Appendix H

Ecological Risk Assessment Calculation Briefs

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Contents

Note: Pending preparation in the subsequent Draft A

Environmental Calculation

ECF-100BC1-11-0014. Ecological Risk Evaluation for the 100-BC Source Operable Units

H1 Introduction

Appendix H provides the support documentation for ecology related items of the RI/FS. Details include biota and fauna lists potentially onsite or in the county, risk evaluation tables, the associated environmental calculation, and other information as outlined in the sections below. This appendix also contains *Ecological Risk Evaluation for the 100-BC Source Operable Units* (ECF-100BC1-11-0014) and its associated tables recorded in file H_ECF-100BC1-11-0014-Tables.xlsx included with this appendix.

H2 Sample Locations

This section contains the sample locations for the contaminants of potential ecological concern (COPECs) at wastes sites identified in Scientific Management Decision Process (SMDP) as shown in Figures H-1 through H-46.

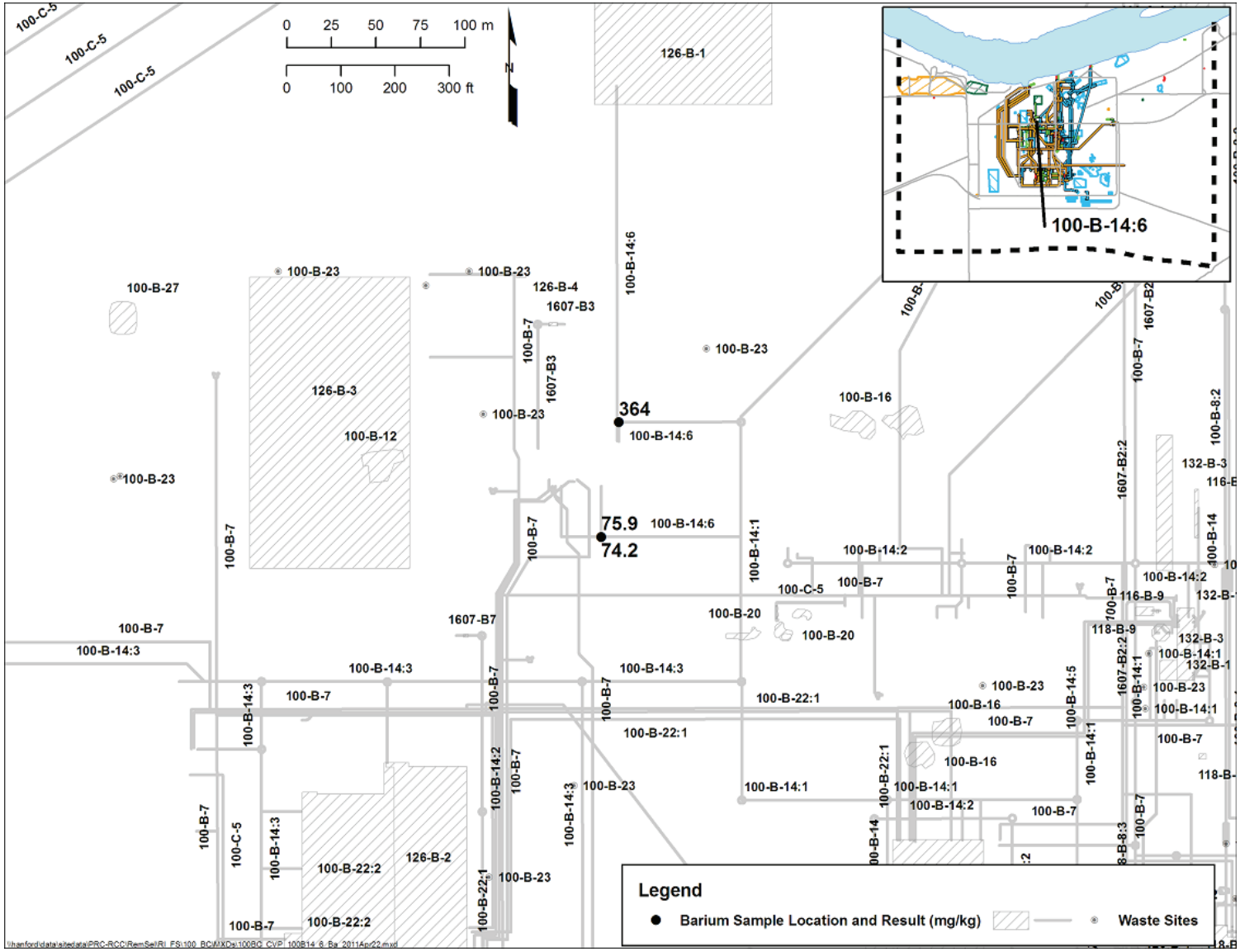

Figure H-1. 100-B Area Process and Sanitary Sewer Underground Pipelines (100-B-14:6) Sampling Locations and Associated Barium Results

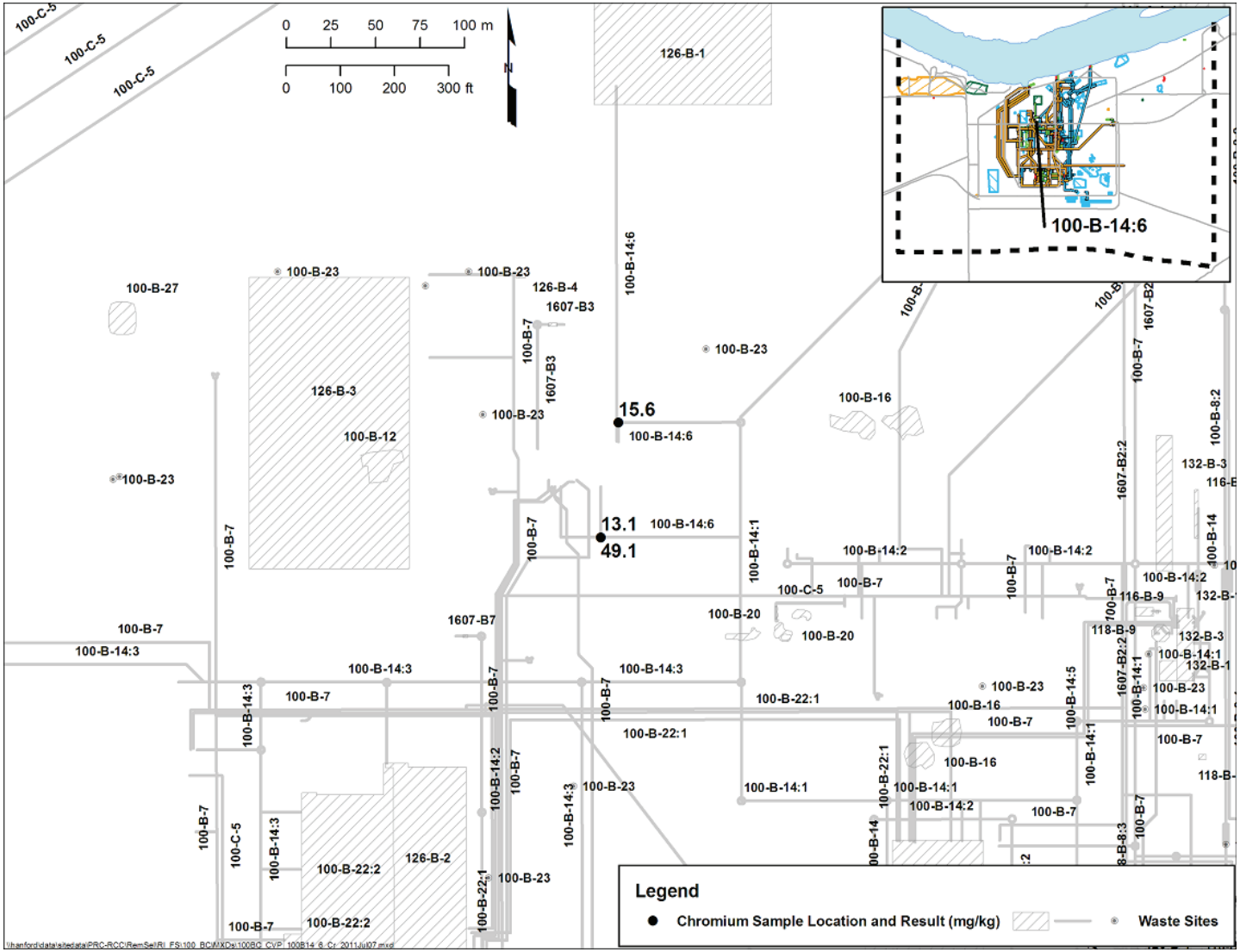

Figure H-2. 100-B Area Process and Sanitary Sewer Underground Pipelines (100-B-14:6) Sampling Locations and Associated Chromium Results

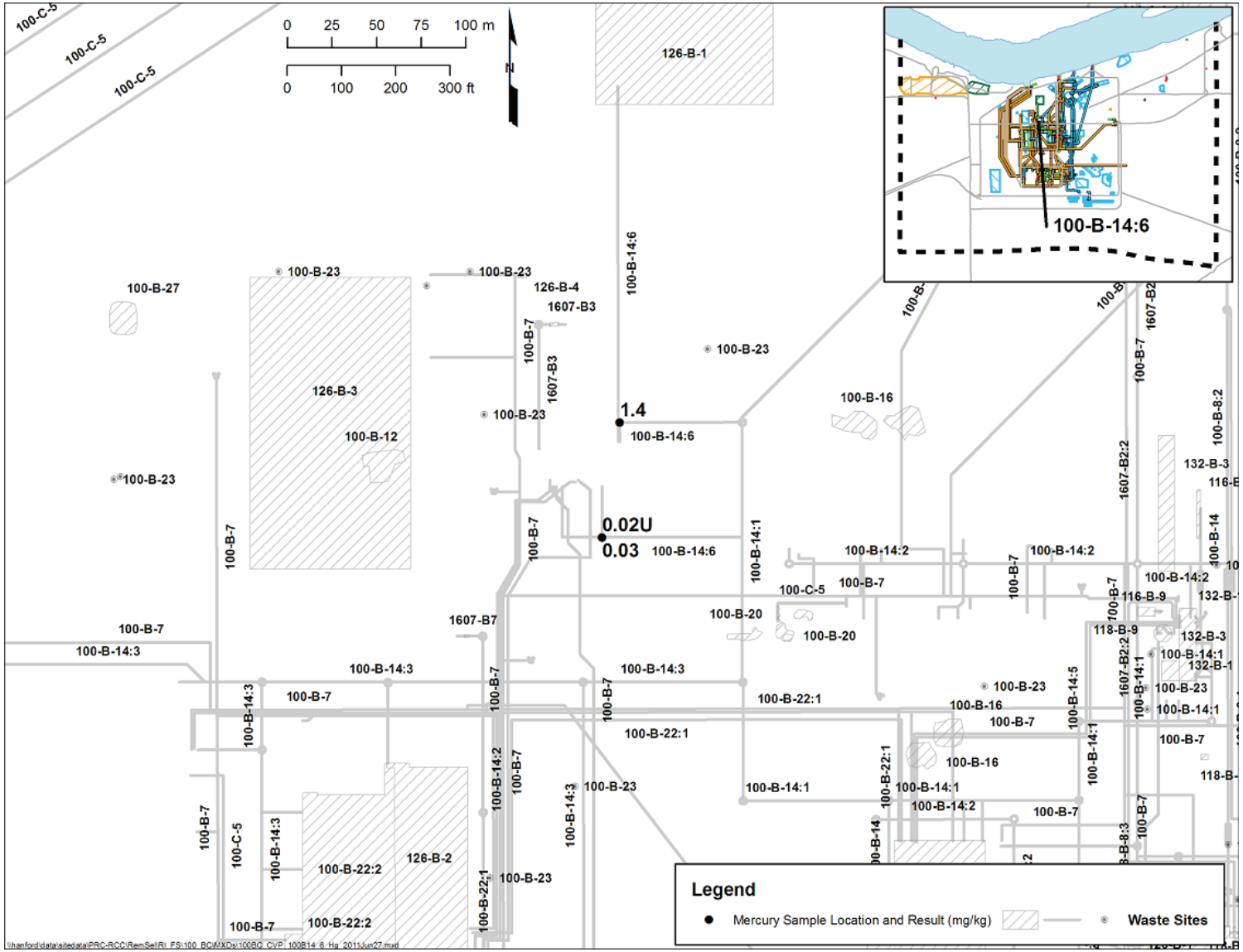

Figure H-3. 100-B Area Process and Sanitary Sewer Underground Pipelines (100-B-14:6) Sampling Locations and Associated Mercury Results

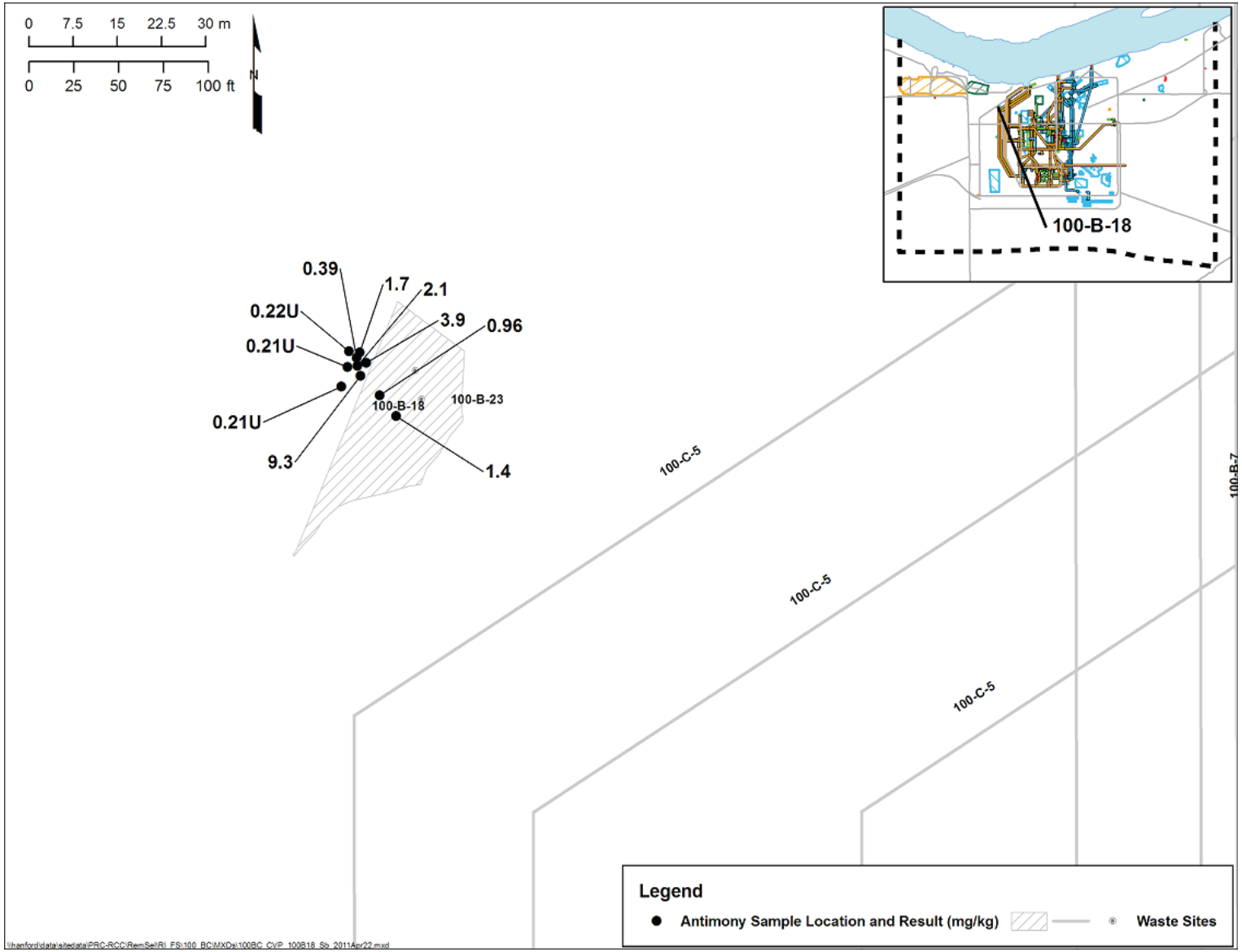

Figure H-4. 184-B Powerhouse Debris Pile (100-B-18) Sampling Locations and Associated Antimony Results

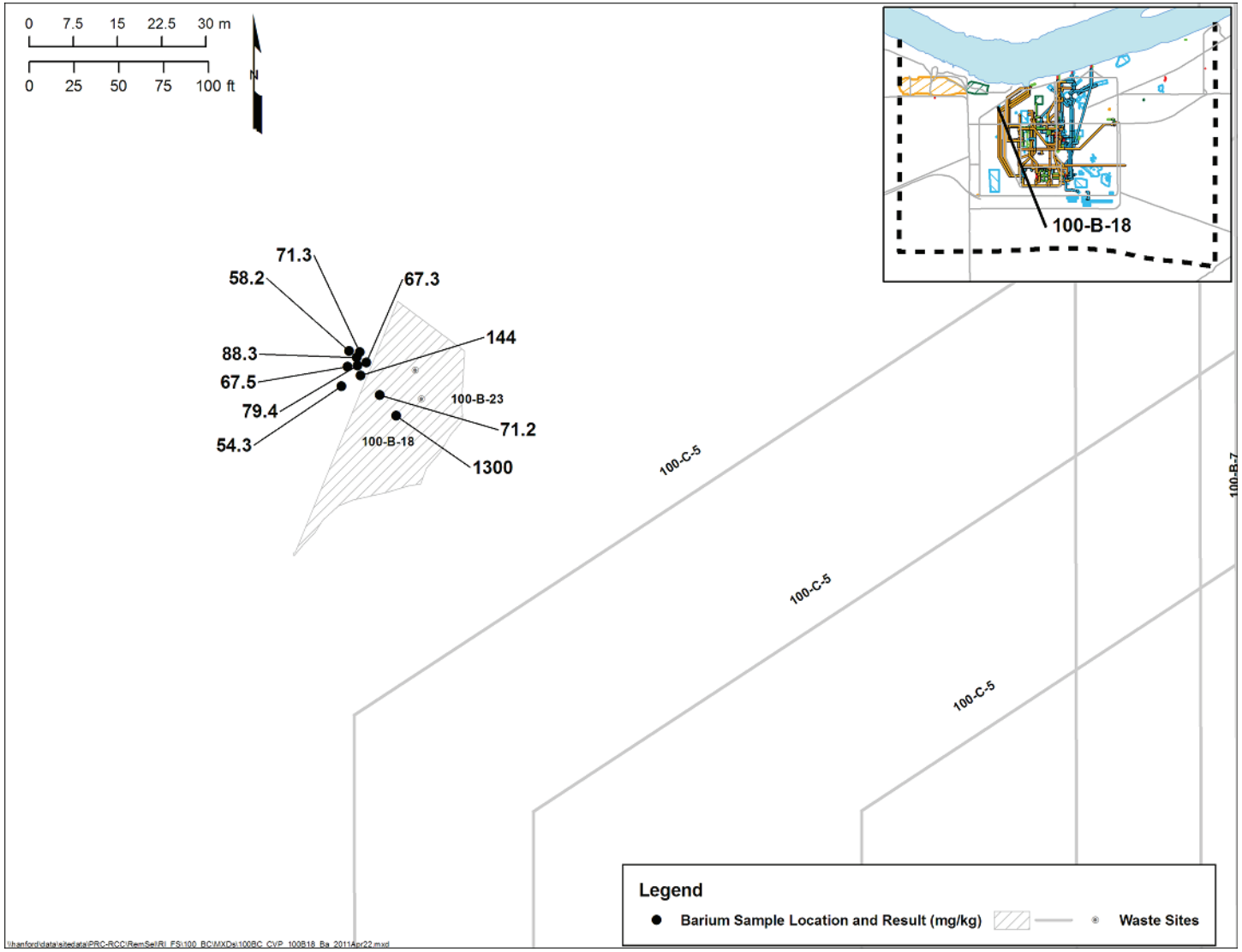

Figure H-5. 184-B Powerhouse Debris Pile (100-B-18) Sampling Locations and Associated Barium Results

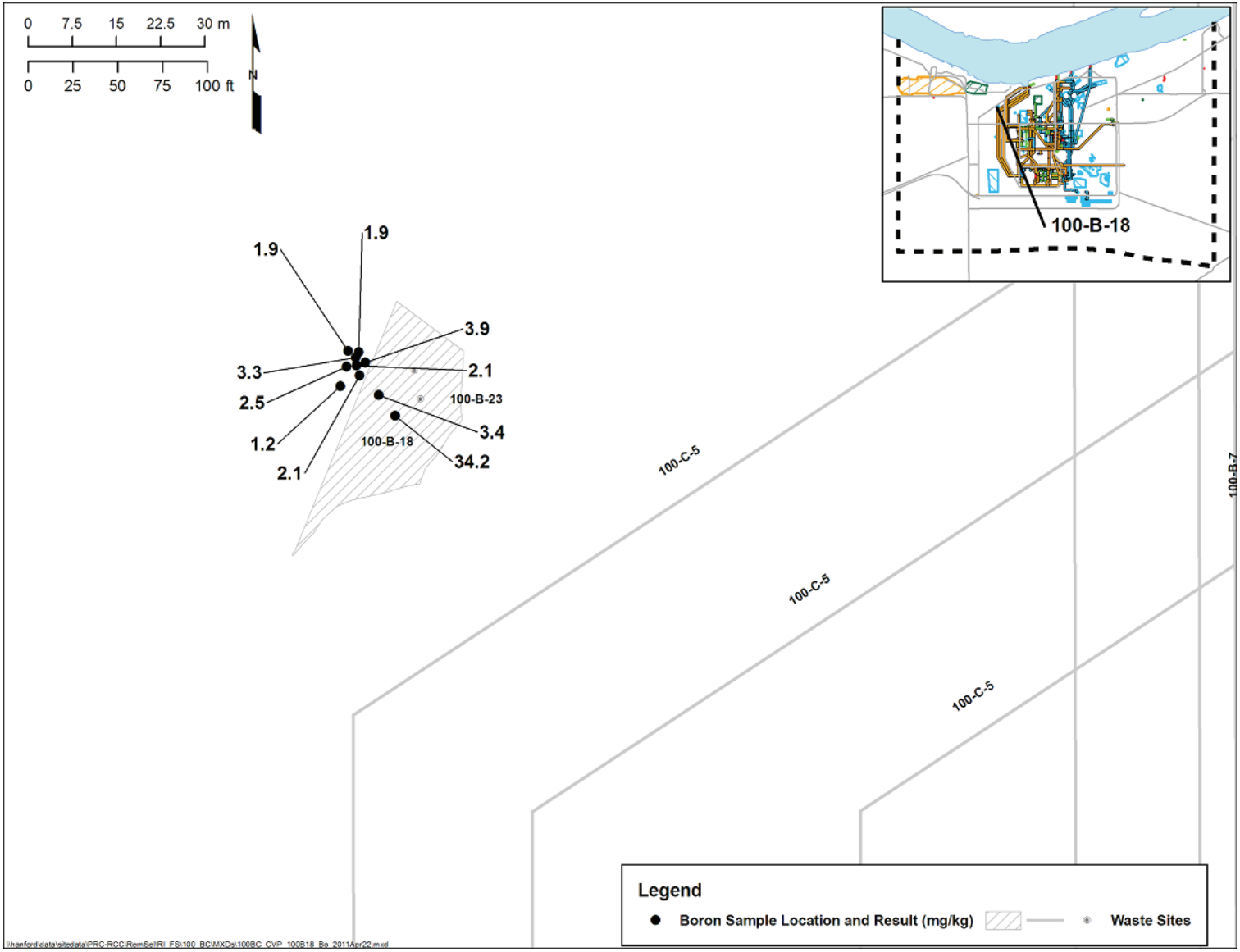

Figure H-6. 184-B Powerhouse Debris Pile (100-B-18) Sampling Locations and Associated Boron Results

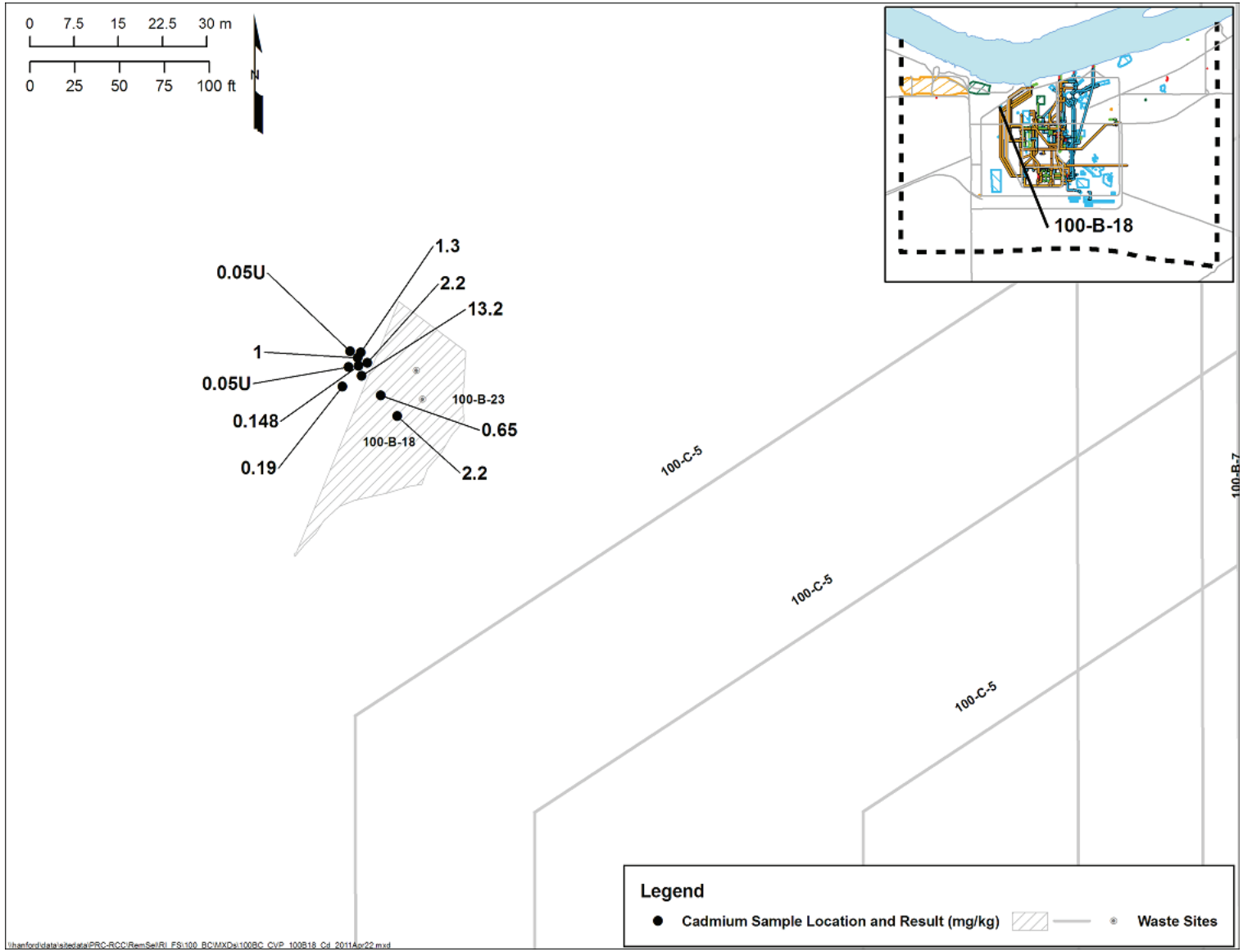

Figure H-7. 184-B Powerhouse Debris Pile (100-B-18) Sampling Locations and Associated Cadmium Results

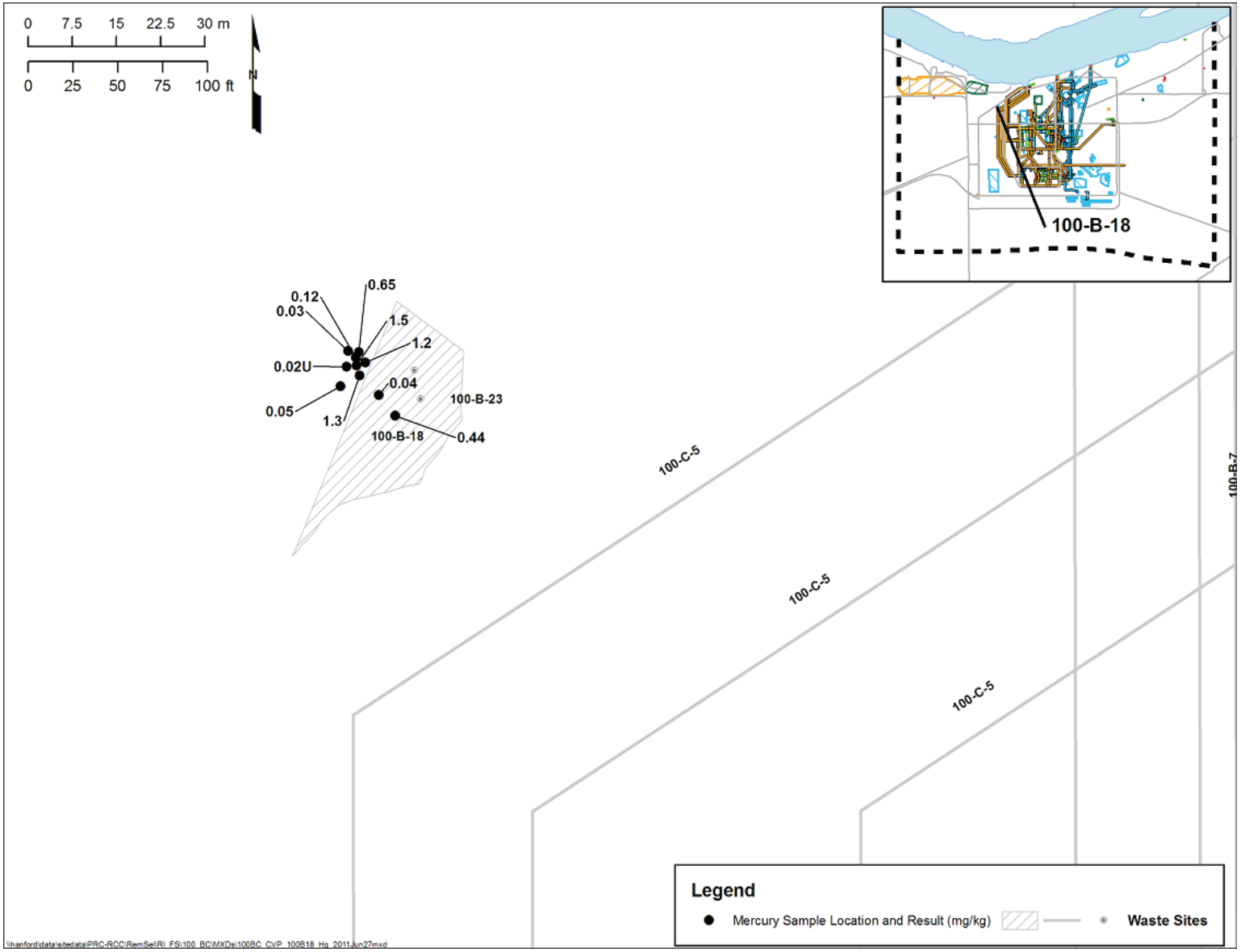

Figure H-8. 184-B Powerhouse Debris Pile (100-B-18) Sampling Locations and Associated Mercury Results

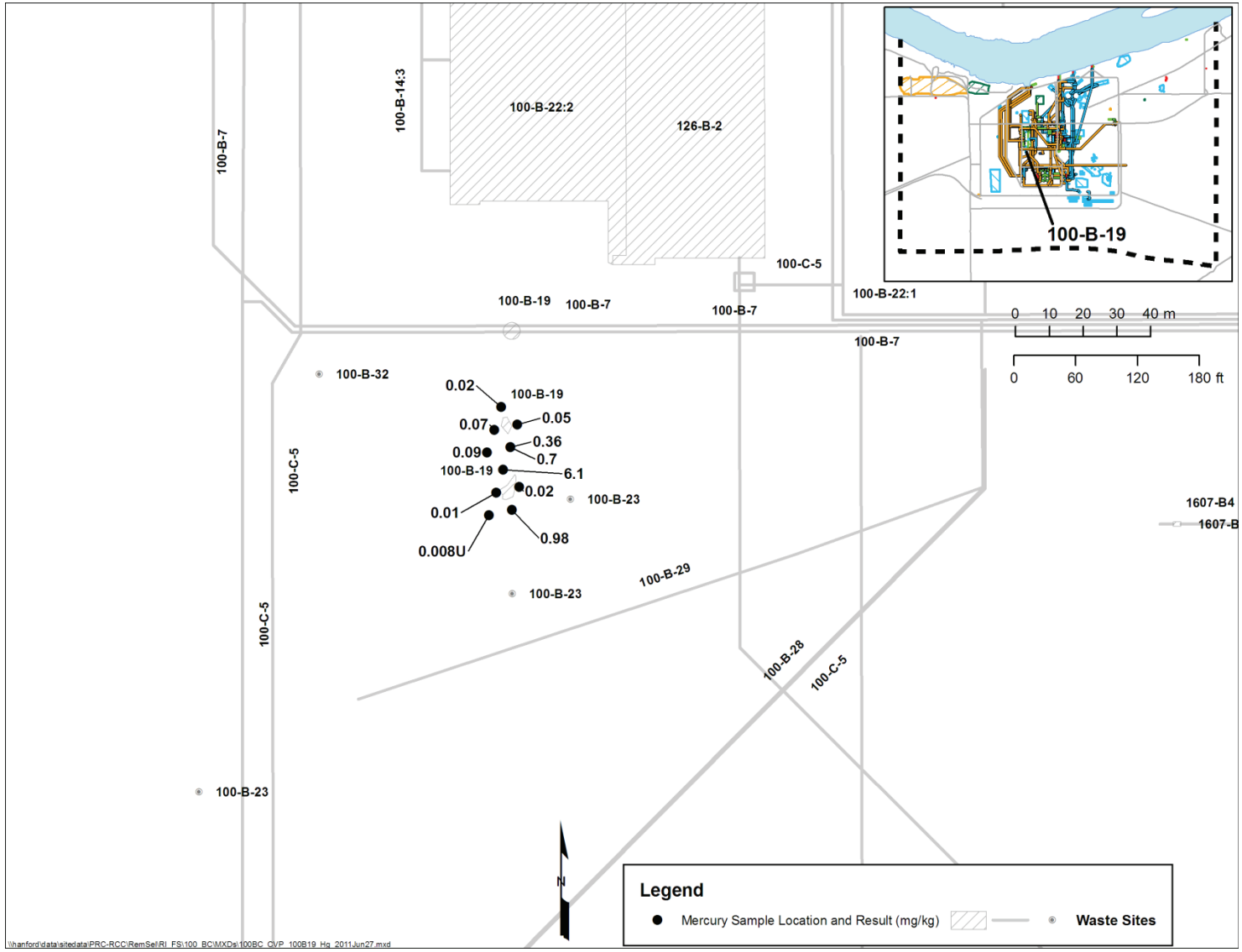

Figure H-9. 100-B/C Stained Soil Sites and 100-B/C Chemical Contaminated Surface Soil Area (100-B-19) Sampling Locations and Associated Mercury Results

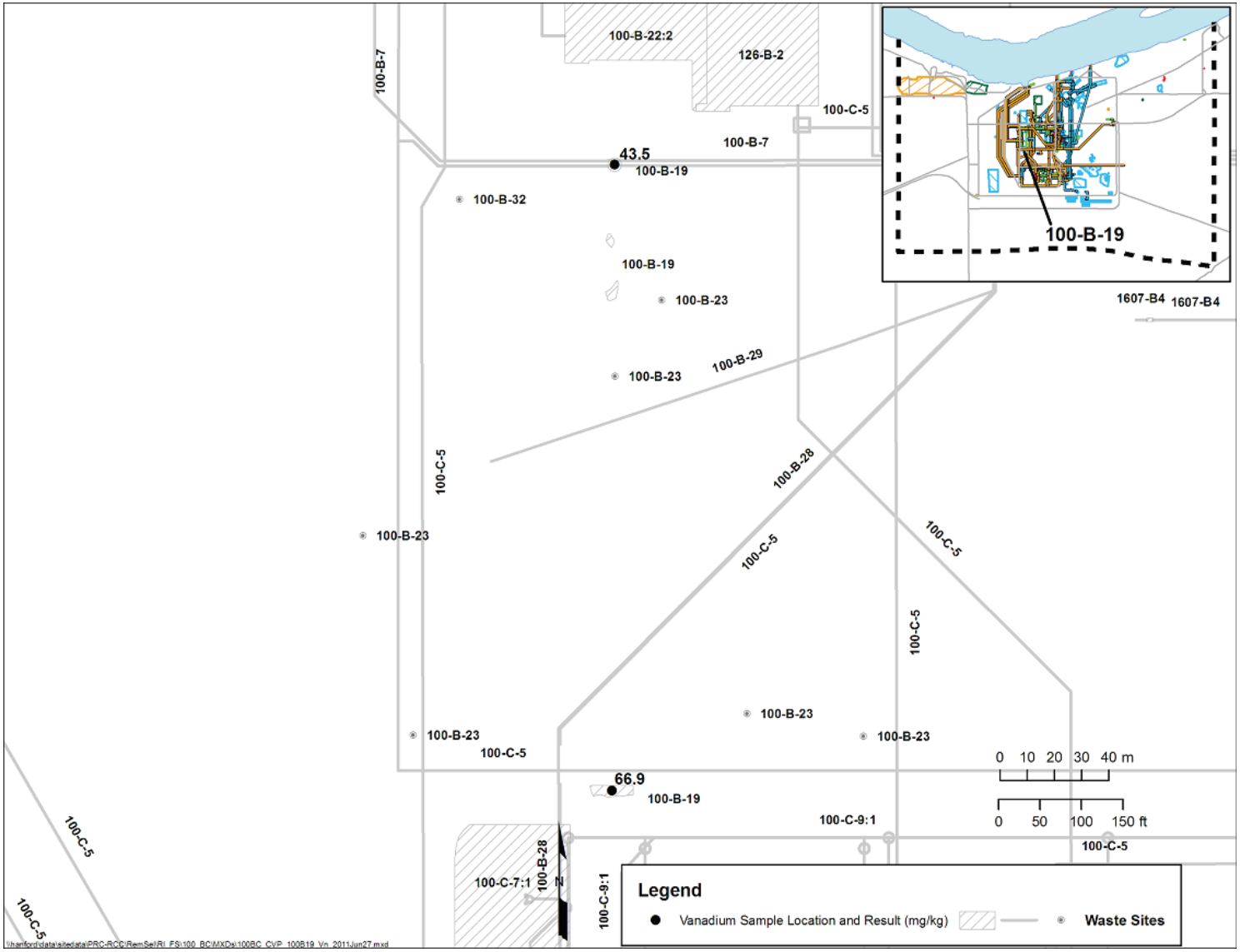

Figure H-10. 100-B/C Stained Soil Sites and 100-B/C Chemical Contaminated Surface Soil Area (100-B-19) Sampling Locations and Associated Vanadium Results

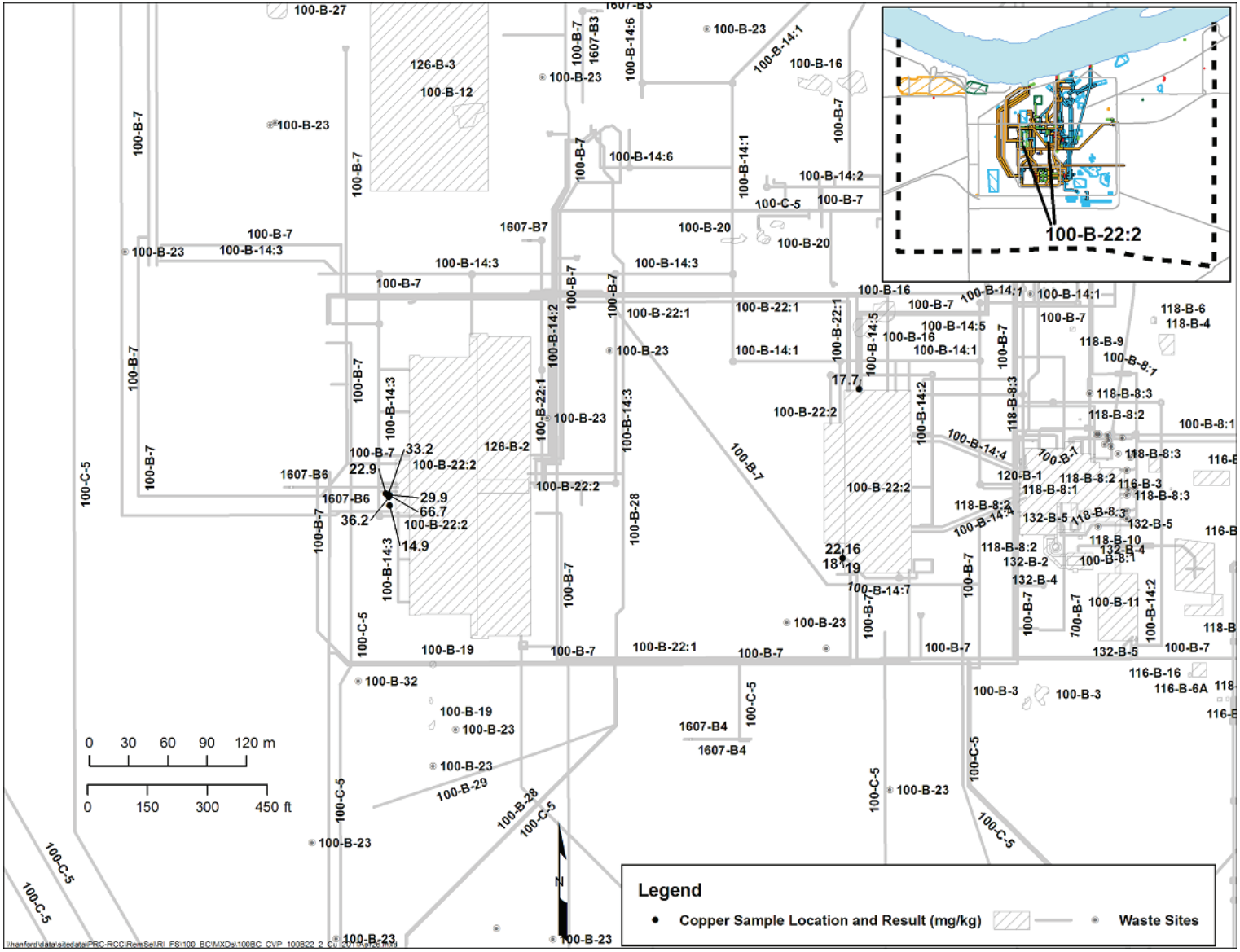

Figure H-11. 100-B Water Treatment Facilities (100-B-22:2) Sampling Locations and Associated Copper Results

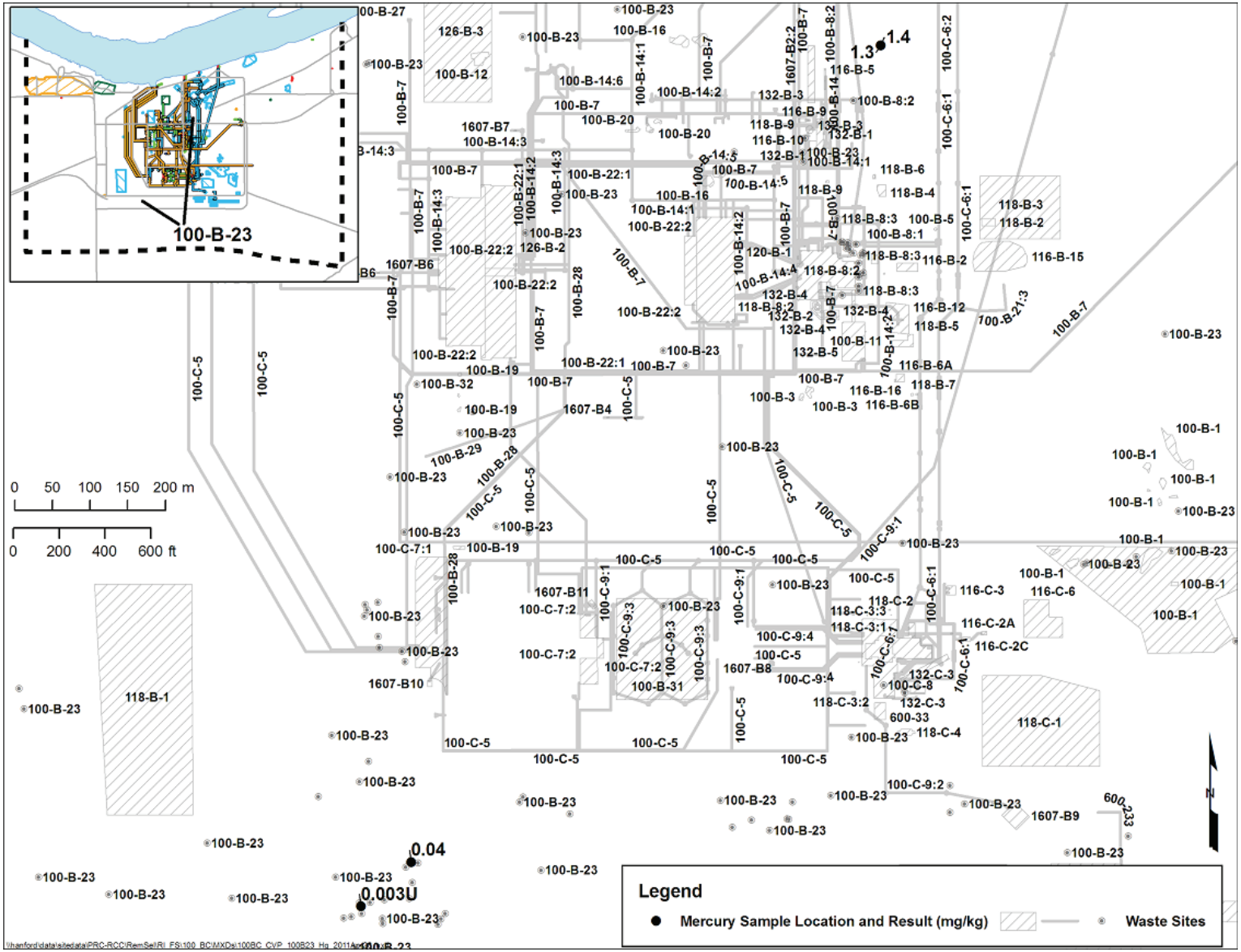

Figure H-12. 100-B /C Area Surface Debris (100-B-23) Sampling Locations and Associated Mercury Results

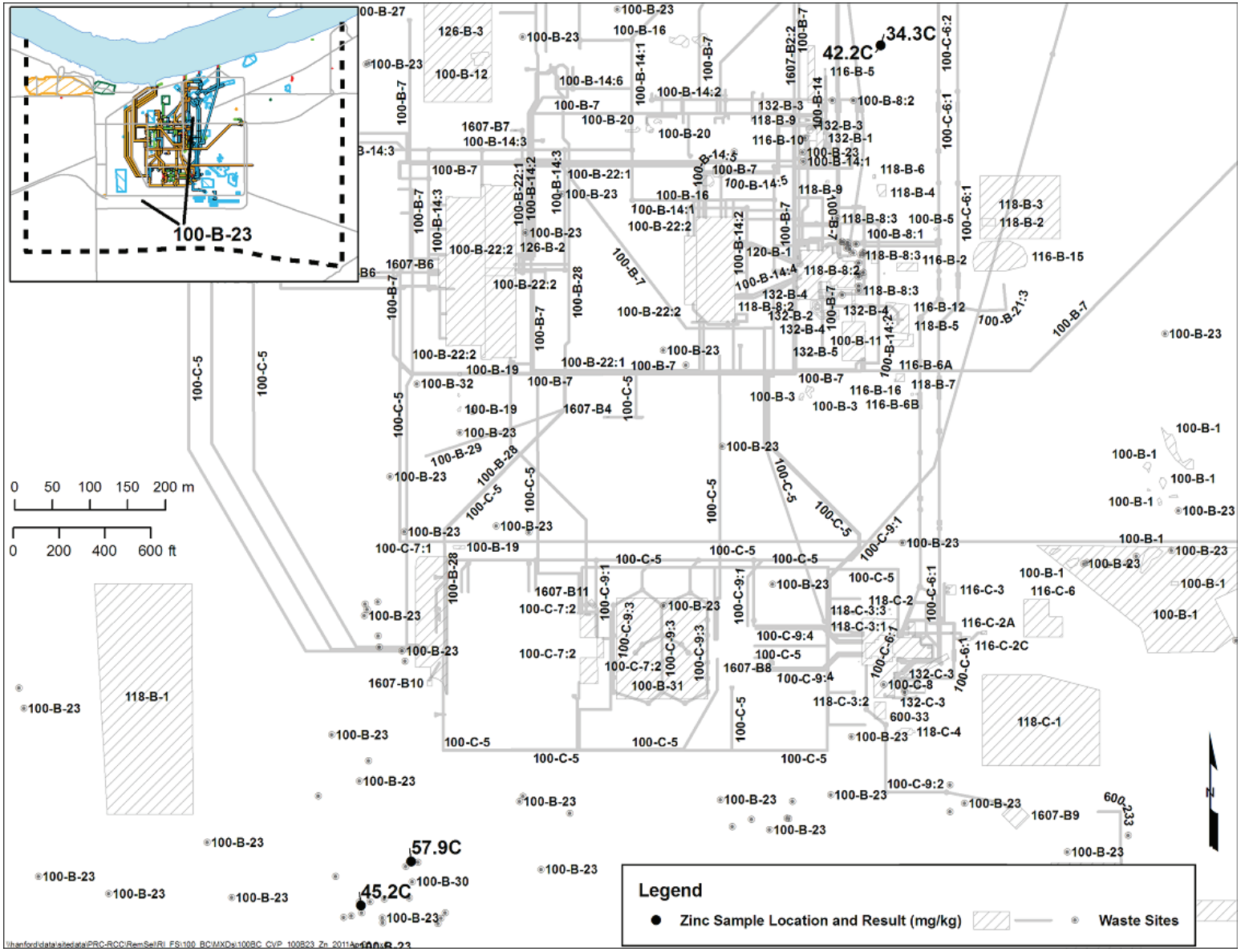

Figure H-13. 100-B /C Area Surface Debris (100-B-23) Sampling Locations and Associated Zinc Results

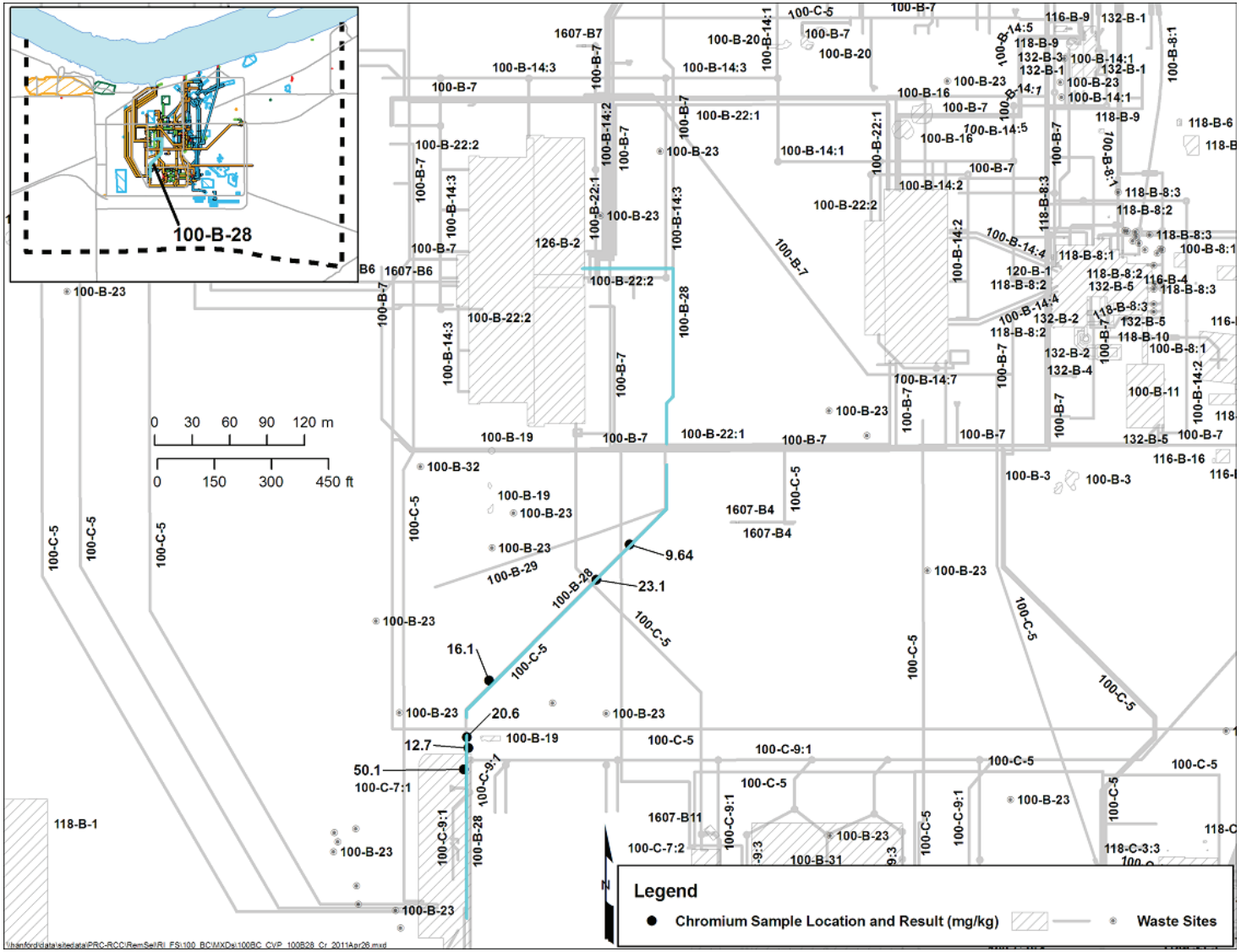

Figure H-14. 183-C Headhouse to the 183-B Pumphouse Sodium Dichromate Transfer Pipeline (100-B-28) Sampling Locations and Associated Chromium Results

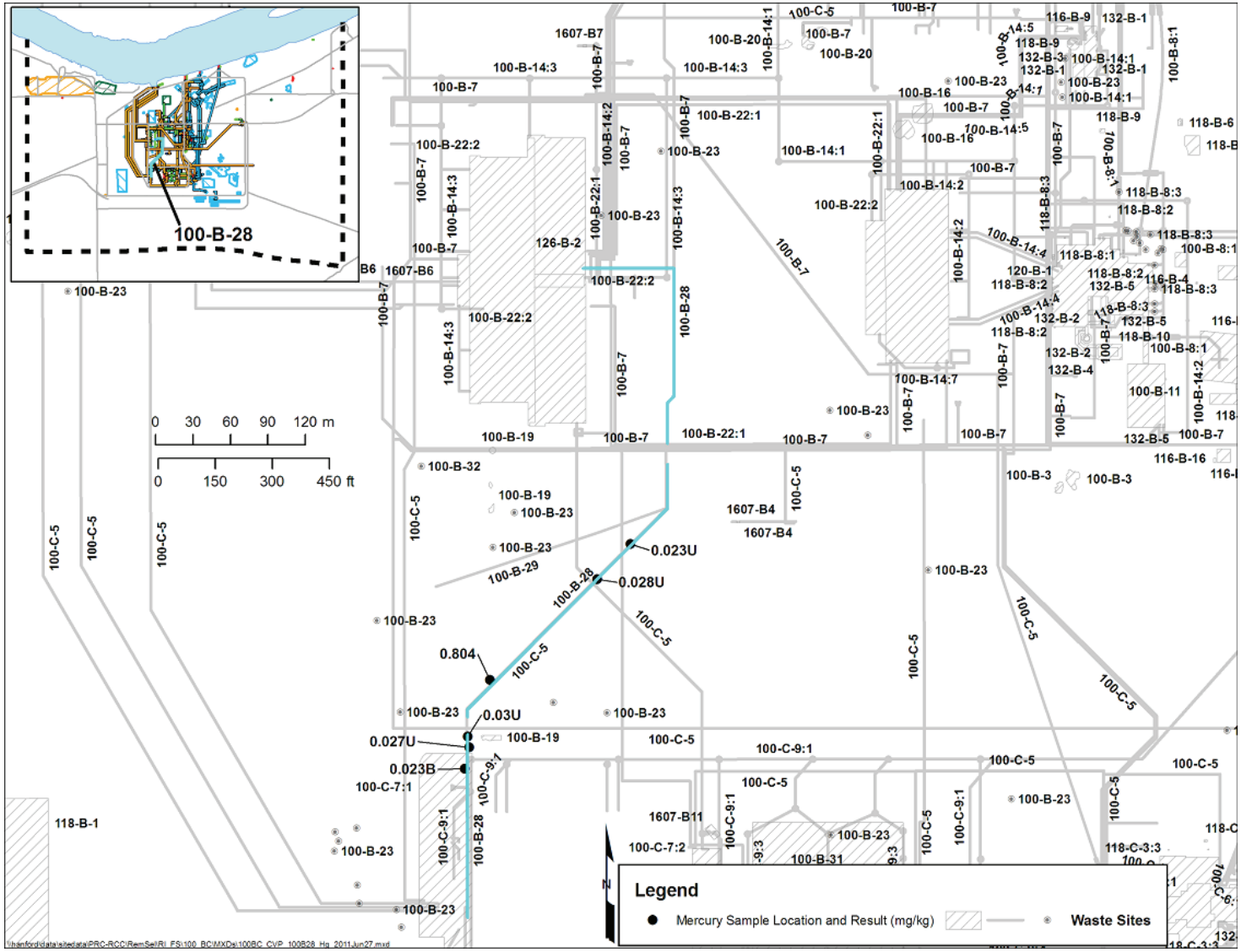

Figure H-15. 183-C Headhouse to the 183-B Pumphouse Sodium Dichromate Transfer Pipeline (100-B-28 Shallow Focused) Sampling Locations and Associated Mercury Results

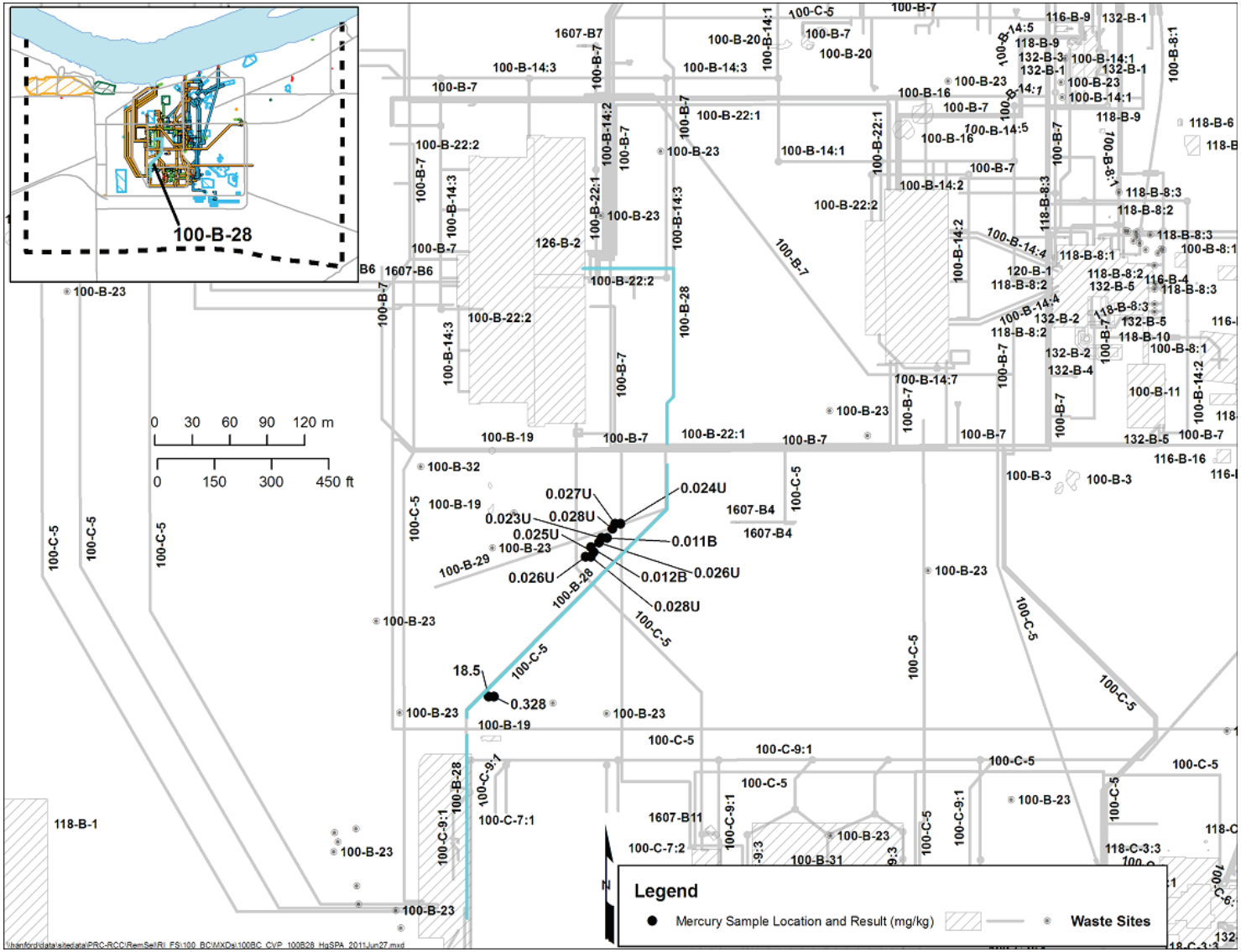

Figure H-16. 183-C Headhouse to the 183-B Pumphouse Sodium Dichromate Transfer Pipeline (100-B-28 Staging Pile Area 4) Sampling Locations and Associated Mercury Results

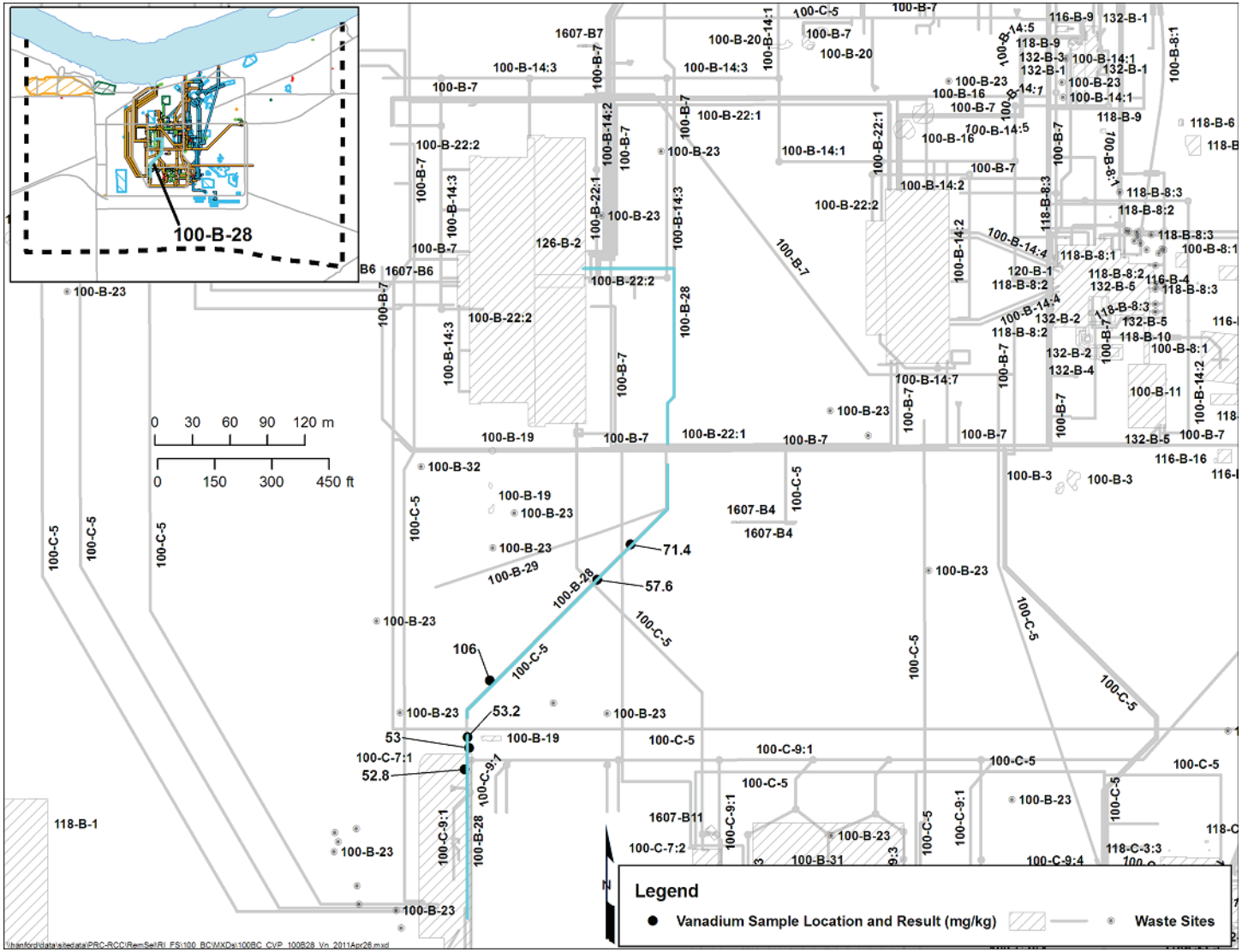

Figure H-17. 183-C Headhouse to the 183-B Pumphouse Sodium Dichromate Transfer Pipeline (100-B-28) Sampling Locations and Associated Vanadium Results

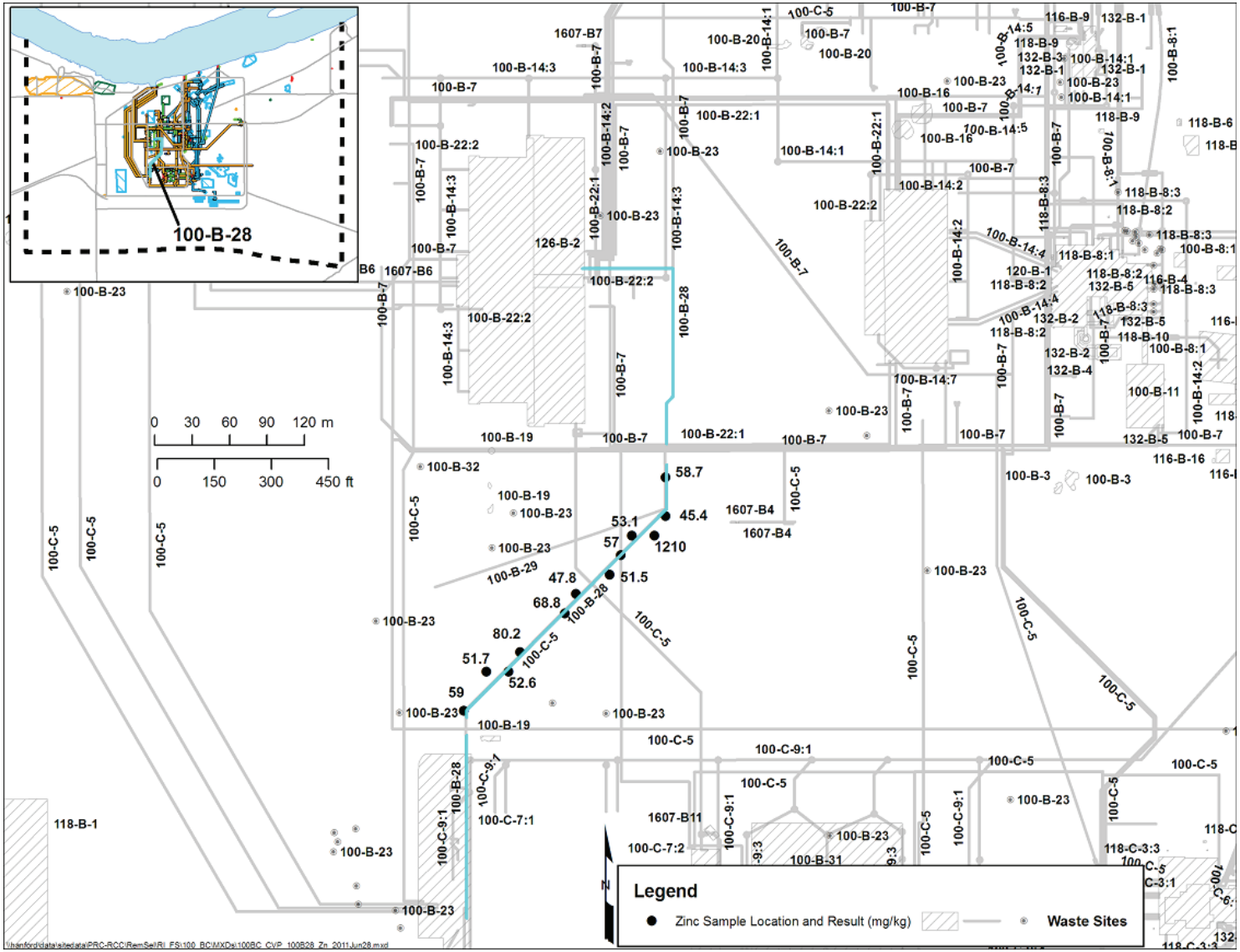

Figure H-18. 183-C Headhouse to the 183-B Pumphouse Sodium Dichromate Transfer Pipeline (100-B-28) Sampling Locations and Associated Zinc Results

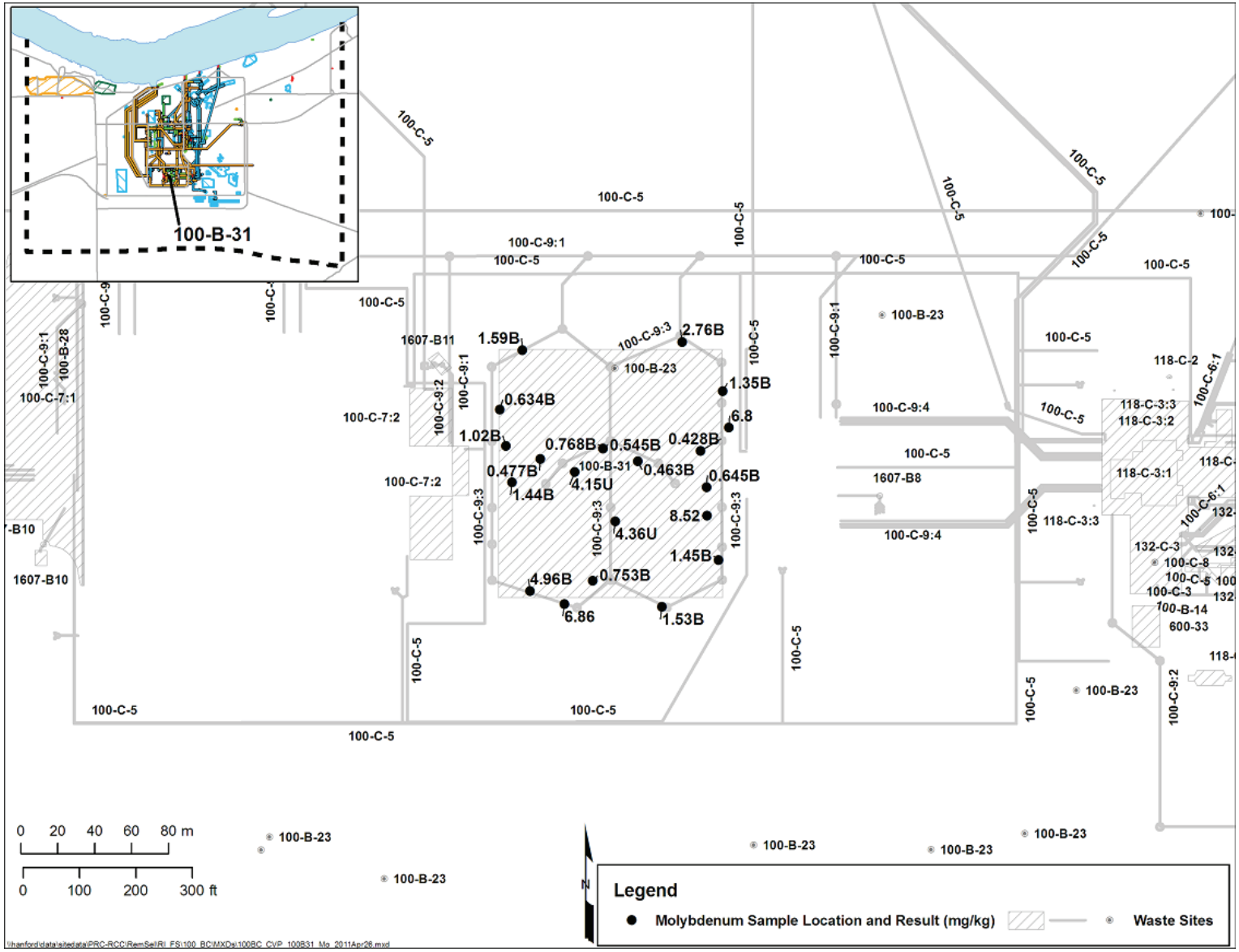

Figure H-19. Garnet Sand Located at the 183-C Clearwell Pads (100-B-31) Sampling Locations and Associated Molybenum Results

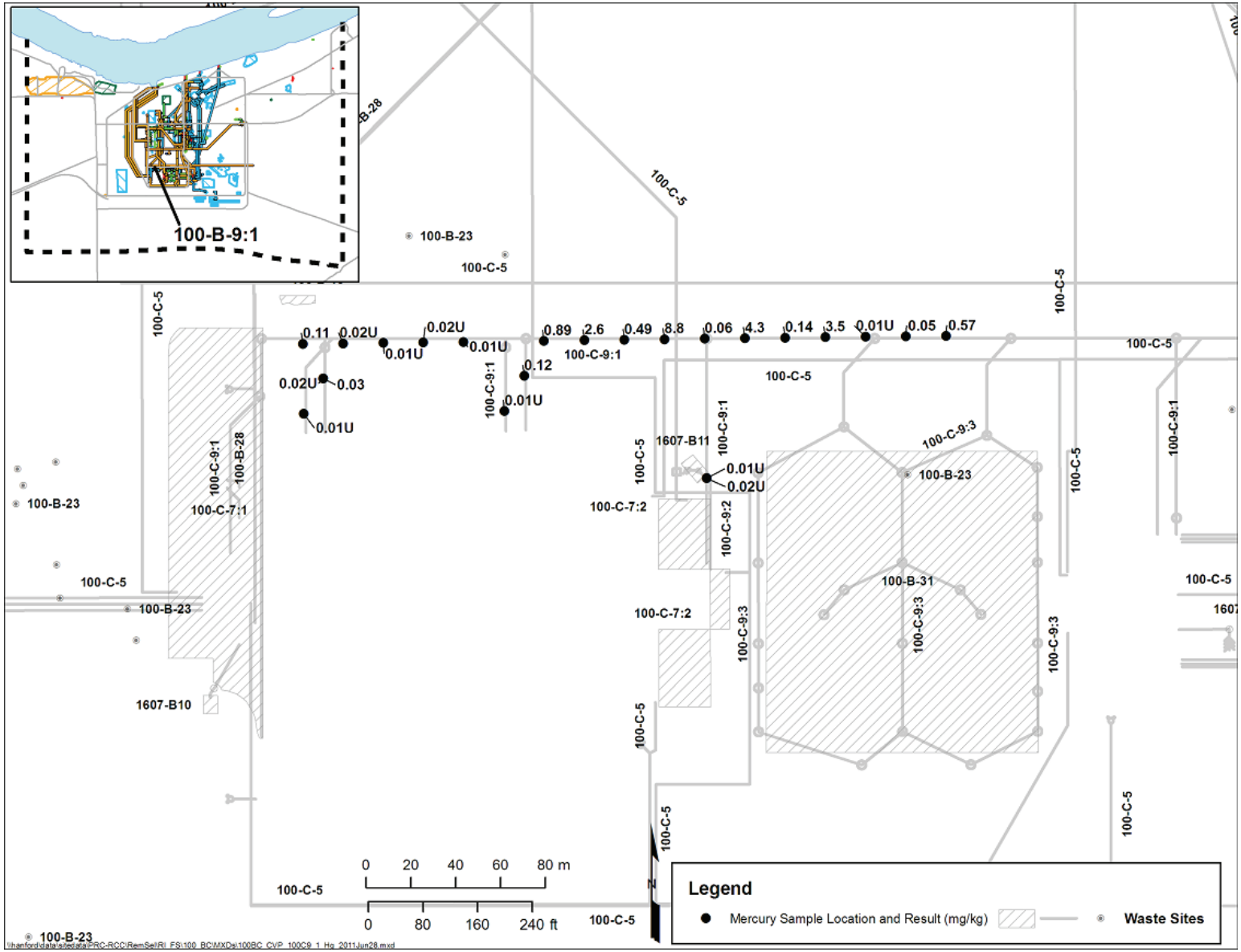

Figure H-20. Main Process Sewer Collection Line (100-C-9:1) Sampling Locations and Associated Mercury Results

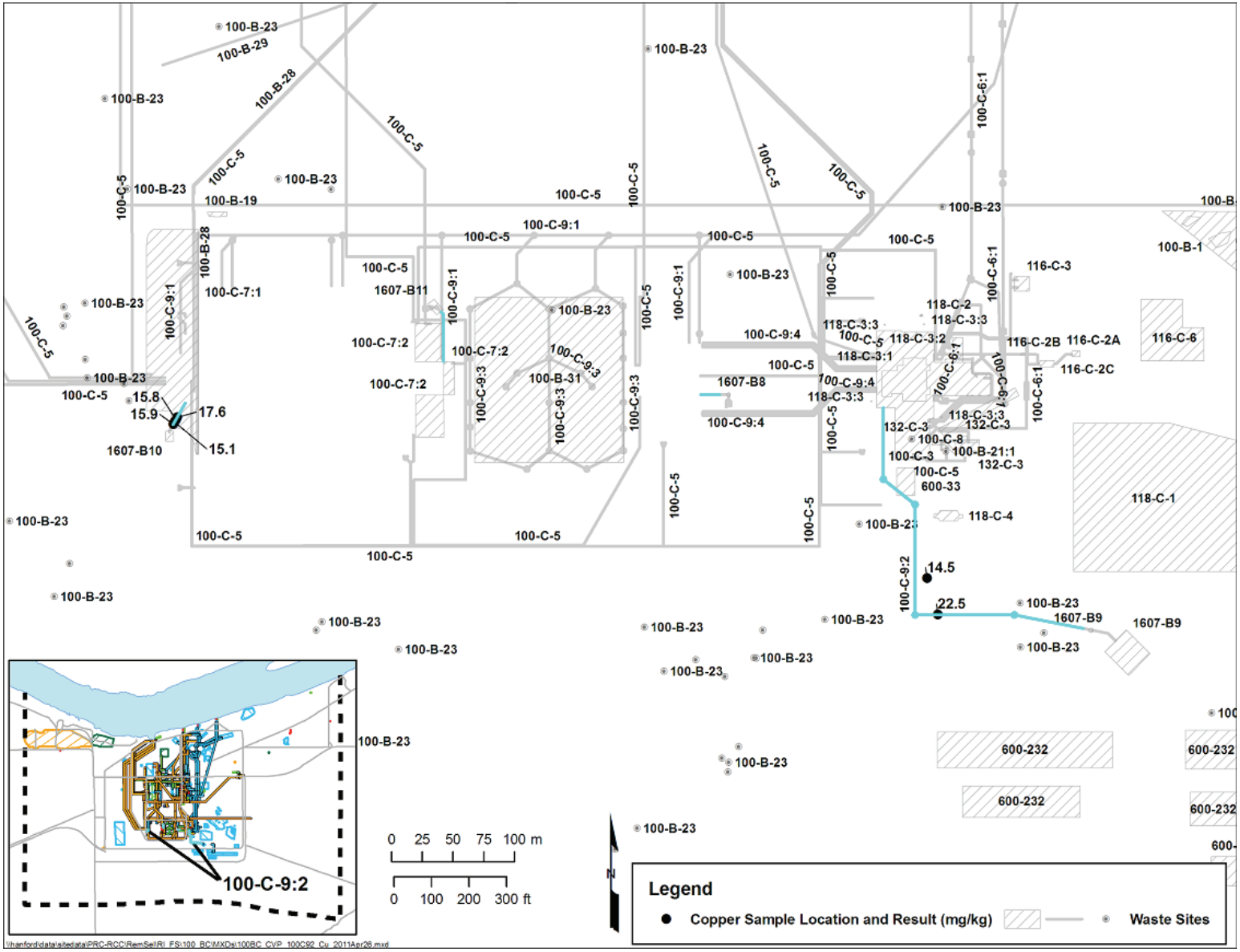

Figure H-21. Sanitary Sewers (100-C-9:2) Sampling Locations and Associated Copper Results

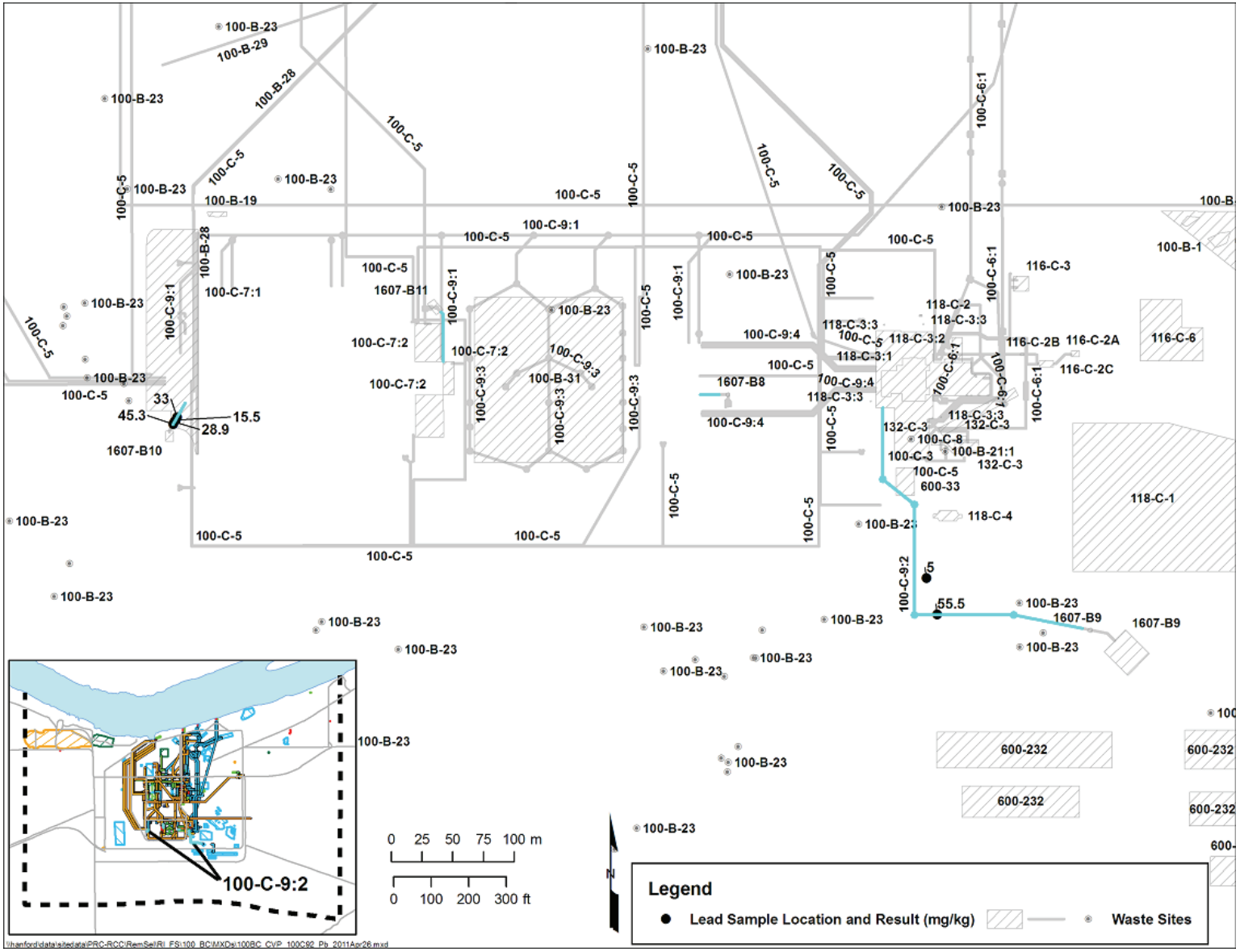

Figure H-22. Sanitary Sewers (100-C-9:2) Sampling Locations and Associated Lead Results

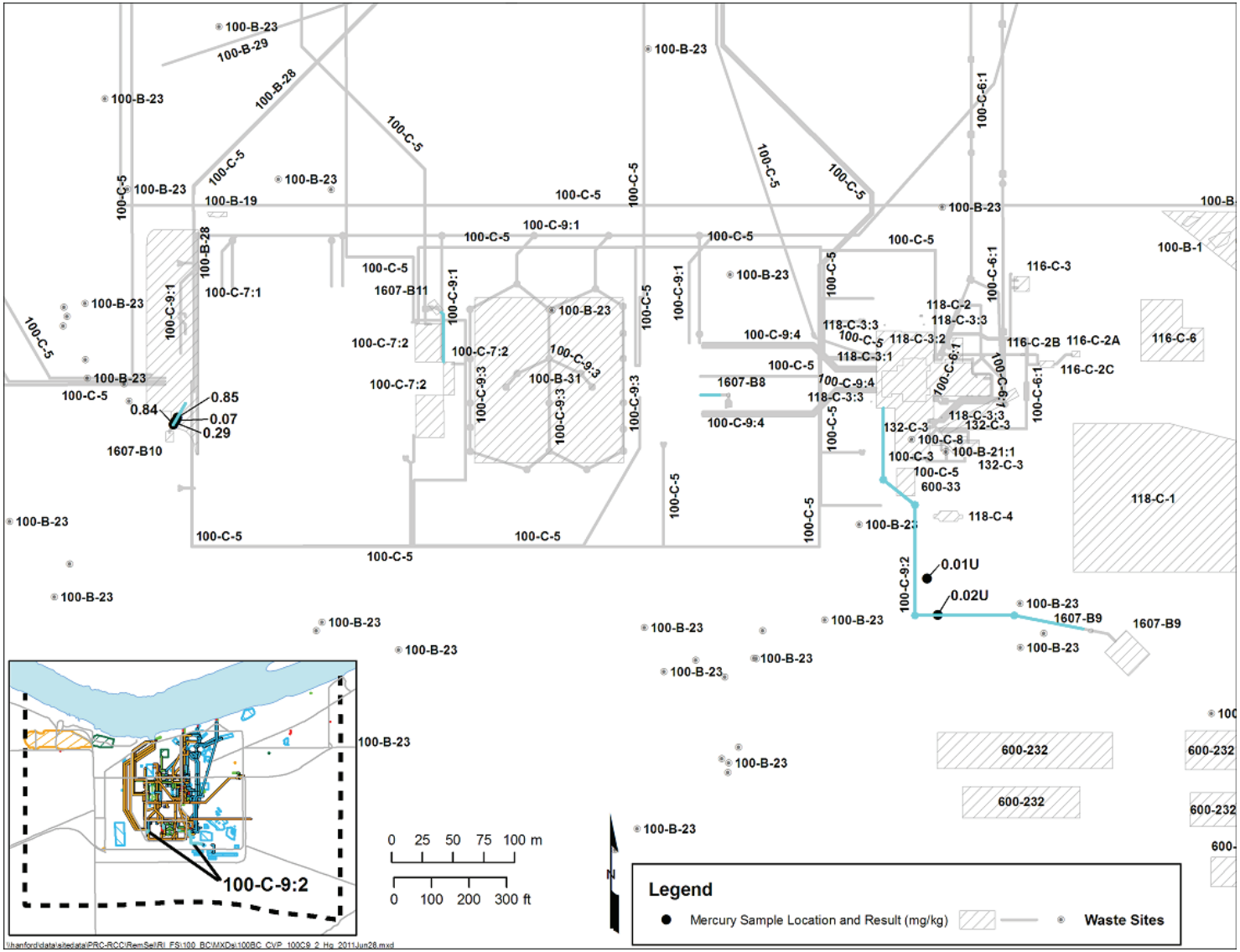

Figure H-23. Sanitary Sewers (100-C-9:2) Sampling Locations and Associated Mercury Results

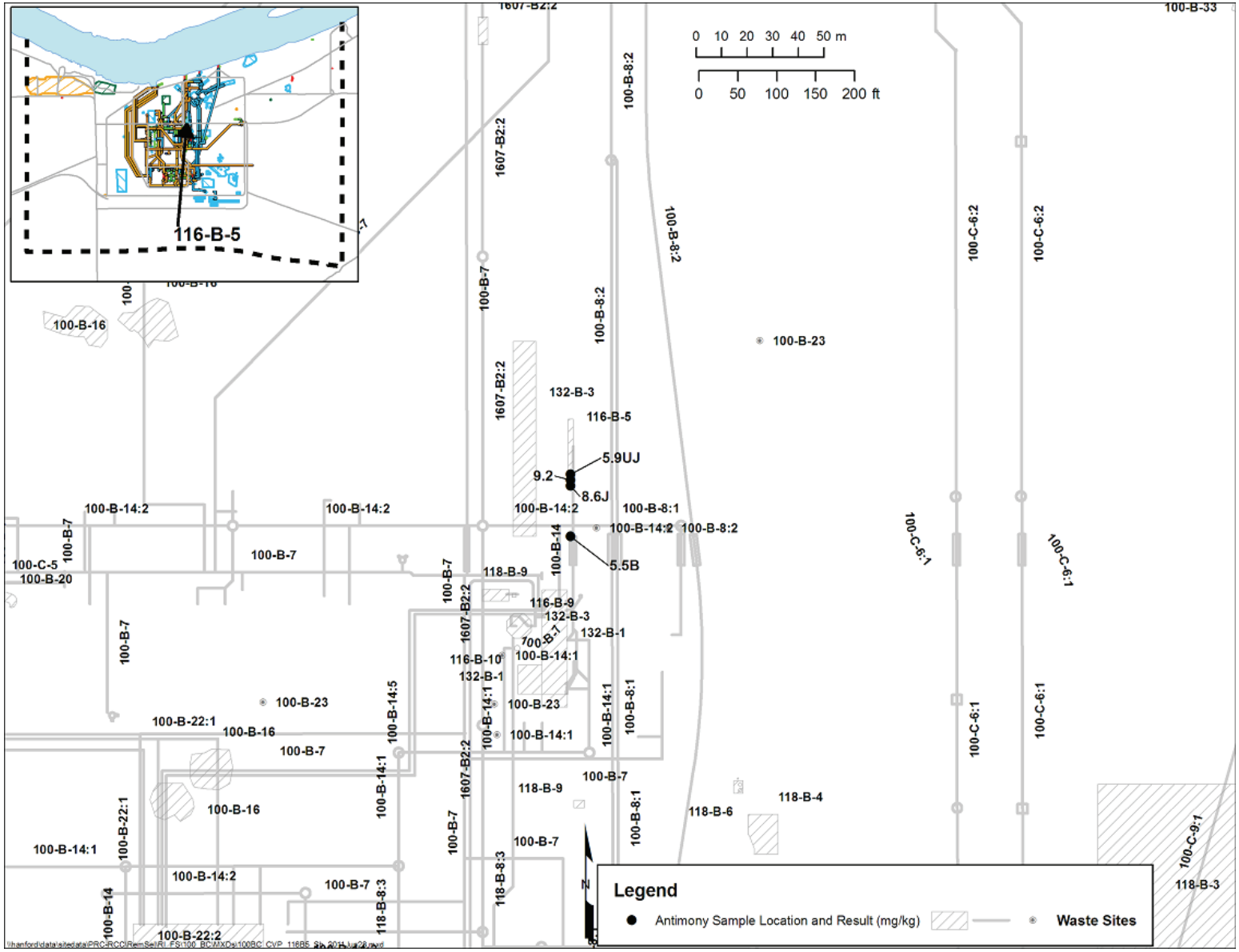

Figure H-24. Crib (100-B-5) Sampling Locations and Associated Antimony Results

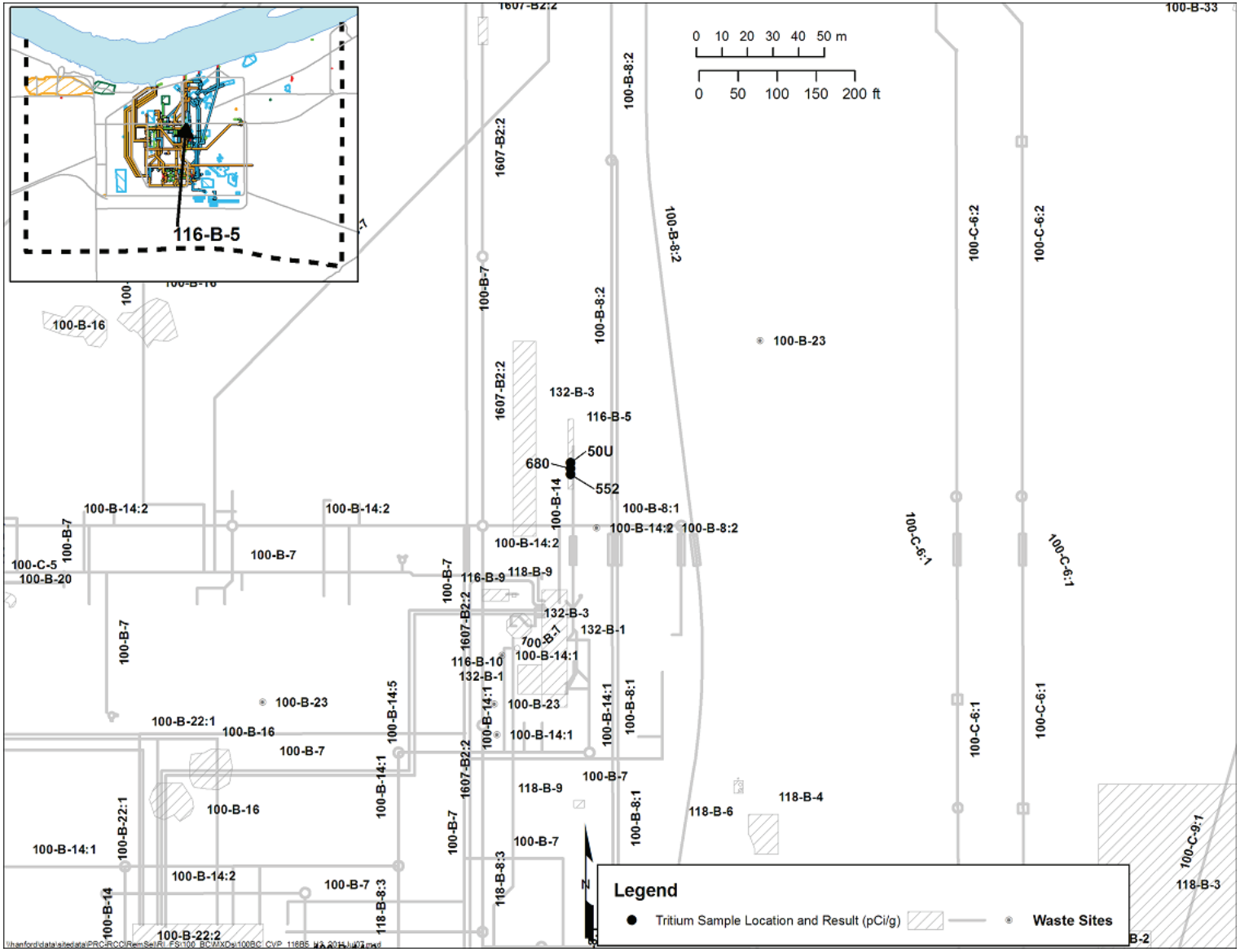

Figure H-25. Crib (116-B-5) Sampling Locations and Associated Tritium Results

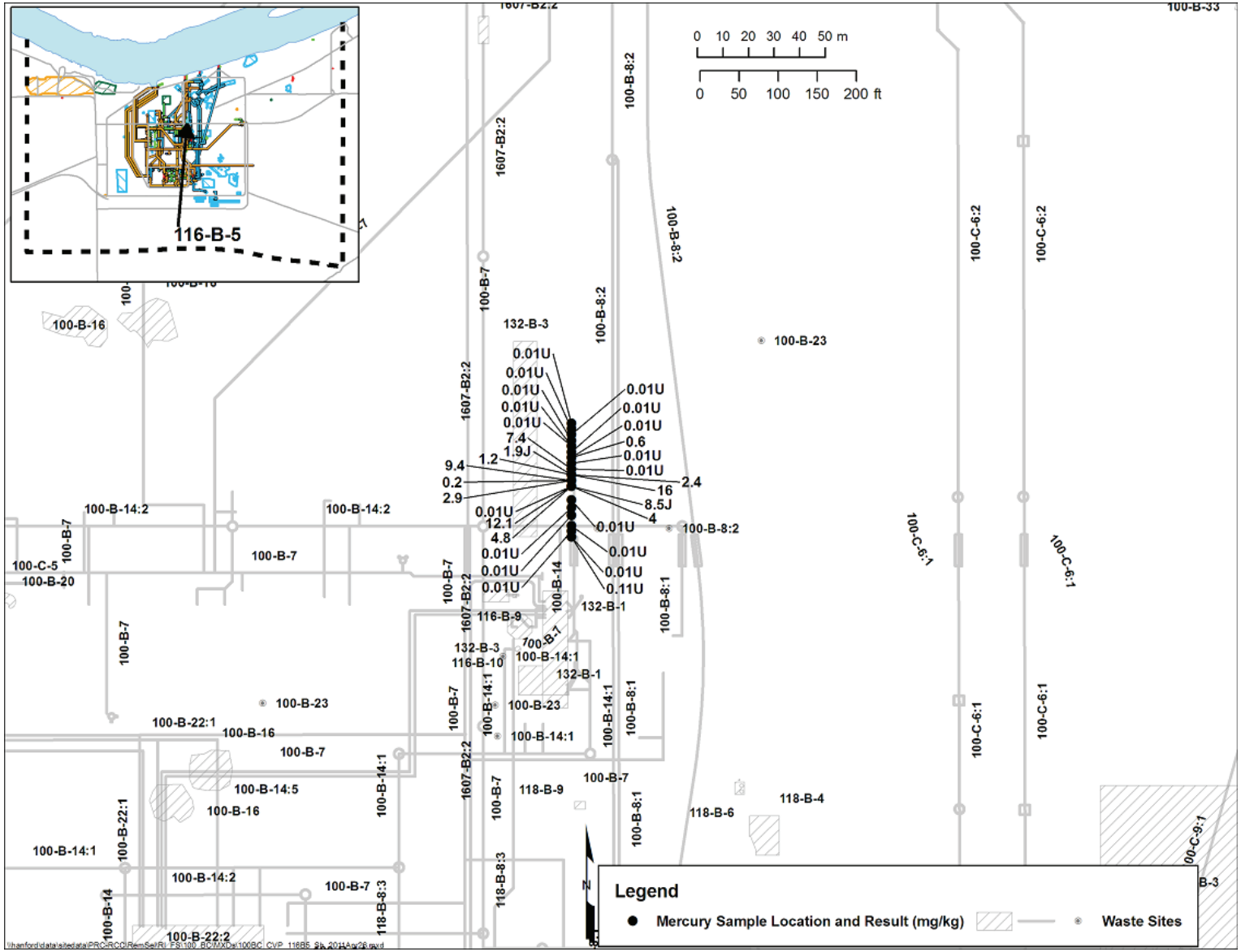

Figure H-26. Crib (100-B-5) Sampling Locations and Associated Mercury Results

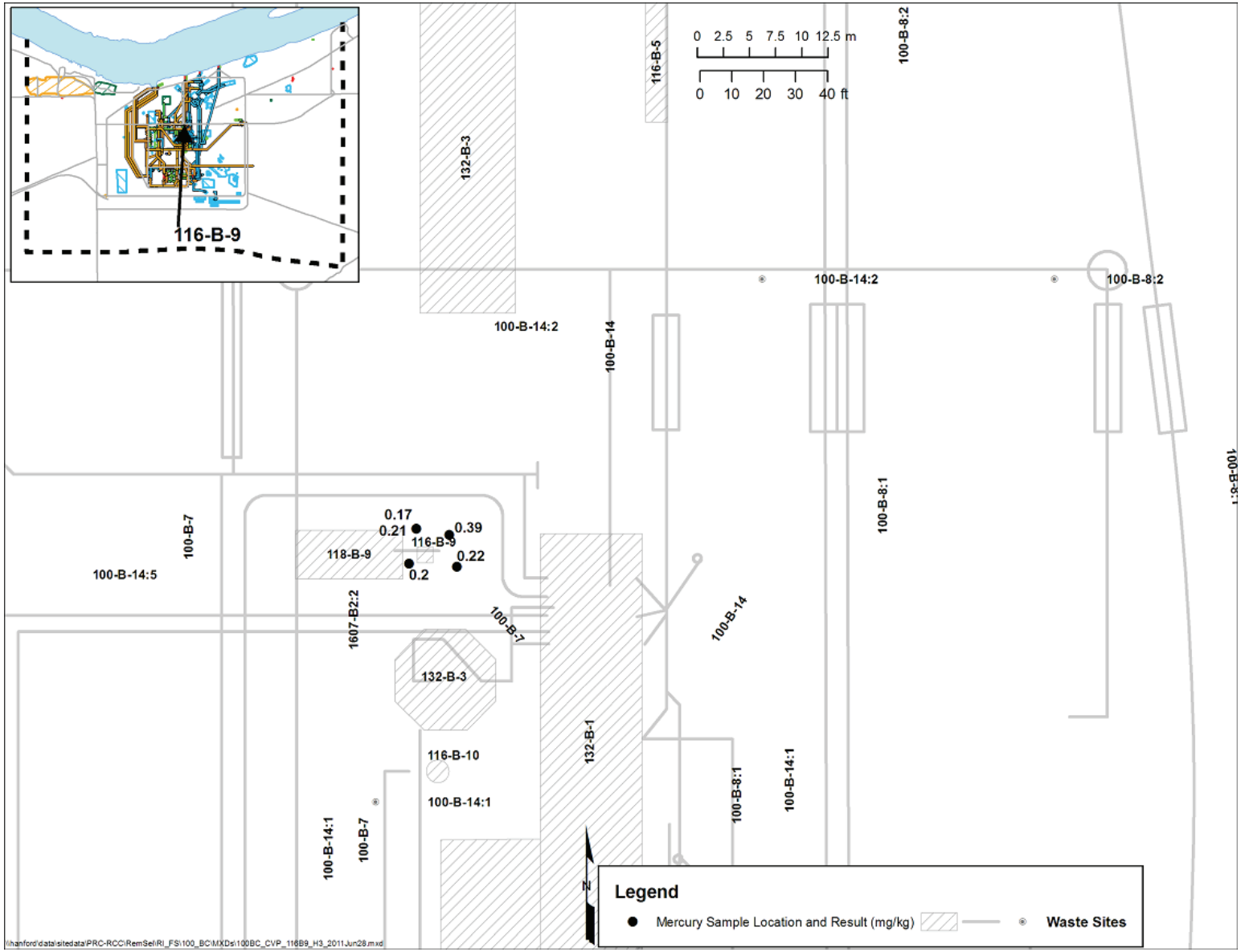

Figure H-27. French Drain (116-B-9) Sampling Locations and Associated Mercury Results

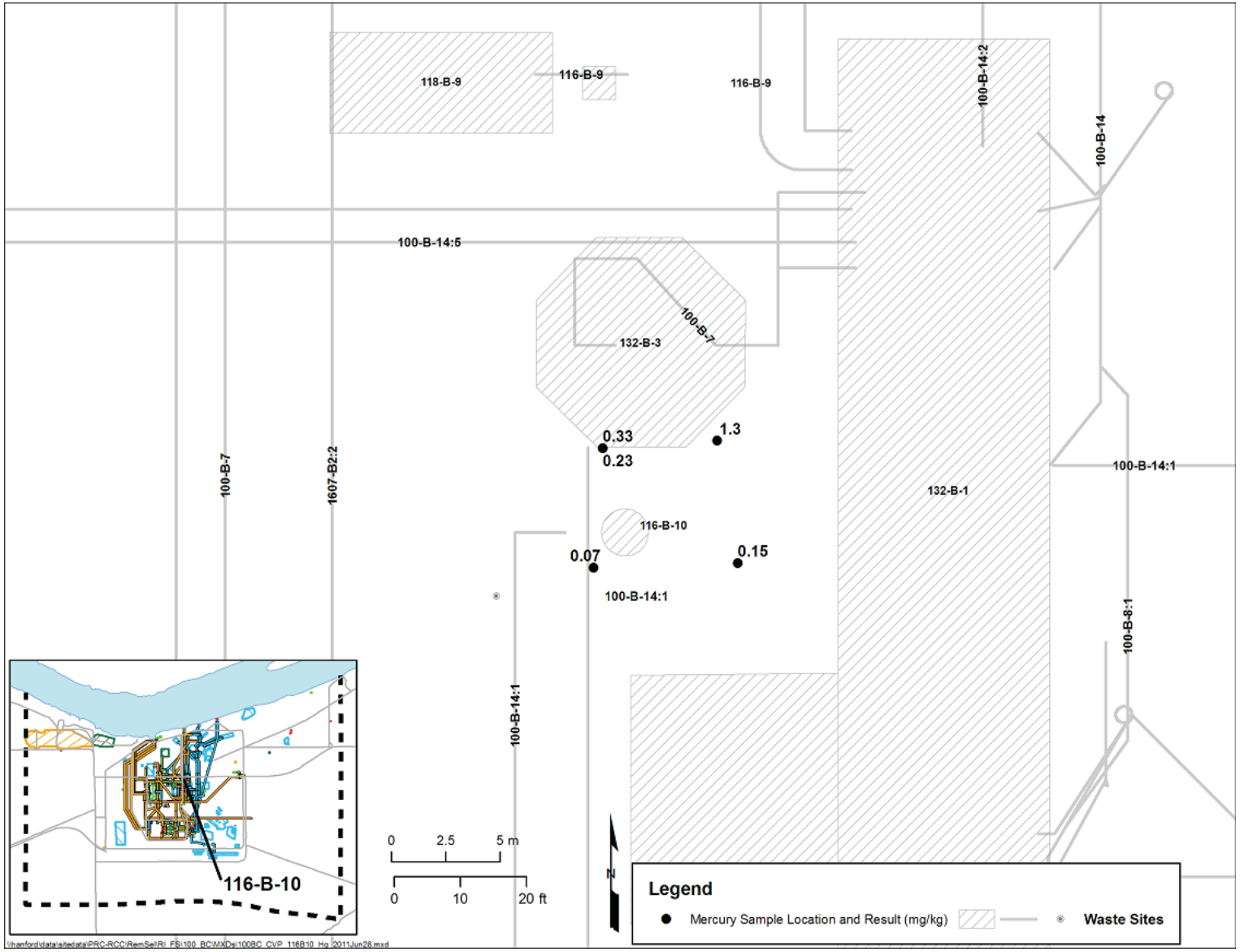

Figure H-28. Dry Well Quench Tank (116-B-10) Sampling Locations and Associated Mercury Results

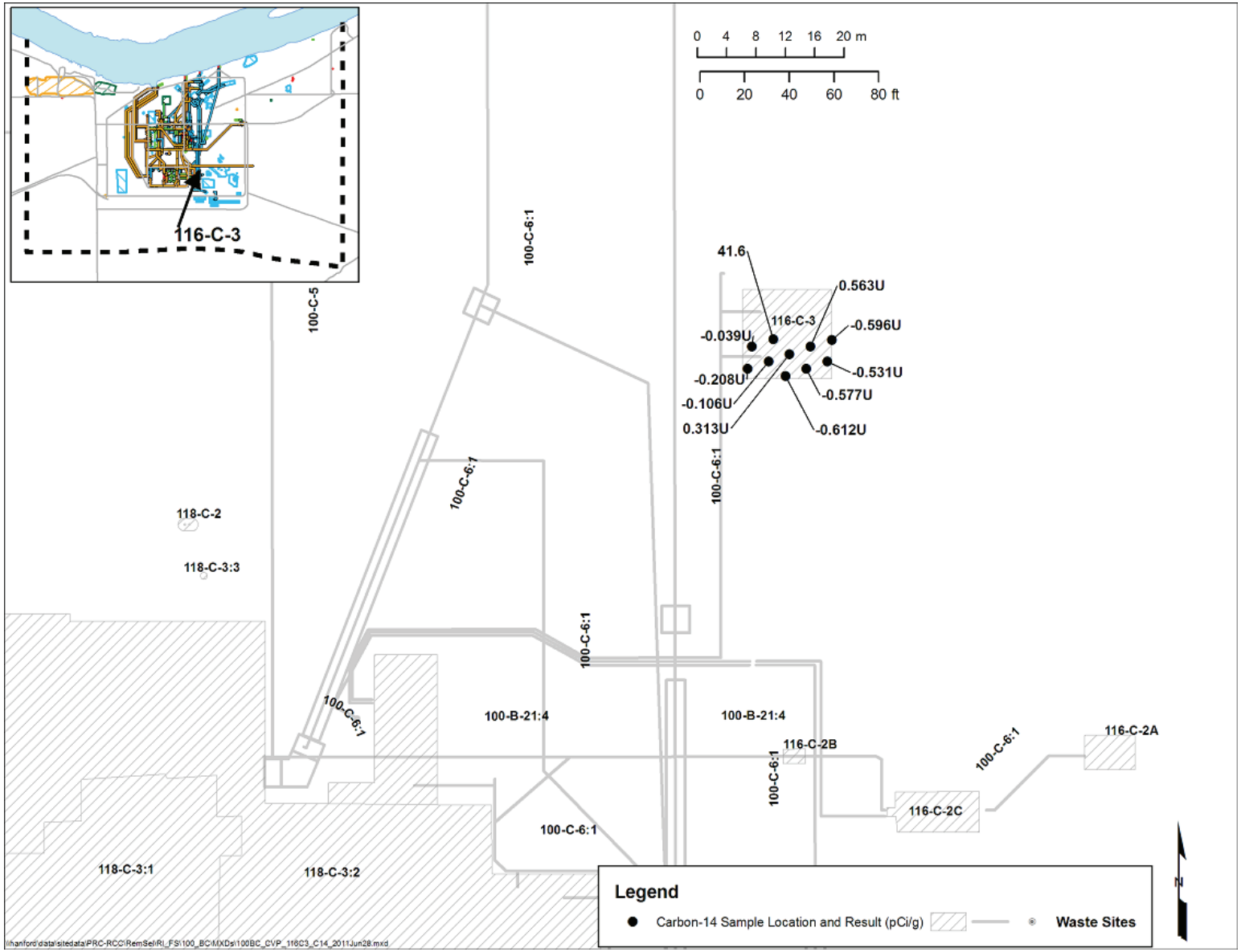

Figure H-29. 105C Chemical Waste Tanks (116-C-3) Sampling Locations and Associated Carbon-14 Results

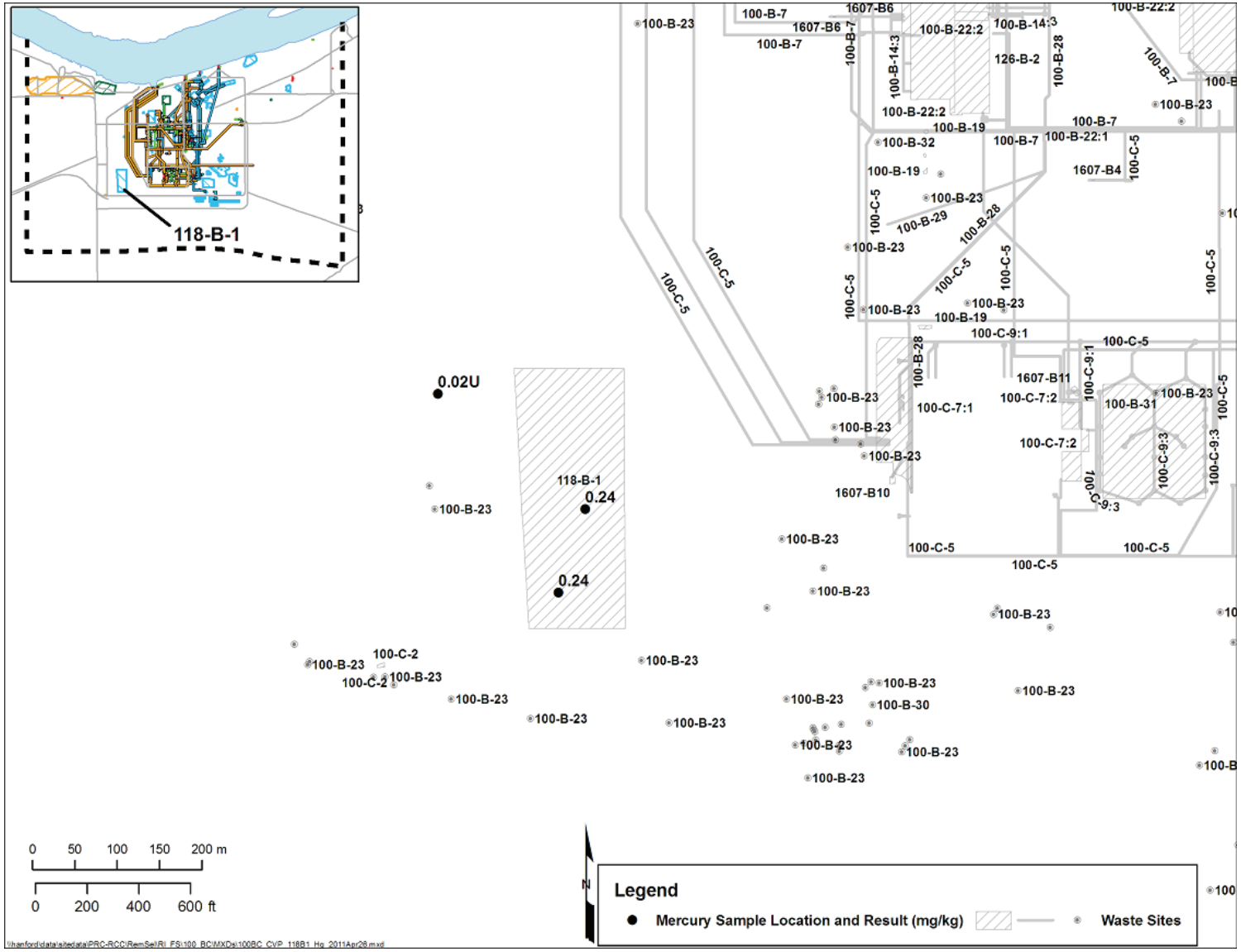

Figure H-30. 105B Solid Waste Burial Ground (118-B-1) Sampling Locations and Associated Mercury Results

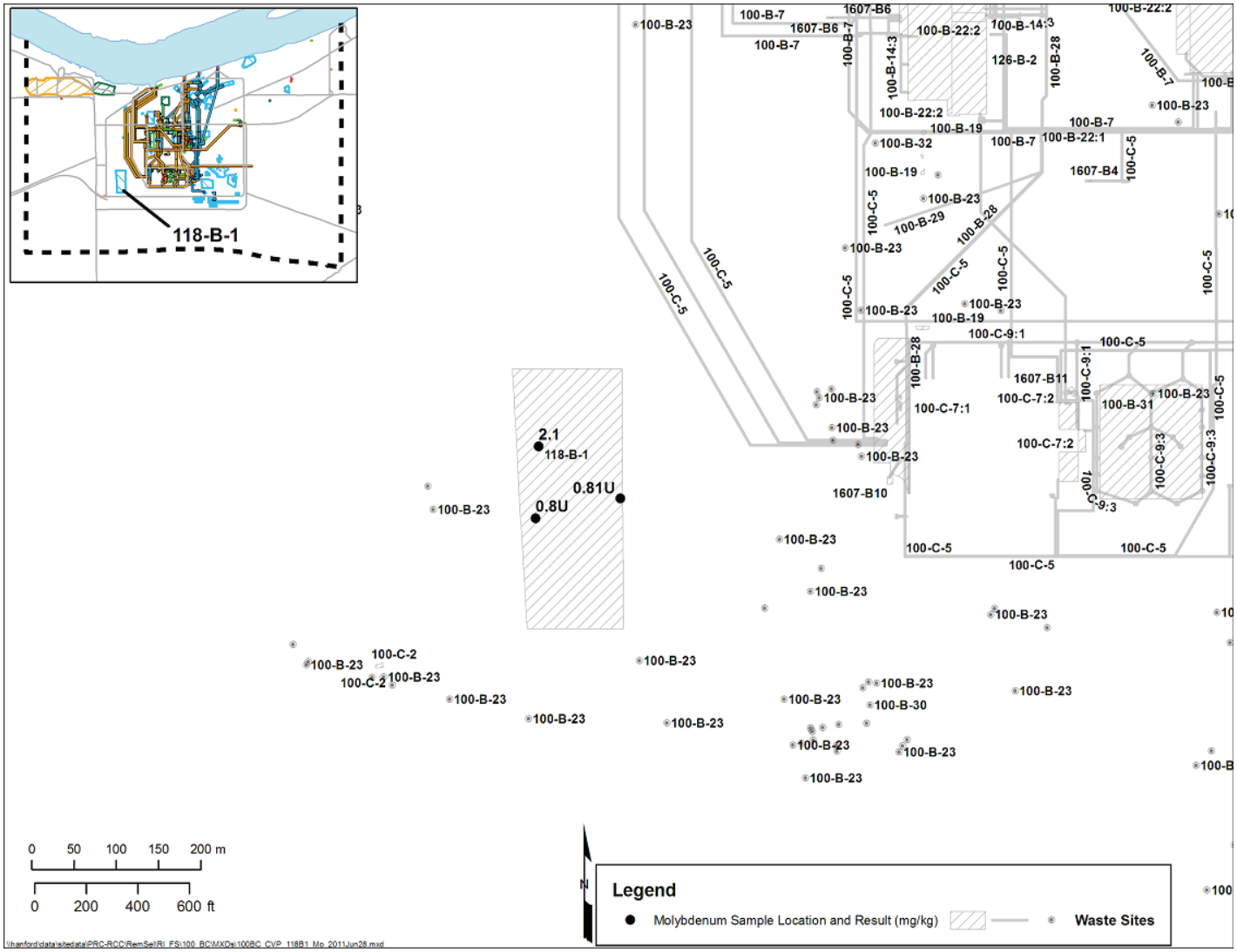

Figure H-31. 105B Solid Waste Burial Ground (118-B-1) Sampling Locations and Associated Molybdenum Results

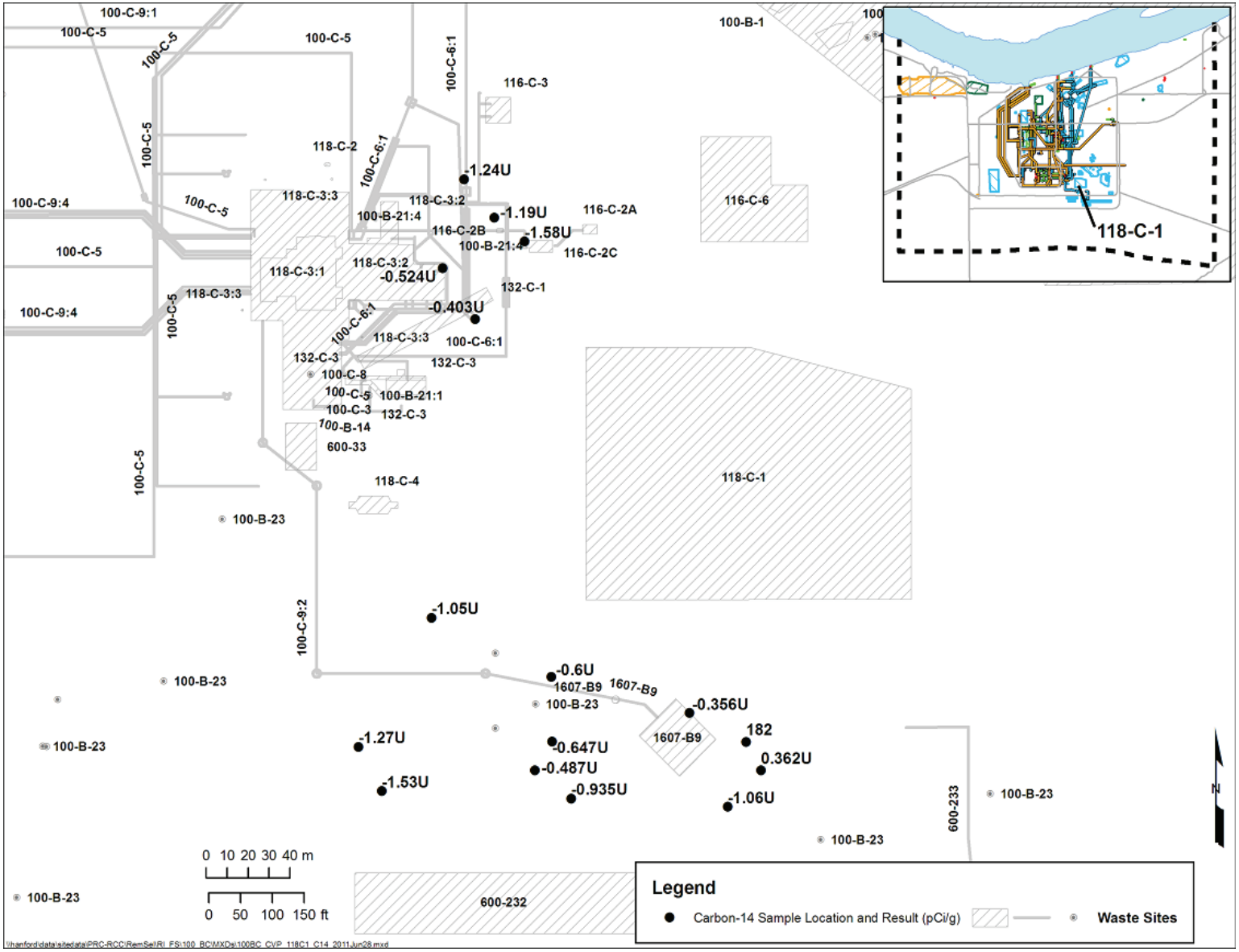

Figure H-32. 105B Solid Waste Burial Ground (118-C-1) Sampling Locations and Associated Carbon-14 Results

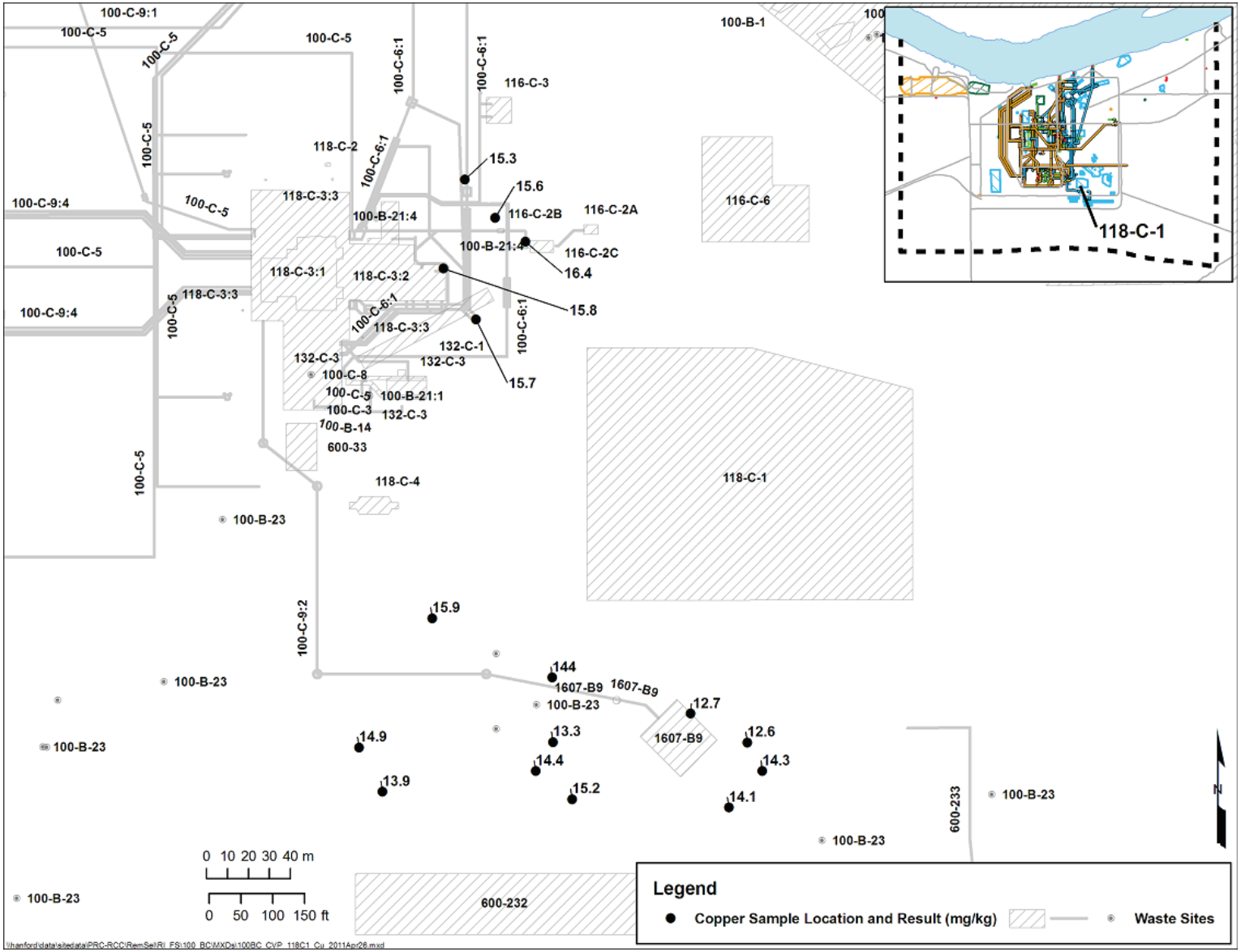

Figure H-33. 105B Solid Waste Burial Ground (118-C-1) Sampling Locations and Associated Copper Results

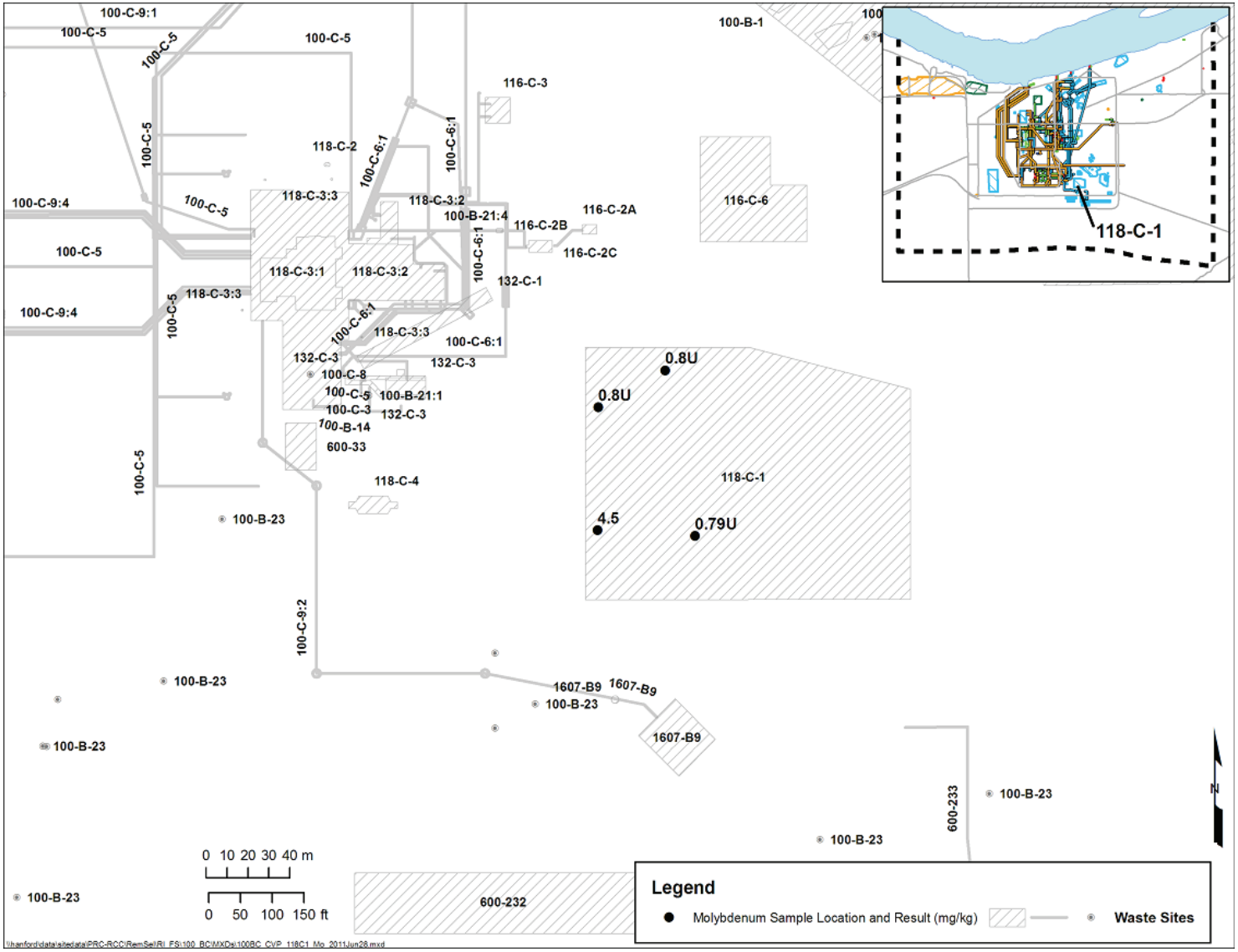

Figure H-34. 105B Solid Waste Burial Ground (118-C-1) Sampling Locations and Associated Molybdenum Results

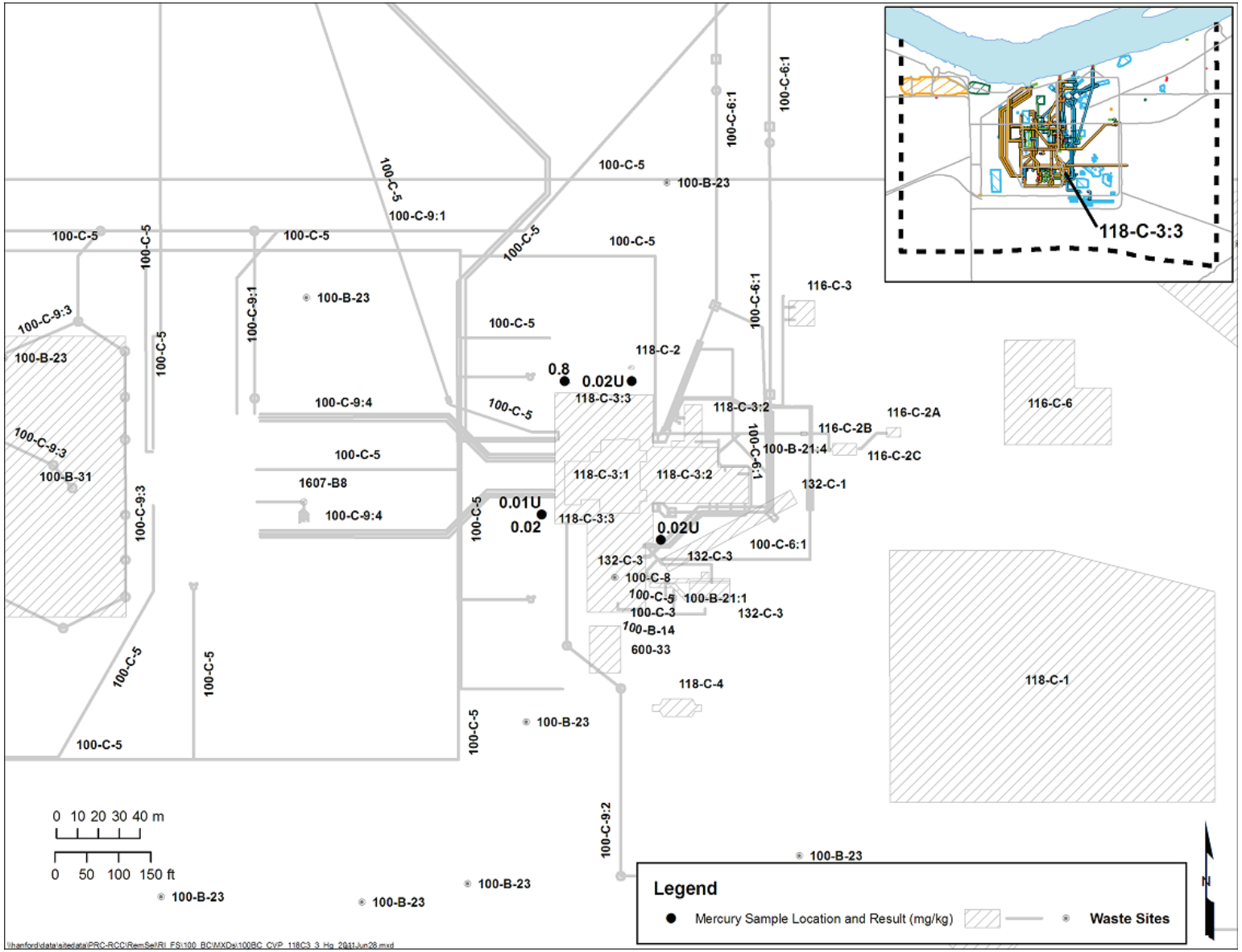

Figure H-35. 105-C French Drains (118-C-3:3) Sampling Locations and Associated Mercury Results

Figure H-36. 120-B-1 105B Battery Acid Sump (120-B-1) Sampling Locations and Associated Chromium Results

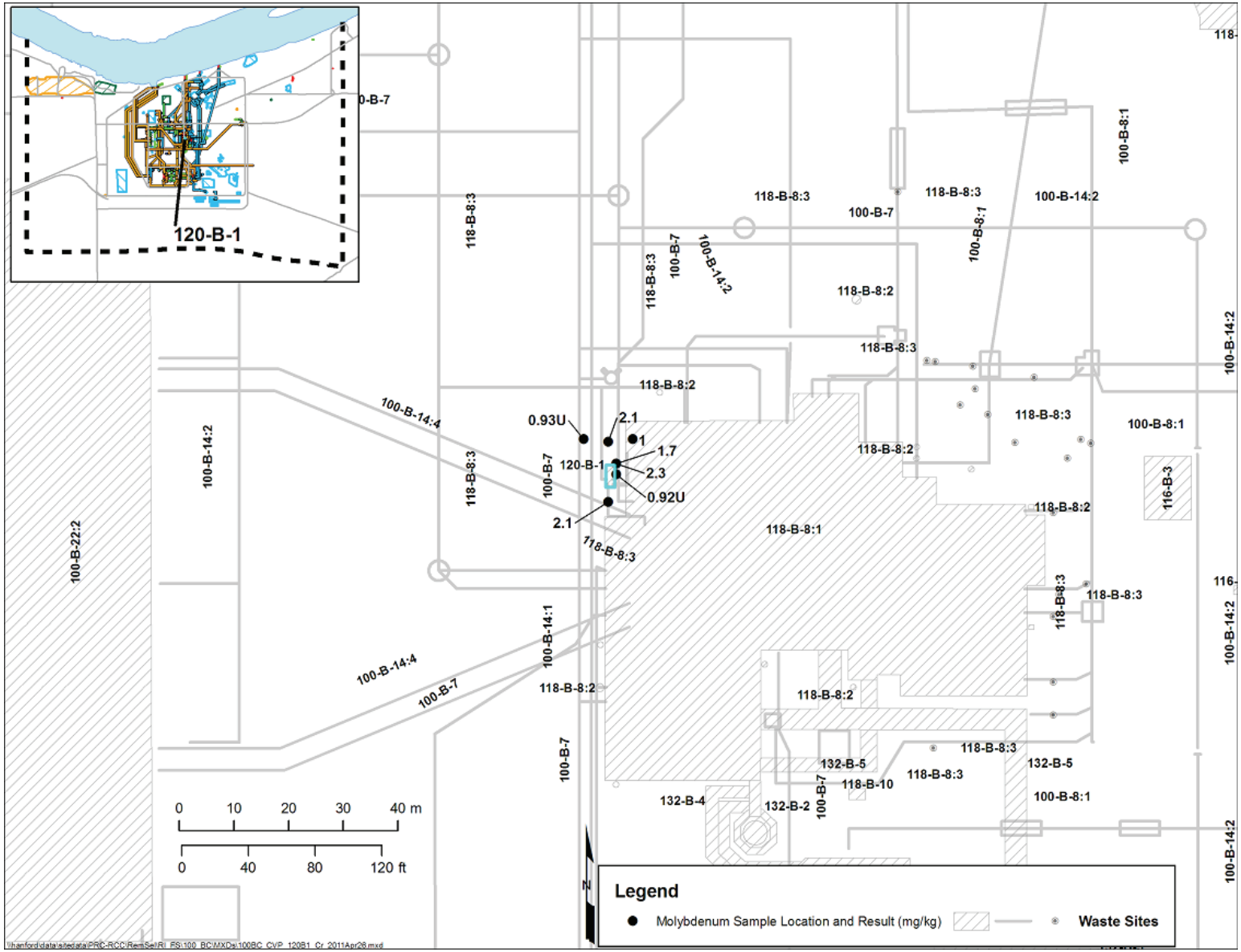

Figure H-37. 120-B-1 105B Battery Acid Sump (120-B-1) Sampling Locations and Associated Molybdenum Results

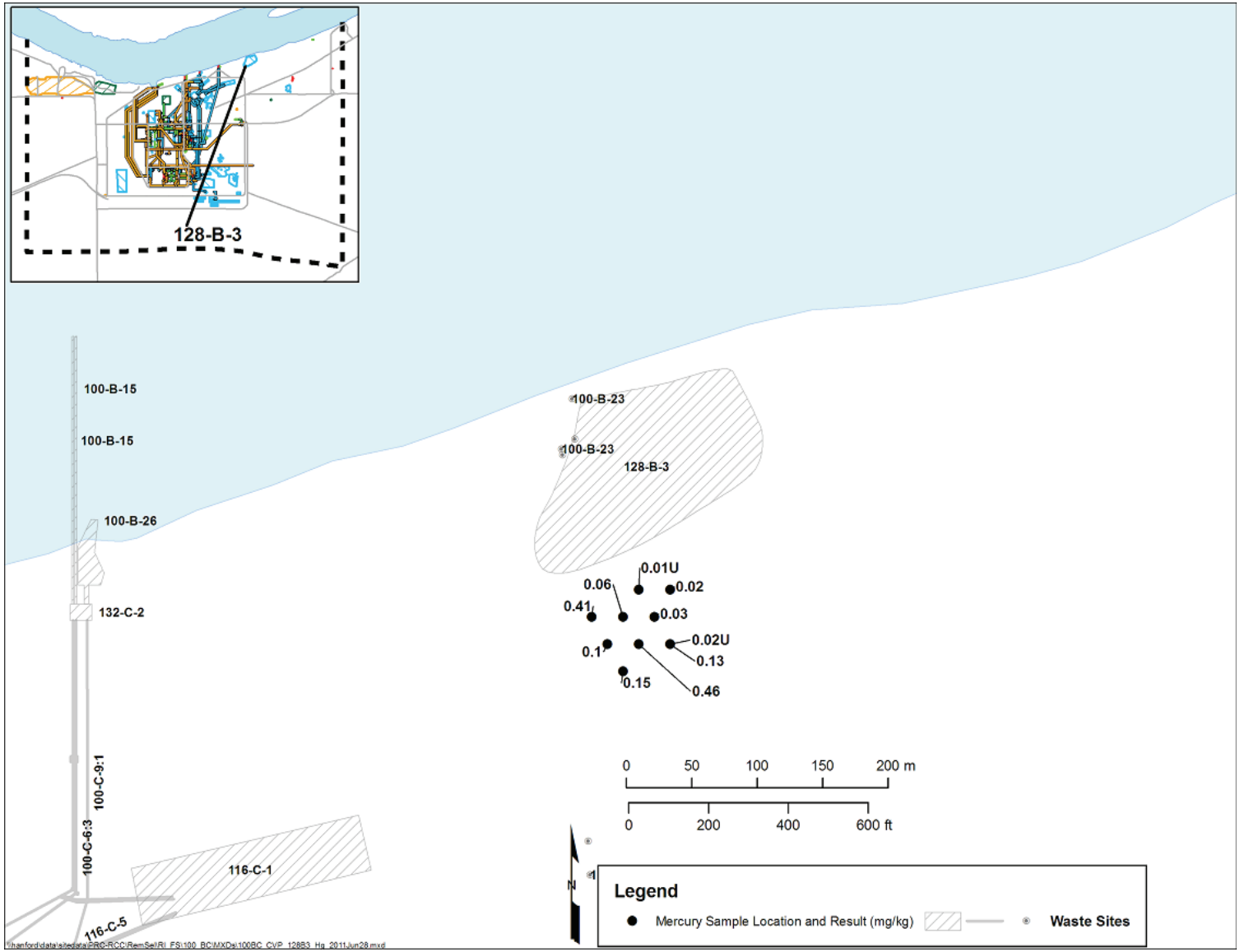

Figure H-38. Burn Pit Site (128-B-3) Sampling Locations and Associated Mercury Results

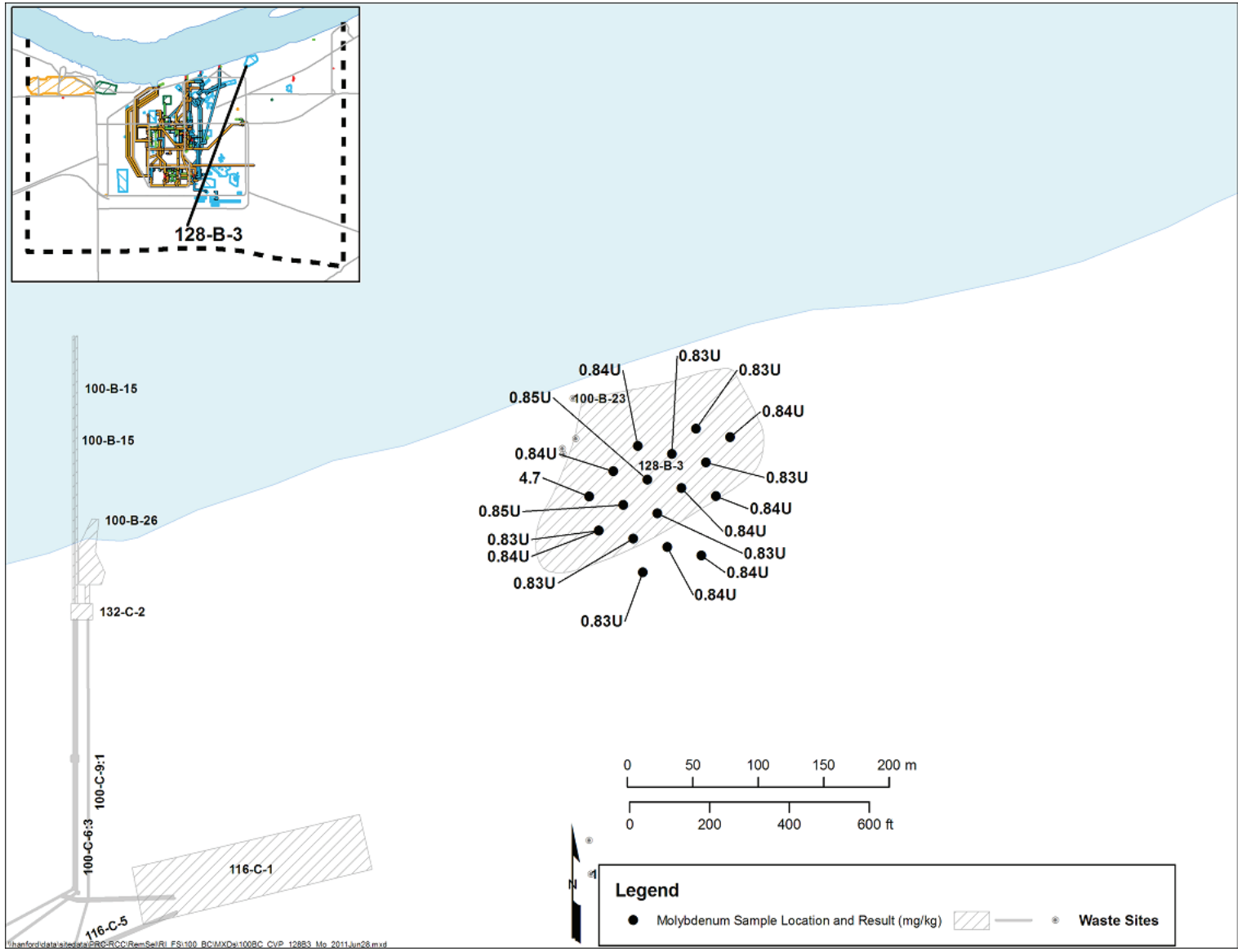

Figure H-39. Burn Pit Site (128-B-3) Sampling Locations and Associated Molybdenum Results

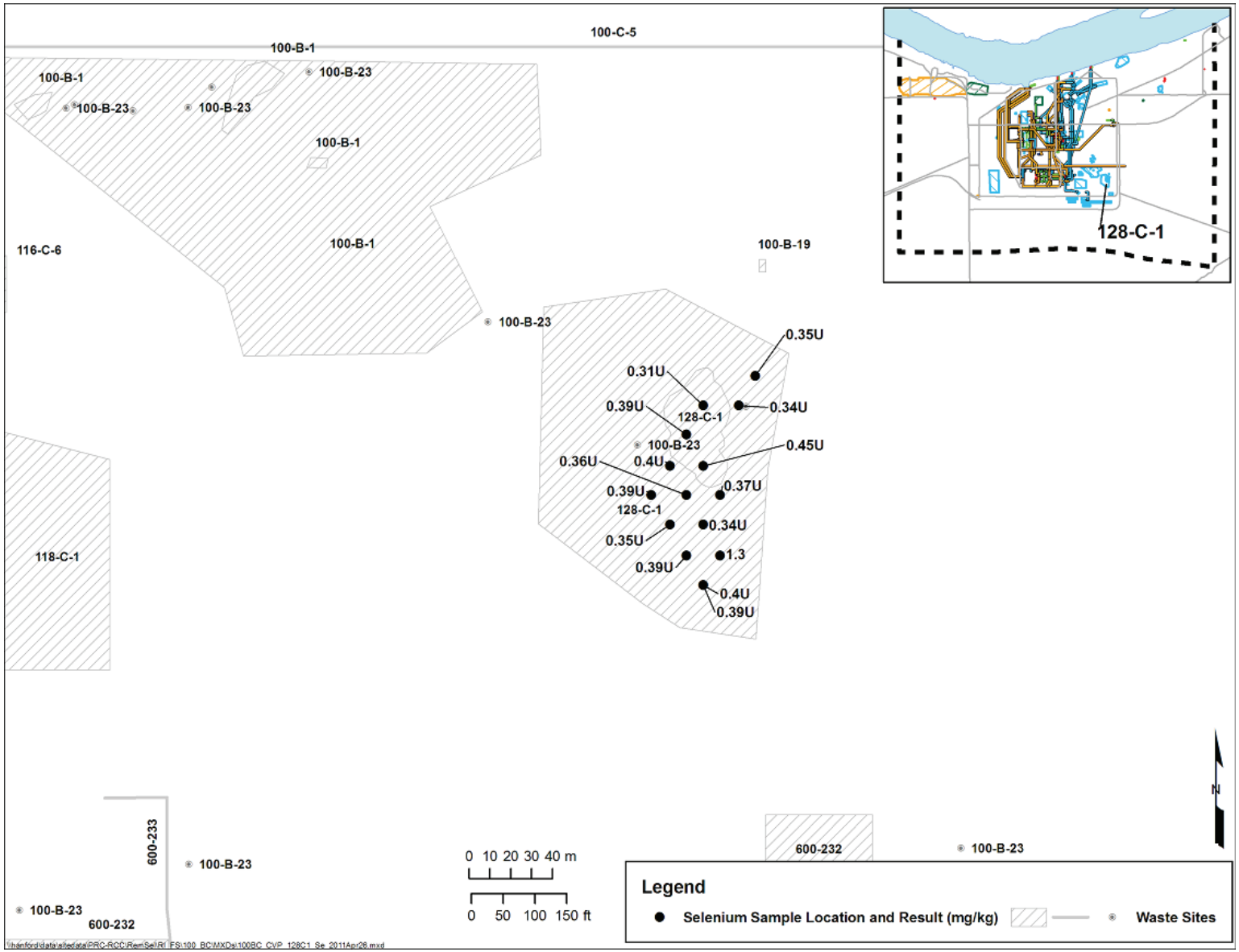

Figure H-40. Burn Pit Site (128-C-1) Sampling Locations and Associated Selenium Results

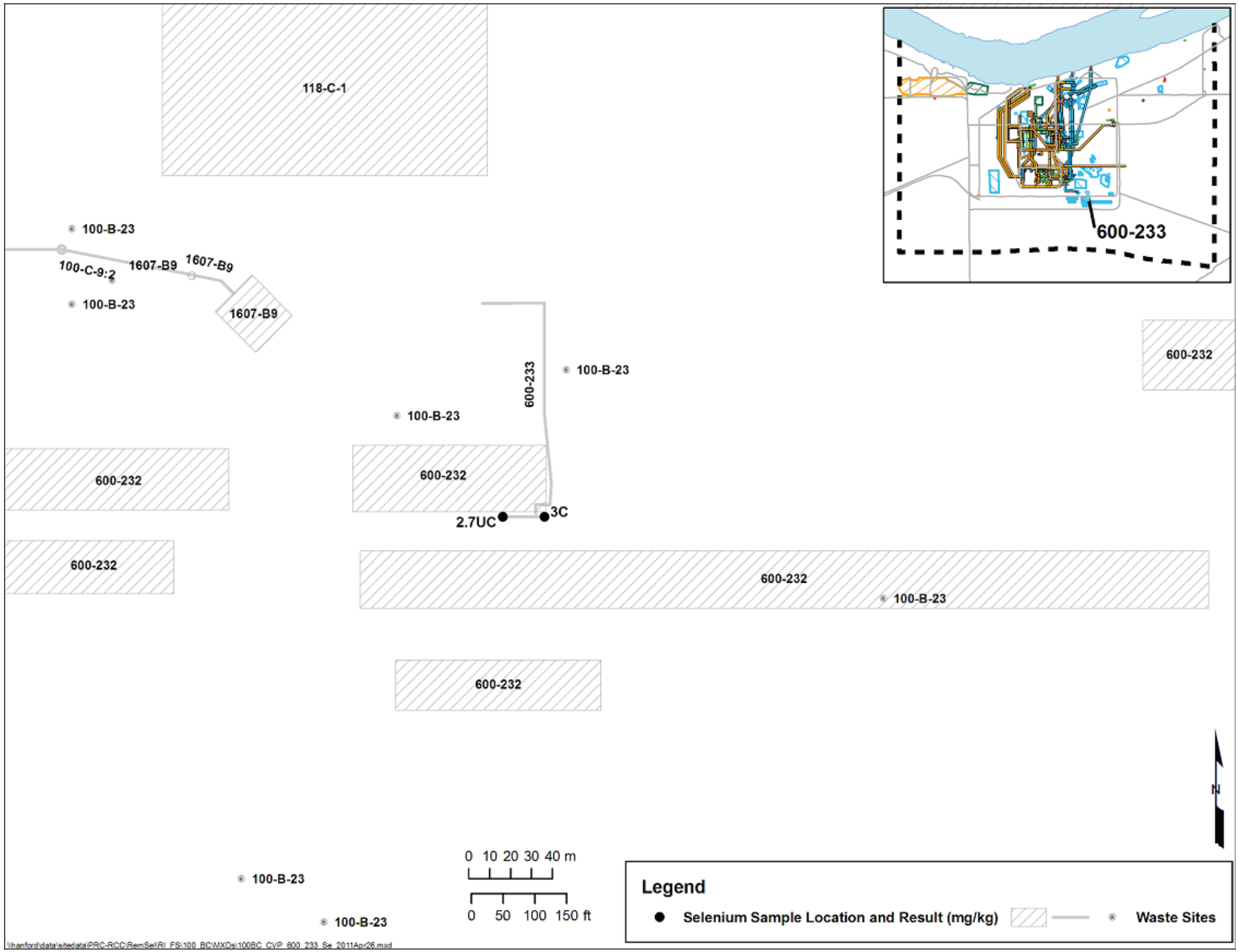

Figure H-41. Vertical Pipe Near 100-B Electrical Laydown Area (600-233) Sampling Locations and Associated Selenium Results

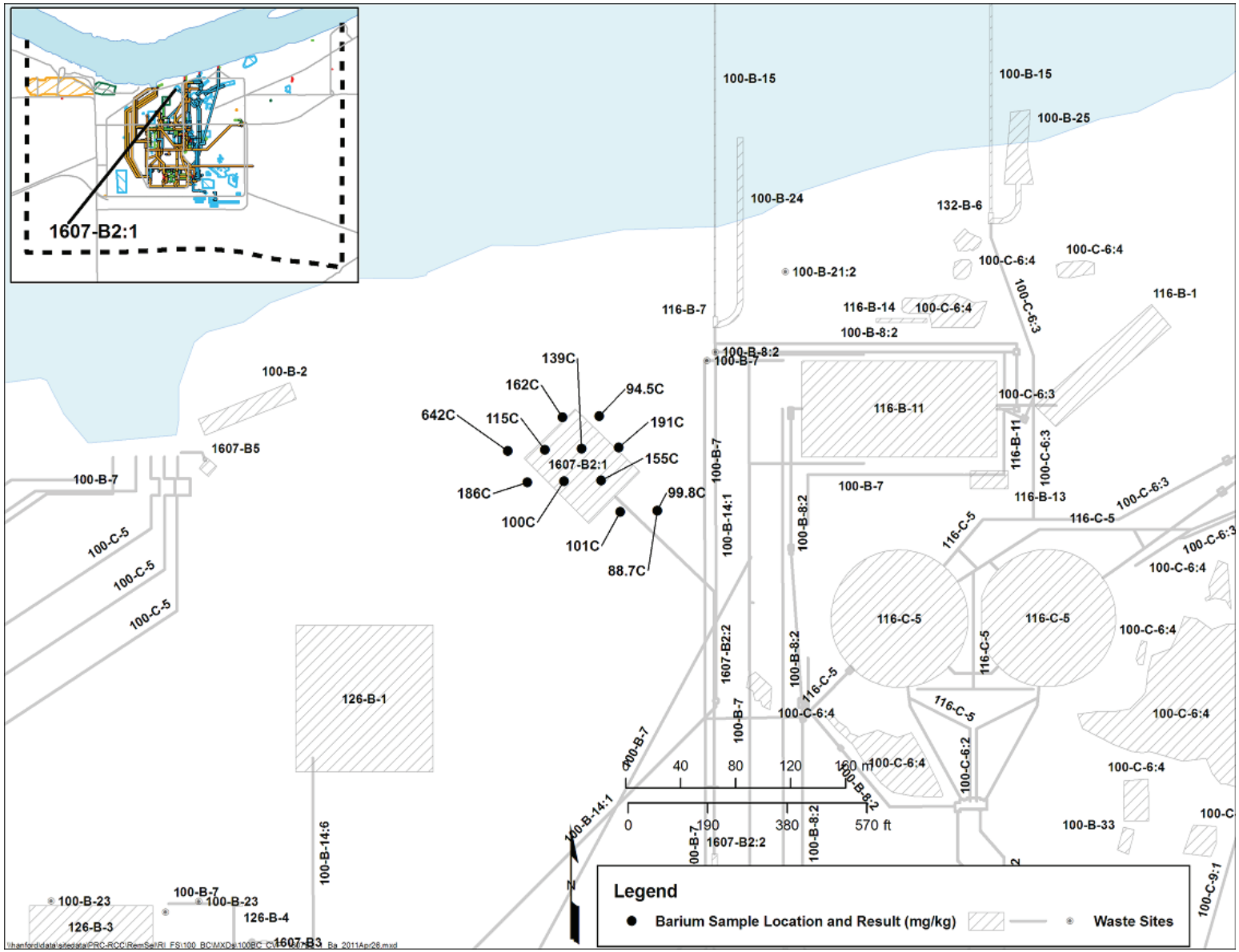

Figure H-42. Septic Tank (1607-B2:1) Sampling Locations and Associated Barium Results

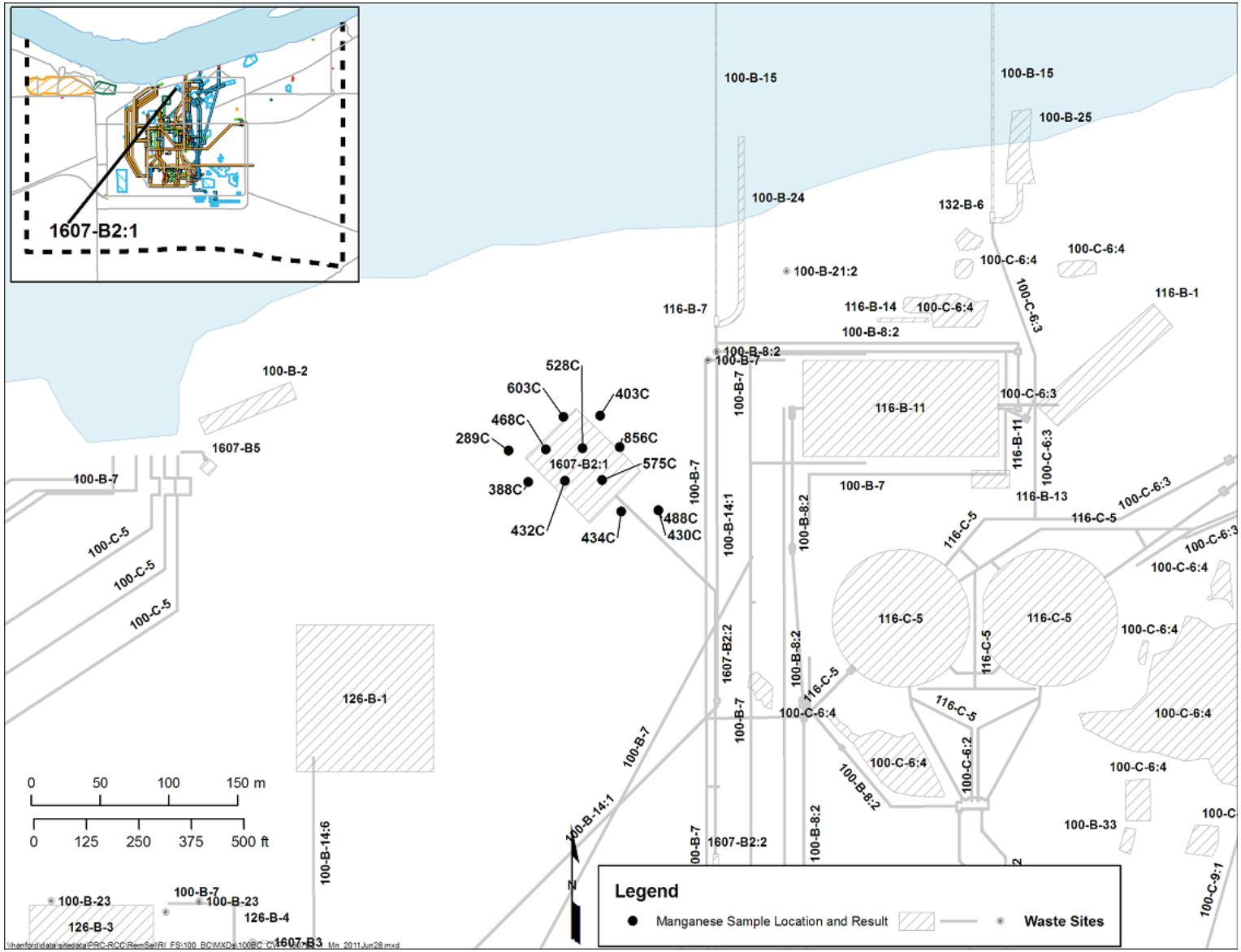

Figure H-43. Septic Tank (1607-B2:1) Sampling Locations and Associated Manganese Results

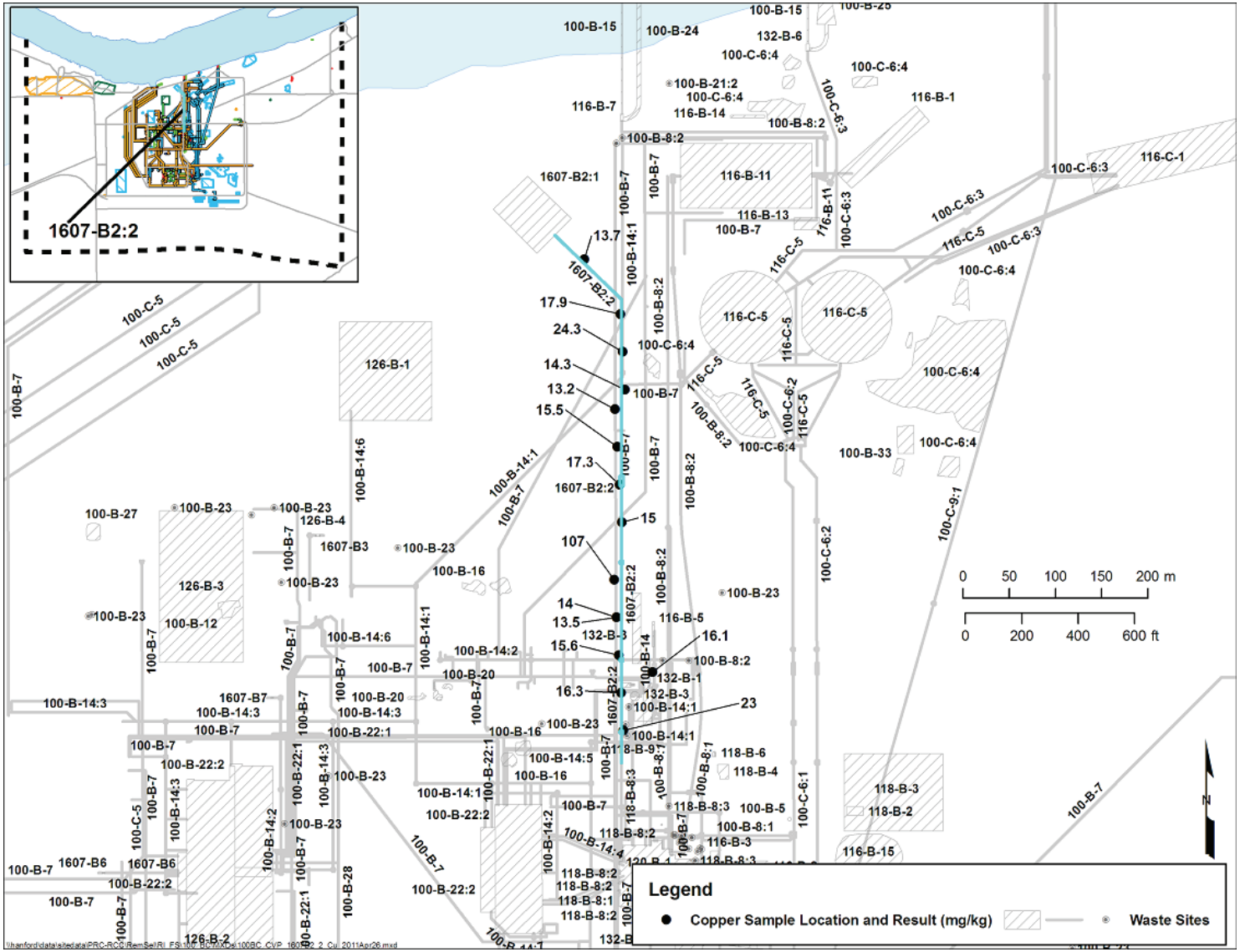

Figure H-44. Septic Tank (1607-B2:2) Sampling Locations and Associated Copper Results

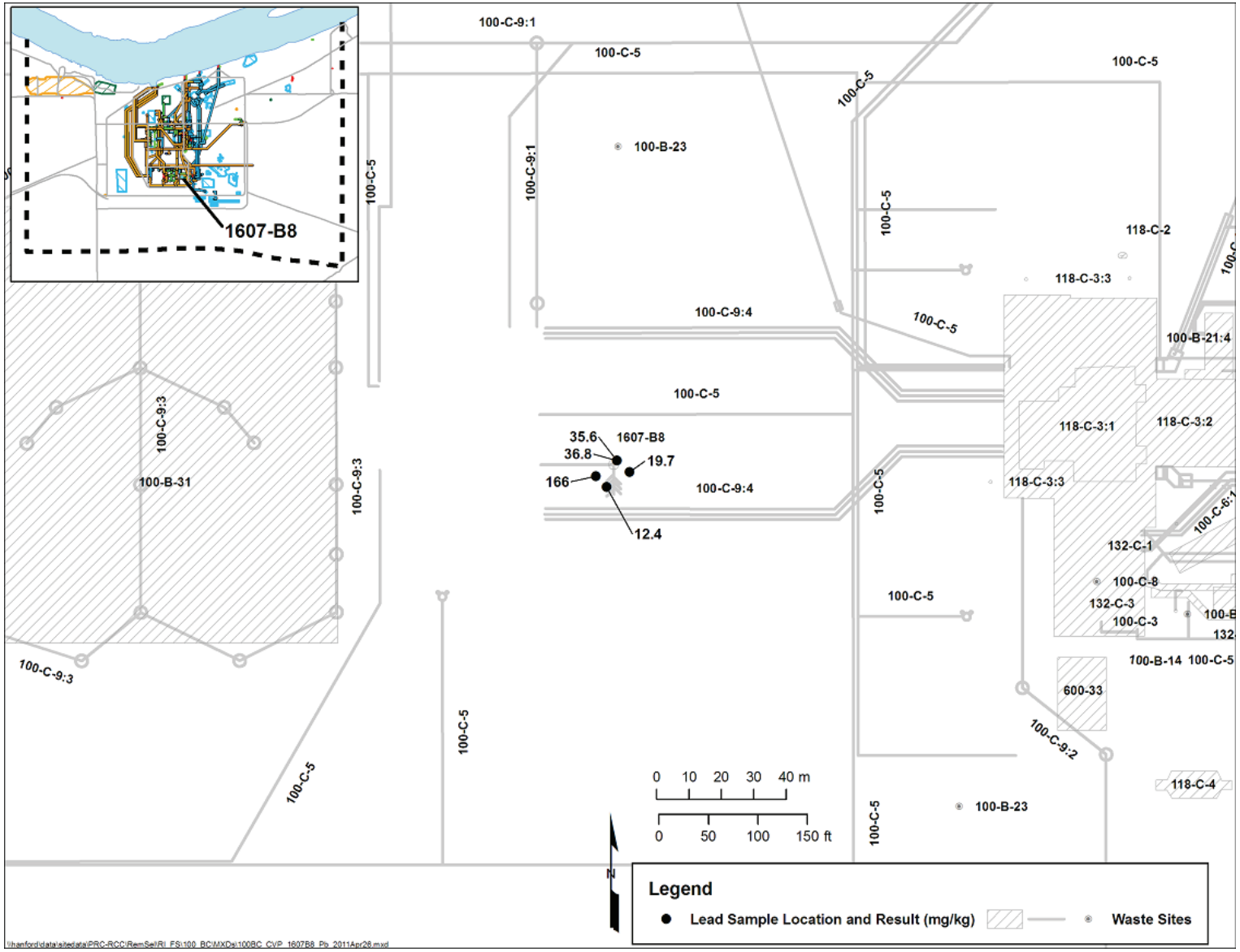

Figure H-45. Septic Tank (1607-B8) Sampling Locations and Associated Lead Results

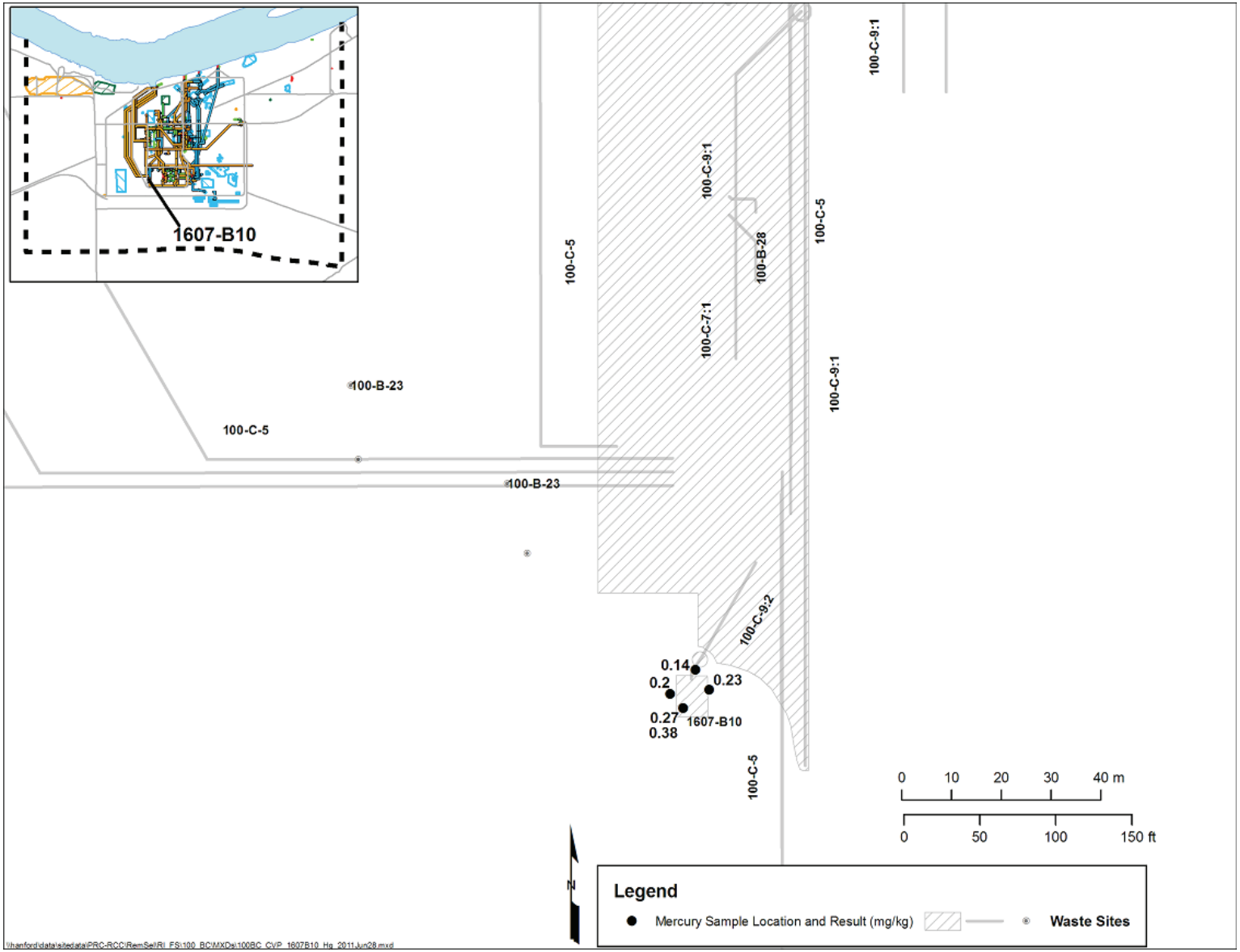

Figure H-46. Septic Tank System (1607-B10) Sampling Locations and Associated Mercury Results

H3 Terrestrial Ecological Risk Evaluation

This section contains the terrestrial ecological risk evaluation calculations in Tables H-1 through Table H-12 as referenced in Chapter 7 of this report. These tables are recorded in the associated file H_DOE-RL-2010-96_WDA-Tables.xlsx included with this appendix. Collectively, the tables present the supporting documentation of the values included in the terrestrial ecological risk evaluation (toxicity reference values, exposure factors, bioconcentration factors, area use factors), and the ecological risk calculations. The calculations include the soil exposure point concentration (EPC) comparison to soil screening levels (SSLs), background, and preliminary remediation goals (PRGs) for each waste site and the subsequent SMDP rationale.

H4 Fauna Occurrence

This section includes a brief discussion of the fauna occurring or potentially occurring on the Hanford Site as referenced in Chapter 3 of this report. Table H-13 contains the functional type, scientific name, common name, habitat type and whether data is available to identify the species at the Hanford Site.

Wildlife use of habitat overlaps considerably between the riparian and upland zones. Use of the riparian zone is likely higher than that of the upland zone associated with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) waste sites because of its proximity to the Columbia River. River access results in greater species diversity and the presence of higher-density and higher-stature vegetation that remains productive over a longer period of time (*Risk Assessment Report for the 100 Area and 300 Area Component of the River Corridor Baseline Risk Assessment*, hereinafter called RCBRA Report [DOE/RL-2007-21, Draft B]). Species lists have been compiled for the major classes of vertebrates that have been observed on the Hanford Site or within the Hanford Reach of the Columbia River and include 46 species of mammals, 145 species of birds, 10 species of reptiles, 5 species of amphibians, and more than 45 species of fish (*Hanford Site National Environmental Policy Act (NEPA) Characterization* [PNNL-6415]). For invertebrates, a total of 1,509 species-level identifications have been completed, and the collection of 40,000 specimens has resulted in the identification of 43 new taxa and 142 new findings in the State of Washington (*Biodiversity Inventory and Analysis of the Hanford Site Final Report 1994-1999* [Soll et al., 1999]). The high diversity of insect species on the Hanford Site reflects the size, complexity, and relatively undisturbed quality of the shrub-steppe habitat. H-13 presents an extensive list of species known or potentially occurring on the Hanford Site classified by habitat type.

Mammals of the upland environment that might be found in and adjacent to the 100 and 300 Areas include mule deer (*Odocoileus hemionus*), badger (*Taxidea taxus*), coyote (*Canis latrans*), Great Basin pocket mouse (*Perognathus parvus*), northern pocket gopher (*Thomomys talpoides*), black-tailed jackrabbit (*Lepus californicus*), and cottontail rabbit (*Sylvilagus nuttalii*) (*100 Areas CERCLA Ecological Investigations* [WHC-EP-0620]). The abundance of these species and the occurrence of others vary according to the soil type and vegetative community. Although other large mammals, such as elk (*Cervus elaphus*), are infrequently observed in the 100 and 300 Areas upland reactor areas, the number of individual large mammals present per unit area may increase as habitat quality and shrub cover improve through natural recovery and waste site restoration. Some mammals common to the upland environment are also likely to use and inhabit the riparian environment, including the western harvest mouse (*Reithrodontomys megalotis*), the Great Basin pocket mouse (*Perognathus parvus*), and the deer mouse (*Peromyscus maniculatus*) (*Synthesis of Ecological Data Collected in the Riparian and Riverine Environments of the Hanford Reach* [PNNL-14516]). A complete list of mammals observed and expected in all habitats of the 100 Area is provided in *100 Areas CERCLA Ecological Investigations* (WHC-EP-0620). The *Hanford Site National Environmental Policy Act (NEPA) Characterization* (PNNL-6415) presents a complete listing of Hanford Site wildlife species.

Several species of birds present in the upland zones rely on structures such as buildings, fences, and utility poles for some of their habitat needs. Raptors, such as red-tailed hawks (*Buteo jamaicensis*), are present and frequently nest on buildings, utility poles and towers, and trees along the river. Nonvegetated areas provide nesting habitat for nighthawks (*Chordeiles minor*) and killdeer (*Charadrius vociferus*). Canada geese (*Branta canadensis*) use open cheatgrass areas for winter grazing. Following restoration, improvements in shrub coverage will provide important habitat for native shrub-steppe bird species such as the horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), savannah sparrow (*Passerculus sandwichensis*), loggerhead shrike (*Lanius ludovicianus*), and possibly sage sparrow (*Amphispiza belli*). Raptors will continue to be present, but as the shrubs develop and the open grassy areas shrink in size, wintering geese will likely avoid the area, preferring the cheatgrass areas associated with nearby abandoned farm fields and orchards. A list of bird species observed in the 100 Area is available in *100 Areas CERCLA Ecological Investigations* (WHC-EP-0620). A catalogue of Hanford Site avian species is presented in *Hanford Site National Environmental Policy Act (NEPA) Characterization* (PNNL-6415).

Synthesis of Ecological Data Collected in the Riparian and Riverine Environments of the Hanford Reach (PNNL-14516), provides information on bird populations with respect to riparian vegetation. Location data are available in the electronic Environmental Monitoring and Compliance Project database managed by PNNL. Research efforts have assessed winter bird populations in cottonwood/willow (*Populus*/*Salix*) communities of the Columbia River shoreline ("A Vagrant Occurrence of the Black Phoebe in Southeastern Washington" [Rickard, 1964]; "Comparison of Winter Bird Populations After a Decade" [Rickard and Rickard, 1972]), and quantified shorebird response to water fluctuations in the Columbia River nearshore environment ("Avian Interactions with Mid-Columbia River Water Level Fluctuations" [Books, 1985]). The information gathered during these research efforts has been used to document the status and ecology of the Hanford Site's avian wildlife.

Common reptiles found in upland environments at the Hanford Site include the rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis melanoleucus*), yellow-bellied racer (*Coluber constrictor*), and side blotch lizard (*Uta stansburiana*) (*Habitat Types on the Hanford Site: Wildlife and Plant Species of Concern* [PNL-8942]; *A Synthesis of Ecological Data from the 100 Areas of the Hanford Site* [WHC-EP-0601]). A variety of snakes common to the upland areas may also use the riparian habitat. Other reptiles that may be found in the riparian zone include the western terrestrial garter snake (*Thamnophis sirtalis*) and the painted turtle (*Chrysemys picta*) (*Herpetofauna of the Hanford Nuclear Reservation, Grant, Franklin and Benton Counties, Washington [*Hallock, 1998]*; Synthesis of Ecological Data Collected in the Riparian and Riverine Environments of the Hanford Reach* [PNNL-14516]). Amphibians in the riparian and nearshore environments of the Hanford Reach include mostly Woodhouse's toads (*Bufo woodhousii*), but bullfrogs (*Rana catesbeiana*) and Great Basin spadefoot toads (*Scaphiopus intermontanus*) may also be present (*Synthesis of Ecological Data Collected in the Riparian and Riverine Environments of the Hanford Reach* [PNNL-14516]).

The dominant ground-dwelling invertebrate species in the upland environment are harvester ants (*Pogonomyrmex owyheei*) and darkling beetles (family *Tenebrionidae*). Harvester ants can exist on vegetated and nonvegetated soils and have been documented on waste sites (*Characterization of the Hanford 300 Area Burial Grounds: Task IV – Biological Transport* [PNL-2774]). Darkling beetles, however, rely on vegetative matter in the soil during their larval stage and therefore are not expected to occur in areas void of vegetation (*Darkling Beetle Populations (Tenebrionidae) of the Hanford Site in Southcentral Washington* [PNL-2465]). Areas that were not used as waste sites or have not been affected by Hanford Site operations likely have less soil disturbance and may support a more robust and diverse community of soil-dwelling fauna than previously disturbed or remediated sites.

More than 45 species of fish have been identified in the Hanford Reach of the Columbia River. Of these species, Chinook salmon (*Oncorhynchus tshawytscha*), Sockeye salmon (*Oncorhynchus nerka*), Coho salmon (*Oncorhynchus kisutch*), and steelhead (*Oncorhynchus mykiss*) use the river as a migration route to and from upstream spawning areas and are of the greatest economic importance. Other fish of importance to sport anglers are the native mountain whitefish (*Prosopium williamsoni*) and white sturgeon (*Acipenser transmontanus*). Introduced species like smallmouth bass (*Micropterus dolomieui*), black crappie (*Pomoxis nigromaculatus*), channel catfish (*Ictalurus punctatus*), and walleye (*Stizostedion vitreum*) are also popular. Other large fish populations include introduced common carp (*Cyprinus carpio*) and native species such as redside shiner (*Richardsonius balteatus*) and largescale suckers (*Catostomus macrocheilus*). Smaller fish, such as sculpin (*Cottus* sp.), are associated with shoreline habitats and have small home ranges (RCBRA Report [DOE/RL-2007-21, Draft B]).

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
Avian Herbivore	*Callipepla californica*	California quail	x	x		x
	Branta canadensis moffitti	Canada goose	x	x	x	
	Eremophila alpestris	Horned lark				x
	Anas platyrhynchos	Mallard	x	x	x	
	Zenaida macroura	Mourning dove	x	x		x
	Melospiza melodia	Song sparrow	x	x		x
Avian Predator	*Recurvirostra americana*	American avocet	x	x		
	Fulica americana	American coot	x		x	
	Corvus brachyrhynchos	American crow	x	x		x
	Carduelis tristis	American goldfinch	x	x		x
	Falco sparverius	American kestrel	x	x		x
	Anthus rubescens	American pipit	x			x
	Turdus migratorius	American robin	x	x		x
	Spizella arborea	American tree sparrow	x	x		x
	Pelecanus erythrorhynchos	American white pelican	x	x	x	
	Anas americana	American wigeon	x		x	

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Haliaeetus leucocephalus	Bald eagle	x	x		x
	Riparia riparia	Bank swallow	x	x		x
	Tyto alba	Barn owl	x	x		x
	Hirundo rustica	Barn swallow	x	x		x
	Bucephala islandica	Barrow's goldeneye	x		x	
	Ceryle alcyon	Belted kingfisher	x	x	x	
	Thryomanes bewickii	Bewick's wren	x	x		
	Sayomis nigricans	Black phoebe	x			x
	Pica pica	Black-billed magpie	x	x		x
	Nycticorax nycticorax	Black-crowned night heron	x	x	x	
	Pheucticus melanocephalus	Black-headed grosbeak	x	x		x
	Amphispiza bilineata	Black-throated sparrow	x			x
	Anas discors	Blue-winged teal	x		x	
	Vireo solitarius	Blue-headed vireo	x	x		
	Euphagus cyanocephalus	Brewer's blackbird	x	x		x
	Spizella breweri	Brewer's sparrow	x			x
	Molothrus ater	Brown-headed cowbird	x	x		x
	Bucephala albeola	Bufflehead	x		x	
	Icterus galbula	Bullock's oriole	x	x		x
	Athene cunicularia hypugea	Burrowing owl	x			x
	Larus californicus	California gull	x		x	
	Aythya valisineria	Canvasback	x		x	

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Catherpes mexicanus	Canyon wren	x			x
	Sterna caspia	Caspian tern	x		x	
	Carpodacus cassinii	Cassin's finch	x			x
	Bombycilla cedrorum	Cedar waxwing	x	x		x
	Spizella passerina	Chipping sparrow	x	x		x
	Alectoris chukar	Chukar	x			x
	Anas cyanoptera	Cinammon teal	x		x	
	Hirundo pyrrhonota	Cliff swallow	x	x		x
	Bucephala clangula	Common goldeneye	x		x	
	Gavia immer	Common loon	x		x	
	Mergus merganser	Common merganser	x		x	
	Chordeiles minor	Common nighthawk	x	x		x
	Phalaenoptilus nuttallii	Common poorwill	x	x		
	Corvus corax	Common raven	x	x		x
	Carduelis flammea	Common redpoll	x			x
	Gallinago gallinago	Common snipe	x	x		
	Accipiter cooperii	Cooper's hawk	x	x		x
	Junco hyemalis	Dark-eyed junco	x	x		x
	Phalacrocorax auritus	Double-crested cormorant	x		x	
	Picoides pubescens	Downy woodpecker	x	x		x
	Calidris alpina	Dunlin	x	x		
	Podiceps nigricollis	Eared grebe	x		x	
	Tyrannus tyrannus	Eastern kingbird	x	x		x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Empidonax spp.	Empidonax flycatcher	x	x		x
	Sturnus vulgaris	European starling	x			x
	Coccothraustes vespertinus	Evening grosbeak	x			x
	Buteo regalis	Ferruginous hawk	x			x
	Sterna forsteri	Forster's tern	x		x	
	Passerella iliaca	Fox sparrow	x	x		x
	Anas strepera	Gadwall	x		x	
	Larus glaucescens	Glaucous-winged gull	x		x	
	Aquila chrysaetos	Golden eagle	x			x
	Regulus satrapa	Golden-crowned kinglet	x	x		x
	Zonotrichia atricapilla	Golden-crowned sparrow	x	x		x
	Ammodramus savannarum	Grasshopper sparrow	x			x
	Perdix perdix	Gray partridge	x			x
	Leucosticte tephrocotis	Gray-crowned Rosy-Finch	x			x
	Ardea herodias	Great blue heron	x	x	x	
	Casmerodius albus	Great egret	x	x	x	
	Bubo virginianus	Great horned owl	x	x		x
	Aythya marila	Greater scaup	x		x	
	Tringa melanoleuca	Greater yellowlegs	x		x	
	Anas crecca	Green-winged teal	x		x	
	Empidonax hammondii	Hammond's flycatcher	x	x		x
	Larus argentatus	Herring gull	x		x	x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Catharus guttatus	Hermit thrush	x	x		x
	Lophodytes cucullatus	Hooded merganser	x		x	
	Podiceps auritus	Horned grebe	x		x	
	Carpodacus mexicanus	House finch	x	x		x
	Passer domesticus	House sparrow	x	x		x
	Troglodytes aedon	House wren	x	x		x
	Charadrius vociferus	Killdeer	x	x		x
	Calcarius lapponicus	Lapland longspur	x			x
	Chondestes grammacus	Lark sparrow	x			x
	Passerina amoena	Lazuli bunting	x			x
	Aythya affinis	Lesser scaup	x		x	
	Tringa flavipes	Lesser yellowlegs	x		x	
	Melanerpes lewis	Lewis's woodpecker	x	x		x
	Melospiza lincolnii	Lincoln's sparrow	x	x		x
	Lanius ludovicianus	Loggerhead shrike	x			x
	Numenius americanus	Long-billed curlew	x			x
	Limnodromus scolopaceus	Long-billed dowitcher	x		x	
	Asio otus	Long-eared owl	x	x		x
	Oporornis tolmiei	MacGillivray's warbler	x	x		x
	Cistothorus palustris	Marsh wren	x	x		x
	Falco columbarius	Merlin	x			x
	Sialia currucoides	Mountain bluebird	x			x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Vermivora ruficapilla	Nashville warbler	x	x		x
	Colaptes auratus	Northern flicker	x	x		x
	Accipiter gentilis	Northern goshawk	x			x
	Circus cyaneus	Northern harrier	x			x
	Mimus polyglottos	Northern mockingbird	x			x
	Anas acuta	Northern pintail duck	x		x	
	Stelgidopteryx serripennis	Northern rough-winged swallow	x	x		x
	Anas clypeata	Northern shoveler	x		x	
	Lanius excubitor	Northern shrike	x			x
	Contopus borealis	Olive-sided flycatcher	x	x		x
	Vermivora celata	Orange-crowned warbler	x	x		x
	Pandion haliaetus	Osprey	x	x	x	
	Empidonax difficilis	Pacific-slope flycatcher	x	x		
	Falco peregrinus anatum	Peregrine falcon	x		x	x
	Podilymbus podiceps	Pied-billed grebe	x		x	
	Falco mexicanus	Prairie falcon	x			x
	Mergus serrator	Red-breasted merganser	x		x	
	Sitta canadensis	Red-breasted nuthatch	x			x
	Aythya americana	Redhead	x		x	
	Sphyrapicus nuchalis	Red-naped sapsucker	x	x		x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Podiceps grisegena	Red-necked grebe	x		x	
	Phalaropus lobatus	Red-necked phalarope	x			
	Buteo jamaicensis	Red-tailed hawk	x			x
	Agelaius phoeniceus	Red-winged blackbird	x	x		x
	Larus delawarensis	Ring-billed gull	x	x		
	Aythya collaris	Ring-necked duck	x		x	
	Phasianus colchicus	Ring-necked pheasant	x	x		x
	Columba livia	Rock dove	x			x
	Salpinctes obsoletus	Rock wren	x			x
	Buteo lagopus	Rough-legged hawk	x			x
	Regulus calendula	Ruby-crowned kinglet	x	x		x
	Oxyura jamaicensis	Ruddy duck	x		x	
	Selasphorus rufus	Rufous hummingbird	x	x		x
	Amphispiza belli	Sage sparrow	x			x
	Oreoscoptes montanus	Sage thrasher	x			x
	Grus canadensis	Sandhill crane	x	x		
	Passerculus sandwichensis	Savannah sparrow	x			x
	Sayornis saya	Say's phoebe	x			x
	Accipiter striatus	Sharp-shinned hawk	x	x		x
	Asio flammeus	Short-eared owl	x			x
	Tringa solitaria	Solitary sandpiper	x		x	
	Porzana carolina	Sora	x	x	x	

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Pipilo erythrophthalmus	Spotted towhee	x	x		x
	Actitis macularia	Spotted sandpiper	x		x	
	Buteo swainsoni	Swainson's hawk	x			x
	Myadestes townsendi	Townsend's solitaire	x	x		x
	Dendroica townsendi	Townsend's warbler	x	x		
	Tachycineta bicolor	Tree swallow	x	x	x	
	Cygnus columbianus	Tundra (Whistling) swan	x		x	
	Ixoreus naevius	Varied thrush	x	x		x
	Pooecetes gramineus affinis	Vesper sparrow	x			x
	Tachycineta thalassina	Violet-green swallow	x	x		x
	Rallus limicola	Virginia rail	x	x	x	
	Vireo gilvus	Warbling vireo	x	x		x
	Sialia mexicana	Western bluebird	x			x
	Aechmophorus occidentalis	Western grebe	x		x	
	Tyrannus verticalis	Western kingbird	x	x		x
	Sturnella neglecta	Western meadowlark	x	x		x
	Calidris mauri	Western sandpiper	x		x	
	Piranga ludoviciana	Western tanager	x	x		x
	Contopus sordidulus	Western wood-pewee	x	x		x
	Zonotrichia leucophrys	White-crowned sparrow	x	x		x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Wilsonia pusilla	Wilson's warbler	x	x		x
	Troglodytes troglodytes	Winter wren	x	x		x
	Aix sponsa	Wood duck	x		x	
	Dendroica petechia	Yellow warbler	x	x		x
	Icteria virens	Yellow-breasted chat	x	x		
	Xanthocephalus xanthocephalus	Yellow-headed blackbird	x	x		x
	Dendroica coronata	Yellow-rumped warbler	x	x		x
Benthic Biota	*Pacifasticus leniusculus*	Crayfish	x		x	
	Anodonta californiensis	California floater (mussel)			x	
	Anodonta kennerlyi	Western floater (mussel)			x	
	Anodonta nuttalliana	Winged floater (mussel)			x	
	Anodonta oregonensis	Oregon floater (mussel)			x	
	Corbicula fluminea	Asiatic clam	x		x	
	Gonidea angulata	Western ridged mussel			x	
	Margaritifera falcata	Western pearlshell mussel			x	
	Fisherola nuttalli	Shortface lanx			x	
	Fulminicola columbianus	Columbia pebblesnail			x	
	Pisidium sp.	Peaclam			x	
	Gyraulus sp.	Snail			x	
	Limnaea sp.	Snail			x	

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Physa sp.	Snail			x	
	Radix sp.	Snail			x	
	Stagnicola sp.	Pondsnail			x	
Carnivorous Reptiles and Amphibians	*Rana catesbeiana*	Bullfrog	x	x		x
	Pituophis catenifer deserticola	Great Basin gopher snake	x	x		x
	Scaphiopus intermontanus	Great Basin spadefoot toad	x			x
	Hypsiglena torquata	Night snake				x
	Sceloporus graciosus	Northern sagebrush lizard	x			x
	*Pseudacris regilla (*formally *Hyla regilla)*	Pacific tree frog		x		
	Chrysemys picta	Painted turtle		x	x	
	Phrynosoma douglassii	Short-horned lizard				x
	Uta stansburiana	Side-blotched lizard	x			X
	Charina bottae	Rocky Mountain rubber boa		x		
	Ambystoma tigrinum	Tiger salamander			x	
	Crotalus viridis	Western rattlesnake	x			x
	Thamnophis sirtalis	Western terrestrial garter snake		x	x	
	Coluber constrictor	Western yellow-bellied racer	x	x		x
	Bufo woodhousei	Woodhouse's toad	x	x		x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
Fish Herbivore	*Cyprinus carpio*	Common carp	x		x	
	Catostomus columbianus	Bridgelip sucker			x	
	Catostomus macrocheilus	Largescale sucker			x	
Fish Predator	*Alosa sapidissima*	American shad			x	
	Ameiurus melas	Black bullhead			x	
	Pomoxis nigromaculatus	Black crappie			x	
	Ictalurus furcatus	Blue catfish			x	
	Lepomis macrochirus	Bluegill	x		x	
	Ameiurus nebulosus	Brown bullhead	x		x	
	Salvelinus confluentus	Bull trout			x	
	Lota lota	Burbot			x	
	Ictalurus punctatus	Channel catfish			x	
	Oncorhynchus tshawytscha	Chinook salmon	x		x	
	Acrocheilus alutaceus	Chiselmouth	x		x	
	Oncorhynchus kisutch	Coho salmon	x		x	
	Oncorhynchus clarkii	Cutthroat trout			x	
	Salvelinus malma	Dolly Varden			x	
	Coregonus clupeaformis	Lake whitefish			x	
	Micropterus salmoides	Largemouth bass			x	
	Rhinichthys falcatus	Leopard dace			x	

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Rhinichthys cataractae	Longnose dace			x	
	Gambusia affinis	Western mosquitofish			x	
	Cottus bairdii	Mottled sculpin			x	
	Prosopium williamsoni	Mountain whitefish	x		x	
	Catostomus platyrhynchus	Mountain sucker			x	
	Pungitius pungitius	Nine spine stickleback			x	
	Ptychocheilus oregonensis	Northern pikeminnow	x		x	
	Lampetra tridentata	Pacific lamprey	x		x	
	Mylocheilus caurinus	Peamouth	x		x	
	Cottus beldingii	Piute sculpin			x	
	Cottus asper	Prickly sculpin	x		x	
	Lepomis gibbosus	Pumpkinseed	x		x	
	Oncorhynchus mykiss	Rainbow trout (steelhead)			x	
	Richardsonius balteatus	Redside shiner	x		x	
	Cottus perplexus	Reticulate sculpin			x	
	Lampetra ayresii	River lamprey			x	
	Percopsis transmontana	Sand roller			x	
	Micropterus dolomieu	Smallmouth bass	x		x	
	Oncorhynchus nerka	Sockeye salmon	x		x	
	Rhinichthys osculus	Speckled (Spotted) dace	x		x	

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Gasterosteus aculeatus	Threespine stickleback	x		x	
	Cottus rhotheus	Torrent sculpin			x	
	Sander vitreus	Walleye	x		x	
	Pomoxis annularis	White crappie			x	
	Acipenser transmontanus	White sturgeon			x	
	Ameiurus natalis	Yellow bullhead			x	
	Perca flavescens	Yellow perch	x		x	
Mammal Herbivore	*Castor canadensis*	Beaver		x	x	
	Lepus californicus	Black-tailed jackrabbit	x			x
	Neotoma cinerea	Bushy-tailed woodrat	x			x
	Cervus elaphus	Rocky Mountain elk	x	x		x
	Perognathus parvus	Great Basin pocket mouse	x	x		x
	Tamias minimus	Least chipmunk				x
	Microtus montanus	Montane vole	x			x
	Odocoileus hemionus	Mule deer	x	x		x
	Ondatra zibethica	Muskrat		x	x	
	Thomomys talpoides	Northern pocket gopher	x			x
	Sylvilagus nuttallii	Nuttall's (or mountain) cottontail	x			x
	Erethizon dorsatum	Porcupine		x		
	Lemmiscus curtatus	Sagebrush vole	x			x

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Urocitellus townsendii (formally Spermophilus townsendii)	Townsend's ground squirrel	x			x
	Urocitellus washingtoni (Formally Spermophilus washingtoni)	Washington ground squirrel				x
	Reithrodontomys megalotis	Western harvest mouse	x	x		x
	Odocoileus virginianus	White-tailed deer		x		
	Lepus townsendii	White-tailed jackrabbit				x
	Marmota flaviventris	Yellow-bellied marmot				x
Mammal Predator	*Taxidea taxus*	badger				x
	Eptesicus fuscus	Big brown bat	x	x		x
	Lynx rufus	Bobcat		x		x
	Canis latrans	coyote	x			x
	Peromyscus maniculatus	Deer mouse	x	x		x
	Lasiurus cinereus	Hoary bat	x	x		x
	Mus musculus	House mouse	x	x		
	Myotis rolans	Long-legged myotis (bat)	x	x		x
	Myotis lucifugus	Little brown myotis (bat)	x	x		x
	Mustela frenata	Long-tailed weasel		x		
	Sorex merriami	Merriam's shrew				x
	Mustela vison	Mink		x		

Table H-13. Species Known or Potentially Occurring on the Hanford Site Classified by Primary Functional and Habitat Type

Functional Type	Scientific Name	Common Name	Hanford Location Data[a]	Habitat Type		
				Riparian	Aquatic	Upland
	Puma concolor concolor	Mountain lion				x
	Onychomys leucogaster	Northern grasshopper mouse	x			x
	Rattus norvegicus	Norway rat		x		x
	Antrozous pallidus	Pallid bat	x	x		x
	Procyon lotor	Raccoon		x		
	Lutra canadensis	River otter		x	x	
	Mustela erminea	Short-tail weasel		x		
	Lasionycteris noctivagans	Silver-haired bat	x	x		x
	Mephitis mephitis	Striped skunk		x		
	Sorex vagrans	Vagrant shrew		x		
	Pipistrellus hesperus	Western pipistrelle (bat)	x	x		x
	Myotis leibii	Western small-footed myotis (bat)	x			x
	Myotis yumanensis	Yuma myotis (bat)	x	x		x

Note: Species listed in this table are from the following sources: locational data from EMC and Surface Environmental Surveillance Program (SESP) project databases; TNC (Soll et al. 1999; Evans et al. 2003); Fitzner and Gray 1991; Hanford Site NEPA Characterization (Neitzel 2003); a working list of species developed by BL Tiller under EMC Project.

H5 Tissue Samples

This section includes the tissue samples presented in Tables H-14 through H-16. These tables present the analyte concentrations for detected and non-detected tissue samples (plant, invertebrate, small mammal, deer antler, and bird) collected from the 100-BC Area.

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Inorganics (mg/kg)										
Aluminum	BC_PILOT				19	2.06	1,288	19	2.06	1,288
	PNNL	2	0.21	0.21	37	0.145	235	39	0.145	235
	RCBRA	1	1.7	1.7	3	9.1	134	4	1.7	134
Antimony	BC_PILOT	9	0.00461	0.00576	10	0.00515	0.0311	19	0.00461	0.0311
	PNNL	15	0.00117	0.0021	24	0.00142	0.0121	39	0.00117	0.0121
	RCBRA	3	0.21	1.1	1	0.34	0.34	4	0.21	1.1
Arsenic	BC_PILOT	6	0.0296	0.0607	13	0.0520	0.287	19	0.0296	0.287
	PNNL	11	0.0117	0.0315	28	0.013455	0.3234	39	0.0117	0.3234
	RCBRA	4	0.39	1.5				4	0.39	1.5
Barium	BC_PILOT				72	0.876	40.0	72	0.876	40.0
	PNNL				39	0.895	29.8	39	0.895	29.8
	RCBRA				4	1.3	17.9	4	1.3	17.9
Beryllium	BC_PILOT	11	0.00459	0.00573	8	0.00310	0.0149	19	0.00310	0.0149
	PNNL	38	0.000468	0.0042	1	0.00632	0.00632	39	0.000468	0.00632
	RCBRA	4	0.01	0.05				4	0.01	0.05
Bismuth	RCBRA	4	0.38	1.2				4	0.38	1.2
Boron	RCBRA	1	0.34	0.34	3	3.8	40.3	4	0.34	40.3
Cadmium	BC_PILOT	9	0.00244	0.00763	63	0.00288	0.570	72	0.00244	0.570
	PNNL	1	0.00294	0.00294	38	0.00259	0.330	39	0.00259	0.330

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
	RCBRA	4	0.05	0.17				4	0.05	0.17
Calcium	RCBRA				4	261	6,280	4	261	6,280
Calculated total uranium	PNNL	1	0.000109	0.000109				1	0.000109	0.000109
	RCBRA	4	3.7E-06	0.070638				4	3.7E-06	0.070638
Chromium	BC_PILOT				72	0.0452	2.15	72	0.0452	2.15
	PNNL	3	0.021	0.021	36	0.0171	0.481	39	0.0171	0.481
	RCBRA	2	0.2	0.21	2	0.51	0.67	4	0.2	0.67
Cobalt	RCBRA	4	0.08	0.34				4	0.08	0.34
Copper	BC_PILOT				19	0.854	4.48	19	0.854	4.48
	PNNL				39	0.111	3.00	39	0.111	3.00
	RCBRA	1	1.1	1.1	3	3	5.3	4	1.1	5.3
Iron	RCBRA	2	55.9	60.5	2	39.8	401	4	39.8	401
Lead	BC_PILOT	4	0.00488	0.0103	68	0.00537	0.987	72	0.00488	0.987
	PNNL	4	0.00651	0.00651	35	0.00300	0.372	39	0.00300	0.372
	RCBRA	4	0.31	0.76				4	0.31	0.76
Lithium	RCBRA	2	0.03	0.03	2	0.12	0.27	4	0.03	0.27
Magnesium	RCBRA				4	167	1,200	4	167	1,200
Manganese	BC_PILOT				72	1.31	59.8	72	1.31	59.8
	PNNL				39	0.560	64.7	39	0.560	64.7
	RCBRA				4	3.5	38.2	4	3.5	38.2

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Mercury	BC_PILOT	37	0.00142	0.0143	35	0.00146	0.0350	72	0.00142	0.0350
	PNNL	18	0.000585	0.0105	21	0.000819	0.0739	39	0.000585	0.0739
	RCBRA	4	0.01	0.04				4	0.01	0.04
Molybdenum	RCBRA	3	0.15	0.71	1	0.4	0.4	4	0.15	0.71
Nickel	BC_PILOT				72	0.0509	1.08	72	0.0509	1.08
	PNNL				39	0.0225	0.647	39	0.0225	0.647
	RCBRA	2	0.26	0.56	2	0.78	0.86	4	0.26	0.86
Phosphorus	RCBRA				4	598	2,080	4	598	2,080
Potassium	RCBRA				4	5,270	14,300	4	5,270	14,300
Selenium	BC_PILOT	40	0.00537	0.0572	32	0.00549	0.241	72	0.00537	0.241
	PNNL	34	0.0042	0.042	5	0.0166	0.0615	39	0.0042	0.0615
	RCBRA	4	0.41	1.1				4	0.41	1.1
Silicon	RCBRA				4	83.4	693	4	83.4	693
Silver	BC_PILOT	25	0.0109	0.0136	2	0.0153	0.0182	27	0.0109	0.0182
	PNNL	34	0.00117	0.0021	5	0.00139	0.00288	39	0.00117	0.00288
	RCBRA	4	0.09	0.17				4	0.09	0.17
Sodium	RCBRA	2	16	23.4	2	25.5	50	4	16	50
Strontium	RCBRA				4	1.2	22.7	4	1.2	22.7
Thallium	BC_PILOT	28	0.00488	0.00641	44	0.00539	0.351	72	0.00488	0.351
	PNNL	12	0.00084	0.0021	27	0.000751	0.0895	39	0.000751	0.0895

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
	RCBRA	4	0.76	1.7				4	0.76	1.7
Thorium	PNNL	29	0.000585	0.0042	10	0.00134	0.0462	39	0.000585	0.0462
Tin	RCBRA	4	1.8	2.9				4	1.8	2.9
Titanium	RCBRA				2	1.3	29.6	2	1.3	29.6
Uranium	BC_PILOT	18	0.000244	0.00942	54	0.000298	0.196	72	0.000244	0.196
	PNNL	13	0.000117	0.00063	26	0.000209	0.0570	39	0.000117	0.0570
	RCBRA	4	1.4	2.2				4	1.4	2.2
Vanadium	RCBRA	3	0.08	0.22	1	0.91	0.91	4	0.08	0.91
Zinc	BC_PILOT				19	2.17	45.4	19	2.17	45.4
	PNNL				39	1.04	17.6	39	1.04	17.6
	RCBRA				4	7.7	15.6	4	7.7	15.6
Zirconium	RCBRA	2	2.5	2.6				2	2.5	2.6
Organics (mg/kg)										
1,2,4-Trichlorobenzene	RCBRA	4	16	37				4	16	37
1,2-Dichlorobenzene	RCBRA	4	16	37				4	16	37
1,3-Dichlorobenzene	RCBRA	4	16	37				4	16	37
1,4-Dichlorobenzene	RCBRA	4	16	37				4	16	37
2,4,5-Trichlorophenol	RCBRA	4	40	92				4	40	92
2,4,6-Trichlorophenol	RCBRA	4	16	37				4	16	37
2,4-Dichlorophenol	RCBRA	4	16	37				4	16	37

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
2,4-Dimethylphenol	RCBRA	4	16	37				4	16	37
2,4-Dinitrophenol	RCBRA	4	40	92				4	40	92
2,4-Dinitrotoluene	RCBRA	4	16	37				4	16	37
2,6-Dinitrotoluene	RCBRA	4	16	37				4	16	37
2-Chloronaphthalene	RCBRA	4	16	37				4	16	37
2-Chlorophenol	RCBRA	4	16	37				4	16	37
2-Methylnaphthalene	RCBRA	4	16	37				4	16	37
2-Methylphenol [cresol, o-]	RCBRA	4	16	37				4	16	37
2-Nitroaniline	RCBRA	4	40	92				4	40	92
2-Nitrophenol	RCBRA	4	16	37				4	16	37
3,3*-Dichlorobenzidine	RCBRA	4	16	37				4	16	37
3+4 Methylphenol [cresol, m+p]	RCBRA	4	16	37				4	16	37
3-Nitroaniline	RCBRA	4	40	92				4	40	92
4,6-Dinitro-2-methylphenol	RCBRA	4	40	92				4	40	92
4-Bromophenylphenyl ether	RCBRA	4	16	37				4	16	37
4-Chloro-3-methylphenol	RCBRA	4	16	37				4	16	37
4-Chloroaniline	RCBRA	4	16	37				4	16	37
4-Chlorophenylphenyl ether	RCBRA	4	16	37				4	16	37
4-Nitroaniline	RCBRA	4	40	92				4	40	92
4-Nitrophenol	RCBRA	4	40	92				4	40	92

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Acenaphthene	RCBRA	4	16	37				4	16	37
Acenaphthylene	RCBRA	4	16	37				4	16	37
Aldrin	RCBRA	3	0.008	0.047	1	0.012	0.012	4	0.008	0.047
Alpha-BHC	RCBRA	4	0.008	0.047				4	0.008	0.047
alpha-Chlordane	RCBRA	4	0.008	0.047				4	0.008	0.047
Anthracene	RCBRA	4	16	37				4	16	37
Aroclor-1016	RCBRA	4	0.08	0.47				4	0.08	0.47
Aroclor-1221	RCBRA	4	0.08	0.47				4	0.08	0.47
Aroclor-1232	RCBRA	4	0.08	0.47				4	0.08	0.47
Aroclor-1242	RCBRA	4	0.08	0.47				4	0.08	0.47
Aroclor-1248	RCBRA	4	0.08	0.47				4	0.08	0.47
Aroclor-1254	RCBRA	4	0.08	0.47				4	0.08	0.47
Aroclor-1260	RCBRA	4	0.08	0.47				4	0.08	0.47
Benzo[a]anthracene	RCBRA	4	16	37				4	16	37
Benzo[a]pyrene	RCBRA	4	16	37				4	16	37
Benzo[b]fluoranthene	RCBRA	4	16	37				4	16	37
Benzo[ghi]perylene	RCBRA	4	16	37				4	16	37
Benzo[k]fluoranthene	RCBRA	4	16	37				4	16	37
beta-1,2,3,4,5,6-Hexachlorocyclohexane	RCBRA	3	0.008	0.047	1	0.071	0.071	4	0.008	0.071
Bis[2-chloro-1-methylethyl]ether	RCBRA	4	16	37				4	16	37

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Bis[2-Chloroethoxy]methane	RCBRA	4	16	37				4	16	37
Bis[2-chloroethyl] ether	RCBRA	4	16	37				4	16	37
Bis[2-ethylhexyl] phthalate	RCBRA	4	0.86	37				4	0.86	37
Butylbenzylphthalate	RCBRA	4	16	37				4	16	37
Carbazole	RCBRA	4	16	37				4	16	37
Chrysene	RCBRA	4	16	37				4	16	37
Delta-BHC	RCBRA	2	0.008	0.047	2	0.0024	0.12	4	0.0024	0.12
Dibenz[a,h]anthracene	RCBRA	4	16	37				4	16	37
Dibenzofuran	RCBRA	4	16	37				4	16	37
Dichlorodiphenyldichloroethane	RCBRA	3	0.008	0.047	1	0.042	0.042	4	0.008	0.047
Dichlorodiphenyldichloroethylene	RCBRA	3	0.008	0.047	1	0.2	0.2	4	0.008	0.2
Dichlorodiphenyltrichloroethane	RCBRA	3	0.008	0.047	1	0.066	0.066	4	0.008	0.066
Dieldrin	RCBRA	3	0.008	0.047	1	0.0092	0.0092	4	0.008	0.047
Diethylphthalate	RCBRA	4	16	37				4	16	37
Dimethyl phthalate	RCBRA	4	16	37				4	16	37
Di-n-butylphthalate	RCBRA	4	16	37				4	16	37
Di-n-octylphthalate	RCBRA	4	16	37				4	16	37
Endosulfan I	RCBRA	1	0.008	0.008	3	0.0072	0.11	4	0.0072	0.11
Endosulfan II	RCBRA	3	0.008	0.047	1	0.068	0.068	4	0.008	0.068
Endosulfan sulfate	RCBRA	4	0.008	0.047				4	0.008	0.047

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Endrin	RCBRA	3	0.008	0.047	1	0.0024	0.0024	4	0.0024	0.047
Endrin aldehyde	RCBRA	4	0.008	0.047				4	0.008	0.047
Endrin ketone	RCBRA	3	0.008	0.047	1	0.0094	0.0094	4	0.008	0.047
Fluoranthene	RCBRA	4	16	37				4	16	37
Fluorene	RCBRA	4	16	37				4	16	37
Gamma-BHC [lindane]	RCBRA	3	0.008	0.047	1	0.0022	0.0022	4	0.0022	0.047
gamma-Chlordane	RCBRA	2	0.008	0.045	2	0.0024	0.043	4	0.0024	0.045
Heptachlor	RCBRA	3	0.008	0.047	1	0.14	0.14	4	0.008	0.14
Heptachlor epoxide	RCBRA	4	0.008	0.047				4	0.008	0.047
Hexachlorobenzene	RCBRA	4	16	37				4	16	37
Hexachlorobutadiene	RCBRA	4	16	37				4	16	37
Hexachlorocyclopentadiene	RCBRA	4	16	37				4	16	37
Hexachloroethane	RCBRA	4	16	37				4	16	37
Indeno[1,2,3-cd]pyrene	RCBRA	4	16	37				4	16	37
Isophorone	RCBRA	4	16	37				4	16	37
Methoxychlor	RCBRA	4	0.008	0.047				4	0.008	0.047
Naphthalene	RCBRA	4	16	37				4	16	37
Nitrobenzene	RCBRA	4	16	37				4	16	37
N-Nitroso-di-n-dipropylamine	RCBRA	4	16	37				4	16	37
N-Nitrosodiphenylamine	RCBRA	4	16	37				4	16	37

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Pentachlorophenol	RCBRA	4	40	92				4	40	92
Phenanthrene	RCBRA	4	16	37				4	16	37
Phenol	RCBRA	4	16	37				4	16	37
Pyrene	RCBRA	4	16	37				4	16	37
Toxaphene	RCBRA	4	0.08	0.47				4	0.08	0.47
Radionuclides (pCi/g)										
Americium-241	RCBRA	4	0.07	0.65				4	0.07	0.65
Antimony-125	BC_PILOT	25	-0.0250	0.0299				25	-0.0250	0.0299
	PNNL	3	-0.0274	0.0165				3	-0.0274	0.0165
	RCBRA	4	0.119	0.39				4	0.119	0.39
Beryllium-7	BC_PILOT	5	0.268	0.531	20	0.279	1.75	25	0.268	1.75
	PNNL	1	0.147	0.147	2	1.43	4.34	3	0.147	4.34
	RCBRA	4	0.023	2.5				4	0.023	2.5
Cesium-134	BC_PILOT	25	-0.003081	0.0202				25	-0.003081	0.0202
	PNNL	3	-0.0153	0.0024				3	-0.0153	0.0024
	RCBRA	4	0.065	0.2				4	0.065	0.2
Cesium-137	BC_PILOT	21	-0.002247	0.0700	4	0.0167	0.0650	25	-0.002247	0.0700
	PNNL	3	-0.00109	0.0245				3	-0.00109	0.0245
	RCBRA	4	0.052	0.18				4	0.052	0.18
Cobalt-60	BC_PILOT	25	-0.008638	0.0196				25	-0.008638	0.0196

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
	PNNL	3	-0.0347	0.00226				3	-0.0347	0.00226
	RCBRA	4	0.055	0.2				4	0.055	0.2
Europium-152	BC_PILOT	25	-0.0202	0.0473				25	-0.0202	0.0473
	RCBRA	4	0.14	0.43				4	0.14	0.43
Europium-154	BC_PILOT	25	-0.0354	0.0544				25	-0.0354	0.0544
	PNNL	3	-0.00676	0.102				3	-0.00676	0.102
	RCBRA	4	0.173	0.52				4	0.173	0.52
Europium-155	BC_PILOT	25	-0.004685	0.0445				25	-0.004685	0.0445
	PNNL	3	-0.000322	0.0736				3	-0.000322	0.0736
	RCBRA	4	0.102	0.44				4	0.102	0.44
Plutonium-238	RCBRA	2	-0.02	0				2	-0.02	0
Plutonium-239/240	RCBRA	2	0	0.018				2	0	0.018
Potassium-40	BC_PILOT				25	1.76	18.2	25	1.76	18.2
	PNNL				3	2.66	27.7	3	2.66	27.7
	RCBRA	2	0	0	2	5.95	11	4	0	11
Radium-226	RCBRA	4	0.113	0.37				4	0.113	0.37
Radium-228	RCBRA	4	0.236	0.85				4	0.236	0.85
Ruthenium-106	BC_PILOT	25	-0.0796	0.0854				25	-0.0796	0.0854
	PNNL	3	-0.0569	0.237				3	-0.0569	0.237
	RCBRA	4	0.44	1.6				4	0.44	1.6

Table H-14. Plant Tissue Samples from 100-BC Area.

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Silver-108 metastable	BC_PILOT	20	-0.007442	0.0101				20	-0.007442	0.0101
Strontium-90	BC_PILOT	36	-0.021593	0.021015	29	0.01686	1.29564	65	-0.021593	1.29564
	PNNL				3	0.0268	7.86	3	0.0268	7.86
	RCBRA	4	-0.049	0.02				4	-0.049	0.02
Technetium-99	BC_PILOT	9	-0.008952	0.451	19	0.0456	1.62	28	-0.008952	1.62
	PNNL	1	-0.0494	-0.0494				1	-0.0494	-0.0494
Thorium-228	RCBRA	4	-0.032	0.069				4	-0.032	0.069
Thorium-230	RCBRA	4	-0.106	0.034				4	-0.106	0.034
Thorium-232	RCBRA	4	-0.034	0.007				4	-0.034	0.007
Tritium	RCBRA	2	-0.867	1.97				2	-0.867	1.97
Uranium-233/234	PNNL	1	0.00386	0.00386				1	0.00386	0.00386
	RCBRA	4	0	0.023				4	0	0.023
Uranium-235	PNNL	1	0.0000486	0.0000486				1	0.0000486	0.0000486
	RCBRA	4	-0.004	0.024				4	-0.004	0.024
Uranium-238	PNNL	1	0.000237	0.000237				1	0.000237	0.000237
	RCBRA	4	0	0.02				4	0	0.02

PNNL = Pacific Northwest National Laboratory

RCBRA = River Corridor Baseline Risk Assessment

Table H-15. Invertebrate Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Inorganics (mg/kg)										
Aluminum	BC_PILOT				11	74.214	270.921	11	74.214	270.921
	RCBRA				2	19.2	37.3	2	19.2	37.3
Antimony	BC_PILOT	2	0.007541	0.007541	9	0.01209	0.039581	11	0.007541	0.039581
	RCBRA	2	0.22	0.49				2	0.22	0.49
Arsenic	BC_PILOT				11	0.154014	0.58254	11	0.154014	0.58254
	RCBRA				2	0.81	1.1	2	0.81	1.1
Barium	BC_PILOT				11	1.42842	20.8278	11	1.42842	20.8278
	RCBRA				2	1	1.3	2	1	1.3
Beryllium	BC_PILOT	9	0.007501	0.007501	2	0.012209	0.027691	11	0.007501	0.027691
	RCBRA	2	0.01	0.02				2	0.01	0.02
Bismuth	RCBRA	2	0.39	0.57				2	0.39	0.57
Boron	RCBRA				2	2	4	2	2	4
Cadmium	BC_PILOT				11	0.12768	2.50971	11	0.12768	2.50971
	RCBRA	1	0.08	0.08	1	0.11	0.11	2	0.08	0.11
Calcium	RCBRA				2	229	327	2	229	327
Calculated total uranium	RCBRA	1	0.074413	0.074413				1	0.074413	0.074413
Chromium	BC_PILOT				11	0.086583	0.84588	11	0.086583	0.84588
	RCBRA				2	0.2	0.54	2	0.2	0.54
Cobalt	RCBRA	2	0.08	0.16				2	0.08	0.16
Copper	BC_PILOT				11	7.2219	34.0347	11	7.2219	34.0347

Table H-15. Invertebrate Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
	RCBRA				2	6.4	8.1	2	6.4	8.1
Iron	RCBRA				2	76.3	99.1	2	76.3	99.1
Lead	BC_PILOT				11	0.045486	0.92169	11	0.045486	0.92169
	RCBRA	1	0.34	0.34	1	0.37	0.37	2	0.34	0.37
Lithium	RCBRA	1	0.1	0.1	1	0.05	0.05	2	0.05	0.1
Magnesium	RCBRA				2	385	697	2	385	697
Manganese	BC_PILOT				11	8.3391	41.097	11	8.3391	41.097
	RCBRA				2	5	7.5	2	5	7.5
Mercury	BC_PILOT				11	0.006584	0.05586	11	0.006584	0.05586
	RCBRA	1	0.02	0.02	1	0.36	0.36	2	0.02	0.36
Molybdenum	RCBRA				2	0.24	0.57	2	0.24	0.57
Nickel	BC_PILOT				11	0.107331	0.80997	11	0.107331	0.80997
	RCBRA	1	0.27	0.27	1	0.27	0.27	2	0.27	0.27
Phosphorus	RCBRA				2	2100	2500	2	2100	2500
Potassium	RCBRA				2	2500	2530	2	2500	2530
Selenium	BC_PILOT				11	0.049077	2.32617	11	0.049077	2.32617
	RCBRA	1	0.83	0.83	1	0.53	0.53	2	0.53	0.83
Silicon	RCBRA				2	45.8	76.4	2	45.8	76.4
Silver	BC_PILOT	4	0.017756	0.017756	7	0.026095	0.117705	11	0.017756	0.117705
	RCBRA	1	0.09	0.09	1	0.12	0.12	2	0.09	0.12
Sodium	RCBRA				2	542	821	2	542	821

Table H-15. Invertebrate Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Strontium	RCBRA				2	1.7	3.3	2	1.7	3.3
Thallium	BC_PILOT				11	0.013965	0.084189	11	0.013965	0.084189
	RCBRA	2	0.78	0.78				2	0.78	0.78
Tin	RCBRA	2	1.2	3				2	1.2	3
Uranium	BC_PILOT	6	0.012329	0.012329	5	0.014803	0.039182	11	0.012329	0.039182
	RCBRA	2	0.98	1.4				2	0.98	1.4
Vanadium	RCBRA	2	0.08	0.1				2	0.08	0.1
Zinc	BC_PILOT				11	34.314	151.221	11	34.314	151.221
	RCBRA				2	36.8	53	2	36.8	53
Zirconium	RCBRA	1	1.2	1.2				1	1.2	1.2
Radionuclides										
Strontium-90	RCBRA	1	-0.046	-0.046				1	-0.046	-0.046
Thorium-228	RCBRA	1	0.072	0.072				1	0.072	0.072
Thorium-230	RCBRA	1	0.252	0.252				1	0.252	0.252
Thorium-232	RCBRA	1	0	0				1	0	0
Uranium-233/234	RCBRA	1	0.05	0.05				1	0.05	0.05
Uranium-235	RCBRA	1	0	0				1	0	0
Uranium-238	RCBRA	1	0.025	0.025				1	0.025	0.025

RCBRA = River Corridor Baseline Risk Assessment

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Inorganics (mg/kg)										
Aluminum	BC_PILOT	1	0.366	0.366	28	0.251	4.55	29	0.251	4.55
	RCBRA	1	2.3	2.3	3	2.9	36.1	4	2.3	36.1
Antimony	BC_PILOT	9	0.00541	0.00541	20	0.00561	0.0126	29	0.00541	0.0126
	RCBRA	4	0.21	0.43				4	0.21	0.43
Arsenic	BC_PILOT	13	0.0569	0.0569	16	0.0303	0.320	29	0.0303	0.320
	RCBRA	3	0.39	0.6	1	0.5	0.5	4	0.39	0.6
Barium	BC_PILOT	5	0.0229	0.838	32	0.00526	2.56	37	0.00526	2.56
	RCBRA				4	0.04	1.9	4	0.04	1.9
Beryllium	BC_PILOT	18	0.00538	0.00538	11	0.00858	0.0852	29	0.00538	0.0852
	RCBRA	3	0.01	0.02	1	0.01	0.01	4	0.01	0.02
Bismuth	RCBRA	4	0.38	0.5				4	0.38	0.5
Boron	RCBRA	2	0.24	0.35	2	0.3	0.48	4	0.24	0.48
Cadmium	BC_PILOT	1	0.00715	0.00715	36	0.00766	0.196	37	0.00715	0.196
	RCBRA	3	0.05	0.07	1	0.15	0.15	4	0.05	0.15
Calcium	RCBRA				4	61.6	10,300	4	61.6	10,300
Calculated total uranium	RCBRA	2	0.00000515	0.182				2	0.00000515	0.182
Chromium	BC_PILOT				37	0.00812	0.255	37	0.00812	0.255
	RCBRA				4	0.14	0.46	4	0.14	0.46
Cobalt	RCBRA	4	0.08	0.14				4	0.08	0.14

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Copper	BC_PILOT				29	3.69	8.55	29	3.69	8.55
	RCBRA				4	2.9	6.9	4	2.9	6.9
Iron	RCBRA				4	103	131	4	103	131
Lead	BC_PILOT	10	0.00887	0.0512	27	0.0119	62.3	37	0.00887	62.3
	RCBRA	3	0.3	0.32	1	0.43	0.43	4	0.3	0.43
Lithium	RCBRA	3	0.03	0.05	1	0.07	0.07	4	0.03	0.07
Magnesium	RCBRA				4	195	559	4	195	559
Manganese	BC_PILOT	2	1.30	1.67	35	1.57	4.12	37	1.30	4.12
	RCBRA				4	2.1	3.5	4	2.1	3.5
Mercury	BC_PILOT	6	0.00155	0.00155	31	0.00172	0.0632	37	0.00155	0.0632
	RCBRA	4	0.01	0.02				4	0.01	0.02
Molybdenum	RCBRA	1	0.28	0.28	3	0.37	1.9	4	0.28	1.9
Nickel	BC_PILOT	20	0.0128	0.185	17	0.0130	0.591	37	0.0128	0.591
	RCBRA	4	0.23	0.26				4	0.23	0.26
Phosphorus	RCBRA				4	3,040	7,200	4	3,040	7,200
Potassium	RCBRA				4	2,070	3,080	4	2,070	3,080
Selenium	BC_PILOT	2	0.331	0.360	35	0.286	2.51	37	0.286	2.51
	RCBRA				4	0.8	1.5	4	0.8	1.5
Silicon	RCBRA				4	6.3	44.6	4	6.3	44.6
Silver	BC_PILOT	29	0.0127	0.0127				29	0.0127	0.0127

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
	RCBRA	4	0.07	0.09				4	0.07	0.09
Sodium	RCBRA				4	962	1,430	4	962	1,430
Strontium	RCBRA				4	0.06	5.5	4	0.06	5.5
Thallium	BC_PILOT	1	0.00143	0.00143	36	0.00222	0.0475	37	0.00143	0.0475
	RCBRA	4	0.67	0.77				4	0.67	0.77
Tin	RCBRA	2	1	2.2	2	1.3	1.4	4	1	2.2
Uranium	BC_PILOT	33	0.000858	0.00884	4	0.000952	0.00326	37	0.000858	0.00884
	RCBRA	4	0.85	1.4				4	0.85	1.4
Vanadium	RCBRA	4	0.08	0.09				4	0.08	0.09
Zinc	BC_PILOT				29	20.4	45.5	29	20.4	45.5
	RCBRA				4	29.6	69.5	4	29.6	69.5
Zirconium	RCBRA	1	0.31	0.31				1	0.31	0.31
Organics (mg/kg)										
1,2,4-Trichlorobenzene	RCBRA	2	3.3	4				2	3.3	4
1,2-Dichlorobenzene	RCBRA	2	3.3	4				2	3.3	4
1,3-Dichlorobenzene	RCBRA	2	3.3	4				2	3.3	4
1,4-Dichlorobenzene	RCBRA	2	3.3	4				2	3.3	4
2,4,5-Trichlorophenol	RCBRA	2	8.3	10				2	8.3	10
2,4,6-Trichlorophenol	RCBRA	2	3.3	4				2	3.3	4
2,4-Dichlorophenol	RCBRA	2	3.3	4				2	3.3	4

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
2,4-Dimethylphenol	RCBRA	2	3.3	4				2	3.3	4
2,4-Dinitrophenol	RCBRA	2	8.3	10				2	8.3	10
2,4-Dinitrotoluene	RCBRA	2	3.3	4				2	3.3	4
2,6-Dinitrotoluene	RCBRA	2	3.3	4				2	3.3	4
2-Chloronaphthalene	RCBRA	2	3.3	4				2	3.3	4
2-Chlorophenol	RCBRA	2	3.3	4				2	3.3	4
2-Methylnaphthalene	RCBRA	2	3.3	4				2	3.3	4
2-Methylphenol [cresol, o-]	RCBRA	2	3.3	4				2	3.3	4
2-Nitroaniline	RCBRA	2	8.3	10				2	8.3	10
2-Nitrophenol	RCBRA	2	3.3	4				2	3.3	4
3,3*-Dichlorobenzidine	RCBRA	2	3.3	4				2	3.3	4
3+4 Methylphenol [cresol, m+p]	RCBRA	2	3.3	4				2	3.3	4
3-Nitroaniline	RCBRA	2	8.3	10				2	8.3	10
4,6-Dinitro-2-methylphenol	RCBRA	2	8.3	10				2	8.3	10
4-Bromophenylphenyl ether	RCBRA	2	3.3	4				2	3.3	4
4-Chloro-3-methylphenol	RCBRA	2	3.3	4				2	3.3	4
4-Chloroaniline	RCBRA	2	3.3	4				2	3.3	4
4-Chlorophenylphenyl ether	RCBRA	2	3.3	4				2	3.3	4
4-Nitroaniline	RCBRA	2	8.3	10				2	8.3	10
4-Nitrophenol	RCBRA	2	8.3	10				2	8.3	10

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Acenaphthene	RCBRA	2	3.3	4				2	3.3	4
Acenaphthylene	RCBRA	2	3.3	4				2	3.3	4
Aldrin	RCBRA				2	0.016	0.047	2	0.016	0.047
Alpha-BHC	RCBRA	2	0.014	0.016				2	0.014	0.016
alpha-Chlordane	RCBRA	2	0.014	0.016				2	0.014	0.016
Anthracene	RCBRA	2	3.3	4				2	3.3	4
Aroclor-1016	RCBRA	2	0.14	0.16				2	0.14	0.16
Aroclor-1221	RCBRA	2	0.14	0.16				2	0.14	0.16
Aroclor-1232	RCBRA	2	0.14	0.16				2	0.14	0.16
Aroclor-1242	RCBRA	2	0.14	0.16				2	0.14	0.16
Aroclor-1248	RCBRA	2	0.14	0.16				2	0.14	0.16
Aroclor-1254	BC_PILOT	10	0.00778	0.0625				10	0.00778	0.0625
	RCBRA	2	0.14	0.16				2	0.14	0.16
Aroclor-1260	BC_PILOT	10	0.00778	0.0625				10	0.00778	0.0625
	RCBRA	2	0.14	0.16				2	0.14	0.16
Benzo[a]anthracene	RCBRA	2	3.3	4				2	3.3	4
Benzo[a]pyrene	RCBRA	2	3.3	4				2	3.3	4
Benzo[b]fluoranthene	RCBRA	2	3.3	4				2	3.3	4
Benzo[ghi]perylene	RCBRA	2	3.3	4				2	3.3	4
Benzo[k]fluoranthene	RCBRA	2	3.3	4				2	3.3	4

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
beta-1,2,3,4,5,6-Hexachlorocyclohexane	RCBRA	2	0.014	0.016				2	0.014	0.016
Bis[2-chloro-1-methylethyl]ether	RCBRA	2	3.3	4				2	3.3	4
Bis[2-Chloroethoxy]methane	RCBRA	2	3.3	4				2	3.3	4
Bis[2-chloroethyl] ether	RCBRA	2	3.3	4				2	3.3	4
Bis[2-ethylhexyl] phthalate	RCBRA	2	0.72	3.3				2	0.72	3.3
Butylbenzylphthalate	RCBRA	2	3.3	4				2	3.3	4
Carbazole	RCBRA	2	3.3	4				2	3.3	4
Chrysene	RCBRA	2	3.3	4				2	3.3	4
Delta-BHC	RCBRA				2	0.018	0.019	2	0.018	0.019
Dibenz[a,h]anthracene	RCBRA	2	3.3	4				2	3.3	4
Dibenzofuran	RCBRA	2	3.3	4				2	3.3	4
Dichlorodiphenyldichloroethane	RCBRA	2	0.014	0.016				2	0.014	0.016
Dichlorodiphenyldichloroethylene	RCBRA	2	0.014	0.016				2	0.014	0.016
Dichlorodiphenyltrichloroethane	RCBRA	1	0.016	0.016	1	0.011	0.011	2	0.011	0.016
Dieldrin	RCBRA	2	0.014	0.016				2	0.014	0.016
Diethylphthalate	RCBRA	2	3.3	4				2	3.3	4
Dimethyl phthalate	RCBRA	2	3.3	4				2	3.3	4
Di-n-butylphthalate	RCBRA	2	3.3	4				2	3.3	4
Di-n-octylphthalate	RCBRA	1	3.3	3.3	1	0.51	0.51	2	0.51	3.3
Endosulfan I	RCBRA	2	0.014	0.016				2	0.014	0.016

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Endosulfan II	RCBRA	2	0.014	0.016				2	0.014	0.016
Endosulfan sulfate	RCBRA	2	0.014	0.016				2	0.014	0.016
Endrin	RCBRA	2	0.014	0.016				2	0.014	0.016
Endrin aldehyde	RCBRA	2	0.014	0.016				2	0.014	0.016
Endrin ketone	RCBRA	2	0.014	0.016				2	0.014	0.016
Fluoranthene	RCBRA	2	3.3	4				2	3.3	4
Fluorene	RCBRA	2	3.3	4				2	3.3	4
Gamma-BHC [lindane]	RCBRA	2	0.014	0.016				2	0.014	0.016
gamma-Chlordane	RCBRA	2	0.014	0.016				2	0.014	0.016
Heptachlor	RCBRA	2	0.014	0.016				2	0.014	0.016
Heptachlor epoxide	RCBRA	2	0.014	0.016				2	0.014	0.016
Hexachlorobenzene	RCBRA	2	3.3	4				2	3.3	4
Hexachlorobutadiene	RCBRA	2	3.3	4				2	3.3	4
Hexachlorocyclopentadiene	RCBRA	2	3.3	4				2	3.3	4
Hexachloroethane	RCBRA	2	3.3	4				2	3.3	4
Indeno[1,2,3-cd]pyrene	RCBRA	2	3.3	4				2	3.3	4
Isophorone	RCBRA	2	3.3	4				2	3.3	4
Methoxychlor	RCBRA	2	0.014	0.016				2	0.014	0.016
Naphthalene	RCBRA	2	3.3	4				2	3.3	4
Nitrobenzene	RCBRA	2	3.3	4				2	3.3	4

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
N-Nitroso-di-n-dipropylamine	RCBRA	2	3.3	4				2	3.3	4
N-Nitrosodiphenylamine	RCBRA	2	3.3	4				2	3.3	4
Pentachlorophenol	RCBRA	2	8.3	10				2	8.3	10
Phenanthrene	RCBRA	2	3.3	4				2	3.3	4
Phenol	RCBRA	1	4	4	1	0.26	0.26	2	0.26	4
Pyrene	RCBRA	2	3.3	4				2	3.3	4
Toxaphene	RCBRA	2	0.14	0.160				2	0.14	0.160
Radionuclides (pCi/g)										
Americium-241	RCBRA	2	0.2	0.28				2	0.2	0.28
Antimony-125	BC_PILOT	7	-0.0161	0.268				7	-0.0161	0.268
	RCBRA	2	0.137	0.16				2	0.137	0.16
Barium-133	RCBRA	1	0.07	0.07				1	0.07	0.07
Beryllium-7	BC_PILOT	7	-0.163	0.266				7	-0.163	0.266
	RCBRA	2	0.022	0.58				2	0.022	0.58
Cesium-134	BC_PILOT	7	-0.00223	0.0869				7	-0.00223	0.0869
	RCBRA	2	0.067	0.079				2	0.067	0.079
Cesium-137	BC_PILOT	7	-0.0277	0.0449				7	-0.0277	0.0449
	RCBRA	2	0.062	0.066				2	0.062	0.066
Cobalt-60	BC_PILOT	7	-0.00319	0.132				7	-0.00319	0.132
	RCBRA	2	0.056	0.068				2	0.056	0.068

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Europium-152	BC_PILOT	7	-0.0388	0.0907				7	-0.0388	0.0907
	RCBRA	2	0.15	0.162				2	0.15	0.162
Europium-154	BC_PILOT	7	-0.268	0.0566				7	-0.268	0.0566
	RCBRA	2	0.154	0.21				2	0.154	0.21
Europium-155	BC_PILOT	7	-0.157	0.053				7	-0.157	0.053
	RCBRA	2	0.144	0.15				2	0.144	0.15
Plutonium-238	RCBRA	1	0	0				1	0	0
Plutonium-239/240	RCBRA	1	0	0				1	0	0
Potassium-40	BC_PILOT	1	1	1	6	1.57	4.84	7	1	4.84
	RCBRA	1	0	0	1	3.28	3.28	2	0	3.28
Radium-226	RCBRA	2	0.12	0.127				2	0.12	0.127
Radium-228	RCBRA	2	0.259	0.3				2	0.259	0.3
Ruthenium-106	BC_PILOT	7	-0.0808	0.121				7	-0.0808	0.121
	RCBRA	2	0.499	0.59				2	0.499	0.59
Strontium-90	BC_PILOT	10	-0.0183	0.267	4	0.0524	0.0778	14	-0.0183	0.267
	RCBRA	1	-0.005	-0.005	1	0.505	0.505	2	-0.005	0.505
Technetium-99	BC_PILOT	8	-0.0894	0.147	1	0.194	0.194	9	-0.0894	0.194
Thorium-228	RCBRA	1	0	0	1	0.18	0.18	2	0	0.18
Thorium-230	RCBRA	2	-0.045	0.051				2	-0.045	0.051
Thorium-232	RCBRA	1	-0.051	-0.051	1	0.119	0.119	2	-0.051	0.119

Table H-16. Small Mammal Tissue Samples from 100-BC Area

Analyte	Data Source	Nondetect Samples			Detect Samples			Total of All Samples		
		Number	Minimum	Maximum	Number	Minimum	Maximum	Number	Minimum	Maximum
Uranium-233/234	RCBRA	2	0.031	0.032				2	0.031	0.032
Uranium-235	RCBRA	2	0	0				2	0	0
Uranium-238	RCBRA	2	0	0.061				2	0	0.061

RCBRA = River Corridor Baseline Risk Assessment

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Environmental Calculation

Environmental Calculation Cover Page

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Project: 100-BC Source Operable Units RI/FS Date: 5/8/12

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Ecological Risk Evaluation for the 100-BC Source Operable Units

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CH2MHILL Plateau Remediation Company **Environmental Calculation Cover Page**	
Calculation No.: ECF-100BC1-11-0014	Revision No.: Rev. 0
Project: 100-BC Source Operable Units RI/FS	Date: 5/8/12
Responsible Manager: Harry Ohlendorf	
Name/Position	
Signature Harry Ohlendorf	Date

A1 Purpose

This Environmental Calculation for the 100-BC Source OUs documents the following:

- Calculation of hazard quotients (HQs), sum of fractions (SOFs), and hazard indices (HIs) for the evaluation of risk to ecological receptors (plants, soil invertebrates, and wildlife) from radionuclides and chemical constituents in the upper 4.6 m (15 ft) of the upland area soils; and,
- Evaluation of the site-relatedness of constituents based on the comparison of site concentrations to non-site-impacted background concentrations for radionuclides and chemical constituents with HQs, SOFs, or HIs $\geq$ 1.

The HQ, SOF, HI, and background comparisons presented in this Environmental Calculation are intended for use in the ecological risk assessment (ERA) being prepared for the 100-BC Source OUs at the Hanford Site. The 100-BC ERA completes screening and preliminary remediation goal (PRG) evaluations; the results of the ERA will be used to evaluate the ecological risk that remains following waste site remediation and to provide information for risk managers to consider when deciding if additional remediation is necessary with respect to ecological risks for the 100-BC OUs.

HQs are intended to characterize the potential for risk to the specified receptors from exposure to contaminants via the evaluated exposure pathways. HQs are the ratios of the estimated site-specific exposures to a constituent compared to the estimated exposure levels where no adverse health effects are likely to occur. Because the dose from radionuclides is additive, the combined effects from two or more radionuclides are calculated as ratios of the estimated total site-specific exposures to effect levels using the SOF method. The dose from polychlorinated biphenyls (aroclors) is also additive; therefore, the total contributions of aroclors were also calculated using the HI method. For inorganic or radiological constituents indicating a potential risk (HQ or SOF $\geq$ 1) for at least one ecological receptor, background comparisons were conducted to determine if the concentrations are greater than those in unaffected areas. Risks are not considered to be site-related in the ERA if onsite concentrations do not exceed background concentrations. Background concentrations were not available for organic constituents.

The risk characterization process described in this document is consistent with *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final* (EPA 540-R-97-006). The HQs, SOFs, HIs, and background comparison outcomes presented in this Environmental Calculation are not intended to be final risk outcomes; it will be revised as needed to incorporate updates to the risk characterization process and/or underlying values used to calculate risks that are identified during the remedial investigation/feasibility study (RI/FS) process for the 100-BC OUs.

The risk characterization process presented in this document is intended for use in evaluating risks for waste sites located in upland habitats. It is not intended for evaluating riparian or near-shore areas of the River Corridor, as these have been defined in the *River Corridor Baseline Risk Assessment, Volume I: Ecological Risk Assessment*, hereinafter called the RCBRA Volume I (DOE/RL-2007-21).

A2 Methodology

The HQs, SOFs, HIs, and background comparisons are based on the evaluation of risk to ecological receptors as described in Section 1. The following sections describe the steps used to develop the screening HQs, SOFs, and HIs (Section 2.1), the approach for comparing site to background concentrations (Section 2.2), the approach for developing the PRG HQs (Section 2.3), and the approach

for estimating wildlife exposure to chemicals and radionuclides received by drinking from seeps in the 100-BC OUs (Section 2.4).

A2.1 Screening HQ, SOF, and HI Calculations

Risks at the 100-BC OUs were evaluated based on the ratio of exposure point concentrations (EPCs) to SSLs (defined below), resulting in HQs, and are described by the following equation:

$$HQ = EPC/SSL$$

where:

HQ	=	ecological hazard quotient (unitless)
EPC	=	soil concentration (µg/kg for non-radionuclides and pCi/g for radionuclides)
SSL	=	soil screening level (µg/kg for non-radionuclides and pCi/g for radionuclides)

Once the HQ was calculated, the SOF for radionuclides or the HI for aroclors was calculated for a decision unit as follows:

$$\text{SOF or HI} = \sum_{j=1}^{n} \text{Exposure}_j / \text{SSL}_j$$

where:

SOF	=	sum of fractions
HI	=	hazard index
Exposure_j	=	exposure concentration for each radionuclide or aroclor within a decision unit
SSL_j	=	soil screening level for each radionuclide or aroclor within a decision unit

HQ, SOF, or HI values less than 1.0 indicate that adverse effects associated with exposure to a given constituent are unlikely (*Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments: Interim Final* [EPA 540-R-97-006]). These constituents were not considered to represent a risk and were excluded from further evaluation in the ERA. An HQ, SOF, or HI $\geq$ 1.0 indicates a potential for risk, but does not indicate that a risk is actually present. Constituents with an HQ, SOF, or HI $\geq$ 1.0 for at least one ecological receptor (plant, invertebrate, bird, or mammal) were further evaluated, as discussed in Section 2.2, to determine if the detected concentrations also exceed background. When the SOF or HI is $\geq$ 1.0, the individual radionuclides or Aroclors are carried into the background evaluation for that decision unit.

Table 1 identifies the soil decision units that were designated for each waste site in the 100-BC OUs. Table 2 defines the area and depth sampled within each soil decision unit and describes the sampling design used. The soil depth decision units evaluated in the ERA, and for which EPCs were calculated, are overburden (backfill), overburden focused (backfill), staging pile area (0 to 4.6 m [0 to 15 ft] bgs), staging pile area-focused (0 to 4.6 m [0 to 15 ft] bgs), shallow (0 to 4.6 m [0 to 15 ft] bgs), and shallow-focused (0 to 4.6 m [0 to 15 ft] bgs). All focused samples were collected using the focused study design.

The EPC represents the 95 percent upper confidence limit (UCL) of the arithmetic mean concentration of the analyzed constituent for each decision unit within the footprint of each remediated waste site. A detailed description of the process used to calculate the EPCs and the resulting EPC values for 100-BC

OUs are provided in the *Computation of Exposure Point Concentrations for the 100-BC-1 and 100-BC-2 Source Operable Units* (ECF-100BC1-11-0012).

The soil EPCs for each evaluated waste site and decision unit were compared to the following SSLs for each receptor group selected for evaluation in the ERA:

- Terrestrial Plants and Soil Invertebrates - The overall lowest of the available plant and soil invertebrate values in *Tier 1 Risk-Based Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-00784) as summarized in *Preliminary Remediation Goals (SSLs in Upland Soil for Terrestrial Ecological Receptors for 100 Area RI/FSs)* (ECF-HANFORD-11-0060) were used as the SSLs for this calculation.
- Avian and Mammalian Wildlife - The overall lowest of the avian and mammalian lowest observed adverse effect level (LOAEL)-based values in *Tier 1 Risk-Based Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-00784) as summarized in *Preliminary Remediation Goals (SSLs in Upland Soil for Terrestrial Ecological Receptors for 100 Area RI/FSs)* (ECF-HANFORD-11-0060) were used as the SSLs for this calculation.

Because the plant/invertebrate and/or wildlife SSL values for 10 COPCs (arsenic, boron, lithium, mercury, manganese, molybdenum, selenium, strontium, thallium, and uranium) were higher than the corresponding PRG values, these COPCs were reviewed to confirm they were below both the SSL and PRG. Any of these 10 COPCs greater than either the SSL or PRG were then carried forward.

A2.2 Background Concentration Comparison

The soil EPCs with an HQ or SOF $\geq$ 1.0 were compared to the lognormal 90th percentile background concentrations for the Hanford Site. Background concentrations are not available for organic chemicals, so organics were not evaluated in the background comparison. Accordingly, organic chemicals with HIs $\geq$ 1.0 were carried forward in the risk assessment process, without comparison to background concentrations. For inorganic constituents in soil at the Hanford Site, background concentrations are described in *Hanford Site Background, Part 1*, *Soil Background for Nonradioactive Analytes* (DOE/RL-92-24). For select inorganic constituents not included in *Hanford Site Background, Part 1*, *Soil Background for Nonradioactive Analytes* (DOE/RL-92-24), the 90th percentile concentrations were obtained from Ecology (*Natural Background Soil Metals Concentrations in Washington State* [Ecology Publication 94-115]), *Soil Background Data for Interim Use at the Hanford Site* (ECF-HANFORD-11-038), or from *Remedial Design Report/Remedial Action Work Plan for the 100 Area* (DOE/RL-96-17). For radiological constituents, background concentrations in soil at the Hanford Site are described in *Hanford Site Background: Part 2, Soil Background for Radionuclides* (DOE/RL-96-12).

Constituents with EPCs meeting or exceeding SSLs (that is, HQ or SOF $\geq$ 1.0) but with EPCs that do not exceed the 90th percentile background concentration were not considered to represent a site-related risk and were excluded from further evaluation. Constituents with EPCs meeting or exceeding SSLs and with EPCs greater than the 90th percentile background concentrations were further considered in the PRG evaluation.

A2.3 PRG HQ Calculation

Chemical-decision-unit combinations with EPCs meeting or exceeding the SSLs and with EPCs greater than the 90th percentile background concentrations were further evaluated based on the ratio of EPCs to PRGs, resulting in HQs, and are described by the following equation:

$$HQ = EPC/PRG$$

where:

HQ	=	ecological hazard quotient (unitless)
EPC	=	soil concentration (µg/kg for nonradionuclides and pCi/g for radionuclides)
PRG	=	preliminary remediation goal (µg/kg for nonradionuclides and pCi/g for radionuclides)

As described in Section 2.1, the EPC represents the UCL of the arithmetic mean concentration of the analyzed constituent for each decision unit within the footprint of each remediated waste site. The soil EPCs for each evaluated waste site and decision unit were compared to PRGs for each receptor group with EPCs exceeding SSLs and background.

The primary difference between the SSL and PRG comparisons for wildlife is the use of bioaccumulation factors that are based on the foodchain present at the Hanford site (for example, arthropods in soil) for the calculation of the PRG, and the incorporation of Hanford Site-specific tissue data in the models. Development of the PRGs for birds and mammals focused on the integration of available Hanford Site-specific bioaccumulation data for plants, terrestrial arthropods, and small mammals into existing bioaccumulation models to more accurately reflect site-specific conditions and the potential exposure of wildlife to chemicals from the ingestion of prey at this Site. Details of the calculations of the avian and mammalian PRGs are found in *Tier 2 Risk-Based Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-01311). As with SSLs, the PRGs selected are also based on LOAELs.

PRGs for the evaluation of potential impacts to terrestrial plants and soil invertebrates are primarily no observed effect concentrations (NOECs) from RCBRA Volume I (DOE/RL-2007-21), Ecology (*Ecological Soil Screening Levels for Arsenic and Lead in the Tacoma Smelter Plume Footprint and Hanford Site Old Orchards Ecology* [Ecology Publication-11-03-006]), and a recent study in 2011 as presented in *Tier 2 Terrestrial Plant and Invertebrate Preliminary Remediation Goals (PRGs) for Nonradionuclides for Use at the Hanford Site* (ECF-HANFORD-11-0158).

A2.4 Freshwater Seeps Drinking Water and HQ Calculations

The estimates of exposure from drinking water ingestion by wildlife include the use of a simplified model whereby the rate of ingestion is standardized to the body weight of the receptor on a per kilogram basis. The simplified allometric scaling equations presented in "Scaling of Osmotic Regulation in Mammals and Birds" (Calder and Braun, 1983) were used to estimate the number of liters consumed per kilogram of body weight per day. These rates of ingestion were then multiplied by the concentration of chemicals to calculate the total dose from the drinking water pathway as shown below:

$$\text{Dose} = [\text{Water} \times \text{DWIR}] \times \text{AUF}$$

where:

Dose	=	drinking water exposure (mg/kg body weight/day)
Water	=	chemical concentration in seep (mg/L)
DWIR	=	drinking water ingestion rate (L/kg body weight/day)
AUF	=	area use factor (area of site/home range of receptor) (unitless)

Drinking water ingestion was estimated for several species of birds and mammals expected to occur in the 100-BC riparian areas along the Columbia River, with the initial assumption that they reside at the site and fulfill their drinking water requirements exclusively from the seeps, but only for 9 months of the year becauses the river stage is elevated from mid-April to mid-July, making the seeps inaccessible. Therefore,

an AUF of 0.75 was employed for all species except bats. For bats, an AUF of 0.5 was used because bats use a combination of hibernating and seeking alternative sources of emergent insects during the winter months (*Living with Wildlife: Bats* [WDFW, 2012]).

Estimates are excluded for rodents (that is, deer mouse, grasshopper mouse, and pocket mouse) because they maintain water balance through excreting concentrated urine, obtaining water from food and water generated during metabolism (*Perognathus parvus* [Verts and Kirkland, 1988]).

Assuming that wildlife meet their daily drinking water requirements from the seeps, instead of a more readily available source such as the river, is a conservative approach meant to evaluate a worst-case scenario rather than attempt to establish a method for predicting exposure under the complex scenario that exists at the site. Therefore, although it represents an overestimate, the 95 percent UCL of the arithmetic mean concentration of the analyzed constituent (as described in Section 2.1) was employed as the EPC as a conservative estimate of exposure. Although filtered water data are used in evaluations of the effects on aquatic receptors (because those are the concentrations that are bioavailable), unfiltered concentrations are more appropriate for drinking water (because bioavailability may change within the digestive tract). Both were included to be comprehensive because in rare cases filtered concentrations can be higher than unfiltered concentrations. Results of filtered concentration and unfiltered concentration data were evaluated separately. When both filtered and unfiltered concentrations were measured in the same sampling location and event, they were not pooled because doing so would overestimate the exposure concentration.

HQs for inorganics were estimated as the ratio of estimated ingestion doses to toxicity reference values (TRVs). The TRVs employed were the same as those used to develop the wildlife PRGs used to evaluate soil as presented in *Tier 1 Risk-Based Soil Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-00784) and *Tier 2 Risk-Based Soil Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-01311).

$$HQ = Dose/TRV$$

where:

HQ = ecological hazard quotient (unitless)
Dose = drinking water exposure (mg/kg body weight/day)
TRV = toxicological reference value (mg/kg-body weight-day)

For radionuclides, the HQs were simply a ratio of the measured concentrations in water to the biota concentration guides (BCGs) for wildlife. The lowest water BCGs of terrestrial or riparian animal receptors were taken from the U.S. Department of Energy's (DOE's) *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE-STD-1153-2002) or were calculated using the *RESRAD-BIOTA: A Tool for Implementing a Graded Approach to Biota Dose Evaluation, User's Guide, Version 1* (DOE/EH-0676) when not available in *A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota* (DOE-STD-1153-2002). SOFs were calculated as described in Section 2.1. Also as described in Section 2.1, the EPC represents the 95 percent UCL of the arithmetic mean concentration of the analyzed constituent.

$$HQ = (EPC*AUF) / BCG$$

where:

HQ = ecological hazard quotient (unitless)

EPC = radionuclide concentration in seep (pCi/L)
AUF = area use factor (unitless)
BCG = biota concentration guides (pCi/L)

A3 Assumptions and Inputs

The following sections provide the input values for the HQ calculations (Sections 3.1, 3.2, and 3.4) and comparison to background concentrations (Section 3.3).

A3.1 EPC Concentrations

Site and decision unit EPCs (described in Section 2.1) for surface soil used to calculate HQs, SOFs, and HIs are shown in Table 3.

A3.2 Soil Screening Levels (SSLs)

Available SSLs (described in Section 2.1) used to calculate the HQs, SOFs, and HIs are included in Table 3.

A3.3 Background Concentrations

Background concentrations (described in Section 2.2) for soil used to evaluate exceedances of background are provided in Table 4. The results of these comparisons are then summarized in Table 5.

A3.4 PRG Evaluation

PRGs (described in Section 2.3) used to calculate the HQs for chemicals with EPCs that exceeded both SSLs and background are provided in Table 6. The results of the comparison to PRGs are then summarized in Table 7.

A3.5 Freshwater Seeps Drinking Water Evaluation

EPCs of seep data for inorganics used to calculate drinking water ingestion HQs are found in Table 8 and those for radionuclides in seeps are found in Table 9. Body weights and allometric scaling-based drinking water ingestion rates are provided in Table 8. TRVs, body weights, and allometric scaling-based drinking ingestion rates for inorganic chemicals are provided in Table 8, while BCGs are provided in Table 9.

A4 Software Applications

All supporting calculations were performed on electronic spreadsheets using Microsoft Excel. Electronic versions of all spreadsheets are provided with calculations included to facilitate comparison with hand calculations and checking logical or lookup functions. This approach meets the requirements for "Single Use Software" as described in *CHPRC Environmental Calculation Preparation and Issue* (PRC-PRO-EP-40205).

A5 Calculation

A5.1 Screening HQ, SOF, HI and PRG HQ Calculations

HQs were calculated by comparing EPC concentrations to SSLs and PRGs using Microsoft Excel spreadsheets. EPCs were compared to SSLs and PRGs for both terrestrial plants or soil invertebrates (the lower of the two) and for avian or mammalian wildlife (similarly, the lower of the two). The SOFs for radionuclides were calculated for a decision unit by summing the individual HQs for each radionuclide

within that decision unit. The HIs for aroclors were similarly calculated for a decision unit by summing the individual HQs for each aroclor within that decision unit. The results of these calculations are presented in Table 3 for the SSL comparison and Table 6 for the PRG comparison.

A5.2 Background Concentration Comparison

Site concentrations were compared to background by comparing EPC concentrations to background concentrations using Microsoft Excel spreadsheets. EPCs were compared only for constituents with SSL-based HQs or SOFs $\geq$ 1.0. The results of these calculations are presented in Table 4.

A5.3 Freshwater Seeps Drinking Water Evaluation

EPCs of chemicals in seeps were used to estimate a worst-case scenario of potential wildlife exposure to chemicals in seep water based on the assumption that wildlife use seeps as an exclusive source of drinking water. However, AUFs were employed that account for the fact that many of the receptors are not present year round as a result of migration or hibernation, and the seeps themselves are not ”available” year round. Results of the comparisons for inorganic chemicals are presented in Table 8. For radionuclides, exposure EPCs of radioactivity were compared to BCGs to evaluate the potential dose of radioactivity received through drinking seep water. Results are presented in Table 9.

A6 Results/Conclusions

Comparisons of EPCs for inorganic and organic chemicals and radionuclides in soil to SSLs are shown in Table 3. Individual radionuclides were carried forward to the background evaluation for four waste site decision units where the SOFs were greater than 1. For those inorganic chemicals and radionuclides with EPC HQs > 1 or SOFs >1, comparisons to background are shown in Table 4. Table 5 provides a summary of the chemicals exceeding the SSLs (plant/invertebrate and/or wildlife) or both the SSLs and background. Antimony, barium, boron, cadmium, chromium, copper, lead, mercury, molybdenum, selenium, vanadium, and zinc were detected with EPCs greater than the SSL and outside of the range of background, so these COPECs were carried forward for additional evaluation. In addition, carbon-14, europium-155, cesium-137, cobalt-60, europium-152, europium-154, tritium, plutonium-239/240, and total beta radiostrontium were either outside of the range of background or background values were not available, so these COPECs were also carried forward for additional evaluation.

Comparisons of EPCs to PRGs for the chemicals carried forward are shown in Table 6, and results are summarized in Table 7. Carbon-14,tritium, barium, boron, cadmium, chromium, copper, lead, mercury, molybdenum, selenium, silver, vanadium, and zinc were detected at concentrations exceeding one or both groups of PRGs (plants/invertebrates, wildlife) in one or more of the following waste sites:

- 100-B-14:1_Overburden_2: Carbon-14
- 100-B-14:2_Overburden_Focused: Mercury
- 100-B-14:6_Shallow_Focused: Barium and Mercury
- 100-B-18_Shallow_Focused: Barium, Boron, Cadmium, and Mercury
- 100-B-19_Shallow_5: Mercury
- 100-B-19_Shallow_Focused: Mercury and Vanadium
- 100-B-20_Shallow_Focused: Mercury
- 100-B-22:2_Shallow_Focused: Copper, Mercury, and Molybdenum
- 100-B-23_Shallow_Focused: Mercury and Zinc
- 100-B-28_Shallow_Focused : Mercury and Vanadium

- 100-B-28_Staging pile area-4: Mercury
- 100-B-31_Shallow: Molybdenum
- 100-C-9:1_Shallow_2: Mercury
- 100-C-9:2_Shallow_Focused: Copper and Mercury
- 116-B-10_Shallow: Mercury
- 116-B-5_Shallow_Focused: Mercury and Tritium
- 116-B-9_Shallow: Mercury
- 116-C-3_Shallow: Carbon-14
- 116-C-3_Staging pile area Focused: Selenium
- 118-B-1_Overburden_1: Mercury
- 118-B-1_Shallow_3: Mercury
- 118-B-1_Shallow_7: Molybdenum
- 118-B-1_Shallow_Focused: Mercury
- 118-B-1_Staging pile area Focused: Mercury
- 118-C-1_Shallow_3: Molybdenum
- 118-C-1_Staging pile area: Copper and Carbon-14
- 118-C-3:3_Shallow_Focused: Mercury
- 120-B-1_Shallow_Focused: Chromium and Molybdenum
- 128-B-3_Shallow_3: Molybdenum
- 128-B-3_Staging pile area: Mercury
- 128-C-1_Shallow: Silver
- 1607-B10_Shallow: Mercury
- 1607-B2:1_Shallow: Barium
- 1607-B8_Shallow: Lead
- 600-233_Shallow_Focused: Selenium

Comparison of EPCs for seeps along the 100-BC riparian area to TRVs resulted in HQs of less than 0.01 for all chemicals (Tables 8 and 9). These results indicate that no further evaluation of inorganics in drinking water is warranted for both inorganic chemicals and radionuclides. The same conclusion is reached even when considering the drinking ingestion in combination with total ingestion from terrestrial pathways.

A6.1 Supporting Information

The backup information supporting these calculations is provided in the following files:

Microsoft Excel workbook “100-BC Area Eco Risk Char Tables_05072012.xlsx” containing:

- Table 1. Waste Sites and Decision Units for the 100-BC Source OUs
- Table 2. Summary of Decision Unit Soil Reaches
- Table 3. Comparison of 100-BC Surface Soil (4.9 m [0 to 15 ft] bgs) Concentrations to SSLs
- Table 4. Comparison of Chemicals Exceeding SSLs in 100-BC Surface Soils (4.9 m [0 to 15 ft] bgs) to Background

- Table 5. Summary of Ecological Evaluation Based on SSLs and Background for Surface Soils (4.9 m [0 to 15 ft] bgs)
- Table 6. Ecological PRG Comparisons for 100-BC Waste Site Decision Units
- Table 7. Summary of Ecological Evaluation Based on PRGs for Surface Soils (4.9 m [0 to 15 ft] bgs)
- Table 8. Wildlife Exposure to Non-radionuclides through Drinking from Seeps in the 100-BC Riparian Area
- Table 9 Wildlife Exposure to Radionuclides through Drinking from Seeps in the 100-BC Riparian Area

A7 References

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