

**FIELD SAMPLING PLAN FOR THE PHASE I REMEDIAL
INVESTIGATION OF OPERABLE UNIT I: THE
RIVERFRONT SITE, NEW HAVEN, MISSOURI**

PREPARED FOR THE
U.S. ENVIRONMENTAL PROTECTION AGENCY REGION VII

DRAFT

December 01, 2000

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**U.S. GEOLOGICAL SURVEY
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Contract No. **SSID 072X TO 00**

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1.0 INTRODUCTION

The USGS (U.S. Geological Survey) will commence Phase I sampling activities at the Riverfront site [Operable Unit 1 (OU-1)]¹, New Haven, Missouri, in mid-December 2000. These activities will include the sampling of surface and subsurface soils outside and beneath the Riverfront building (northeast corner of the intersection of Front St. and Cottonwood St.) and the collection and analysis of ground-water samples in the vicinity of the Riverfront site. Subsurface soil samples will be collected using a small trailer mounted soil drill rig, a GeoProbe² unit (truck or crawler), or by hand using bucket augers. Soil samples will be scanned for the presence of PCE (tetrachloroethene), TCE (trichloroethene), cis-DCE (cis-1,2-dichloroethene), and BTEX (benzene, toluene, ethylbenzene, and xylene) every 2 ft (feet) in depth using a portable GC (gas chromatograph). Split samples from selected intervals will be submitted for laboratory analysis of constituents and compounds on the HSL (Hazardous Substance List), which includes VOCs (volatile organic compounds), SVOCs (semivolatile organic compounds), organochlorine pesticides, and RCRA (Resource Conservation Recovery Act) metals. In addition, grain-size analysis will be done. Hereinafter activities involved in the collection of soil samples for laboratory analysis will be referred to as HSL sampling. Temporary “drive points” may be used to supplement the existing monitoring well network and provide detailed information on the vertical and lateral extent of VOC contamination in the Missouri River alluvial aquifer beneath the site.

Activities in this limited scope sampling plan are covered in the general work plan and QAPP (Quality-Assurance Project Plan) for the Riverfront site RI (Remedial Investigation). Activities also are covered under the Riverfront site RI HSP (Health and Safety Plan). This document describes the general activities and the number and type of samples to be collected to fulfill the RI work plan objective to characterize the nature and extent of PCE contamination at OU-1. The HSL samples will be collected from a subset of soils to verify the portable GC data, and to

¹ The entire U.S. Environmental Protection Agency project in New Haven, Missouri, is titled “The Riverfront Site” and is designated herein as the Riverfront site RI. Within this site is the Riverfront site, or Operable Unit 1, located in the downtown business district. Any further reference to the Riverfront site will be to Operable Unit 1.

² Use of trade names does not represent endorsement by the U.S. Geological Survey.

provide data of adequate quality and quantity for the MDOH (Missouri Department of Health) to conduct the RI risk assessment.

The general activities at the Riverfront site and vicinity include:

- a) Subsurface soil sampling outside the Riverfront building
- b) Subsurface soil sampling inside the Riverfront building (or sub-slab sampling)
- c) Installation of temporary drive-point monitoring wells
- d) Other sampling methods (soil gas and tree core) as time/budget allows

Methods for sample collection, field sample analysis, laboratory sample analysis, equipment to be used, and decontamination procedures at the Riverfront site are outlined in the Riverfront site RI QAPP.

2.0 SCHEDULE OF ACTIVITIES

Sampling at the Riverfront site will proceed in a schedule that produces the greatest amount of usable information regarding contaminant magnitude and extent, soil characteristics, and ground-water flow direction. The schedule also will provide for the best use of available equipment, personnel, and time in order to obtain such needed information. The following is a timetable of anticipated activities at the Riverfront site (table 1):

Table 1. Timetable of anticipated activities at the Riverfront site (OU-1).

[GC, gas chromatograph; PCE, tetrachloroethene; HSL, Hazardous Substance List; TBD, to be determined]

Activity	Anticipated Begin Date	Anticipated End Date	Equipment/Personnel	Purpose
Temporary drive-point well installation and ground-water sampling	12/11/2000	12/12/2000	1-ton truck-mounted GeoProbe Unit, portable GC, 4 personnel minimum	Characterize vertical distribution of PCE in the ground water and provide additional information on the lateral extent of PCE contamination in the alluvial aquifer.
Soil boring/soil sampling outside Riverfront building	12/18/2000	01/15/2001	Tractor- or trailer-mounted augering tool, hand augering kit, portable GC, 2 personnel minimum	Determine extent/magnitude of PCE contamination outside the Riverfront building. Selected samples for HSL contaminants.
Soil boring/soil sampling inside Riverfront building	01/18/2001	02/18/2001	Tractor- or trailer-mounted augering tool, hand augering kit, portable GC, 2 personnel minimum	Determine extent/magnitude of contamination beneath the Riverfront building. Selected samples for HCL contaminants.

Temporary drive-point well installation and ground-water sampling	TBD	TBD	Tractor- or trailer-mounted augering tool, hand augering kit, portable GC, 2 personnel	Determine extent/magnitude of PCE contamination at the Riverfront site.
Sanitary lagoon sampling	TBD	TBD	Passive diffusion samplers, portable GC, 2 personnel	Qualitative assessment of PCE in the lagoon sludge and sediments.
Stream sediment/water sampling	TBD	TBD	Passive diffusion samplers, submersible pumps with Teflon hose, portable GC, 3 personnel minimum	Determine if measurable quantities of PCE are moving into the Missouri River.

On December 11 and 12, a 1-ton truck-mounted GeoProbe³ unit will be employed to push a series of temporary drive-point monitoring wells to the base of the alluvium (approximately 30 to 35 ft deep) at locations along the southern and eastern walls of the Riverfront building, locations around the wastewater treatment lagoon to the east, and along the bank of the Missouri River to the north (fig. 1). The purpose of the installation of the temporary drive-point monitoring wells is to initially determine the vertical and horizontal magnitude and extent of ground-water contamination outside the Riverfront building and to test the operation and capabilities of equipment that will be used in the more extensive soil boring investigation later in December.

Beginning in mid-December, soil borings will be conducted in areas surrounding the Riverfront building to determine the magnitude and extent of PCE contamination in alluvial sediments at the Riverfront site. In mid-January 2001, a similar soil investigation will take place inside the Riverfront building using similar techniques/equipment. Additional temporary drive-point monitoring wells may be installed to collect samples and monitor ground-water contamination. The details of the soil boring and drive-point sampling procedures will be explained in following sections of this report.

At a time later to be determined, passive diffusion samplers will be installed in the wastewater lagoon sediments and in the Missouri River sediments adjacent to the Riverfront site to determine the extent of contamination in these media. These samples have been used by the USGS to sample interstitial water and sludge water (Schumacher, 1990). Results of this sampling also will be used to determine if the New Haven wastewater treatment lagoon may be an additional source of PCE.

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3.0 SOIL SAMPLING PROTOCOL

3.1 Building Exterior Sampling

Soil sampling at the Riverfront site will occur outside of the Riverfront building along the east, south, and north sides of the building (fig. 2). A small parcel (lot 54.1) immediately west of Cottonwood St. from the main building also will be investigated. The initial sample locations will be biased (hereinafter referred to as biased sampling) toward locations where PCE was suspected or likely to have been used or dumped, such as near exterior building doors and drains. These areas include the ground outside the exterior doors along the south side of the building, soils beneath the concrete slab along the east side of the building, a concrete ditch along the north side of the building, and a north-south running drainage ditch located on the site about 75 ft east of the building. The USEPA (U.S. Environmental Protection Agency) has obtained information that waste solvents were dumped outside the exterior doors or washed outside the building through exterior doors. In addition, historic aerial photography and interviews with local citizens indicate that the area adjacent to the east side of the building, formerly a gravel lot, was used to store supplies including drums of unknown contents. This “storage” area is now covered by the concrete slab on the east side of building. The proposed locations of biased soil samples are shown on figure 2.

Soil samples from each biased borehole location will be analyzed within 45 minutes of collection using a portable GC. Results of the soil sample analysis from each biased location will guide the location of subsequent boreholes. For example, if PCE is detected at location “A” above one-tenth the USEPA action level of 57,000 ug/kg (micrograms per kilogram), then additional boreholes will be located at 30-ft intervals on either side of boring “5” parallel to the building line and roughly at the compass direction. These samples will be designated according to the direction and distance from the initial boring, for example, 5E30 (30 ft east of boring 5), 5E15 (15 feet east of boring 5), 5N30 (30 ft north of boring 5; fig. 2). Subsurface soils at these additional locations will be sampled and the results used to determine the next sampling locations. If contamination is present again above the one-tenth action level, then additional borings will be done at 30-ft intervals from the previous points. The process will be repeated, resulting in an expanding square grid of soil borings until a “clean” (less than one-tenth the action level) sampling point is obtained, or until an obstruction is encountered (property line, utility, etc.). If the first set of soil borings 30-ft from location “A” indicate “clean” soils, then a boring will be placed at one-half the distance between location “A” and the “clean” location. If soils from the initial biased borehole locations indicate no PCE contamination above the one-tenth action level, then borings will be

done along a 30-ft regular-spaced grid along the outside of the building perimeter up to 60 ft from the building exterior.

The samples will be collected from soil borings made using a tractor- or trailer-mounted soil exploration drill rig which uses a 4-ft long, 2-in. diameter coring barrel that is pushed through the sediments. The core barrel is lined with disposable plastic sleeves that retain the core. In areas where the drill rig cannot be used, a hand-operated soil boring kit containing a self-augering bucket head, multiple lengths of steel extension rods with attachable handle, a coring tube driving tool, a 1.5-in. diameter by 6-in. long hollow steel soil coring tube, and stainless-steel coring collars will be used. The bucket auger will be used to advance the borehole to the desired depth and removed from the borehole. The core tube will then be advanced into the bottom of the hole using a small sledge hammer and removed. The top 1-in. of the core will be discarded to eliminate down-hole contamination.

Screening and laboratory VOC samples will be collected from the surface (0-2 feet) and at 2-ft intervals in each borehole. Laboratory samples typically will be composite samples over a 2-ft interval. Generally, a stainless-steel knife will be used to divide the core into equal halves. Subsamples will be collected from one half of the core using a stainless-steel spoon and packed into a 4-oz (ounce) glass jar as quickly as possible for laboratory VOC analysis. Samples for non-volatile HSL constituents will be collected from the same half of core, composited, and placed in an additional 4-oz glass jars. The remainder of the core will be used for construction of a geologist log and archived. Samples from each 2-ft interval will be screened for selected VOCs (including PCE) using the portable GC. Screening samples will be collected using a 10cc (cubic centimeter) disposable plastic syringe with the top removed to collect a 5-gram sediment sample. The sample will be placed in a pre-weighed 40-mL (milliliter), septum-capped, amber vial (containing 20 mL of organic-free water). The vial will be weighed again to determine the mass of sample inside. The vial will then be warmed on a heating block for 20 to 30 minutes, and the headspace will be analyzed using the portable GC. Results of the screening sample analysis will be used to select which samples collected for potential laboratory analysis will be shipped to the laboratory. The remaining samples will be placed in a cooler and retained for 7 days until the laboratory confirms receipt of the laboratory samples, after which they will be drummed as IDW (investigation derived waste).

A minimum of two USGS personnel will be assigned to perform the borings during the 2 weeks allotted to the task. One person will be assigned to conduct the borings while the second person will be assigned to sampling and decontamination duties. Three people may be employed to help expedite the procedure with one person dedicated to analyzing samples on the portable GC.

After the soil borings are completed, the boreholes will be abandoned by filling with a mixture of Portland cement and bentonite grout (1:1 mixture by volume) to a depth of 0.5 ft. The remaining borehole will be filled with soil to ground surface.

3.2 Sub-Slab Sampling

Soil samples also will be collected from inside the building below the cement floor slab (or sub-slab). The building will be divided into several sampling areas, representing the original building area plus several building additions or phases (as confirmed using historic aerial photographs). Biased samples will be collected from inside the building in the areas corresponding to the building phases (fig. 2). The samples will be collected near doorways inside the building, which appear to have been the exterior doors prior to the addition of the next building phase. In addition, a biased sample will be taken from a location near a floor drain close to the center of the building perimeter. The sampling procedure will commence as mentioned in the above section. However, if no contamination is present in any of the samples, a 30-ft sampling grid, measured and assigned at a future date by USGS personnel, will be used to sample each phase of the Riverfront building. Holes in the slab will be opened using a hammer drill or similar concrete boring tool. Since the zero point is the concrete slab, no initial sample can be taken from that point. Therefore, the initial sample will be collected from the first available soil below the slab sub-base. Samples will be collected at 2-ft intervals from the top of the slab. A minimum of two USGS personnel will be assigned to the borings which will require a maximum of 3 weeks to complete.

4.0 HAZARDOUS SUBSTANCES LIST (HSL) SAMPLING PROTOCOL

A minimum of 10 surface (0-2 ft) and 10 sub-surface (6-8 ft) composite soil samples will be collected for HSL to support the RI risk assessment. The collection of the HSL samples for the risk assessment will coincide with the collection of the VOC samples and will be performed in a similar manner. These samples will be collected from boreholes identified by the portable GC as being the most contaminated but also selected to be distributed across the site. Samples from similar depths from 2 to 3 adjacent boreholes (no more than 60 ft apart) will be composited

together into a single HSL sample. Samples for VOCs from adjacent boreholes will not be composited. A minimum of 10 composite samples from both intervals will be collected from the site.

5.0 DRIVE-POINT SAMPLING

The truck-mounted GeoProbe⁴ unit will be employed to push a series of temporary drive-point monitoring wells to the base of the alluvium (approximately 30 to 35 ft deep) at the Riverfront site. A 1 to 2 in. (inch) diameter drill rod will be used to advance a retractable well screen into the sediments. At selected depths, a cover on the well screen is retracted and “point” water samples collected at selected depths in a single borehole. The water samples will be collected from the drive point using a peristaltic pump and analyzed using the portable GC. After sampling, the drive points will be removed from the borehole and the borehole will be grouted with a mixture of Portland cement and bentonite grout (1:1 mixture by volume). If needed, the upper 12 ft of each borehole will be reamed out to 3-in. diameter to facilitate the installation of the grout mix.

Following the receipt of analytical results from soil borings and the initial drive points, additional temporary drive-point well screens may be installed at the Riverfront site. The drive points will be installed in a pilot borehole 3 to 6 in. in diameter augered through the silt clay cap (8 to 12 ft) per Corps of Engineers request. The pilot hole will be dug using a tractor- or trailer- mounted and/or hand-held augering tool, and the drive point will either be driven by hand or pushed using the drill rig to the desired depth or until refusal. The drive point will be constructed of a 0.5- to 1-in. galvanized steel pipe, and a 6-in. long stainless-steel screen with a sampling hose extending to ground surface. Selected drive points may be left in place for several months with the annulus through the clay cap grouted with bentonite grout. Sampling of the drive-point wells will be performed in a manner similar to that described in the New Haven Riverfront site RI QAPP. After the drive points are removed, the boreholes will be filled with a mixture of Portland cement and bentonite (1:1 mixture by volume). A minimum of three USGS personnel will be assigned to the installation of the drive points, which will take about one week to complete.

⁴ Use of trade names does not represent endorsement by the U.S. Geological Survey.

6.0 OTHER SAMPLING PROTOCOLS

6.1 Soil-gas sampling

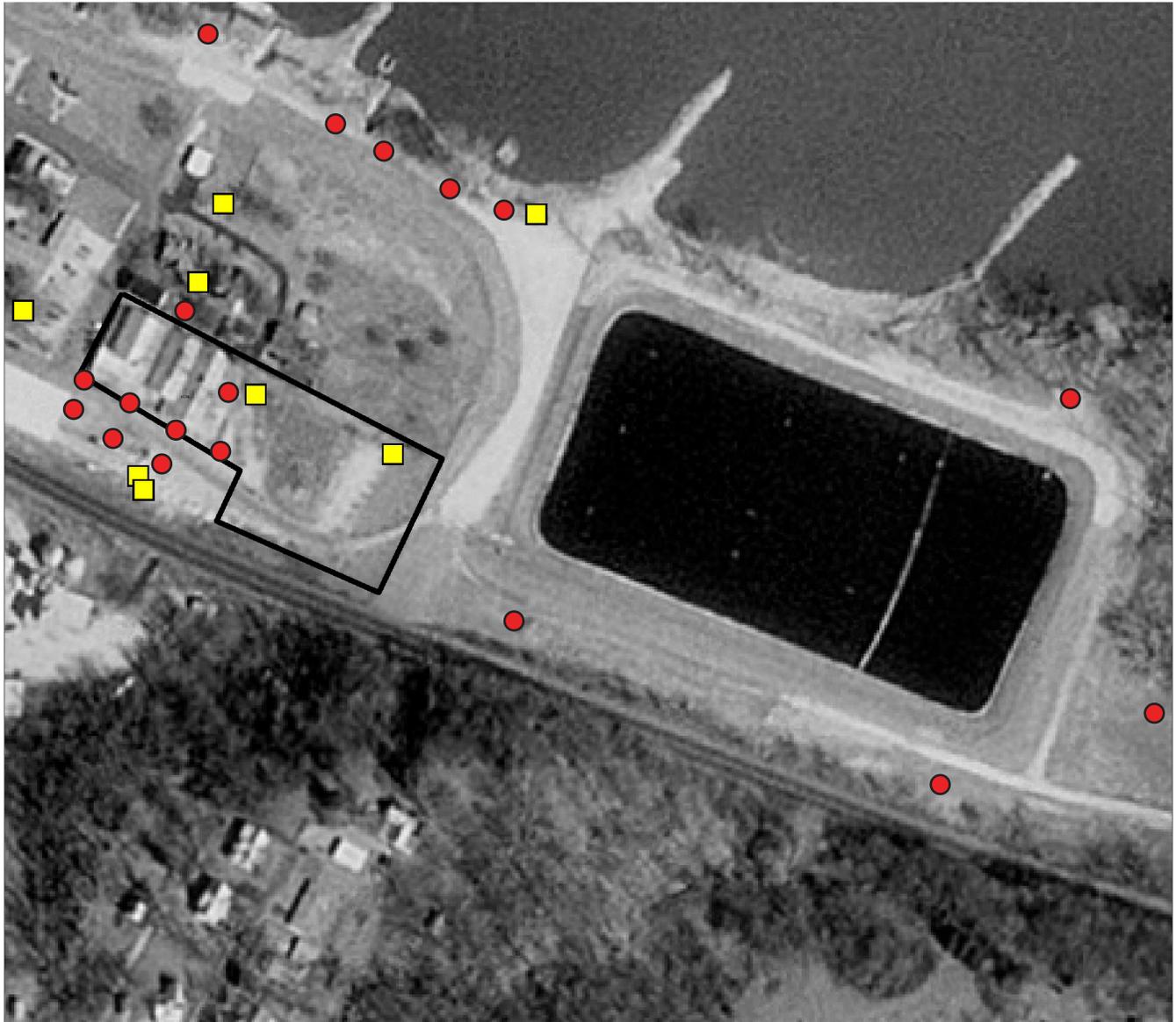
The use of soil-gas samplers may be employed to help determine the extent of the contamination at the Riverfront site in the sub-slab area. If done, these samples will be collected in advance of soil borings inside the building. Soil-gas samplers will consist of a 1- to 2-in. diameter hole dug at a depth of 1 to 3 ft (or into the slab sub-base). A small sheet of plastic will be placed over the hole and secured with tape to create an airtight seal. A sheet of aluminum foil will be secured over the top of the plastic to protect the plastic from puncturing. The plastic will seal the hole from the outside air and will trap any gasses emanating from below the slab. A syringe will be used to pierce through the plastic and collect a sample for field analysis on the portable GC.

6.2 Tree-core sampling

Tree-core sampling also may be employed at the Riverfront site to help delineate the extent of contamination at the Riverfront site. A description of the sampling and analysis of tree cores can be found in the New Haven Riverfront site RI QAPP. Similar to soil-gas sampling, tree-core sampling primarily would be used to determine the extent of contamination, not the magnitude. In addition, a limited number of trees exist at the Riverfront site that are suitable for coring. For these reasons, the use of tree-core sampling will be limited.

6.3 References

Schumacher, J.G., 1990, Geochemical data for the Weldon Spring chemical plant site and vicinity property, St. Charles County, Missouri—1989-1990: U.S. Geological Survey Open-File Report 90-351, revised in 1991, 45 p.



base: U.S. Geological Survey 1986 digital orthophotoquadrangle

0 200 400 Feet

■ Existing monitoring well

● Proposed GeoProbe temporary drive point location.

Figure 1. Location of possible GeoProbe temporary drive-point locations to be sampled during December 11-12, 2000.

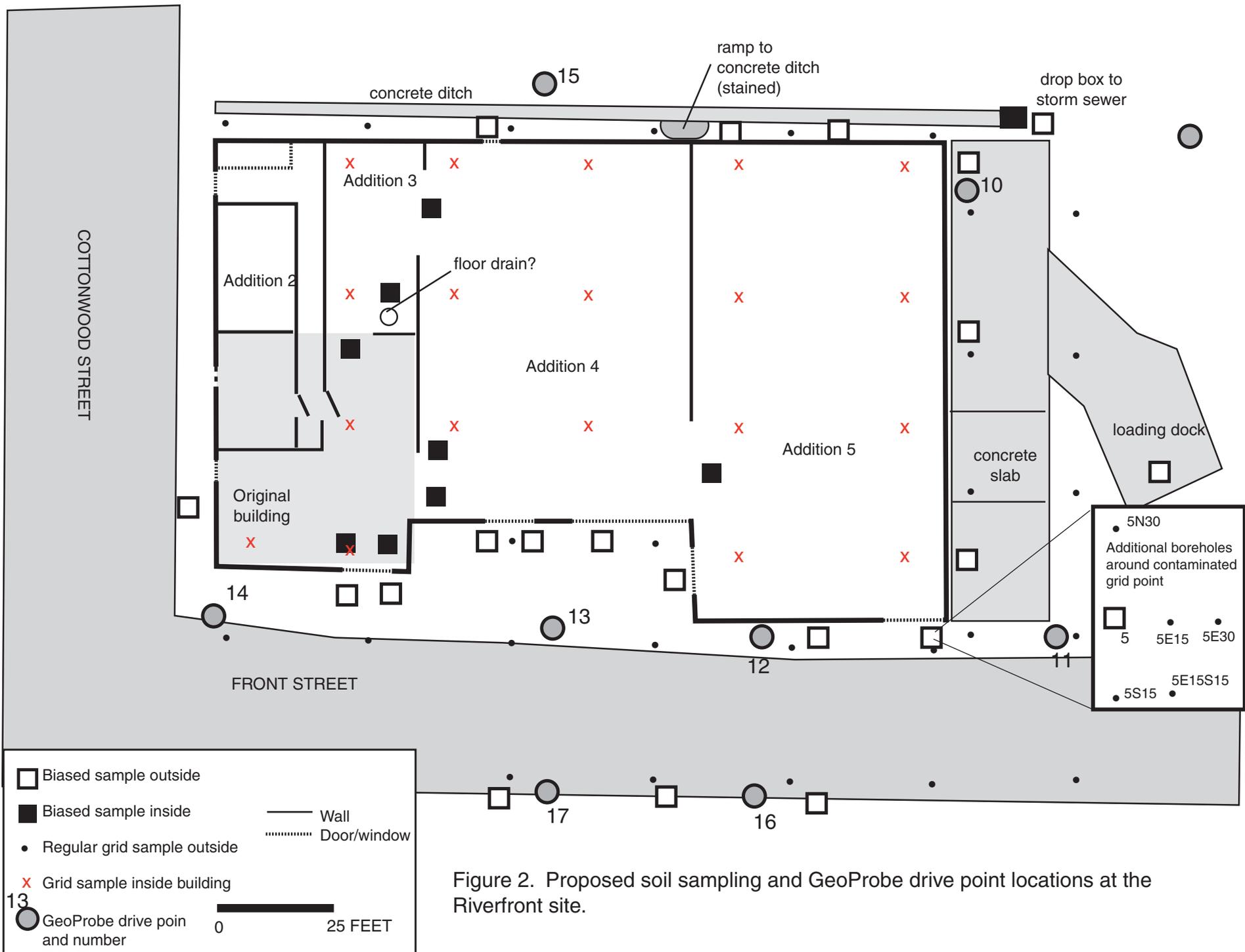


Figure 2. Proposed soil sampling and GeoProbe drive point locations at the Riverfront site.