used in insulation and as a soil amendment). Thermal System Insulation (TSI) includes the broad class of friable ACM products applied to pipes, fittings, boilers, tanks, ducts or other structural components to prevent heat loss or gain (sometimes referred to as "mag"). Transite is the name for ACM cement boards and pipes and is typically gray, dense, and easily broken. Chrysotile makes up 90% to 95% of all asbestos used in building materials in the U.S, although the percentage of amphibole asbestos minerals may be high in some ACM. Frequently used definitions pertaining to ACM include the following:

Asbestos Containing Waste Material (ACWM) – generally refers to ACM that is no longer in use but rather occurs as waste products and typically is encountered in subsurface fill at remediation Sites. Buried ACM is more typically referred to as ACWM.

Category I Nonfriable ACM – includes asbestos-containing packing, gaskets, resilient floor covering, and asphalt roofing products containing more than 1 percent asbestos that cannot be crumbled to powder by hand pressure. Category I ACM is considered pliable rather than brittle, breaks by tearing rather than fracturing, and does not easily release asbestos fibers upon breaking.

Category II Nonfriable ACM – refers to any material, excluding Category I nonfriable ACM, containing more than 1 percent asbestos that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Transite is an example of Category II ACM. Category II ACM is not pliable, breaks by fracturing rather than tearing, and does release some asbestos fibers upon breaking.

Friable ACM – refers to ACM that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure. Nonfriable materials may become friable during grinding, cutting, burning, crushing, and similar operations, including some types of building demolition which may generate and release asbestos fibers.

Nonfriable Asbestos Containing Material – refers to ACM that, when dry, cannot be crumbled, pulverized, or reduced to powder by hand pressure. Nonfriable asbestos may be either Category I or Category II ACM.

Regulated Asbestos-Containing Material (RACM) – refers to (a) Friable ACM, (b) Category I ACM that has become friable, (c) Category I ACM that will be or has been subjected to sanding, grinding, cutting, or abrading, or (d) Category II ACM that has a high probability of becoming or has become crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or facility renovation.

2.2 Health Risks Associated With Asbestos

The health risks associated with asbestos result from the inhalation of microscopic asbestos fibers that become airborne due to the disturbance of ACM. Asbestos is a recognized human carcinogen and its exposure can lead to lung cancer and mesothelioma, which is cancer of the pleural membrane of the lung. No known safe level of exposure to asbestos fibers is known.

Asbestosis is a disease caused by scarring of the lung tissue due to inhalation of asbestos fibers. Although less common, medical evidence suggests that ingesting asbestos may result in cancers of the esophagus, larynx, oral cavity, stomach, colon and kidney.

2.3 Asbestos Air Standards

Due to the ability of asbestos fibers to be transported easily in air, fibers are found in ambient air at concentrations ranging from 0.00001 to 0.0001 fibers per milliliter (fiber/mL). OSHA has set a time weighted average (TWA) permissible exposure limit for working conditions at 0.1 fibers per cubic centimeter (f/cc or f/mL) averaged over a 30 minute period. The Minnesota Department of Health (MDH) has set the Clean Indoor Air Standard for Minnesota at 0.01 f/cc. Although these standards apply to working conditions, they may be also be used as a guide in the evaluation of asbestos air emissions during air monitoring at remediation sites. Neither the MPCA nor the U.S. EPA has, however, specified an acceptable exposure or ambient air standard for asbestos.

2.4 Asbestos Detection Methods

The most accurate method to detect asbestos and estimate concentrations that may become airborne typically combines the use of polarizing light microscopy (PLM), electron microscopy, and energy dispersive X-ray analysis. PLM also is the recommended detection method specified in the federal regulations for abandoned waste sites (see Section 3). Although transmission electron microscopy (TEM) is extensively used in research to identify smaller concentrations of asbestos fibers, it is not currently in widespread use or required for use in soil and air sampling at remediation sites.

2.5 Buried Asbestos Containing Materials

Asbestos Containing Waste Material (ACWM) is waste ACM that has been removed from buildings and is commonly encountered within demolition materials buried as part of former abandoned dumps or within fill. Abandoned dumps may be identified as part of routine Phase I Investigations, although in many cases buried ACWM is associated with smaller undocumented dumping areas or granular fill containing ACWM rather than large former municipal dumps. Many properties in urban areas were constructed and graded several decades ago using imported fill from undocumented sources. Such fill may contain varying amounts of debris and ACWM.

Demolition debris and other solid waste encountered in dumps or fill are also considered as solid waste that has been improperly disposed of, whether ACWM is present or not. Voluntary parties and their consultants need to investigate such sites carefully, following both VIC and Asbestos Program requirements, to avoid exacerbating site hazards and regulatory enforcement.

3.0 Regulatory Background

3.1 Federal NESHAP Standard

A property on which the disturbance and excavation of ACWM takes place is strictly regulated through National Emission Standards for Hazardous Air Pollutants (NESHAP), as codified in Title 40 Code of Federal Regulations Part 61. NESHAP was established in accordance with Section 112 of the Clean Air Act, which required the U.S. EPA to develop and enforce regulations to protect the general public from exposure to airborne contaminants that are known to be hazardous to human health. These regulations were first developed in 1973 and subsequently, have been amended several times.

The purpose of NESHAP is to protect the public health by minimizing the release of asbestos when facilities that contain ACM are demolished or renovated. The MPCA considers a property that has buried ACWM incorporated as part fill or debris as an Inactive Waste Disposal Site under NESHAP. Disturbance or excavation of buried ACWM at Inactive Waste Disposal Sites is considered a renovation under NESHAP. In addition, historically approved disposal sites that have not accepted ACWM within the past year and unpermitted dumps containing ACM are considered an Inactive Waste Disposal Site.

The Federal NESHAP standards are adopted by reference into Minnesota Rules in Minnesota Rules, part 7011.9920. The MPCA Asbestos Program is the delegated authority in Minnesota to enforce federal NESHAP regulations. The method specified in NESHAP for asbestos detection (Appendix E, subpart E, 40 CFR part 763, section 1) is PLM.

3.2 Regulated Nature of ACWM

All buried ACWM at VIC Sites is considered by the MPCA to be Regulated Asbestos Containing Material (RACM). RACM includes ACM that may have been used within buildings as non-friable Category I or Category II ACM but has now been incorporated into waste or fill and buried. Whether asbestos was friable or nonfriable, waste ACM may have been crumbled, abraded, pulverized, or powdered by the original demolition activities or through the act of dumping or burial. Once ACWM is identified within debris, all ACM and impacted demolition debris or solid waste materials are regarded as RACM and regulated by the NESHAP.

NESHAP requires that if RACM is removed from an Inactive Waste Disposal Site, the removal must be conducted by a licensed asbestos abatement contractor using an MPCA-approved Emissions Control Plan. The MPCA Asbestos Program must review and approve, in advance, any Emission Control Plans prepared to fulfill NESHAP requirements for proposed activities at VIC Sites. Further guidance related to the Emission Control Plan requirement is provided in Sections 4 and 5 in this document.

3.3 Other Applicable Regulations Pertaining to ACWM

Asbestos work is regulated by several state programs to ensure that the public is protected. Asbestos associated with subsurface soils through past disposal or filling is considered to be a

hazardous substance under the Minnesota Environmental Response and Liability Act (MERLA). Proper management and handling of ACWM during site work is required in order to remain eligible for MPCA VIC Program assurances under MERLA.

The MPCA Asbestos Program has prepared the "Asbestos Guidance on Excavation Projects," dated July 1999, which must be followed if a site contains RACM and is considered to be an Inactive Waste Disposal Site under the NESHAP. Prior to a renovation or demolition, all buildings must be evaluated by an asbestos inspector certified by the Minnesota Department of Health (MDH) under the Asbestos Hazardous Emergency Response Act (AHERA). Parties are required to submit the completed "Notification of Intent To Perform A Demolition" form to the MPCA Asbestos Program staff a minimum of 10 working days prior to conducting a building demolition. Asbestos monitoring and sampling conducted at sites regulated under the NESHAP must be conducted by an MDH/AHERA-certified asbestos inspector (Asbestos Inspector). Remedial excavation or reconsolidation activities of suspect ACWM must be conducted by a MDH/AHERA-licensed asbestos contractor (Asbestos Contractor).

The Asbestos Unit of the Division of Environmental Health at the MDH specifies work practices to identify and manage asbestos, and to safely remove, encapsulate, or enclose asbestos-containing materials. MDH is responsible for the licensing of asbestos contractors and the certification of asbestos workers, site supervisors, inspectors, management planners, and project designers to ensure that properly trained personnel perform asbestos work or management. The "Notifications of Asbestos Air Monitoring" within structures must be provided to the MDH Asbestos Unit at least 5 calendar days prior to beginning a project. The "Notification of Asbestos Related Work" must be provided to both the MDH and the Asbestos Coordinator of the MPCA within 10 working days of the beginning of work.

County and city environmental departments may have additional regulations or ordinances pertaining to asbestos or solid waste. Parties conducting response actions are responsible for contacting the appropriate county and city representatives before initiating a remediation project involving asbestos or solid waste to determine whether additional requirements exist.

The Minnesota Department of Labor and Industry is responsible for administering the federal OSHA requirements to protect workers from asbestos exposure. The OSHA Construction Standard for Asbestos is 29 CFR 1926.1101.

U.S. EPA's Worker Protection Rule, 40 CFR 763, Subpart G, extended the OSHA standard to state and local employees who perform asbestos work and who are not covered by the OSHA Asbestos Standards, or by a state OSHA plan. The OSHA Standard is incorporated by reference. People who plan to renovate or remove asbestos from a building of a certain size, or who plan to demolish any building, are required to notify the appropriate federal, state and local agencies, and to follow all federal, state, and local requirements for removal and disposal of RACM.

4.0 Investigating VIC Sites With Suspected ACWM

4.1 Phase I Investigations

A Phase I Investigation is required for most sites for which technical assistance is sought and is an explicit requirement if the voluntary party is pursuing a No Action Determination or a Certificate of Completion. The purpose of a Phase I Investigation is to determine, whether, based upon a physical site survey and research of available historical documents and environmental databases, the site may have been the subject of a release or threatened release of a hazardous substance, pollutant, or contaminant. The Phase I Investigation also determines the types of additional inquiry that should be included in the Phase II Investigation Work Plan. The Voluntary Party is requested to refer to VIC Guidance Document #8, for guidance on preparation of Phase I Investigations.

Particularly useful resources for accessing the potential of ACWM at properties include: aerial photographs that may identify past dumping activities; evidence of historic areas of lower topography which may have been filled; areas of higher topography that may contain excess fill; city directories describing past businesses; insurance maps documenting past building and property details; documentation of past on-site building demolition; facility inspection reports; and interviews with former employees. The historical practice of demolishing buildings and burying most of the materials in-place is one of the most common sources of buried ACWM. Old utility lines made of transite or wrapped with asbestos material may be indicated on old city records, building plans or fire insurance maps. Records of buried dumps or fill material on a property also are common indications that asbestos may be present.

4.2 Phase II Investigations

Properties where buried ACWM is suspected should undergo a thorough Phase II Investigation to determine the nature, type and distribution of the ACWM present in the subsurface, and whether the ACWM will be disturbed or left on-site. Phase II Investigations should be conducted in accordance with an MPCA approved Phase II Investigation Work Plan. The MPCA VIC Program staff will consider all properties that contain fill with debris or refuse, even at low percentages, to have the potential for ACWM to be encountered or present in the subsurface. For such suspect properties, a Phase II Investigation should be designed and conducted to determine the amount, type and distribution of the debris at the site and the presence of pollutants, contaminants or hazardous substances, including ACWM. To appropriately evaluate debris and ACWM, test pits or test trenches should be conducted rather than or in addition to the use of soil borings to delineate the lateral and vertical extent of fill impacted by debris (including ACWM). The number of test pits/trenches required will vary depending on the aerial extent of the fill, the thickness, and the heterogeneity of the type of debris and distribution of ACWM. It is important that a sufficient number of exploratory test pits/trenches and sampling be conducted to characterize and document the variety and distribution of waste through the aerial and vertical extent of the fill.

The Phase II Investigation Work Plan should take into account the nature of the proposed property use or redevelopment plans, and the remedial objectives and closure requirements. If the involved parties do not desire to use institutional controls to manage residual contamination on-site, then the investigation must be designed to ensure that the full extent of the on-site waste is determined and fully characterized. The location of proposed green spaces, paving areas, building footprints, and the type of access future workers and the public will have to the site represent information that better describes potential exposure scenarios, which, if known, can assist in focusing the Phase II Investigation.

If ACWM is suspected at a site but has not yet been confirmed and soils are proposed to be disturbed and temporarily excavated through the use of test pits, test trenches, or surface grading activities, an Asbestos Inspector must be involved in the project to inspect the site wastes for the presence of ACWM. If suspect ACWM is identified, the Asbestos Inspector must collect samples of the waste or suspect soils to confirm the presence, the type and the amount of asbestos present in the materials. The MPCA VIC staff also may require representative samples of soil or debris associated with suspect ACWM to be collected and analyzed. Soil associated with identified or suspect ACWM must also be treated as if it contains ACWM, and the Asbestos Inspector should evaluate such soils visually. If friable asbestos has been identified, the Asbestos Inspector should also collect and analyze soil samples.

A Phase II Investigation Work Plan must include a Contingency Plan, if test pits, test trenches or other exploratory excavations are proposed and the potential to encounter ACWM exists. In general, the greater the likelihood of encountering ACWM during an investigation, the more likely the MPCA VIC Program shall require that an Emissions Control Plan be submitted and approved in advance as part of the Phase II Investigation Work Plan (see Section 5.2). In the event ACWM is encountered during investigatory excavation activities and no appropriate contingencies have been approved in advance by the MPCA, excavation activities should cease and the MPCA VIC Project and Asbestos Program staff should be contacted as soon as possible to determine the appropriate waste management procedures. Once ACWM is confirmed, the property and all subsequent excavation activities are regulated under NESHAP as an Inactive Waste Disposal Site and must follow the appropriate regulations.

Soil and debris temporarily excavated from test trenches and pits may be stockpiled and covered adjacent to the excavation during Phase II Investigations if conducted in accordance with an approved work plan and the oversight of an environmental consultant and an Asbestos Inspector. Response actions involving excavation of soil and debris for off-site disposal or on-site reconfiguration, however, may be conducted only under the direction of an Asbestos Contractor.

Exploratory excavations conducted during Phase II Investigations without a certified Asbestos Contractor should: a) be approved in advanced by the MPCA; b) be conducted only if appropriate wetting procedures are proposed and implemented; c) replace and cover all excavated wastes back in the excavation during the same working day; and d) ensure all temporary stockpiles are placed on and are covered with plastic during the excavation activities. If wastes excavated are of limited volume, localized and can be easily disposed, the MPCA VIC or Asbestos Program staff may require that an Asbestos Contractor be involved and that the wastes not be replaced in the excavation, but be properly disposed.

5.0 Requirements for Excavation or Disturbance of ACWM

5.1 Excavation Requirements based on the NESHAP

The Asbestos Program at the MPCA has prepared the "Asbestos Guidance on Excavation Projects" (NESHAP Guidance) to summarize the requirements which must be followed when ACWM is excavated at Inactive Waste Disposal Sites. The Asbestos and VIC Program strongly encourage the party to utilize qualified environmental consultants and technicians to ensure that appropriate regulations are followed and hazardous emissions are prevented during site investigation and remediation activities.

The VIC Program strongly encourages environmental consultants to closely coordinate with the Asbestos Program staff to ensure that the NESHAP is appropriately followed. A summary of these requirements is briefly outlined below:

- A "Notification of Asbestos Related Work" (Notice) must be completed and submitted to the Asbestos Program within 10 working days of initiating the project. The advance notice may be waived, if RACM unexpectedly is encountered during an excavation in progress.
- An Emission Control Plan (ECP) must be prepared and submitted to the Asbestos Program for review and approval pursuant to 40 CFR 61.145. The minimum requirements for an ECP are summarized in Section 6.0.
- The area of proposed asbestos excavation must be secured and clearly marked by asbestos warning signs that are visible at all entrances and exits to the area.
- RACM must be adequately wetted to minimize emissions during excavations and loaded into trucks or containers lined and covered by polyethylene. If excess water is generated due to the required wetting of the soil, ensure that wastes transported off-site to the landfill do not contain any free liquids. The shipments must be properly manifested and must contain a waste generator label and warning signs.
- Stockpiling of ACWM impacted soils should be done on-site and within the zone of contamination.
- If ACWM is present at the surface, trucks/excavation equipment must be decontaminated prior to leaving the zone of contamination or clean granular fill must be placed over the area.
- Off-site disposal of RACM is only allowed at approved landfills that are permitted by the MPCA to accept RACM as part of their Solid Waste Management Plan.
- The excavated area of the site must be visually inspected by an Asbestos Inspector. Inspection frequency, though at the discretion of the Inspector, should be sufficiently frequent to thoroughly inspect the excavation area and the materials excavated.

An Asbestos Contractor should be retained and be present for on-site coordination of all excavation activities where ACWM is known to exist or is suspect. If excavation activities are being conducted through use of an MPCA approved Contingency Plan the Asbestos Contractor may not be required to be on-site during excavation activities at locations where Phase II

Investigation results indicate that ACWM is not present. The Asbestos Contractor, must, however, be on call to respond to observations of an on-site Asbestos Inspector.

Excavating ACWM without the use of an approved ECP, contrary to an approved ECP, or without oversight from an Asbestos Contractor may be considered to be a significant violation of NESHAP and MPCA requirements and may lead to enforcement actions and the levying of fines.

5.2 Emissions Control Plan Requirements

An ECP must be prepared and approved by the MPCA Asbestos Program staff before RACM can be excavated from an Inactive Waste Disposal Site. The regulated party may provide this ECP directly to the Asbestos Program staff for review or may coordinate this review through the VIC Project staff. Approved ECPs utilized at a VIC Project form an integral component of the project's work plan or response action plan.

Many ECPs have very similar formats and content, however, each ECP will require site specific project details. Every ECP must, at a minimum, include the following:

Project and Site Description
Include a detailed description of the project with the name of project, the address, a site location map, an estimate of the amount of RACM present at the site and the amount of RACM to be excavated. The site map should have an accurate scale and include a location map of the area impacted by RACM and the area proposed to be excavated or disturbed. The project description should briefly describe the nature of the project (emergency response action, redevelopment proposed, utility work, etc.) and the proposed schedule, including the proposed start date. Indicate in this section when the "Notification of Asbestos-Related Work" was or will be submitted to the MPCA Asbestos Compliance Program staff. General site information should describe the slope of the site surface, the site's lateral proximity to surface water, the vertical depth to ground water, and a description of on-site and surrounding land use and potential receptors.

Description of the Waste/RACM
Provide a narrative description of the type of RACM and other waste to be encountered, including representative test pit/trench or soil boring logs. Include information regarding any other known or suspected contamination associated with the waste/RACM and/or other risk factors (i.e. volatile vapors, methane gas, heavy metals, etc.) and how these issues are being addressed as part of the project.

Project Contacts Information
List names, contact information, and responsibilities for the site owner, the site project manager, the licensed asbestos inspectors and contractors, and the disposal facility involved in the project. Also, provide a list of regulatory contacts (i.e. VIC staff, Asbestos Program staff, as well as city, county, and MDH staff, if applicable) associated with the site.

Site Security
Describe the required signs that will be used to demarcate the area contaminated by RACM. Discuss how site security will be established, so that access to the site will be restricted to authorized personnel during excavation activities and when RACM is potentially accessible or exposed.

Emission Control Procedures
Provide a detailed description of the type of emission control procedures to be utilized during all phases of the work or when site conditions may generate emissions. Such conditions include the following: a) RACM is exposed at the surface; b) digging of test pits or test trenches; c) active excavation activities or site grading of soils containing RACM; d) loading of RACM into containers or trucks; and e) removal of RACM from trucks for disposal at a permitted landfill. This section must include the wetting practices that will be used to minimize emissions.

Excavation/Removal Activities
Discuss the portion of the site, upon which excavation or removal activities will take place. Describe the methods and type of equipment to be used during excavation and loading activities and how such equipment will be decontaminated. Trucks and equipment must be decontaminated prior to leaving the zone of contamination.

Air Monitoring
Describe the type of air monitoring proposed for the project and list the personnel conducting this work.

Containerization/Transport
Describe the type of containers to be used for storage and for transport of RACM off-site to an approved disposal facility. The ECP should describe the type of signs the transport trucks shall display during loading/unloading of the RACM. In addition, the container must be lined with plastic and covered during transport.

Description of Residual RACM/Waste
Provide detailed information regarding the type, amount and location of any and all RACM proposed to be left on-site, any vertical buffers proposed, and the type of institutional controls (such as restrictive covenants or an affidavit) proposed to document and/or restrict access to this material.

Transport/Disposal Information
Provide the name, address and contact information for the transportation contractor and the landfill or other disposal facility accepting the RACM and the type of manifests utilized during the transport.

Other Project Specific Details
The requirements provided above are not meant to be exhaustive, but should form the core component of every ECP. Other information, that should be provided, if pertinent, includes identified community concerns, other known site hazards, or any other factors that the Asbestos Program or VIC staff should be aware of prior to initiation of the project.

5.3 Perimeter Air Monitoring Requirements

Air monitoring of ambient air along the perimeter of sites or work areas may be required, if the project activities have the potential for generating fugitive dust containing asbestos fibers. Such activities may include Phase II Investigations involving the digging of test pits, site grading activities, and excavation of suspect ACWM as part of response actions. The use of a properly designed ECP should minimize or prevent the emission of asbestos fibers from excavation projects dealing with ACWM. Depending on the volume of materials disturbed or the nature of the waste, the MPCA may require perimeter air monitoring for asbestos, which would consist of collecting potential fibers on a filter and analyzing the fibers with PLM. In such cases, air monitoring plans will be a required component of the RAP.

6.0 Cleanup Requirements for Sites with ACWM

A Response Action Plan (RAP) must be prepared and submitted to the MPCA for review and approval prior to conducting ACWM excavation activities that involve off-site disposal or on-site reconsolidation or reburial of ACWM waste. A RAP is a detailed report specifying remedial objectives, how the objectives will be achieved, and remedial design specifications. The detailed elements of the remedial design may be submitted separate from a more conceptual RAP; however, an approved RAP is required prior to initiating remedial actions at VIC Sites.

If a RAP is required and implemented, a RAP Implementation Report or documentation report must be submitted and approved in order for the VIC Program to issue either a No Action Determination or a Certificate of Completion. Refer to VIC Guidance Document #18 for future guidance pertaining to preparation of a RAP and a RAP Implementation Report. If ACWM excavation and disturbance is a component of the remedial actions, the approved ECP will be considered a component of the RAP and should be appended to the RAP. A Focused Feasibility Study (FFS) should be completed as an interim step, prior to developing a RAP, particularly at complex sites or when several potentially acceptable remedial options are available.

Contingency Plans are required as a component of the RAP, if site redevelopment or excavation activities have the potential to encounter ACWM. The Contingency Plan should clearly indicate under what conditions the ECP is to be utilized. The ECP will address emission control requirements; however, the RAP must describe measures that will be taken to segregate, stockpile and properly characterize suspect materials that may contain asbestos, other contaminated soil, suspect debris or other hazardous materials. Compliance with a Contingency Plan should allow construction to continue while suspect materials are characterized.

6.1 Overview of Cleanup Alternatives

The best alternative for remediation of an abandoned dump, when financially and technically feasible, is to dig up the dump or refuse materials and dispose of the waste in a permitted landfill. Due to the expense and potential risks of excavating large volumes of impacted refuse, risk-based site closures that involve leaving ACWM on-site may be more practicable. Generally there are two types of cleanups that are conducted at properties with ACWM: a) complete removal of the asbestos materials with disposal at an approved landfill; and b) risk-based closure in which

residual ACWM is left on-site in the subsurface and long term management and risks are largely addressed through the combined use of engineering controls, institutional controls, and a Contingency Plan. For Sites with smaller volumes of localized ACWM whose lateral and vertical extent can be determined a complete removal may be the preferred option. For such removal actions the Asbestos Inspector should inspect the excavation and collect soil samples for analysis to document that no asbestos fibers remain in the soil.

6.2 Risk-Based Closures at Sites Containing ACWM

It may not be practicable for all ACWM to be excavated and removed from all sites, especially at sites containing large volumes of waste or on which ACWM is very deeply buried. The VIC Program may allow some or all ACWM to remain on-site if appropriate vertical separation distances and institutional controls are utilized. Residual ACWM waste remaining at a site must be managed in a manner consistent with the "Guidance on Incorporation of Planned Property Use into Site Decisions" (Property Use Guidance), which forms part of the MPCA's Risk Based Site Evaluation (RBSE) Manual. The two principal requirements are the use of institutional controls and the appropriate use of vertical separation distances between the surface soils and the buried waste. Other considerations that are discussed below are recommendations on the physical segregation of wastes, mechanical sorting of debris that may contain ACWM, reconfiguring and reuse of wastes, and long term maintenance requirements at sites where ACWM is suspect.

Institutional Controls
Minnesota Statute, § 115B.02, subd. 9a defines institutional controls as legally enforceable restrictions, conditions, or controls on the use of real property, ground water, or surface water located at or adjacent to a facility where response actions are taken. Institutional Controls include real property notification, affidavits, contractual agreements (including consent orders), easements, and environmental restrictive covenants.

The MPCA allows the use of institutional controls, in addition to treatment, containment, or removal of contaminants, as part of an overall site remedy. Institutional controls are intended to ensure that the response (cleanup) actions remain protective of public health and the environment. Institutional Controls document the presence of contamination at a particular parcel and provide notice through recording in official property records so that interested parties become aware of residual contamination and any accompanying property use conditions and restrictions. Institutional Controls may also include easements to ensure access to property for purposes such as maintaining response actions or long-term monitoring.

MPCA continues to prefer measures that reduce the need for use restrictions and long-term monitoring/maintenance activities. General guidance on the application of the institutional controls that are within MPCA's authority to require or seek is summarized in "Guidance on Incorporation of Planned Property Use Into Site Decisions" (Property Use Document) which is a component of the MPCA's Risk Based Site Evaluation Manual.

An acceptable site remedy, which incorporates long term management of buried ACWM, requires the use of institutional controls – either a Declaration of Restrictions and Covenants (Restrictive Covenant) or a Real Property Affidavit (Deed Notice). The type of institutional control required will depend upon the proposed land use and the volume, characteristics, and depth of burial of the

ACWM. If the remedial objectives at a site require unrestricted future use of the property (e.g. residential use) then long term management of buried ACWM will not be considered an acceptable remedy.

Vertical Separation Requirement
ACWM waste or impacted fill remaining on-site as part of remedial design must be buried an appropriate depth beneath the surface. This burial depth, or vertical separation distance, will depend upon the proposed land use for the site and on whether the waste materials are buried beneath an engineering control or not. An engineering control is a relatively impervious structure that is utilized as a component of a RAP to assist in restricting direct access to subsurface soils and reducing the potential for erosion of the cover. Common engineering controls include pavement, sidewalks, building footprints, and engineered caps. The soil within this vertical separation must not pose an unacceptable human health risk as determined by the RBSE Manual. The burial of ACWM waste allows the potential risks to be decreased to acceptable levels by an appropriate depth of burial and use of institutional controls and engineering controls. Minimum vertical separation distances considered appropriate for industrial and restricted commercial properties with little or no slope are as follows:

Beneath Green Space	4-feet
Beneath Paving and Sidewalks	2- to 4-feet
Beneath Building Floors	1- to 2-feet

The above vertical separation distances correspond to the approximate vertical intervals of the "accessible zone" as described in the Property Use Document. The accessible zone is considered the interval that is considered most likely to be accessed in the future. A range in distances is provided because what represents the "accessible zone" may vary between sites. If the ACWM is buried deep enough to be considered a remotely accessible depth (see Property Use Guidance), a Deed Notice and not a Restrictive Covenant possibly may be used as the institutional control.

Clean cover used for vertical separation in green space areas without any impervious engineered surfaces ideally should be well vegetated only by shallow rooting plants (i.e. grasses, shrubs). Exceptions to this recommendation may be considered, if the ACWM is buried deeper than four feet below the surface.

Reconfiguring Waste
The reconfiguration or reconsolidation of solid wastes and debris is sometimes appropriate as a remedial strategy in order to reduce the aerial footprint of waste or, under certain conditions, to relocate wastes to other portions of a site. If the wastes being reconfigured include potential ACWM, the activities will require the use of an Asbestos Contractor and an approved ECP and RAP. The MPCA VIC and Asbestos Programs may allow the reconfiguration of solid waste, if it takes place within the existing footprint of the buried on-site waste or debris, meets the appropriate vertical separation distance, includes placement of a Restrictive Covenant on the property deed, and does not violate other municipal or county requirements. Placement of solid waste outside the existing footprint of a dump is not an acceptable reconsolidation solution and is considered a violation of the Minnesota solid waste rules and may result in enforcement actions. As is the case with all solid wastes, no reconsolidation of ACWM is allowed within five feet of the water table or near surface water.

Reuse and Screening of Site Waste Materials or Fill
On-site fill contaminated with ACWM cannot be reutilized as controlled fill except under very limited conditions and only with the advance approval of the MPCA. It is never appropriate to use such fill or any fill with solid waste as off-site controlled fill. Solid waste within fill can be mechanically sorted and separated by use of a bar screen. The resulting waste-free fill may be usable as controlled engineered fill on-site or for limited off-site uses, such as road aggregate.

The mechanical screening of fill with debris is allowed under certain conditions as a means of reducing the volume of debris requiring off-site disposal at a landfill. If mechanical screening is conducted, it is recommended that a bar screen with a maximum one-inch opening be used. Solid waste and fill that does not pass through the screen must be handled or disposed of properly. Mechanical screening of fill containing ACWM is not acceptable, as no practicable means of controlling asbestos emissions exists in this case. Therefore, it is very important that fill be well characterized before any mechanical screening is attempted. In such cases, a Contingency Plan and ECP containing directives for ceasing screening activities if ACWM is identified in this material must be utilized during such screening activities.

If no ACWM is found during the mechanical screening of fill and debris, the screened granular fill may be left on-site, although it will need to be buried with appropriate vertical separation distances. The need for institutional controls to restrict or document such screened fill material will be evaluated by the MPCA VIC staff on a site by site basis.

Long Term O&M Requirements
Long term operation and maintenance requirements may not be necessary if the use of a Restrictive Covenant appropriately restricts access to subsurface wastes. However, if engineering controls are used to restrict or minimize access, operation and maintenance (O&M) of the engineering controls may be required (e.g. the maintenance of paving surfaces, building floors, vegetated surfaces, or engineered caps). Contingency Plans that serve as work plans in the event of site redevelopment activities or site disturbance in the future are sometimes appropriate and may be considered a type of long term O&M. In such cases, these plans are considered to be part of an ongoing response action and may require the use of a voluntary response action agreement in order for VIC assurances to be issued.

7.0 References and Resources

MPCA's Asbestos Program Web Site:
http://www.pca.state.mn.us/programs/asbestos_p.html

MPCA's Risk Based Site Evaluation Manual
http://www.pca.state.mn.us/cleanup/riskbasedoc.html

MPCA VIC Program Web Site:
http://www.pca.state.mn.us/cleanup/vic.html

MDH's Asbestos Program Web Site:
http://www.dehs.umn.edu/ihsd/asbestos/

- Asbestos Program Publications:
  - Guidance for the Removal, Transport, and Disposal of Category I Asbestos-Containing Materials," MPCA Air Quality/Asbestos Program/#4.04/December 2000;
  - "Asbestos Guidance on Excavation Projects," Air Quality/Asbestos Program/#4.03/July 1999;
- Asbestos Program/Asbestos Hotline: 651-297-8685
- MN Department of Health: 651-215-0900

Appendix C

If compositing of samples is conducted and grid sampling is used, each grid square should be divided into four sub-areas for composite sampling. The composite concentration can then be applied to the grid square. If composite sampling is conducted without a grid, assign the composite concentration to the centroid of the polygon formed by the individual sample locations (no more than four). Averaging of composite sample data is not acceptable, since the composite samples are already representative of a physical average of the sub-samples. For more information on this topic, please refer to Section 5 (Data Collection and Evaluation) of the MPCA *Risk-Based Evaluation for Soil - Human Health Pathway Guidance*..

Certain site-specific soil data are required for the assessment of human health risks. Parameters such as soil moisture and total organic carbon should be analyzed. See the MPCA *Risk-Based Evaluation for Soil - Human Health Pathway Guidance* for additional information.. All laboratory method detection limits should be low enough so data can be used for risk evaluation purposes. In order to be used to evaluate risk, the data should also be representative of potential exposure scenarios.

6.0 SURFACE WATER SAMPLING

(To be added at a later date)

7.0 SAMPLING FOR REMEDIATION VERIFICATION

7.1 Introduction

Information presented in this section is intended to guide the environmental professional in the recommended methods for verifying that soil contamination has been adequately remediated. Primarily, the minimum number and the location of required samples are addressed.

Verification sampling strategies for soil remediation depend on the type of remediation -- excavation or in-situ treatment. The minimum number of samples and sampling locations are different for each remediation type. While the minimum number of samples required is easily determined for both situations, determining the sampling locations is more complex and requires some professional judgment. The sampling strategies are outlined below.

Ex-situ remedies may be amenable to statistical sampling strategies or batch sampling. Any proposed sampling for ex-situ remedies should be developed on a site by site basis with the oversight of the MPCA project staff.

7.2 Excavations

Verifying that contaminated soil has been remediated by means of excavation requires samples from the excavation floors and sidewalls. The tables below provide the minimum number of samples necessary to verify cleanup for various sizes of excavations. Remediation verification is demonstrated by comparing the analytical results from each sampling point with the cleanup goals. If the cleanup goals are exceeded at any point, this verification methodology may require additional excavation at that point until the goals are met. Specifically, if less than ten samples are collected from either excavation floors or sidewalls, the calculated average concentrations will have very little meaning from a risk standpoint. In these situations, the appropriate risk/cleanup standards should be considered as numbers that are not to be exceeded in any sample.

A sampling strategy that uses bias to choose sample locations is recommended. This guidance document cannot dictate the exact locations for sample collection using this strategy. The location of the sample collection points relies on site specific information from the remedial investigation, analysis of the release or contaminant distribution and the soil types encountered in the excavation. Sampling and analyzing the soil samples from the locations most likely to have contaminants can minimize the number of samples needed to verify that remediation is complete. Since professional judgment and site specific knowledge are required for selecting sampling locations, the rationale used to select these locations must be well documented in the implementation report.

Analysis of data generated by prior investigations at the site should yield information for the verification analysis. The field personnel present during the remediation should be sufficiently familiar with the conditions on site to implement an appropriate verification sampling plan. Soil verification sampling should incorporate all pertinent biases of a site which may include, but are not limited to, the following:

- preferential pathways of contaminant migration
- source areas, stained soils, other site specific "clues" (e.g., fractures in clays)
- changes in soil characteristics (e.g., sand/clay interfaces)
- soil types and characteristics.

Compositing soil samples for verifying soil remediation may be acceptable for non-volatile parameters. Generally, when sampling for non-volatile parameters, each composite sample to be analyzed may be comprised of a maximum of four subsamples. However, please be aware that if contamination is indicated in a composited sample at levels above the cleanup goal, the entire area of the excavation comprising the composite sample may require additional excavation until the cleanup goals are met. Suspected contaminated areas discovered during verification sampling should not be sampled as part of a composite but should be sampled discretely.

The minimum required number of verification samples is determined by the subsequent tables. Confirmation sampling should generally be conducted on a grid.

7.2.1 Excavation Floor

The minimum acceptable number of floor samples to be analyzed is based on the area of the excavation floor as designated in Table 7A shown below.

Table 7A Excavation Floor Samples

Area of Floor (sq ft)	Number of Samples
<500	2
500-<1,000	3
1,000-<1,500	4
1,500-<2,500	5
2,500-<4,000	6
4,000-<6,000	7
6,000-<8,500	8
8,500-<10,890 (0.25 acres)	9
>10,890	Use Guidance Below

The following guidance is to be used when excavation floor areas exceed 10,890 square feet:

Floor Acreage	Square Feet	Grid Interval
0.25 - 3.0	10,890-130,680	15 - 30 Feet
3.0 and over	130,680 +	30 Feet plus

7.2.2 Excavation Sidewalls

Sidewall samples are required to verify that the horizontal extent of the soil contamination has been remediated. The number of sidewall samples shall be determined by Table 7B shown below. In no case is less than one sample on each sidewall acceptable. Known hot spots should be sampled separately. Once again, when sampling for non-volatile parameters, each sample to be analyzed may be comprised of four subsamples.

Table 7B Excavation Sidewall Samples

Area of Sidewall (sq ft)	Number of Samples
<500	4
500-1,000	5
1,000-1,500	6
1,500-2,000	7
2,000-3,000	8
3,000-4,000	9
>4,000	1 sample per 45 lineal feet of sidewall

When sampling the sidewalls of excavations that exceed five feet in depth, the sidewall sampling locations must be staggered in the vertical plane. This will ensure that lateral remediation has been adequate at all depths within the excavation.

7.3 Soil Stockpiles

Often times an excavation results in a contaminated soil stockpile that then needs to be treated (on- or off-site) or sent off-site for appropriate disposal. Sampling of the stockpile is necessary in order to characterize the contaminated or treated soil and to determine the appropriate final disposition. Landfills and the various types of treatment facilities (such as thermal treatment facilities or land farm sites) have permitted limits on the levels of contaminants they can accept. Sampling is necessary to ensure receiving facilities are operating within their permit limits. Additional samples beyond what is recommended here may be necessary based on each facility's specific permit requirements. TCLP and/or total analyses should be conducted for each type of contaminant suspected to be present. The detection limits for the total analyses should be determined based on the requirements of the receiving facilities permit, or on the cleanup level established for the site. The following table shall be used to determine the appropriate number of stockpile samples to be collected for analyses.

Table 7C Stockpile Samples

Cubic Yards of Soil in Pile	Number of Samples
0-500	1 per 100 cubic yards
501- 1000	1 per 250 cubic yards
1001 or more	1 per 500 cubic yards

If less than ten samples are collected from a stockpile, a calculated average concentration will have very little meaning from a risk standpoint. Therefore, in this type of situation, the appropriate risk/cleanup standards should be considered as numbers that are not to be exceeded in any sample. Compositing of stockpile samples is acceptable for the non-volatile parameters. Each sample may be comprised of four subsamples collected randomly from within the stockpile.

7.4 In-Situ Soil Remediation

When in-situ remedies are used, the effectiveness of the remedy must be verified by soil sampling. In these cases, three-dimensional sampling must be undertaken to verify that the soils have been adequately treated.

In instances of in-situ stabilization, the sampling should be conducted using a grid pattern with a vertical component added at each node. The number of samples collected for analyses should be determined using Tables 7A and 7B. The vertical extent of the remedy should be determined by compositing samples within each grid over 10 foot depth intervals extending to the bottom of the stabilization zone.

For in-situ treatment such as soil vapor extraction (SVE), the number of samples collected for analyses should be determined using Tables 7A and 7B, but should be biased toward the sampling points located remote from the SVE points. The vertical component must also be addressed and, therefore, the soil borings should be screened continuously using a PID, and any soils showing elevated organic vapors should be sampled. If no elevated PID readings are detected, discrete samples should be collected at 5 foot intervals over the depth of the treatment zone.

Compositing of remediation verification samples is acceptable for in-situ remediations for the non-volatile parameters. Each sample may be comprised of no more than 4 subsamples.

MINNESOTA POLLUTION CONTROL AGENCY
SITE REMEDIATION SECTION

DRAFT GUIDELINES
RISK BASED SITE CHARACTERIZATION AND SAMPLING GUIDANCE

WORKING DRAFT, September 16, 1998

Comment Period Ends December 31, 1998

Send Written Comments to:
Guidance Coordination Team
Minnesota Pollution Control Agency
Site Remediation Section
520 Lafayette Road
St. Paul, Minnesota 55155-4194
Fax (651) 296-9707

NOTICE

THIS DOCUMENT IS A WORKING DRAFT. The Site Remediation Section of MPCA is developing guidelines for evaluating risks to human health and the environment at sites that may require investigation or response actions pursuant to the Minnesota Environmental Response and Liability Act, Minn. Stat. § 115B.01 to 115B.24 (MERLA).

DEVELOPMENT OF A SITE REMEDIATION SECTION SITE EVALUATION MANUAL. The attached document and other documents will be incorporated into a Site Remediation Risk-Based Site Evaluation Manual which will contain guidelines for conducting MERLA-related evaluations, including risk evaluations under the State Superfund program and the MPCA Voluntary Investigation and Cleanup (VIC) Program.

MPCA staff intend to use the policies and procedures in the manual as guidelines to evaluate the need for investigation or remedial actions to address releases and threatened releases of hazardous substances or pollutants or contaminants under MERLA, and the scope and nature of such actions. These policies and procedures are not exclusive and do not have the force and effect of law. MPCA staff may use other policies or procedures to evaluate the need for or adequacy of response actions under MERLA, including procedures set forth in outstanding MPCA Requests for Response Action and Consent Orders. The final standard for all such evaluations is the MERLA statutory requirement that such actions must be reasonable and necessary to protect the public health and welfare and the environment.

The Minnesota state Superfund program, governed by the Minnesota Environmental Response and Liability Act (MERLA) and the supplementary rules, and the federal Superfund program, governed by the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the federal regulations in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), work together to clean up various types of sites.

~ Continued ~

Appendix D

Best Management Practices for the Off-Site Reuse of Unregulated Fill

Remediation Division

This document defines **unregulated fill** and provides guidance from the Minnesota Pollution Control Agency (MPCA) Remediation Division regarding Best Management Practices for its off-site reuse.

Off-site reuse of excess soil as fill or aggregate is a common practice at many development and road construction projects. If no known or potential sources of contamination are identified during environmental due diligence and subsequent field observations, then sampling of excess soil for laboratory analysis is not necessary. However, when excess soil originates from a site with known or potential sources of contamination, characterization of the soil is warranted prior to off-site reuse in order to ensure the protection of public health and the environment.

If contamination is detected in the soil, the unregulated fill criteria and best management practices described herein provide a framework for making good decisions about the off-site reuse of the soil. If the soil does not meet the criteria for unregulated fill, the soil should be managed or disposed of in accordance with applicable regulations.

Definition of unregulated fill

Unregulated fill, for the purpose of this guidance, is defined as excess soil in which a release of contaminants has been identified at concentrations less than the MPCA's most conservative risk-based values (see complete criteria on the next page). Thus, the identified contaminants in the fill are present at concentrations that are not of regulatory concern to the MPCA. Unregulated fill is not a solid waste.*

Exclusions

1. Some excess soil and other material generated at a redevelopment site is regulated as either solid or hazardous waste and must be managed according to applicable solid or hazardous waste laws, including:
   - Soil that is characteristically hazardous or contaminated due to a release of a listed hazardous waste, as defined in Minn. R. ch. 7045. Such soil must be managed in accordance with the requirements of the MPCA's Resource Conservation and Recovery Act (RCRA) program.
   - Waste material such as salvaged bituminous, crushed concrete, bricks, fly ash, etc. proposed to be reused as fill. The beneficial reuse of solid wastes is governed by Minn. R. 7035.2860. Information regarding the beneficial reuse of solid wastes can be found on the MPCA's website at http://www.pca.state.mn.us/waste/sw-utilization.html.
2. The management and reuse of dredged material may be regulated by permit or subject to other regulations. Information about the management of dredged materials can be found on the MPCA's website at http://www.pca.state.mn.us/water/dredgedmaterials.html.

**If sent to a permitted landfill for disposal, unregulated fill may be subject to a solid waste tax.*

Criteria for unregulated fill

Unregulated fill is excess soil that meets all of the following field screening and contaminant concentration criteria:

- free from solid waste, debris, asbestos-containing material, visual staining, and chemical odor
- organic vapors less than 10 parts per million, as measured by a photoionization detector (PID)
- for petroleum-impacted soil, less than 100 mg/kg diesel range organics (DRO)/gasoline range organics (GRO)
- for contaminants detected in soil, less than the MPCA's Residential Soil Reference Values (SRVs) and Tier 1 Soil Leaching Values (SLVs)*

**Naturally-occurring concentrations of some metals, such as arsenic, selenium, or copper, sometimes exceed the SRV or SLV. Such soils are not considered impacted in the absence of a contaminant source or other field or laboratory indications of contamination.*

A list of current SRVs can be found in the MPCA's Risk-Based Guidance for the Soil-Human Health Pathway. A list of current SLVs can be found in the Risk-Based Guidance for Evaluating the Soil Leaching Pathway. Both documents can be found at http://www.pca.state.mn.us/cleanup/riskbasedoc.html. For contaminants detected in soil that do not have established SRVs or SLVs, additional evaluation may be needed to determine whether the soil can be considered unregulated fill.

Some detections of DRO in soil may stem from the presence of natural organic material or non-petroleum contaminants in the soil, such as coal tars or other material containing polynuclear aromatic hydrocarbons (PAHs). Evaluation of DRO data should take into consideration the history of the property, including the known or likely presence of a petroleum source, the presence (or lack thereof) of other contaminants in the soil sample, and the type of soil. If positive DRO results are related to non-petroleum contaminants, risk-based criteria for the non-petroleum contaminants should be applied. If necessary, laboratory analytical methods are available to help determine if the DRO is from natural organic material in the soil.

Placement of unregulated fill

To avoid potential problems or public concern stemming from the placement of unregulated fill in sensitive settings, the MPCA recommends the following Best Management Practices:

- Avoid placing unregulated fill at schools, playgrounds, daycares, and residential properties. Unregulated fill is most suitable for use at industrial or commercial properties.
- Avoid placing unregulated fill in gardens where food for human/animal ingestion will be grown.
- Observe a minimum ten-foot separation distance between unregulated fill and the water table.
- Avoid placing unregulated fill where contaminants may be transported by run-off to lakes, rivers, wetlands, or streams.

Sampling decisions

Decisions of whether to sample soil for contamination prior to off-site reuse should be based on the history of the source area, the nature of the source material, the extent to which the soil has been previously characterized, and other factors that are part of a due diligence assessment of the environmental condition of the source property.

If the soil originates from a site where known or potential sources of contamination are present, samples of the soil should be collected for field screening and laboratory analyses. Examples of sites where environmental due diligence may reveal known or potential sources of contamination include sites where contamination was previously identified as a result of regulatory action or voluntary

investigation, previously developed sites (commercial, industrial, recreational, or residential), agricultural properties, or land that may have been subject to dumping, spills, or historic filling activities.

If no known or potential sources of contamination are identified during environmental due diligence and subsequent field observations, then sampling of excess soil for laboratory analyses is not necessary.

Sample type and frequency

When soil sampling is appropriate, the frequency and type of samples should be based on the potential sources of contamination, the depth, volume, and heterogeneity of the source material, and the availability of existing data. At a minimum, analytical parameters should include volatile organic compounds, PAHs, RCRA metals, DRO, and GRO. Other contaminants of concern should be included as appropriate, based on the history of the source location. Analytical data should be age-appropriate and representative of the source material.

Some soils even lightly impacted by heavy metals have the potential to leach at concentrations at or above the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit. As a rule-of-thumb, a TCLP analysis for RCRA metals should be conducted if the soil concentration of a metal is 20 times or greater the TCLP regulatory criteria.

A typical frequency for the field screening of potentially contaminated soil using a PID is one measurement for every ten cubic yards of soil. For analytical samples, the stockpile sampling guidance presented in Section 7.3 of the MPCA's Site Characterization and Sampling Document can be used as a frame of reference for the appropriate sampling frequency based on soil volume: http://www.pca.state.mn.us/cleanup/pubs/sitechar.pdf. Soil sampling guidelines for the Petroleum Remediation Program are presented in guidance Document 4-04: http://www.pca.state.mn.us/publications/c-prp4-04.pdf. Flexibility in the number of samples may be warranted, depending on the site-specific circumstances. Sound professional judgment, taking into account all of the factors discussed above, should be used when developing a sampling plan to determine whether excess soil meets the criteria for unregulated fill.

Implementation

All parties are encouraged to use the best management practices described herein in order to make good decisions about the off-site reuse of unregulated fill. It is the responsibility of the property owners and other parties engaged in development and construction activities to make sure that their activities include appropriate environmental due diligence and that excess soil and other materials generated by these activities are managed in an environmentally responsible manner.

Note that some local units of government, including Dakota County, may have local ordinances which restrict the off-site reuse of unregulated fill within their boundaries. Parties seeking to import unregulated fill should check with local regulators to determine if such ordinances are in effect in their project area.

Nothing in this guidance excuses anyone from compliance with any law, rule, or other legal obligation (including any environmental covenant) that applies to any development or construction activity, including the generation, management, transport, and reuse of excess soil.

For more information

Questions about the information presented above can be directed to the MPCA at 651-296-6300 or 1-800-657-3864.

Program management decision on regulated fill

Voluntary Investigation and Cleanup Program
Petroleum Brownfields Program
Solid Waste Program

Issue

Regulating the off-site reuse of certain contaminated soils generated during redevelopment activities at a Minnesota Pollution Control Agency (MPCA) brownfield site.

Decision

This Program Management Decision (PMD) allows the Voluntary Investigation and Cleanup (VIC) and Petroleum Brownfields (PB) programs to take the lead in providing regulatory oversight for the off-site reuse of "regulated fill," as defined below, and subject to the criteria established in this PMD.

Background

The MPCA has risk-based Soil Reference Values (SRVs) which provide a framework for evaluating risk to human health based on contaminant levels and type of property use. The MPCA's most conservative risk-based values, Residential SRVs, are applied at residential and recreational properties. At industrial and commercial properties, where human contact with soil is more limited, application of Industrial SRVs allows higher concentrations of soil contaminants to safely remain at the site. A developer may need to excavate large quantities of soil for geotechnical soil correction, changes in grade, or for the construction of basements, underground parking, or utility corridors. Often, this soil consists of fill that has concentrations of contaminants greater than Residential SRVs but less than Industrial SRVs. Such soil can be safely reused on other industrial/commercial properties that are enrolled in VIC or PB and require soil import to backfill an excavation or to achieve the necessary design grade.

Typically, for properties enrolled in an MPCA brownfield program, the VIC/PB programs have regulatory authority over the on-site management of contaminated soils. VIC/PB staff review historical information; existing site conditions; proposed land use; the type, concentration and distribution of contaminants; and proposed or in-place safeguards to ensure protection of human health and the environment. Through various approvals and assurances, VIC/PB staff has the ability to impose conditions, restrictions or affirmative obligations on property owners/developers. This combination of environmental review, familiarity with the planned property use, and ability to issue directives and positive incentives, makes VIC/PB staff well-positioned to provide regulatory oversight of off-site reuse of soil at VIC/PB sites.

Under this PMD, the VIC/PB programs will take the regulatory lead for regulated fill moving from one VIC/PB site to another VIC/PB site.

Rationale and benefits

- Soils with contamination remain under MPCA oversight to assure placement and conditions that protect public health and the environment.
- Regulatory oversight is streamlined by having one MPCA division rather than two involved in off-site soil-reuse decisions.
- Landfill space is conserved by avoiding disposal of soils that can be safely reused.
- Green space that would otherwise be mined for clean fill is preserved.
- Less fuel is consumed and fewer greenhouse gases are generated from transporting soils.
- Public and private money formerly spent on soil disposal or purchase of clean fill can be saved or used to jump-start other brownfield redevelopment projects.

Terms and conditions

The VIC/PB programs will create a category of "regulated fill" with input from the Solid Waste program. Regulated fill will have soil contaminants at concentrations greater than Residential SRVs, but less than or equal to, Industrial SRVs. The VIC/PB programs will provide regulatory oversight for the off-site reuse of regulated fill moving from one VIC/PB site to another VIC/PB site under a specific set of criteria including:

1. Both the generating and receiving site must be enrolled in the VIC and/or PB program and have an MPCA-approved Response Action Plan or Soil Management Plan which describes the terms and conditions of the export/import of regulated fill. Technical fill-placement decisions on the receiving site should be consistent with Minn. R. 7035.2825 subp. 2, "Location standards for permit-by-rule facilities". This part specifies that demolition debris land disposal facilities permitted by rule must not be located on a site with karst features, within wetland areas, within floodplain areas, within shoreland areas; or in locations with less than five feet of separation from the water table.
2. Case-by-case evaluation of regulated fill by VIC/PB staff will be done to ensure that risk to human health and the environment is acceptable and is not increased by the placement of regulated fill.
3. The receiving site must have a restricted commercial or industrial land use.
4. The soil contaminants at the receiving site must be similar to the contaminants of the regulated fill to be imported.
5. Appropriate institutional controls must be placed in accordance with standard VIC/PB policies.
6. A limited timeframe for final placement of the regulated fill must be imposed, and no temporary staging of regulated fill at a third location will be allowed.
7. Before submittal of the regulated fill application to MPCA, the property owner of the importing site will furnish a copy of the application to the local unit(s) of government. The local unit(s) of government will sign the notification confirming receipt of the information.
8. The receiving site must have a legitimate need for fill material, as documented by engineering plan sheets for the redevelopment project.
9. Violations of any of the conditions of approval will result in revocation of assurances and/or approvals. Removal of placed regulated fill may be required and/or formal enforcement action may be taken against the parties associated with the generating or receiving site.

Approval

I have reviewed this management decision and concur.

Signed: Kathryn J Sather

Date: 2/17/12

Kathryn Sather
Director, Remediation Division

Signed: David J. Benke

Date: 2/21/12

David Benke
Director, Resource Management and Assistance Division

Signed: John C. Stine

Date: 2/22/12

John Linc Stine
Deputy Commissioner

Appendix E

LEGEND

●	Denotes soil boring
AC	Denotes air conditioner
AGP	Denotes above ground pipe
AIS	Denotes advertising/info sign
BE	Denotes building entrance
BH	Denotes beehive catch basin
BTL	Denotes beaver tail curb
BWB	Denotes brick wall base
CB	Denotes catch basin
CBOX	Denotes control box
CBX	Denotes communication box
COL	Denotes building column
CWB	Denotes concrete wall base
CWT	Denotes concrete wall top
DG	Denotes drain grate
EB	Denotes electric box
EMH	Denotes electric manhole
FF	Denotes finished floor
FH	Denotes fire hookup
FP	Denotes flag pole
FW	Denotes face of walk
GM	Denotes gas meter
GP	Denotes guard post
GW	Denotes guy wire
HCPB	Denotes handicap push button
HCR	Denotes handicap ramp
HCS	Denotes handicap sign

LEGEND

HH	Denotes hand hole
HHC	Denotes communication hand hole
HHE	Denotes electic hand hole
HYD	Denotes fire hydrant
INV	Denotes structure invert
KWB	Denotes keystone wall base
KWT	Denotes keystone wall top
LA	Denotes landscaped area
LD	Denotes loading dock
LP	Denotes light pole
MC	Denotes metal cover
MG	Denotes metal grate
MH	Denotes manhole
MONO	Denotes monopole
OHE	Denotes overhead electric line
OPC	Denotes outdoor power center
(P)	Denotes per plan
PEP	Denotes polyethylene pipe
PKS	Denotes parking sign
PP	Denotes power pole
PPU	Denotes powe pole with utilities
PVC	Denotes polyvinylchloride pipe
RCP	Denotes reinforced concrete pipe
RD	Denotes roof drain
SAN	Denotes sanitary manhole
SAN S	Denotes sanitary sewer
SANC	Denotes sanitary clean out

LEGEND

SMH	Denotes storm manhole
STC	Denotes surmountable concrete curb
STCO	Denotes storm clean out
ST S	Denotes storm sewer
SWB	Denotes stone wall base
SWT	Denotes stone wall top
TC	Denotes top of concrete curb
TCS	Denotes traffic control sign
TPIT	Denotes test pit
TRANS	Denotes transformer
UGC	Denotes underground communication line
UGE	Denotes underground electric line
VCP	Denotes vitrified clay pipe
W	Denotes water line
WV	Denotes water valve
WW	Denotes window well
BAS	Denotes Basswood tree
BOX	Denotes Boxelder tree
COT	Denotes Cottonwood tree
HACK	Denotes Hackberry tree
MPL	Denotes Maple tree
PIN	Denotes Pine tree
SHB	Denotes shrub
SPR	Denotes Spruce tree
WLNT	Denotes Walnut tree

BENCH MARKS (BM)

1.) Top of top nut of fire hydrant on the north side of Building 19 in island with flagpole
Elevation = 810.29 feet

2.) Top of top nut of fire hydrant on the east side of the link between Building 19 & Building 6
Elevation = 817.68 feet

3.) Top of top nut of fire hydrant on the south side of the link between Building 6 & Building 15
Elevation = 807.77 feet

4.) Top of top nut of fire hydrant in the southwest quadrant of the entrance road from the west and bridge
Elevation = 798.99 feet

NOTE: Elevations shown are based on NGVD 29 Datum

DESCRIPTION OF PROPERTY SURVEYED:

Part of Government Lot 5 situated in Section 17, Township 28, Range 23, Hennepin County, Minnesota

5017 Minnehaha Avenue
Minneapolis, MN

GENERAL NOTES

1.) Survey coordinate basis: Hennepin County

UTILITY NOTES

1.) Visible above ground evidence of utilities is shown hereon per field location. This survey does not purport to show all underground utilities.

2.) Other underground utilities of which we are unaware may exist. Verify all utilities critical to construction or design.

3.) Some underground utility locations are shown as marked onsite by Hance Utility Locating.

4.) Contact GOPHER STATE ONE CALL at 651-454-0002 (800-252-1166) for precise onsite location of utilities prior to any excavation.

N

30 0 30 60
SCALE IN FEET

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Dated this 5th day of June, 2014

SUNDE LAND SURVEYING, LLC.

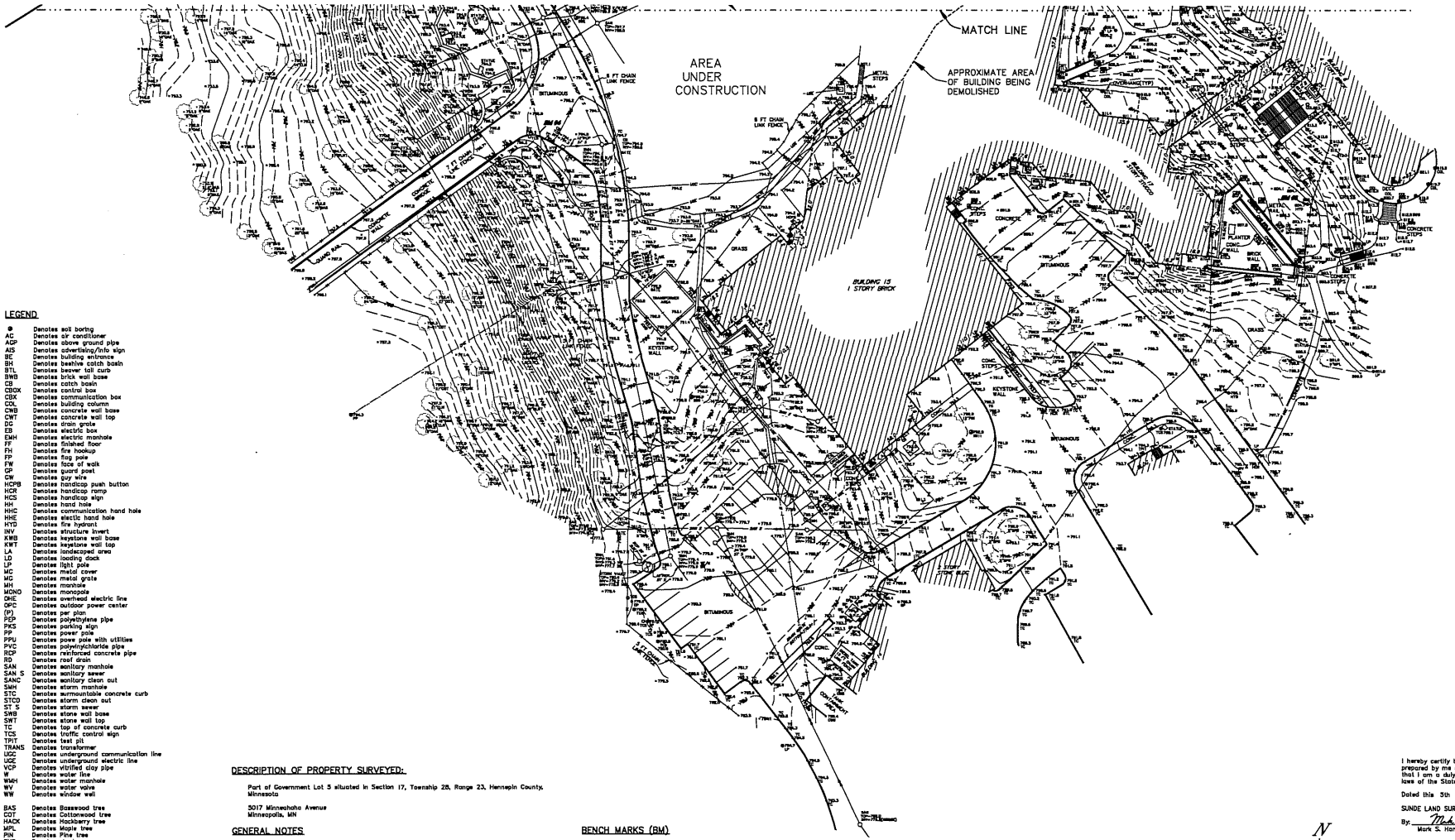
By: [signature]
Mark S. Hanson, P.L.S. Minn. Lic. No. 15480

Revision	By	Date
	MDH	

Drawing Title:
**TOPOGRAPHIC, LOCATION and UTILITY SURVEY FOR
THE STATE OF MINNESOTA
MINNESOTA VETERANS HOME
BUILDING 22**

SUNDE LAND SURVEYING
www.sunde.com
Main Office:
9001 East Bloomington Freeway (35W) • Suite
Bloomington, Minnesota 55420-3435
952-881-2455 (Fax: 952-888-9526)
West Office:
Mandan, North Dakota 701-663-5562

Project: 96-379-F	Bk/Pg: 848/32	Date: 06/05/2014
Township: 28 Range: 23 Section: 17		
File: 96379F001.dwg		Sheet: 1 of 2



LEGEND

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DESCRIPTION OF PROPERTY SURVEYED:

Part of Government Lot 5 situated in Section 17, Township 28, Range 23, Hennepin County, Minnesota

5017 Minnehaha Avenue
Minneapolis, MN

GENERAL NOTES

1.) Survey coordinate basis: Hennepin County

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NOTE: Elevations shown are based on NGVD 29 Datum

N

30 0 30 60
SCALE IN FEET

I hereby certify that this survey, plan, or report was prepared by me or under my direct supervision and that I am a duly Licensed Land Surveyor under the laws of the State of Minnesota.

Dated this 5th day of June, 2014

SUNDE LAND SURVEYING, LLC.

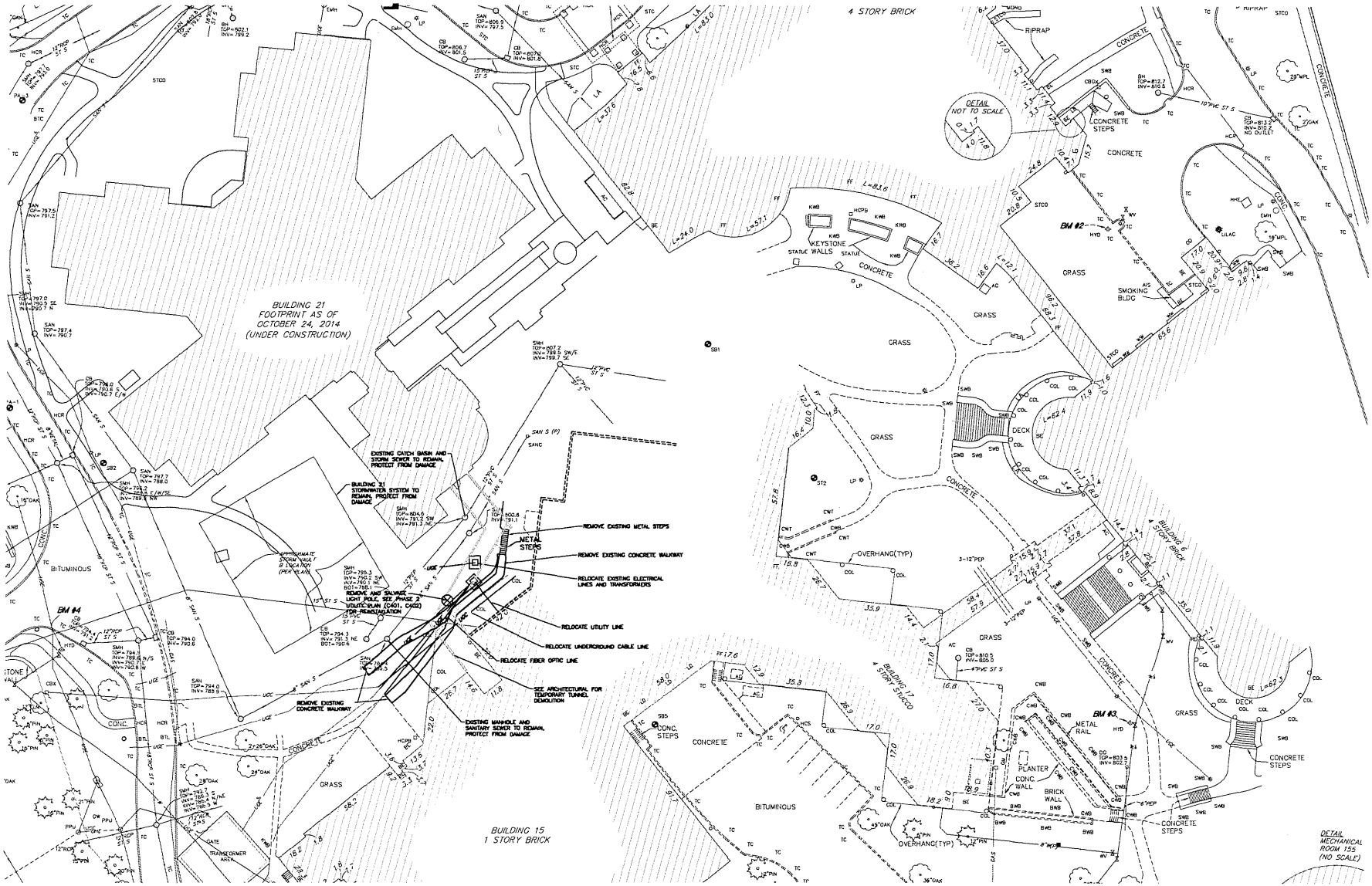
By: Mark S. Hanson
Mark S. Hanson, P.L.S. Minn. Lic. No. 15480

Revision	By	Date
	MSH	

Drawing Title:
TOPOGRAPHIC, LOCATION and UTILITY SURVEY FOR
THE STATE OF MINNESOTA
MINNESOTA VETERANS HOME
BUILDING 22

SUNDE LAND SURVEYING
Main Office:
9301 East Bloomington Freeway (35W) • Suite
Bloomington, Minnesota 55420-2420
952-881-3400 (Fax 952-888-9328)
West Office:
Minden, North Dakota 701-463-3062
www.sundeland.com

Project: 98-378-F	By/Pg: 846/32
Twnship: 28 Range: 23 Section: 17	Date: 06/05/2014
File: 98378F001.dwg	Sheet: 2 of 2



NORTH

1 C201 SITE DEMOLITION PLAN

0 20' 40' 80'

PRELIMINARY
NOT FOR CONSTRUCTION

Nelson·Tremain Partnership
ARCHITECTURE AND DESIGN FOR AGING
125 Southeast Main Street, Suite 245
Minneapolis, Minnesota 55414
Telephone (612) 331-7178
Fax (612) 331-8255

Consultant

PIERCE PINI & ASSOCIATES
9298 CENTRAL AVE NE,
SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
FAX 763.537.1354

Certification:
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Minnesota

Kevin Gardner

45815 — Reg. No.
01/22/2015 — Date

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:
FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

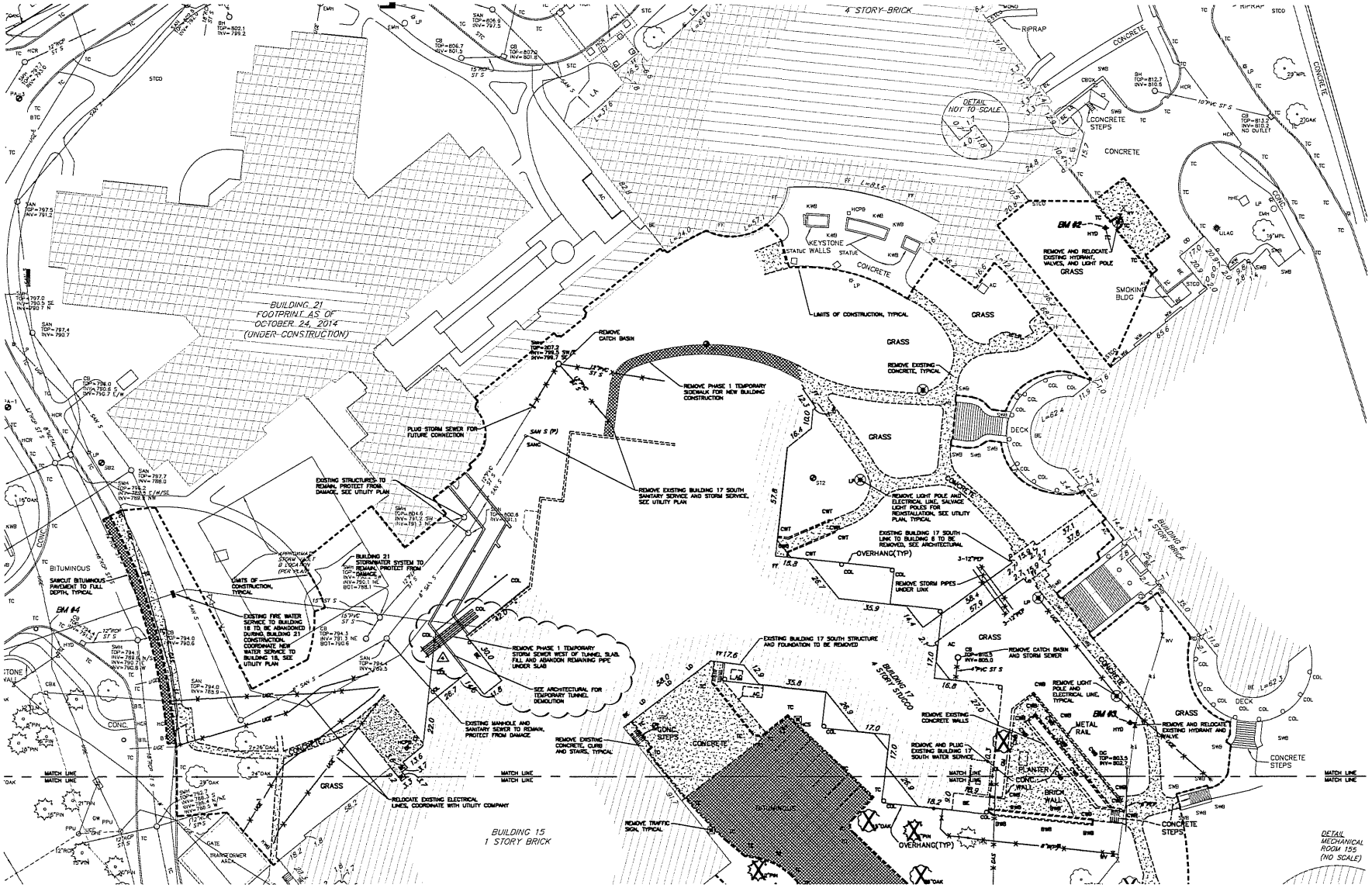
FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

Sheet Title:
PHASE 1
SITE DEMOLITION PLAN

Sheet Number:
C001



NORTH

1 C201 SITE DEMOLITION PLAN

0 20' 40' 80'

1"=20'

Nelson·Tremain Partnership
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45815	01/22/2015
Reg. No.	Date

Owner:

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FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

3	02-09-15	Addendum #3
4	05-01-15	PR #1

Sheet Title:
SITE DEMOLITION PLAN

Sheet Number:
C201

NORTH

1 C202 SITE DEMOLITION PLAN

0 20' 40' 80'

1"=20'

PRELIMINARY
NOT FOR CONSTRUCTION

Nelson Tremain Partnership
ARCHITECTURE AND DESIGN FOR AGING
125 Southeast Main Street, Suite 245
Minneapolis, Minnesota 55414
Telephone (612) 331-7178
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Consultant

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BLAINE, MN 55434
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01/22/2015 — Date

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:
FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

Sheet Title:
SITE DEMOLITION PLAN

Sheet Number:
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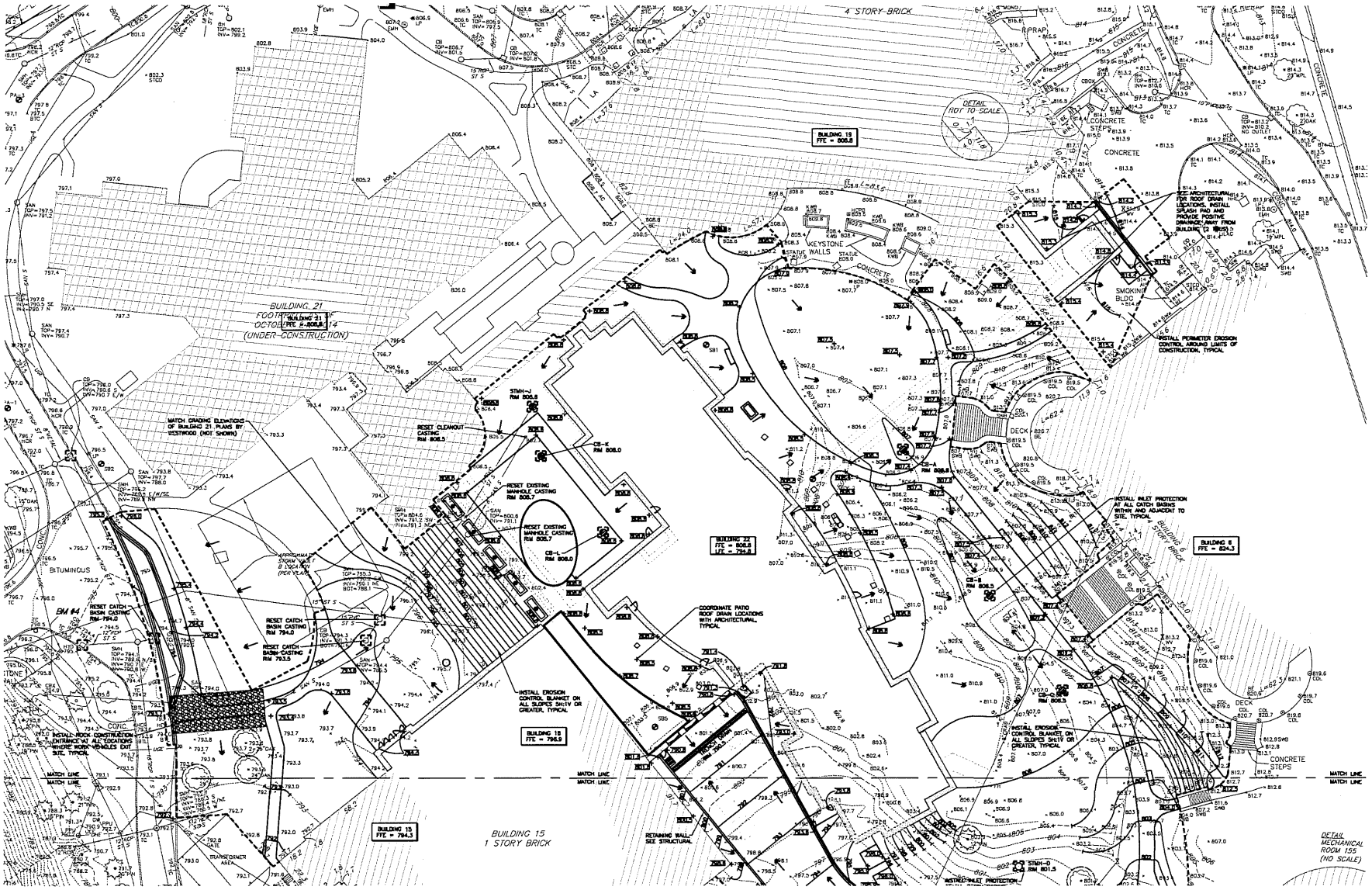

NORTH

1 C301 GRADING, DRAINAGE AND EROSION CONTROL PLAN

0 20' 40' 80'

1"=20'

PRELIMINARY
NOT FOR CONSTRUCTION

Nelson·Tremain Partnership
ARCHITECTURE AND DESIGN FOR AGING
125 Southeast Main Street, Suite 245
Minneapolis, Minnesota 55414
Telephone (612) 331-7178
Fax (612) 331-8255

Consultant

PIERCE PINI & ASSOCIATES
929B CENTRAL AVE NE,
SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
FAX 763.537.1354

Certification:
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Minnesota

Kevin Gardner

45815 — Reg. No.
01/22/2015 — Date

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:
FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#7SMP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

Sheet Title:
GRADING, DRAINAGE AND EROSION CONTROL PLAN

Sheet Number:
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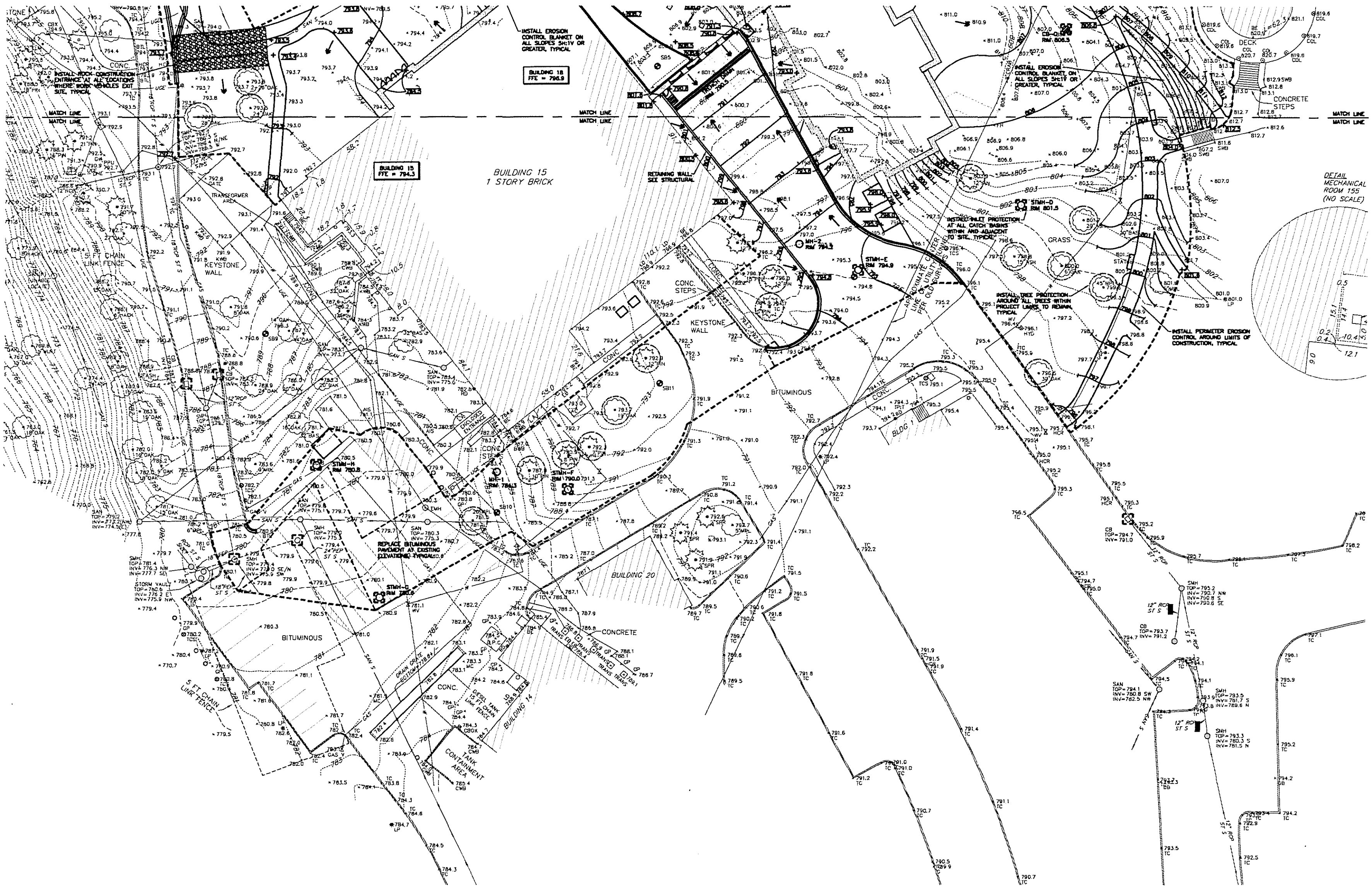

GRADING, DRAINAGE AND EROSION CONTROL PLAN

1 / C302

NORTH

0 20' 40' 80'

1"=20'

PRELIMINARY
NOT FOR CONSTRUCTION

Nelson·Tremain Partnership
ARCHITECTURE AND DESIGN FOR AGING
125 Southeast Main Street, Suite 245
Minneapolis, Minnesota 55414
Telephone (612) 331-7178
Fax (612) 331-8255

Consultant

PIERCE PINI & ASSOCIATES
9298 CENTRAL AVE NE, SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
FAX 763.537.1354

Certification:
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Kevin Gardner

45815 | 01/22/2015
Reg. No. | Date

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:
FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

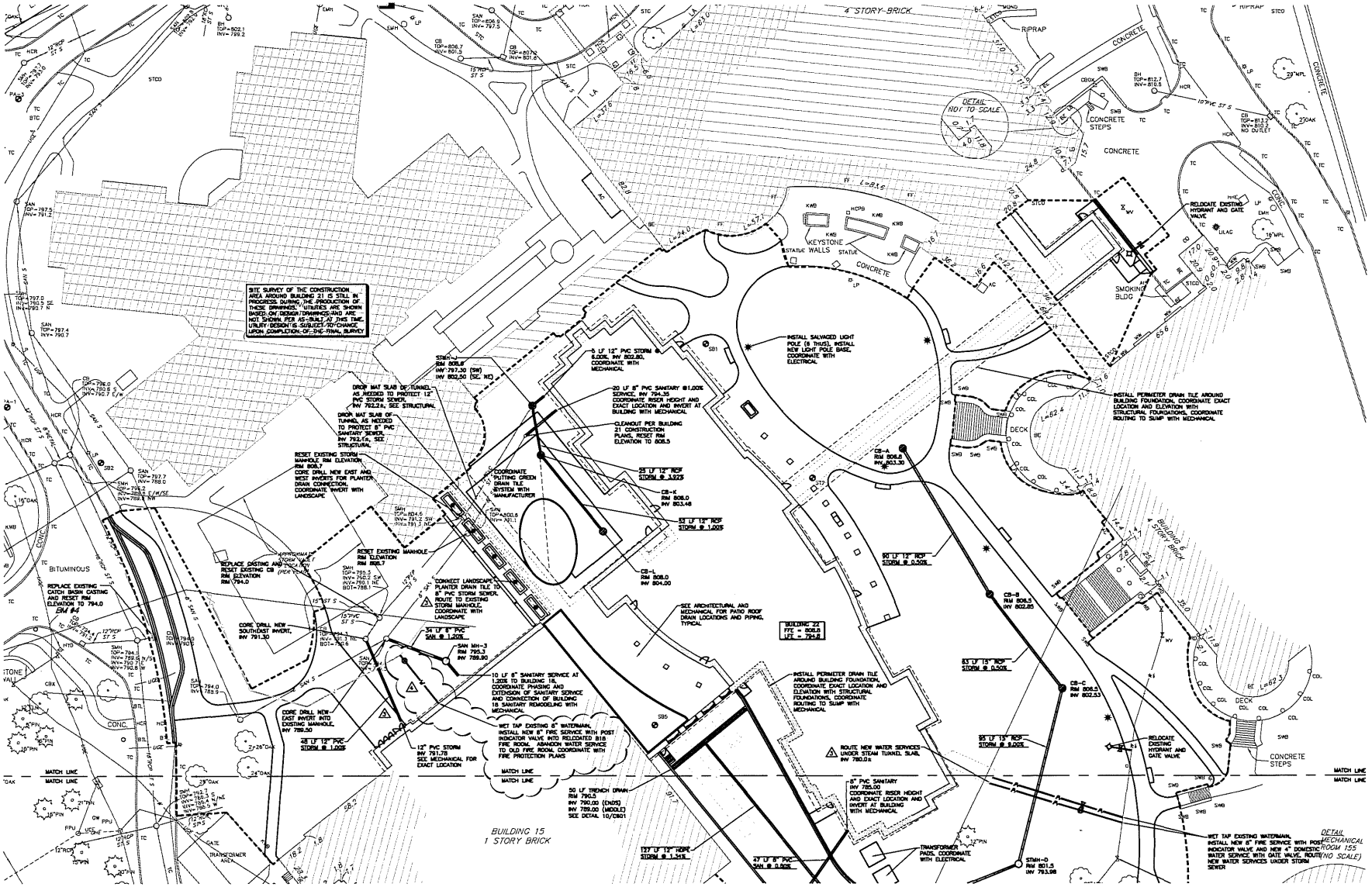
FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

Sheet Title:
GRADING, DRAINAGE AND EROSION CONTROL PLAN

Sheet Number:
C302



Nelson·Tremain Partnership
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Consultant

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9298 CENTRAL AVE NE, SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
FAX 763.537.1354

Certification:
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Minnesota

Kevin Gardner

45815 — Reg. No.
01/22/2015 — Date

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:
FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

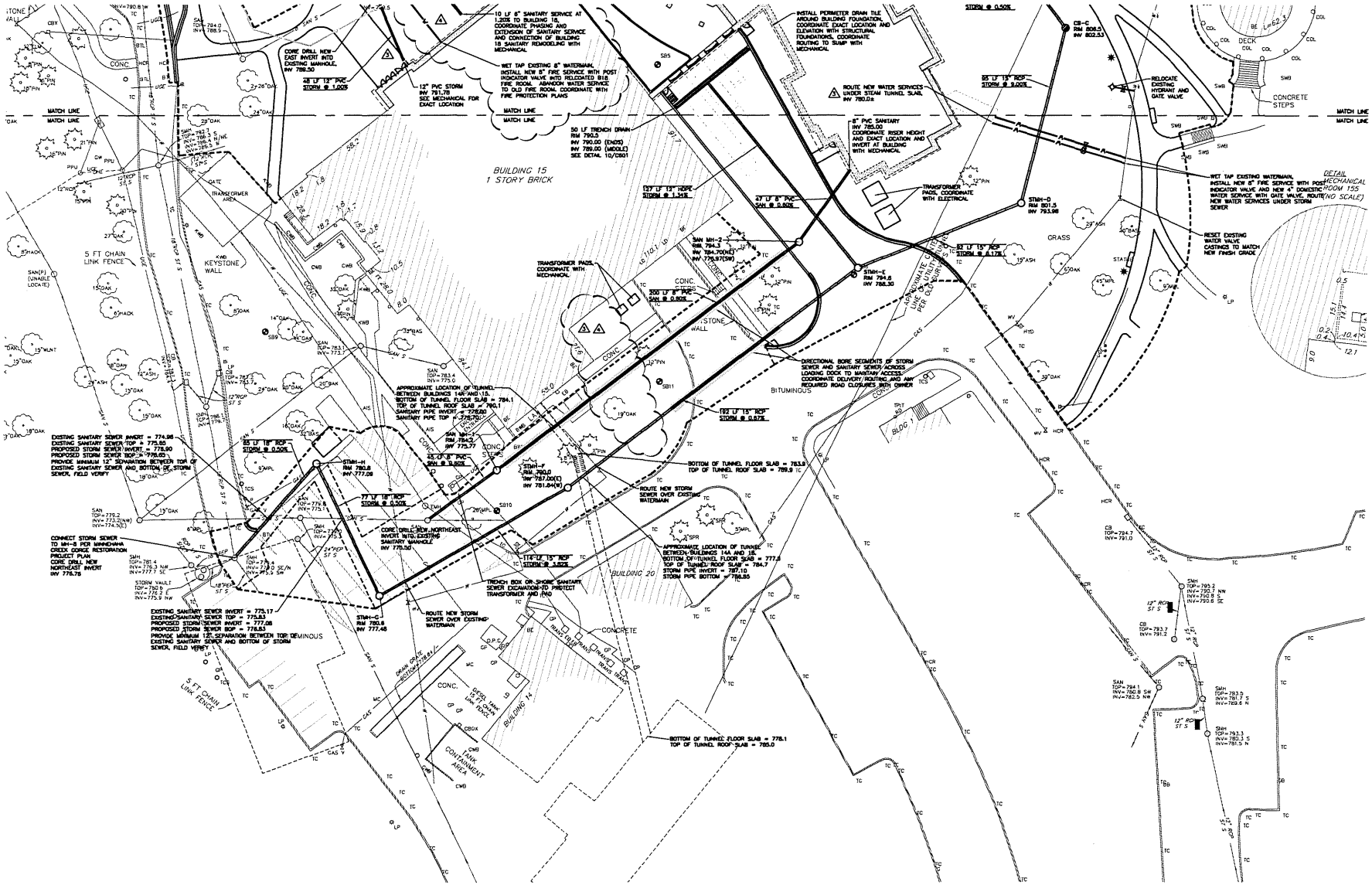
5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

3	02-09-15	Addendum #3
4	05-01-15	PR #1

Sheet Title:
UTILITY PLAN

Sheet Number:
C401



NORTH

1 C402 UTILITY PLAN

0 20' 40' 80'

1"=20'

Nelson Tremain Partnership
ARCHITECTURE AND DESIGN
125 Southeast Main Street, Suite 245
Minneapolis, Minnesota 55414
Telephone (612) 331-7178
Fax (612) 331-8255

Consultant

PIERCE PINI & ASSOCIATES
9298 CENTRAL AVE NE, SUITE 312
BLAINE, MN 55434
TEL 763.537.1311
FAX 763.537.1354

Certification:
I hereby certify that this plan, specification or report was prepared by me or under my direct supervision and that I am a duly licensed Professional Engineer under the laws of the state of Minnesota

Kevin Gardner

45815 — Reg. No.
01/22/2015 — Date

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:
FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

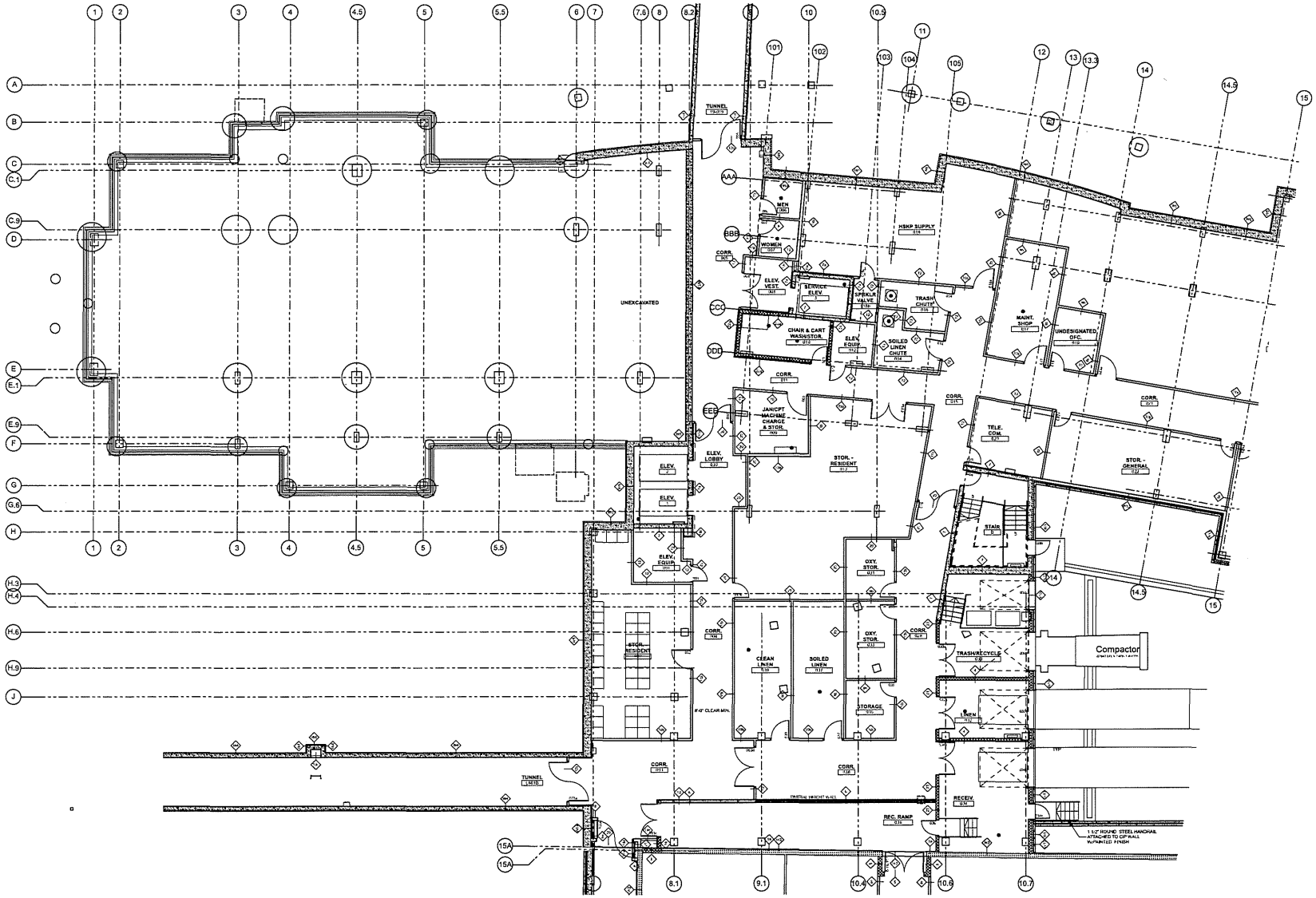
5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

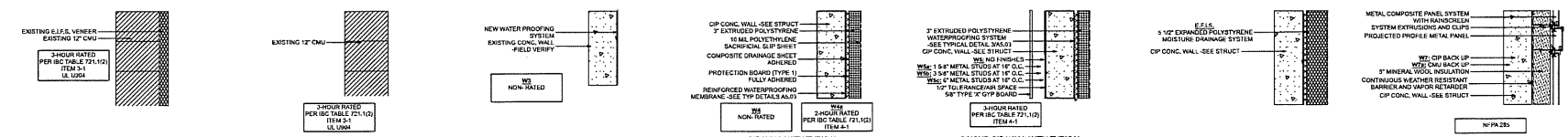
3	02-09-15	Addendum #3
4	05-01-15	PR #1

Sheet Title:
UTILITY PLAN

Sheet Number:
C402



1 LOWER LEVEL WALL TYPES
A1.20 SCALE: 1/8" = 1'-0"



2 EXTERIOR WALL TYPES
A1.20 SCALE: 1" = 1'-0"

Nelson-Tremain Partnership
ARCHITECTURE ENGINEERING INTERIORS
125 Southeast Main Street, Suite 245
Minneapolis, Minnesota 55414
Telephone (612) 331-7178
Fax (612) 331-8255

Consultant

Certification:

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED ARCHITECT UNDER THE LAWS OF THE STATE OF MINNESOTA

ARCHITECT: GAIUS G. NELSON

LICENSE NO.: 15890

DATE: JANUARY 22, 2015

SIGNATURE:

Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:

FAI 27-046
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

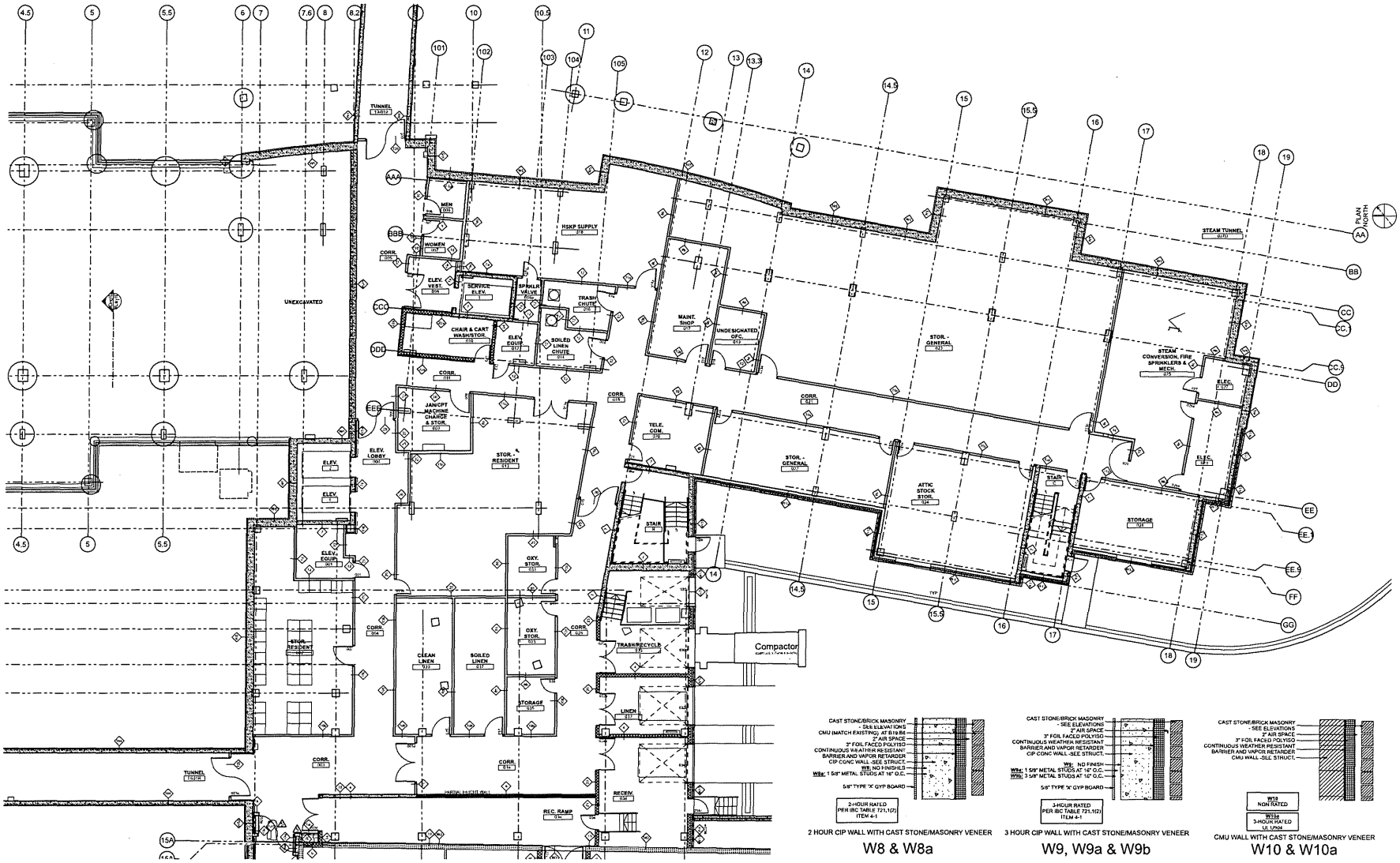
FEDERAL GRANT PROJECT # FAI 27-046
STATE OF MN RECS PROJECT #75MP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

Sheet Title:
WALL TYPES / LOWER LEVEL FLOOR PLAN AREA A

Sheet Number:
A1.20



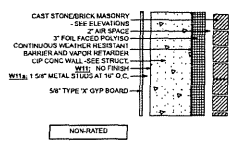
1 A1.21 LOWER LEVEL WALL TYPES
SCALE: 1/8" = 1'-0"

2 HOUR CIP WALL WITH CAST STONE/MASONRY VENEER
W8 & W8a

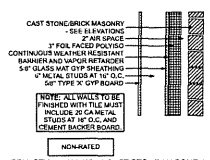
3 HOUR CIP WALL WITH CAST STONE/MASONRY VENEER
W9, W9a & W9b

CMU WALL WITH CAST STONE/MASONRY VENEER
W10 & W10a

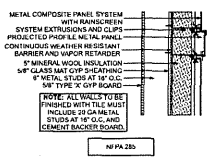
3 A1.21 EXTERIOR WALL TYPES
SCALE: 1" = 1'-0"



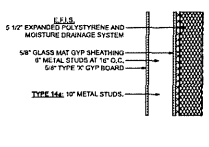
CIP WALL WITH CAST STONE/MASONRY VENEER
W11 & W11a



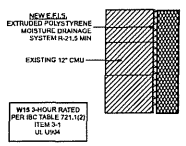
METAL STUD WALL WITH CAST STONE/MASONRY
W12



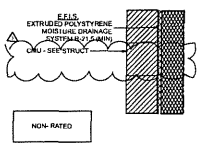
METAL STUD WALL WITH METAL PANEL
W13



EIFS WITH METAL STUD BACK UP
W14 & W14a



EXISTING 3 HOUR CMU WALL WITH NEW EIFS
W15



CMU WALL WITH EIFS
W16

2 A1.21 EXTERIOR WALL TYPES
SCALE: 1" = 1'-0"

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STATE OF MN RECS PROJECT
#75MP0037

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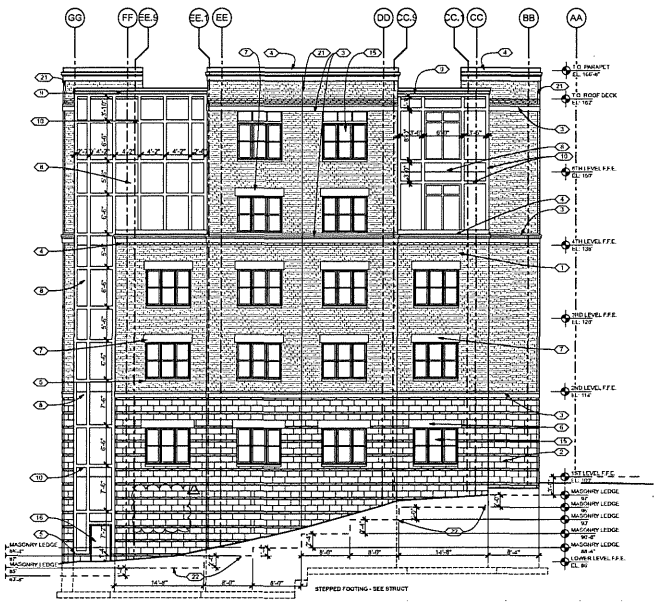
Issues:

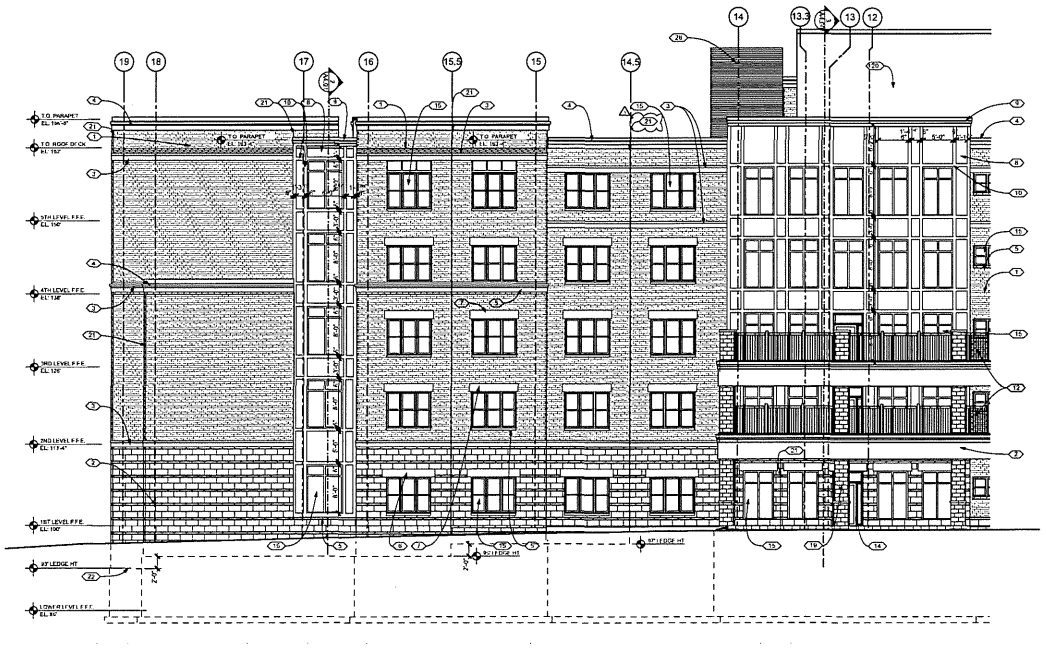
3	02-09-15	Addendum #3
5	03-09-15	Addendum #5

Sheet Title:
WALL TYPES / LOWER LEVEL FLOOR PLAN AREA B

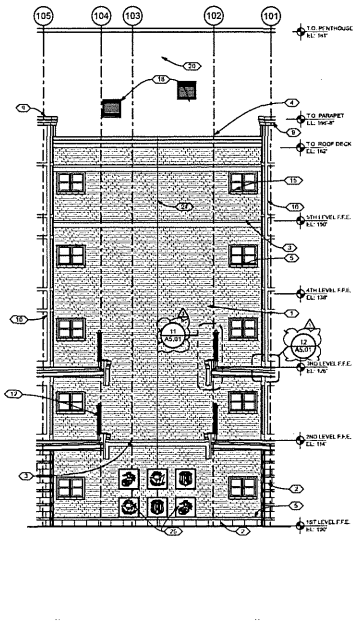
Sheet Number:
A1.21



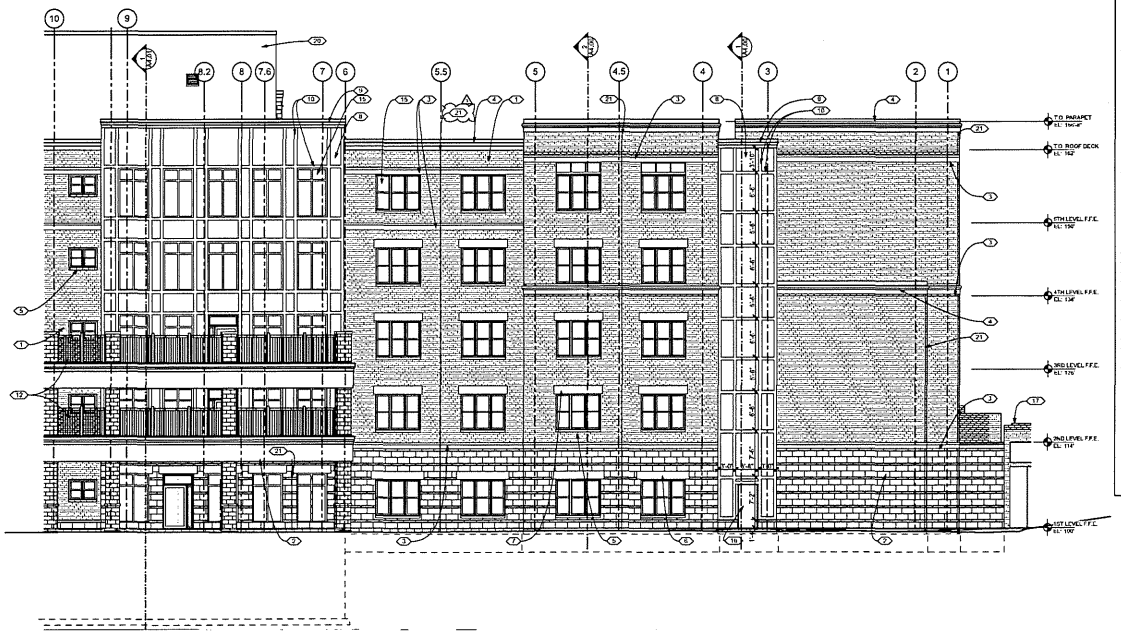
1 A3.01 SOUTH ELEVATION - AREA B
SCALE: 1/8" = 1'-0"



2 A3.01 EAST ELEVATION - AREA B
SCALE: 1/8" = 1'-0"



3 A3.01 EAST ELEVATION - @ PANTRY
SCALE: 1/8" = 1'-0"



4 A3.01 EAST ELEVATION - AREA A
SCALE: 1/8" = 1'-0"

EXTERIOR ELEVATION KEYNOTES

1. BRICK MASONRY VENEER
2. CAST STONE VENEER
3. CAST STONE BAND
4. CAST STONE CORNICE PROFILE W/ MTL CAP FLASHING.
5. CAST STONE SILL
6. CAST STONE LINTEL. SMOOTH - 8" BEARING AT WINDOW OPENING EDGE (TYP. AT CAST STONE VENEER)
7. CAST STONE LINTEL. ROUGH - 4" BEARING AT WINDOW OPENING EDGE
8. METAL PANEL CLADDING SYSTEM
9. METAL PANEL CORNICE PROFILE
10. METAL PANEL PROJECTED PROFILE (6" WIDE TYP.)
11. PRE-FIN. ALUMINUM SUNSHADE
12. PRE-FINISHED ALUMINUM RAILING SYSTEM
13. ALUMINUM STOREFRONT WINDOW
14. ALUMINUM ENTRYWAY SYSTEM
15. FIXED ALUMINUM WINDOW
16. HOLLOW METAL DOOR - PAINT
17. EXISTING WALL
18. PRE-FINISHED MECHANICAL LOUVER
19. CAST STONE COLUMN CLADDING
20. EXTERIOR INSULATION FINISH SYSTEM (EIFS)
21. CONTROL JOINT AT MASONRY/CAST STONE
22. STEPPED MASONRY LEDGE
23. PRE-FINISHED OVERHEAD DOOR - STEEL FRAME AT WALL OPENING
24. DOCK BUMPERS, DOCK SEAL, & DOCK LEVELER AT LOADING DOCK
25. CAST STONE FEATURE PANELS
26. MECHANICAL ENCLOSURE
27. EXTERIOR METAL STAIR
28. "LANNON STONE" VENEER TO MATCH EXTERIOR VENEER AT EXISTING CHAPEL BUILDING 15.
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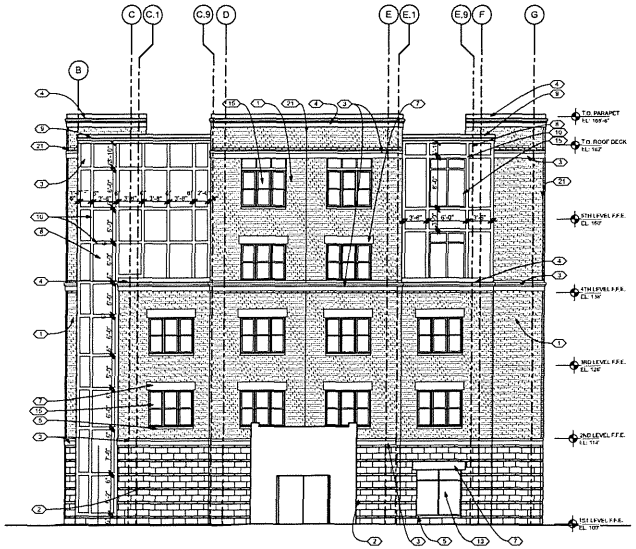
3	02-05-15	Addendum #3

Sheet Title:

EXTERIOR ELEVATIONS

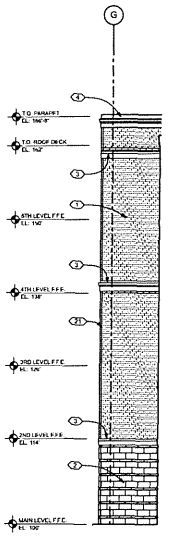
Sheet Number:

A3.01

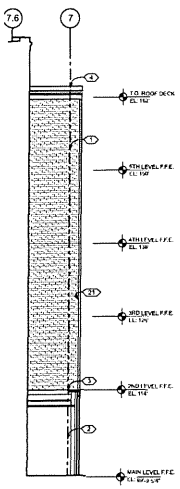


1 A3.02 NORTH ELEVATION - AREA A
SCALE: 1/8" = 1'-0"

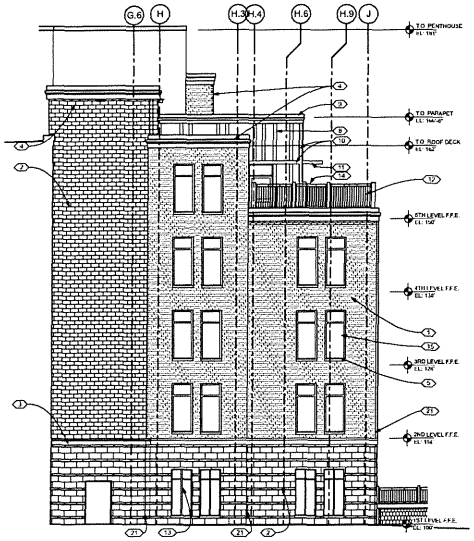
2 A3.02 WEST ELEVATION - AREA A
SCALE: 1/8" = 1'-0"



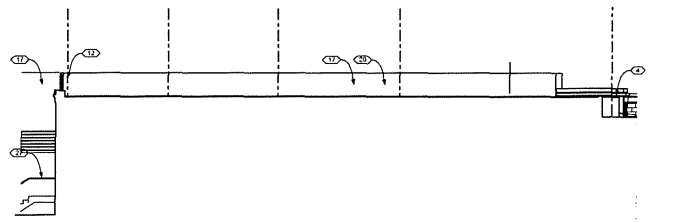
3 A3.02 SOUTH ELEVATION - AREA A PROJECTION
SCALE: 1/8" = 1'-0"



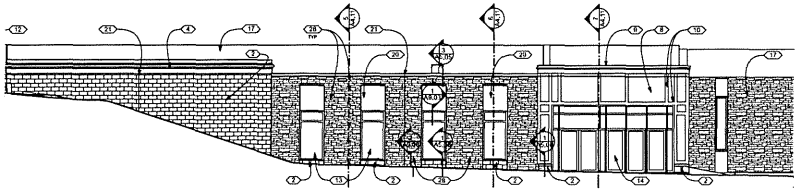
4 A3.02 EAST ELEVATION - CONFERENCE
SCALE: 1/8" = 1'-0"



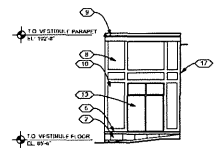
5 A3.02 NORTH ELEVATION - NEIGHBORHOOD CENTER
SCALE: 1/8" = 1'-0"



6 A3.02 EAST ELEVATION - B.18 @ PLAZA
SCALE: 1/8" = 1'-0"



7 A3.02 NORTH ELEVATION - LINK TO BLNG 18
SCALE: 1/8" = 1'-0"



8 A3.02 WEST ELEVATION AT BLDG 18 VEST.
SCALE: 1/8" = 1'-0"

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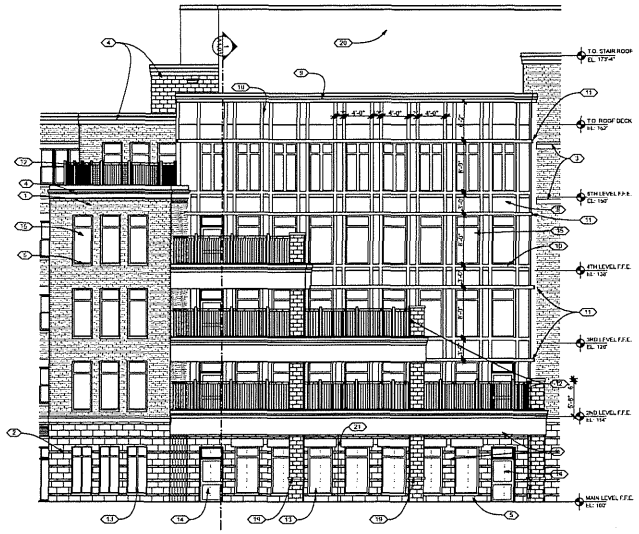
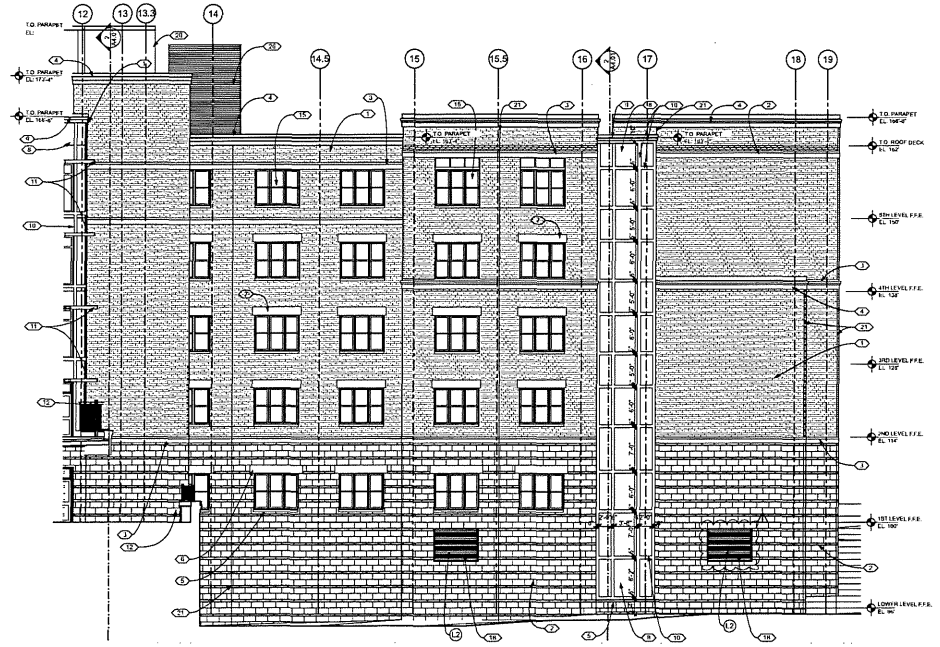
EXTERIOR ELEVATIONS

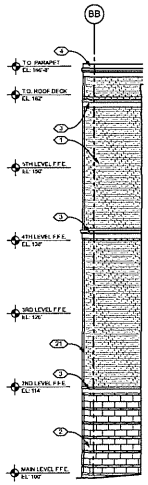
Sheet Number:
A3.02



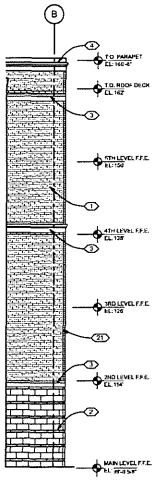
1 A3.03 WEST ELEVATION - NEIGHBORHOOD CENTER
SCALE: 1/8" = 1'-0"



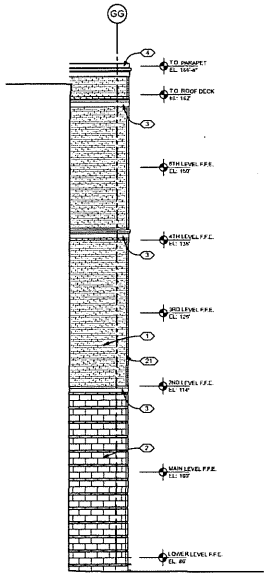
2 A3.03 WEST ELEVATION - AREA B
SCALE: 1/8" = 1'-0"



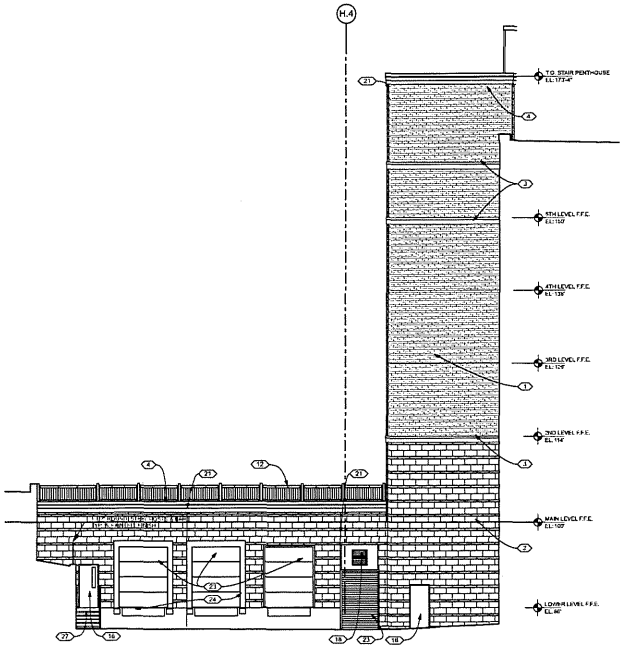
3 A3.03 NORTH ELEV - AREA B EAST PROJ.
SCALE: 1/8" = 1'-0"



4 A3.03 SOUTH ELEV - AREA A EAST PROJ.
SCALE: 1/8" = 1'-0"



5 A3.03 NORTH ELEVATION - AREA B WEST PROJ.
SCALE: 1/8" = 1'-0"



6 A3.03 SOUTH ELEVATION - STAIR B
SCALE: 1/8" = 1'-0"

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3	02-05-15	Addendum #3

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EXTERIOR ELEVATIONS

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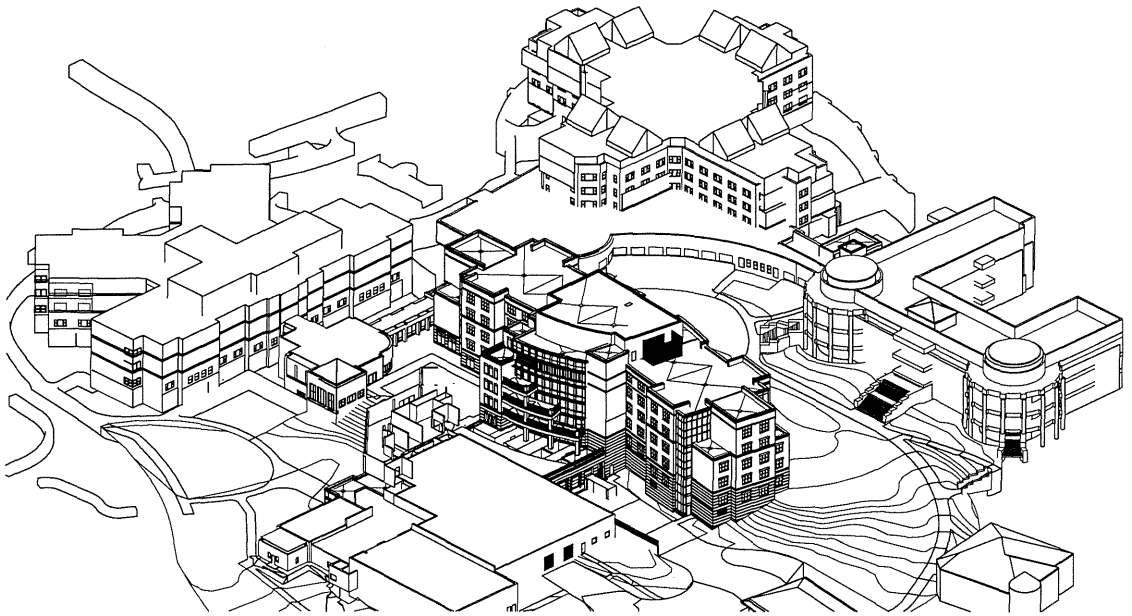
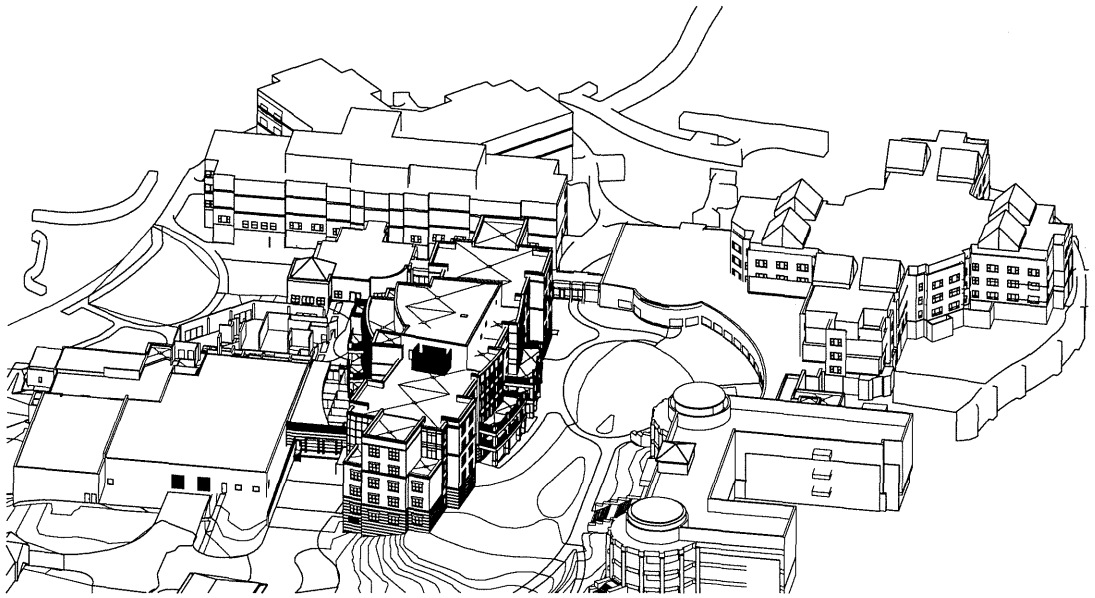
A3.03



1 A3.05 SW AXONOMETRIC
NOT TO SCALE



2 A3.05 SE AXONOMETRIC
NOT TO SCALE

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Minneapolis, Minnesota 55414
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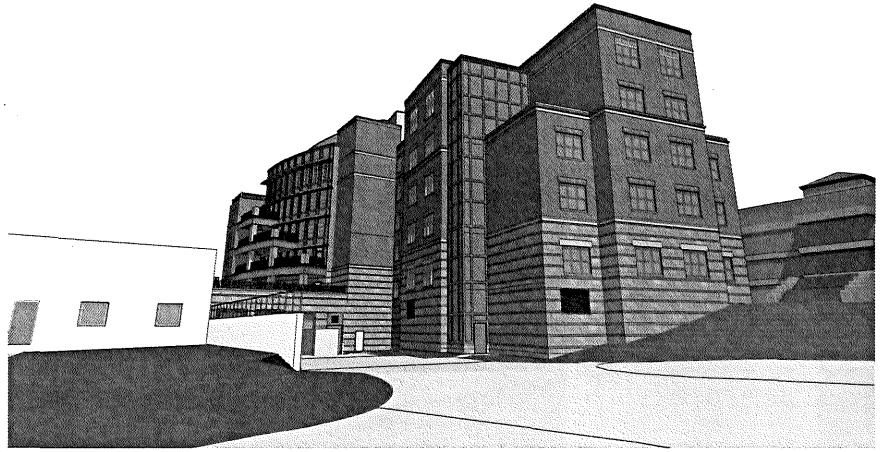
Sheet Title:

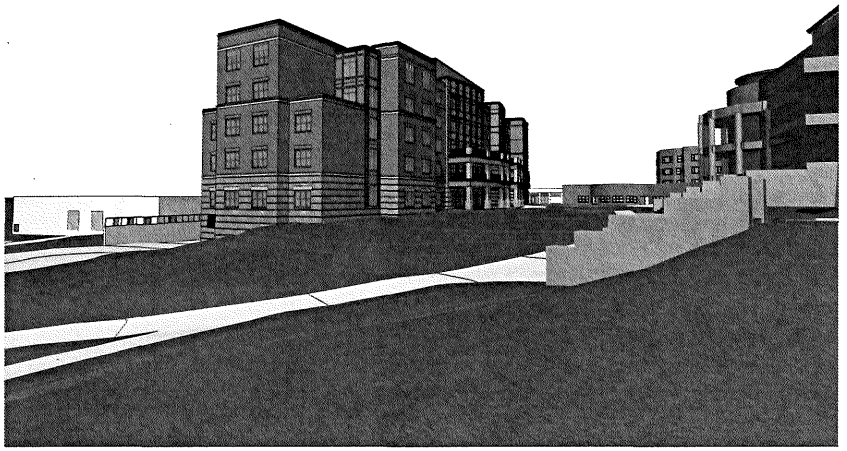
AXONOMETRIC VIEWS

Sheet Number:

A3.05



A3.06 S EXTERIOR PERSPECTIVE
NOT TO SCALE



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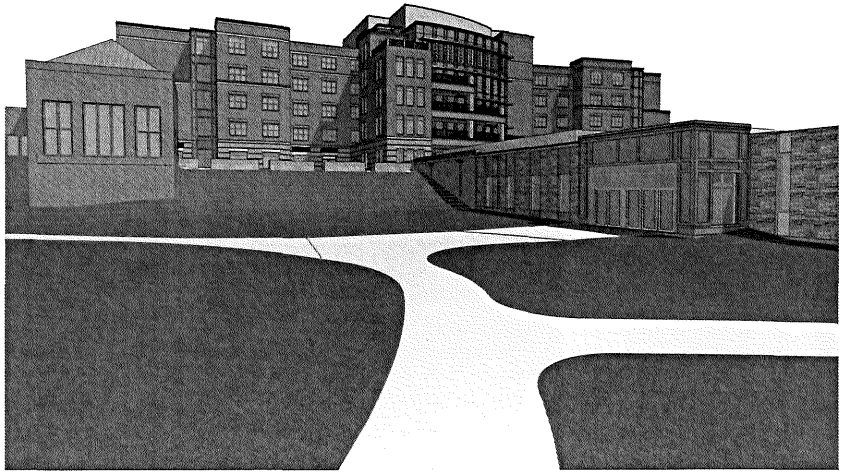

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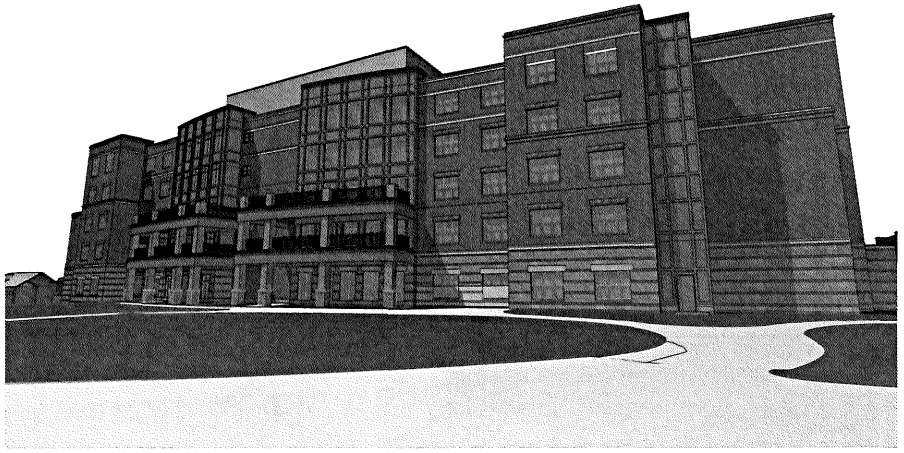

A3.06 NE EXTERIOR PERSPECTIVE
NOT TO SCALE

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Owner:

Minnesota Department of Veterans Affairs

100% Construction Documents
BID SET

January 22, 2015

Project:

FAI 27-048
MINNEAPOLIS 100 BED REPLACEMENT PROJECT

FEDERAL GRANT PROJECT
FAI 27-048
STATE OF MN RECS PROJECT
#75MP0037

5101 Minnehaha Avenue South
Minneapolis, MN 55417

Issues:

Sheet Title:

PERSPECTIVES

Sheet Number:

A3.06

Appendix F

TABLE 1

Summary Laboratory Soil Results - Detected Parameters (mg/kg)
Proposed Building #22 (Building 17 South)
5101 Minnehaha Avenue South
Minneapolis, Minnesota

Sample Name Sample Date	Industrial SRVs	Residential SRVs	LGP-11/3-5 5/12/2014	LGP-11/7-9 5/12/2014	LGP-12/3-5 5/12/2014	LGP-13/1-3 5/12/2014	LGP-14/1-3 5/12/2014	LGP-15/3-5 5/12/2014	LHA-16/1-3 5/12/2014	LGP-17/0-2 5/12/2014	LGP-17/3-5 5/12/2014	LGP-18/0-2 5/12/2014	LGP-18/2-4 5/12/2014	LGP-19/2-4 5/12/2014	LGP-19/5-7 5/12/2014	LHA-20/1-3 5/12/2014
Resource Conservation and Recovery Act (RCRA) Metals																
Arsenic	20	9	3.4	1.3	<4.5	<4.3	<1.1	4.2	<0.94	<1.1	4.2	3.3	2.8	2.8	2.4	<0.85
Barium	18000	1100	85.0	110	23.1	18.4	101	57.8	36.4	64.1	77.6	113	111	63.6	63.0	36.6
Cadmium	200	25	0.16	0.19	<0.13	<0.13	0.28	0.18	<0.14	<0.17	0.24	0.29	0.20	<0.12	<0.15	<0.13
Chromium (III/VI)	650/100000	87/44000	13.3	16.3	7.7	7.1	14.1	19.2	8.7	12.1	12.3	13.8	16.3	11.5	19.2	9.6
Lead	700	300	19.5	15.1	<4.5	<4.3	20.2	12.7	14.0	16.3	23.7	31.2	12.9	18.9	9.8	7.1
Selenium	1300	160	6.3	7.8	<3.3	<3.3	10.1*	6.9	3.8	2.4	5.8	6.7	10.1	3.1	4.9	1.2
Silver	1300	160	0.50	0.99	<0.45	<0.43	0.73	0.61	<0.47	<0.55	0.54	0.71	0.69	<0.38	<0.50	<0.42
Mercury	1.5	.5	<0.022	0.023	<0.021	<0.018	0.028	0.020	<0.019	0.044	0.031	0.049	0.033	0.039	<0.023	<0.019
Polycyclic Aromatic Hydrocarbons (PAHs)																
Acenaphthene	5260	1200	<0.012	<0.011	<0.011	<0.011	<0.012	<0.011	<0.010	0.027	0.012	<0.012	<0.012	0.013	<0.011	<0.011
Acenaphthylene	NS	NS	<0.012	<0.011	<0.011	<0.011	0.014	<0.011	<0.010	0.078	0.15	0.041	0.015	0.023	<0.011	0.022
Anthracene	45400	7880	<0.012	<0.011	<0.011	<0.011	0.013	<0.011	<0.010	0.19	0.15	0.044	0.012	0.047	<0.011	0.019
Benzo(a)anthracene	See BaP eq.	See BaP eq.	0.035	0.020	<0.011	<0.011	0.053	0.013	0.037	0.77	0.62	0.20	0.058	0.16	<0.011	0.084
Benzo(a)pyrene	3	2	0.041	0.026	<0.011	<0.011	0.063	0.014	0.054	0.63	0.68	0.21	0.068	0.18	<0.011	0.10
Benzo(b)fluoranthene	See BaP eq.	See BaP eq.	0.053	0.037	<0.011	<0.011	0.082	0.019	0.071	0.88	1.0	0.29	0.096	0.24	<0.011	0.13
Benzo(g,h,i)perylene	See BaP eq.	See BaP eq.	0.025	0.018	<0.011	<0.011	0.038	<0.011	0.040	0.28	0.36	0.13	0.046	0.12	<0.011	0.069
Benzo(k)fluoranthene	See BaP eq.	See BaP eq.	0.021	0.014	<0.011	<0.011	0.035	<0.011	0.028	0.28	0.37	0.12	0.039	0.093	<0.011	0.061
Chrysene	See BaP eq.	See BaP eq.	0.045	0.027	<0.011	<0.011	0.070	0.015	0.048	0.90	0.71	0.24	0.069	0.19	<0.011	0.099
Dibenz(a,h)anthracene	See BaP eq.	See BaP eq.	<0.012	<0.011	<0.011	<0.011	0.012	<0.011	0.011	0.10	0.13	0.041	0.016	0.034	<0.011	0.020
Fluoranthene	6800	1080	0.068	0.048	<0.011	<0.011	0.12	0.024	0.075	1.4	0.82	0.33	0.068	0.35	<0.011	0.16
Fluorene	4120	850	<0.012	<0.011	<0.011	<0.011	<0.012	<0.011	<0.010	0.041	0.019	<0.012	<0.012	0.015	<0.011	<0.011
Indeno(1,2,3-cd)pyrene	See BaP eq.	See BaP eq.	0.022	0.016	<0.011	<0.011	0.035	<0.011	0.035	0.27	0.37	0.12	0.043	0.11	<0.011	0.061
Naphthalene	28	10	<0.012	<0.011	<0.011	<0.011	<0.012	<0.011	<0.010	<0.011	0.096	<0.012	0.084	<0.012	<0.011	<0.011
Phenanthrene	NS	NS	0.026	0.020	<0.011	<0.011	0.059	<0.011	0.031	0.80	0.34	0.13	0.049	0.17	<0.011	0.051
Pyrene	5800	890	0.061	0.039	<0.011	<0.011	0.095	0.024	0.068	1.5	0.75	0.32	0.062	0.30	<0.011	0.14
Total BaP Eq. MN 2006sh. ND=0	3	2	0.055	0.035	<0.011	<0.011	0.090	0.017	0.077	0.91	1.0	0.31	0.10	0.26	<0.011	0.15

Notes:

BOLD: Indicates Parameter was detected above the Minnesota Pollution Control Agency's (MPCA) RSRV

NS - No Standard

*Sample was re-analyzed for Selenium using a different method (Inductively Couple Plasma Mass Spectrometry [IC-PMS]) and was not detected above laboratory method limits.