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TABLE OF CONTENTS

VOLUME I. TEXT, APPENDICES, AND FIELD PHOTOGRAPHS ii
VOLUME II. TABLES xv
VOLUME III. FIGURES xix
VOLUME IV. SHEETS xxii
ACRONYMS AND ABBREVIATIONS xxiii

TECHNICAL SUMMARY TS-1

VOLUME I. TEXT, APPENDICES, AND FIELD PHOTOGRAPHS

1. INTRODUCTION 1-1
1.1 PURPOSE OF THE REMEDIAL INVESTIGATION REPORT 1-1
1.2 REMEDIAL INVESTIGATION OVERVIEW AND SCOPE 1-2
1.2.1 Initial Planning and Records Review 1-2
1.2.2 Non-Intrusive Field Work 1-3
1.2.3 Intrusive Field Work - Phase I 1-3
1.2.4 Intrusive Field Work - Phase II 1-3
1.2.5 Intrusive Field Work - Phase III 1-3
1.2.6 Intrusive Field Work - Phase IV 1-4
1.2.7 Investigative Area Designations 1-4
1.2.8 Conceptual Site Model 1-5
1.3 REMEDIAL INVESTIGATION AUTHORITY 1-5
1.4 REMEDIAL INVESTIGATION GOALS AND OBJECTIVES 1-7
1.5 REMEDIAL INVESTIGATION REPORT ORGANIZATION 1-9

2. SITE BACKGROUND 2-1
2.1 SITE LOCATION 2-1
2.2 SITE HISTORY 2-1
2.2.1 Operational History 2-1
2.2.1.1 Operation Timeline 2-1
2.2.1.2 Government Contracts 2-3
2.2.1.3 Operation Description 2-4
2.2.1.4 Building Remediation and Removal Timeline 2-10
2.2.2 Regulatory History 2-11
2.2.3 Previous Investigations 2-12
2.3 SITE CHARACTERISTICS 2-13
2.3.1 Topography 2-13
2.3.2 Geology 2-13
2.3.2.1 Regional Geology 2-13
2.3.2.2 Site Geology 2-14
2.3.2.2.1 Shale Bedrock 2-16
2.3.2.2.2 Native Sediment 2-16
2.3.2.2.3 Old Fill 2-16
2.3.2.2.4 New Fill 2-17
2.3.3 Hydrogeology 2-18
2.3.3.1 Regional Hydrogeology 2-18
2.3.3.2 Site Hydrogeology 2-18

TABLE OF CONTENTS
(CONTINUED)

2.3.4 Surface Water 2-20
2.3.4.1 Cuyahoga River 2-20
2.3.4.2 Big Creek 2-21
2.3.4.3 Runoff 2-21

3. REMEDIAL INVESTIGATION DATA COLLECTION PROGRAM 3-1
3.1 REMEDIAL INVESTIGATION APPROACH 3-2
3.1.1 Observational Approach 3-2
3.1.2 RI Constituents of Interest 3-4
3.1.3 Phase III and IV Sampling following Conceptual Site Model Update 3-6
3.2 GENERAL CHARACTERIZATION 3-11
3.2.1 Radiological Parameter Evaluations 3-12
3.2.1.1 Airborne Uranium Contamination Transport Evaluation 3-12
3.2.1.2 Enriched Uranium Evaluation 3-12
3.2.1.3 Radiological Soil Screening Correlation 3-13
3.2.1.4 Radium-226 Re-Analysis 3-14
3.2.2 Site Clearing Activities 3-15
3.2.3 Stream Water Elevation Data 3-15
3.2.4 Source Water Field Blanks 3-16
3.2.5 Civil Location Surveys 3-16
3.2.6 Field Photographs 3-16
3.2.7 Field Screening 3-17
3.2.7.1 Ambient Air Sampling 3-17
3.2.7.2 Chemical Parameters 3-17
3.2.7.2.1 Chemical Soil Core Screening 3-17
3.2.7.2.2 Borehole Screening 3-17
3.2.7.3 Radiological Parameters 3-18
3.2.7.3.1 Radiological Soil Core Screening 3-18
3.2.7.3.2 Downhole Gamma Logging 3-18
3.2.7.3.3 XRF Analysis 3-19
3.2.8 Geochemical Sampling 3-19
3.2.9 Geotechnical Sampling 3-20
3.2.10 Meteorological Data 3-21
3.3 BACKGROUND SAMPLING ACTIVITIES 3-21
3.3.1 Phase I and II Soil 3-21
3.3.2 Phase IV Soil 3-22
3.3.3 Sediment and Surface Water 3-23
3.3.4 Groundwater 3-23
3.4 BUILDING CHARACTERIZATION 3-23
3.4.1 Building Characterization Data Collection and Material Sampling Methods 3-24
3.4.1.1 Building Material Sampling Methods 3-24
3.4.1.2 Building Radiation Survey Methods 3-25
3.4.2 Building Radiation Survey Reference Measurements 3-27
3.4.3 IA01 (Building G-1) 3-27
3.4.3.1 IA01 Definition 3-28
3.4.3.2 Building Material Sampling 3-28
3.4.3.3 Building Radiation Survey 3-28
3.4.4 IA02 (Other Existing Buildings) 3-28
3.4.4.1 IA02 Definition 3-29

TABLE OF CONTENTS
(CONTINUED)

3.4.4.2 Building Material Sampling 3-29
3.4.4.3 Building Radiation Survey 3-29
3.5 SOIL CHARACTERIZATION 3-31
3.5.1 Soil Sampling Methods 3-35
3.5.2 Geophysical Survey Methods 3-36
3.5.3 Gamma Walkover Survey Methods 3-37
3.5.4 IA03 (Soil in the Vicinity of Building G-1) 3-38
3.5.4.1 IA03 Definition 3-38
3.5.4.2 Geophysical Survey 3-38
3.5.4.3 Gamma Walkover Survey 3-38
3.5.4.4 Soil Sampling 3-38
3.5.5 IA04 (Northside Soil Complex) 3-39
3.5.5.1 IA04 Definition 3-39
3.5.5.2 Geophysical Survey 3-40
3.5.5.3 Gamma Walkover Survey 3-40
3.5.5.4 Soil Sampling 3-40
3.5.5.5 Buried Infrastructure 3-41
3.5.6 IA05 (Southside Soil Complex) 3-42
3.5.6.1 IA05 Definition 3-42
3.5.6.2 Geophysical Survey 3-42
3.5.6.3 Gamma Walkover Survey 3-42
3.5.6.4 Soil Sampling 3-42
3.5.7 IA06 (Eastside Soil) 3-43
3.5.7.1 IA06 Definition 3-43
3.5.7.2 Geophysical Survey 3-43
3.5.7.3 Gamma Walkover Survey 3-44
3.5.7.4 Soil Sampling 3-44
3.5.7.5 Phase III Gridded Soil Sampling 3-44
3.5.8 IA07 (Westside Soil) 3-45
3.5.8.1 IA07 Definition 3-45
3.5.8.2 Geophysical Survey 3-46
3.5.8.3 Gamma Walkover Survey 3-46
3.5.8.4 Soil Sampling 3-46
3.5.9 Multiple IA Sample Collection 3-47
3.5.9.1 Phase III Analysis of Archived Samples 3-47
3.5.9.2 Phase IV Analysis of Archived Samples 3-48
3.5.9.3 Historical Pit/Pond Soil 3-48
3.5.9.4 Targeted Concrete Slabs 3-49
3.6 SEDIMENT AND SURFACE WATER CHARACTERIZATION 3-50
3.6.1 Sediment and Surface Water Sampling Methods 3-50
3.6.2 IA08 (Sediment and Surface Water) 3-51
3.6.2.1 IA08 Definition 3-51
3.6.2.2 Sediment and Surface Water Sampling 3-51
3.6.2.3 River Sediment Sampling 3-51
3.6.3 IA09 (Sewers and Drains) 3-52
3.6.3.1 IA09 Definition 3-52
3.6.3.2 Sediment and Surface Water Sampling Activities 3-52
3.6.3.3 Backfill Soil Sampling 3-52
3.6.3.4 Phase III Sewer Sediment Sampling 3-53

TABLE OF CONTENTS
(CONTINUED)

3.6.3.5 Phase IV Sediment and Surface Water 3-53
3.6.4 IA03 and IA04 Sanitary Sewer Line 3-54
3.6.5 IA03 and IA09 Storm Sewer Junction 3-54
3.7 GROUNDWATER CHARACTERIZATION - IA10 3-55
3.7.1 Groundwater Sampling Methods 3-55
3.7.2 Groundwater Monitoring Well Development Methods 3-56
3.7.3 IA10 (Groundwater) 3-56
3.7.3.1 IA10 Definition 3-56
3.7.3.2 Existing Pre-RI Monitoring Well Evaluation 3-56
3.7.3.3 Temporary Well Point Installation 3-57
3.7.3.4 Temporary Piezometer Installation 3-57
3.7.3.5 Monitoring Well Installation 3-58
3.7.3.6 Groundwater Level Measurements 3-59
3.7.3.7 Slug Testing 3-59
3.7.3.8 Phase I and II Groundwater Sampling 3-60
3.7.3.9 Phase IV Groundwater Sampling 3-60
3.8 INVESTIGATION-DERIVED WASTE 3-61

4. REMEDIAL INVESTIGATION LABORATORY ANALYTICAL SUMMARY 4-1
4.1 PROJECT QUALITY OBJECTIVES 4-1
4.1.1 Level of Quality Control Effort 4-2
4.1.2 Accuracy, Precision, and Sensitivity of Analysis 4-3
4.1.3 Completeness, Representativeness, and Comparability 4-4
4.2 LABORATORY ANALYTICAL PARAMETERS AND METHODS 4-4
4.2.1 Off-Site Analytical Laboratories 4-4
4.2.2 On-Site BEGe Laboratory 4-5
4.2.2.1 On-Site BEGe Laboratory Correlation Study 4-5
4.2.2.1.1 Data Set Characteristics 4-6
4.2.2.1.2 Comparison Methodology and Results 4-6
4.2.2.1.3 Conclusions 4-8
4.3 ANALYTICAL DATA QUALITY 4-8
4.3.1 Process Overview 4-9
4.3.2 Results of Phase I Data Verification and Phase II Data Validation 4-11
4.3.2.1 Phase I Data Qualifications 4-11
4.3.2.2 Phase II Data Qualifications 4-12
4.3.2.3 Miscellaneous Data Quality Issues 4-12
4.3.3 Phase III and IV Data Validation 4-13
4.3.3.1 Phase III Data Qualifications 4-13
4.3.3.2 Phase IV Data Qualifications 4-14
4.3.3.3 Miscellaneous Data Quality Issues 4-15
4.4 ON-SITE XRF ANALYSIS, QUALITY CONTROL, AND EVALUATION 4-15
4.4.1 Analysis and Method 4-16
4.4.1.1 Quality Assurance 4-16
4.4.1.2 Daily Calibration 4-17
4.4.2 XRF Results 4-17
4.4.3 XRF Evaluation Summary 4-17
4.4.3.1 XRF Performance 4-18
4.4.3.1.1 XRF Accuracy 4-18
4.4.3.1.2 XRF Precision 4-18

TABLE OF CONTENTS
(CONTINUED)

4.4.3.1.3 XRF Screening-Level Reproducibility 4-18
4.4.3.1.4 XRF Performance over a Work Day 4-18
4.4.3.1.5 XRF LOD for Total Uranium 4-19
4.4.3.2 Sample Heterogeneity 4-19
4.4.3.2.1 Small-Scale Sample Variability 4-19
4.4.3.2.2 Bagged Sample Intrinsic Variability 4-19
4.4.3.3 Relationship between XRF Reported Molybdenum and Total Uranium 4-19
4.4.3.4 Comparability between Field XRF and Laboratory Methods 4-20

5. SITE-SPECIFIC SCREENING LEVELS 5-1
5.1 SCREENING LEVELS 5-1
5.2 SITE-SPECIFIC BACKGROUND 5-2
5.3 SITE-SPECIFIC PRELIMINARY REMEDIATION GOALS 5-3

6. REMEDIAL INVESTIGATION RESULTS 6-1
6.1 GENERAL CHARACTERIZATION RESULTS 6-2
6.1.1 Radiological Parameter Evaluations 6-2
6.1.1.1 Airborne Uranium Contamination Transport Evaluation 6-2
6.1.1.2 Enriched Uranium Evaluation 6-3
6.1.1.3 Radiological Soil Screening Correlation 6-7
6.1.1.4 Radium-226 Re-Analysis 6-8
6.1.2 Stream Water Elevation Data 6-9
6.1.3 Source Water Field Blanks 6-9
6.1.4 Downhole Gamma Logging 6-9
6.1.5 Geochemical Sampling 6-10
6.1.6 Geotechnical Sampling 6-10
6.1.7 Meteorological Data 6-11
6.2 BACKGROUND SAMPLING RESULTS 6-11
6.2.1 Soil 6-12
6.2.1.1 Industrial Background Soil 6-12
6.2.1.2 Non-industrial Background Soil 6-13
6.2.2 Sediment and Surface Water 6-13
6.2.3 Groundwater 6-14
6.3 BUILDING CHARACTERIZATION RESULTS 6-15
6.3.1 Building Radiation Survey Reference Measurements 6-17
6.3.2 IA01 (Building G-1) 6-17
6.3.2.1 Building Material Sampling 6-17
6.3.2.2 Building Radiation Survey 6-18
6.3.2.2.1 Building G-1 Exterior 6-18
6.3.2.2.2 Building G-1 Interior 6-18
6.3.3 IA02 (Other Existing Buildings) 6-19
6.3.3.1 Building Material Sampling 6-20
6.3.3.2 Building Radiation Survey 6-21
6.3.3.2.1 Boiler House 6-21
6.3.3.2.2 Foundry 6-22
6.3.3.2.3 Warehouse 6-22
6.3.3.2.4 Garage 6-23
6.3.3.2.5 Scale House 6-24
6.4 SOIL CHARACTERIZATION RESULTS 6-24

TABLE OF CONTENTS
(CONTINUED)

6.4.1 IA03 (Soil in Vicinity of Building G-1) 6-26
6.4.1.1 Gamma Walkover Survey 6-26
6.4.1.2 Soil Sampling 6-27
6.4.2 IA04 (Northside Complex Soil) 6-30
6.4.2.1 Geophysical Survey 6-30
6.4.2.2 Gamma Walkover Survey 6-31
6.4.2.3 Soil Sampling 6-31
6.4.2.4 IA04 Buried Infrastructure 6-33
6.4.3 IA05 (Southside Complex Soil) 6-33
6.4.3.1 Gamma Walkover Survey 6-34
6.4.3.2 Soil Sampling 6-34
6.4.4 IA06 (Eastside Soil) 6-36
6.4.4.1 Geophysical Survey 6-36
6.4.4.2 Gamma Walkover Survey 6-37
6.4.4.3 Soil Sampling 6-37
6.4.4.3.1 Phase III Gridded Soil Sampling 6-38
6.4.5 IA07 (Westside Soil) 6-39
6.4.5.1 Geophysical Survey 6-40
6.4.5.2 Gamma Walkover Survey 6-40
6.4.5.3 Soil Sampling 6-40
6.4.6 Multiple IA Sample Collection 6-43
6.4.6.1 Analysis of Archived Soil Samples 6-43
6.4.6.2 Historical Pit/Pond Soil 6-43
6.4.6.3 Targeted Concrete Slabs 6-45
6.5 SEDIMENT AND SURFACE WATER CHARACTERIZATION RESULTS 6-46
6.5.1 IA08 (Sediment and Surface Water in the Cuyahoga River and Big Creek) 6-46
6.5.1.1 Phase III River Sediment Sampling 6-47
6.5.2 IA09 (Sewers and Drains) 6-47
6.5.2.1 Sediment and Surface Water Sampling 6-47
6.5.2.2 Backfill Soil Sampling 6-49
6.5.2.3 Sewer Sediment Sampling 6-50
6.5.2.4 Sanitary Sewer Line 6-51
6.5.2.5 Storm Sewer Junction 6-51
6.6 GROUNDWATER CHARACTERIZATION RESULTS 6-52
6.6.1 Existing Monitoring Well Evaluation 6-52
6.6.2 Monitoring Well Installation 6-52
6.6.3 Temporary Well Point Installation 6-52
6.6.4 Temporary Piezometer Installation 6-52
6.6.5 Groundwater Level Measurements 6-53
6.6.6 Slug Testing 6-55
6.6.7 Groundwater Sampling 6-55
6.7 INVESTIGATION-DERIVED WASTE 6-57
6.7.1 Disposal Characterization Summary 6-58
6.7.2 Disposal Summary 6-58

7. NUMERIC GROUNDWATER FLOW AND TRANSPORT MODELING 7-1
7.1 INTRODUCTION 7-1
7.2 MODELS AND METHODS USED 7-2
7.2.1 Groundwater Flow and Particle Tracking Models 7-2

TABLE OF CONTENTS
(CONTINUED)

7.2.2 Input Parameter Models 7-3
7.2.3 Data for Model Development 7-3
7.2.4 Hydrostratigraphy 7-5
7.2.5 Overburden Layer 7-5
7.2.6 Bedrock 7-6
7.2.7 Groundwater Flow System 7-7
7.2.7.1 Aquifer Type 7-7
7.2.7.2 Water Levels 7-7
7.2.7.3 Hydraulic Conductivity 7-9
7.2.7.4 Recharge 7-9
7.2.7.5 Discharge 7-11
7.2.7.6 Other Physical Soil Variables 7-12
7.2.8 Model Construction, Assumptions and Limitations 7-12
7.2.9 Physical Features of Model Domain 7-14
7.2.9.1 Design and Discretization 7-15
7.2.9.2 Boundary Conditions 7-15
7.2.10 Model Calibration 7-16
7.2.10.1 Observed and Simulated Head Targets 7-17
7.2.10.2 Calibration Statistics 7-18
7.2.10.3 Volumetric Flow Budget 7-19
7.2.10.4 Parameter Sensitivity 7-19
7.2.10.4.1 Hydraulic Conductivity 7-20
7.2.10.4.2 Recharge 7-20
7.2.10.4.3 Wells 7-20
7.2.10.4.4 River Boundary 7-20
7.2.10.4.5 Head-Dependent Flux Boundary (MODFLOW General Head Boundary) 7-20
7.2.11 Groundwater Pathway Analysis 7-20
7.2.12 Groundwater Transport Analysis 7-22
7.2.12.1 Input Parameters and Transport Analysis 7-23
7.2.12.2 Transport Results 7-24
7.2.12.3 Transport Uncertainty 7-26
7.2.13 Application of Modeling Results to FS Alternative Evaluations 7-27
7.2.14 Alternative Evaluation Screening 7-28
7.3 SUMMARY 7-28

8. BASELINE RISK ASSESSMENT 8-1
8.1 INTRODUCTION 8-1
8.2 HUMAN HEALTH RISK ASSESSMENT 8-1
8.2.1 Data Collection and Evaluation 8-2
8.2.1.1 Data Collection of Constituents of Interest 8-2
8.2.1.2 Data Evaluation 8-3
8.2.1.3 Choice of Data Sets for Use in the Risk Assessment 8-4
8.2.2 Selection of Constituents of Potential Concern 8-6
8.2.2.1 Background Characterization and Comparison 8-7
8.2.2.2 Frequency of Detection 8-9
8.2.2.3 Risk-Based Screening 8-9
8.2.2.4 Summary of COPCs 8-10
8.2.3 Exposure Assessment 8-11
8.2.3.1 Characterization of Exposure Setting 8-11

TABLE OF CONTENTS
(CONTINUED)

8.2.3.1.1 EU 1 - Soil in the Vicinity of Building G-1 8-12
8.2.3.1.2 EU 2 - Other Northside Complex Soil 8-12
8.2.3.1.3 EU 3 - Southside Complex Soil 8-12
8.2.3.1.4 EU 4 - Eastside Soil 8-13
8.2.3.1.5 EU 5 - Westside Soil 8-13
8.2.3.1.6 EU 6 – Sediment and Surface Soil 8-13
8.2.3.1.7 EU 7 – Groundwater 8-13
8.2.3.1.8 EU 8 – Sewers and Drains 8-14
8.2.3.2 Conceptual Site Model 8-14
8.2.3.3 Current and Potential Future Human Receptors 8-15
8.2.3.3.1 Trespasser/Recreational Visitor 8-15
8.2.3.3.2 Industrial Worker 8-16
8.2.3.3.3 Maintenance Worker 8-16
8.2.3.3.4 Construction Worker 8-17
8.2.3.3.5 Resident 8-17
8.2.3.3.6 Subsistence Farmer 8-17
8.2.3.4 Quantification of Exposure Point Concentrations and Pathway-Specific Intakes 8-18
8.2.3.4.1 Quantification of Exposure Point Concentrations in Environmental Media 8-18
8.2.3.4.2 Quantification of Exposure Point Concentrations in Food 8-19
8.2.3.5 Pathway-Specific Intakes 8-23
8.2.3.5.1 Soil and Sediment Exposure Pathways 8-23
8.2.3.5.2 Game Fish Ingestion 8-25
8.2.3.5.3 Dermal Exposures 8-26
8.2.4 Special Considerations for Radiological Risk Assessment 8-26
8.2.5 Toxicity Assessment 8-28
8.2.5.1 Chemical Toxicity 8-29
8.2.5.2 Radiation Toxicity 8-31
8.2.6 Risk Characterization 8-33
8.2.6.1 Non-Carcinogenic Hazard Characterization 8-33
8.2.6.1.1 Non-carcinogenic Hazard Characterization Results 8-34
8.2.6.1.2 Current Use Receptors Hazard Characterization Results for Non-carcinogens 8-35
8.2.6.1.3 Potential Future Use Receptors Hazard Characterization Results for Non-carcinogens 8-35
8.2.6.1.4 Groundwater Exposure Risk Characterization 8-36
8.2.6.2 Carcinogenic Risk Characteristic 8-36
8.2.6.2.1 Carcinogenic (Radiological) Risk Characterization Results 8-37
8.2.6.2.2 Current Use Receptors Risk Results 8-37
8.2.6.2.3 Potential Future Use Receptors Risk Characterization Results 8-38
8.2.6.2.4 Groundwater Exposure Risk Characterization 8-40
8.2.6.3 Radiological Dose Characterization 8-40
8.2.6.3.1 Current Use Receptors Dose Characterization Results 8-41
8.2.6.3.2 Potential Future Use Receptors Dose Characterization Results 8-42
8.2.6.3.3 Groundwater Dose Characterization 8-43
8.2.7 Uncertainty Analysis 8-43
8.2.7.1 Uncertainty Related to Environmental Data 8-44
8.2.7.2 Uncertainty in Exposure Assessment 8-47
8.2.7.3 Uncertainties Related to Toxicity Information 8-49
8.2.7.4 Uncertainties in Risk Characterization 8-52
8.2.8 HHRA Summary and Identification of COCs 8-54

TABLE OF CONTENTS
(CONTINUED)

8.2.8.1 Identification of Preliminary COCs 8-54
8.2.8.1.1 Preliminary Chemical COCs 8-54
8.2.8.1.2 Preliminary Radiological COCs 8-55
8.2.8.2 Development of Site-specific PRGs 8-55
8.2.8.2.1 PRGs for Chemicals 8-55
8.2.8.2.2 PRGs for Radionuclides 8-55
8.3 HUMAN HEALTH RISK ASSESSMENT FOR BUILDING CONTAMINATION 8-56
8.3.1 Data Evaluation 8-57
8.3.1.1 Initial Data Reduction and Building EUs 8-57
8.3.2 Building Data Screening 8-59
8.3.2.1 Development of Exposure Point Concentrations 8-59
8.3.2.1.1 Normally Distributed Data 8-59
8.3.2.1.2 Lognormally Distributed Data 8-60
8.3.2.1.3 Nonparametric Data 8-60
8.3.2.1.4 Other Data Considerations 8-61
8.3.2.2 Dose Rates 8-61
8.3.3 Exposure Assessment 8-61
8.3.3.1 Inhalation 8-62
8.3.3.2 Ingestion 8-62
8.3.3.3 External Gamma 8-63
8.3.4 Radionuclide Toxicity Assessment 8-64
8.3.5 Risk Characterization 8-64
8.3.5.1 Dose and Risk Results 8-64
8.3.6 Uncertainty Analysis 8-65
8.3.6.1 Uncertainty Related to Environmental Data 8-65
8.3.6.2 Uncertainty in Exposure Assessment 8-66
8.3.6.3 Uncertainties Related to Toxicity Information 8-67
8.3.7 Building Risk Assessment Summary and Identification of COCs 8-67
8.3.7.1 Identification of Building COCs 8-67
8.3.7.2 Development of Site-specific Preliminary Remediation Goals for Radionuclides 8-68
8.4 SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT 8-68
8.4.1 Introduction and Scope 8-68
8.4.2 Screening Level Problem Formulation 8-69
8.4.2.1 Environmental Setting 8-71
8.4.2.1.1 Sensitive Environments 8-72
8.4.2.1.2 Threatened & Endangered Species 8-72
8.4.2.1.3 Terrestrial Habitats 8-72
8.4.2.1.4 Riparian Habitat 8-74
8.4.2.1.5 Aquatic Habitats 8-75
8.4.2.1.6 Summary of Environmental Setting 8-76
8.4.2.2 General Screen: Identification of COPECs 8-76
8.4.2.2.1 General Screen Methodology 8-76
8.4.2.2.2 Screening Results 8-78
8.4.2.3 Ecological Conceptual Site Models 8-78
8.4.2.3.1 Contamination Source 8-79
8.4.2.3.2 Source Media 8-79
8.4.2.3.3 Transport Mechanisms 8-79
8.4.2.3.4 Exposure Media 8-79
8.4.2.3.5 Exposure Routes 8-80

TABLE OF CONTENTS
(CONTINUED)

8.4.2.3.6 Ecological Receptors 8-80
8.4.2.4 Ecological Assessment Endpoints and Measures 8-81
8.4.2.5 Selection of Site-Specific Ecological Receptor Species 8-83
8.4.2.5.1 Terrestrial Exposure Classes and Receptors 8-83
8.4.2.5.2 Aquatic and Riparian Exposure Classes and Receptors 8-85
8.4.2.6 Exposure Units 8-87
8.4.3 Site-Specific Screening Level Ecological Risk Assessment Methods 8-87
8.4.3.1 Site-Specific Methods Approach 8-88
8.4.3.2 Receptor Parameters 8-89
8.4.3.3 Exposure Equations for COPECs 8-89
8.4.3.3.1 Terrestrial Plants 8-89
8.4.3.3.2 Terrestrial Soil Invertebrates 8-89
8.4.3.3.3 Animals (Rabbit, Vole, Shrew, Robin, Fox, and Hawk) 8-90
8.4.3.3.4 Aquatic Biota 8-91
8.4.3.3.5 Riparian Herbivores (Muskrat and Mallard), Sediment 8-91
8.4.3.3.6 Riparian (Muskrat and Mallard), Water 8-91
8.4.3.3.7 Riparian Carnivores (Mink and Heron), Sediment 8-92
8.4.3.3.8 Riparian Carnivores (Mink and Heron), Water 8-92
8.4.3.3.9 Benthic Invertebrates 8-93
8.4.3.4 Uptake Factors (BCFs and BAFs), Including Unit Conversions 8-93
8.4.3.4.1 BCFs for Terrestrial Plants (SPv) 8-93
8.4.3.4.2 BAFs for Terrestrial Invertebrates (BAF-S) 8-94
8.4.3.4.3 BAFs for Terrestrial Mammals and Birds (BAF_{ta}) 8-94
8.4.3.4.4 BAF for Aquatic Animals (BAF_{aq}) 8-94
8.4.3.4.5 BCFs for Aquatic Plants 8-95
8.4.3.4.6 Bioaccumulation Factors for Benthic Invertebrates (BASF) 8-95
8.4.3.5 Screening for Radiological COPECs 8-95
8.4.3.5.1 Screening Steps for Radiological COIs 8-95
8.4.3.6 Effects Evaluation for COPECs 8-96
8.4.3.7 Site-Specific Risk Characterization 8-97
8.4.4 Site-Specific Screening Level Exposure Estimates 8-98
8.4.4.1 Non-Radionuclides 8-98
8.4.4.2 Radionuclides 8-98
8.4.5 Screening Level Risk Characterization 8-98
8.4.5.1 Non-Radionuclides 8-98
8.4.5.2 Radionuclides 8-99
8.4.6 Uncertainties 8-99
8.4.6.1 Problem Formulation 8-99
8.4.6.2 Exposure Assessment 8-100
8.4.6.3 Effects Assessment 8-101
8.4.6.4 Risk Characterization 8-101
8.4.6.4.1 Risk Outside the Modeled Study Area 8-101
8.4.6.4.2 Background Risk 8-102
8.4.6.4.3 Cumulative Risk 8-102
8.4.6.5 Summary of Uncertainties 8-102
8.4.7 Refinement of the Screening Level Ecological Risk Assessment 8-102
8.4.7.1 Comparison of Molybdenum to Industrial Background Levels 8-103
8.4.7.2 Refinement of Hazard Quotient in EU 6 for Heron with Site-Specific Area Use Factor 8-103
8.4.7.3 Availability of Habitat 8-103

TABLE OF CONTENTS
(CONTINUED)

8.4.7.4 Habitat and Presence of COIs Relative to Background Levels in EU 4 8-104
8.4.7.5 Observations from Ecological Site Walkover 8-104
8.4.7.6 Ecological Management Goals 8-104
8.4.8 Scientific Management Decision Point 8-104
8.5 SUMMARY OF BASELINE RISK ASSESSMENT RESULTS 8-105

9. SUMMARY AND CONCLUSIONS 9-1
9.1 SUMMARY 9-1
9.1.1 Conceptual Site Model 9-1
9.1.2 Nature and Extent of Contamination 9-1
9.1.2.1 Airborne Uranium Evaluation 9-2
9.1.2.2 Enriched Uranium Evaluation 9-2
9.1.2.3 Thorium-230 Evaluation 9-3
9.1.2.4 Recycled Uranium Constituents 9-4
9.1.2.5 Radiological Soil Core Screening 9-5
9.1.2.6 Radium-226 Re-Analysis 9-5
9.1.2.7 Background Sampling 9-6
9.1.2.8 Buildings 9-7
9.1.2.9 Soil 9-9
9.1.2.10 Sediment and Surface Water 9-14
9.1.2.11 Groundwater (IA10) 9-15
9.1.3 Groundwater Flow and Transport 9-16
9.1.4 Baseline Risk Assessment 9-17
9.1.4.1 HHRA for Environmental Media 9-18
9.1.4.2 HHRA for Building Media 9-21
9.1.4.3 Screening Level Ecological Risk Assessment 9-24
9.2 CONCLUSIONS 9-25
9.2.1 Constituents of Concern 9-25
9.2.2 Preliminary Remediation Goals 9-27
9.2.2.1 Soil and Groundwater PRGs 9-27
9.2.2.2 Building PRGs 9-27

10. REFERENCES 10-1

TABLE OF CONTENTS
(CONTINUED)

APPENDICES

Appendix 1. Remedial Investigation Report Supporting Information
Appendix 2. Baseline Risk Assessment Supporting Information
Appendix 3. Groundwater Flow and Transport Supporting Information
Appendix 4. XRF Evaluation

FIELD PHOTOGRAPHS

Photograph 1. Cuyahoga River Gravel Bar/Base Flow - IA05
Photograph 2. Post-Clearing - IA03 Building G-1
Photograph 3. Post-Clearing - IA03 North of Railroad Tracks
Photograph 4. NIFW Pre-Clearing - IA06
Photograph 5. NIFW Post-Clearing - IA06
Photograph 6. Post-Clearing - IA06
Photograph 7. Pre-Clearing - IA07 East Looking South
Photograph 8. Clearing with Bobcat - IA07
Photograph 9. NIFW Clearing and Existing Piezometers – IA07
Photograph 10. Post-Clearing - IA07 South Closed Landfill
Photograph 11. Civil Survey/Reference Control Points - IA06
Photograph 12. Field GPS Survey in Progress - IA04
Photograph 13. Soil Core Radiological Screening
Photograph 14. Downhole Gamma Logging Setup - IA06
Photograph 15. Geoprobe In-Progress - Cleveland Metroparks Natural Background
Photograph 16. RI Background Well Installation In-Progress - BKG-MW0004
Photograph 17. Background Well Flush-Mount Completion - BKG-MW0005
Photograph 18. Building G-1 Floor Coring Setup
Photograph 19. Building G-1 Roof – North
Photograph 20. Building G-1 Interior - 2nd Floor Northeast
Photograph 21. Foundry Roof - North Side
Photograph 22. Foundry Roof - South Side
Photograph 23. Building Material Sample – Wall/Brick
Photograph 24. Building Material Sample - Window Sill
Photograph 25. Building G-1 Asbestos Sample Location - Floor Tile
Photograph 26. Building Material Roof Sampling In-Progress
Photograph 27. Building Material Roof Sampling – After Sampling Repair
Photograph 28. Building Radiation Survey Grid Setup - Garage South Exterior Wall
Photograph 29. Hand Auger Soil Sampling Setup - IA03
Photograph 30. Geoprobe In-Progress - IA07 North on C&D Trucking Property
Photograph 31. Geoprobe In-Progress - IA07 North on C&D Trucking Property
Photograph 32. Hollow-Stem Auger Setup - IA05
Photograph 33. Hollow-Stem Auger In-Progress - IA07 Milan Trucking
Photograph 34. EM31 Survey in Progress - IA04
Photograph 35. EM31 Survey in Progress - IA07
Photograph 36. Geophysics GPR In-Progress - IA03
Photograph 37. Sheet Piling/Geophysical Anomaly - IA06
Photograph 38. Parsons Team Field Staging/Office Area
Photograph 39. Parsons Team Field Staging Area – BEGe Laboratory/Storage SeaLands

TABLE OF CONTENTS
(CONTINUED)

FIELD PHOTOGRAPHS
(CONTINUED)

Photograph 40. Gamma Walkover Survey Instrumentation
Photograph 41. Gamma Walkover Survey in Progress – IA03
Photograph 42. Gamma Walkover Survey in Progress - IA04
Photograph 43. Gamma Walkover Survey Grid Reference Baseline - IA06
Photograph 44. Excavator – IA04 Trenches
Photograph 45. Excavation Activities - IA04 Trenches
Photograph 46. Trench Excavation – IA04 Trenches
Photograph 47. Geoprobe Rig Setup – IA06
Photograph 48. Big Creek South Bank Fill Material - IA07 Near C&D Trucking
Photograph 49. Concrete Coring Setup – IA05
Photograph 50. Surface Water/Sediment Sampling - IA08 Big Creek
Photograph 51. Sewer Sampling with Bailer In-Progress - IA09
Photograph 52. Sanitary Sewer Sampling - IA09 North of Harvard Ave
Photograph 53. Sanitary Sewer Sampling – IA09
Photograph 54. Geoprobe In-Progress - IA09 Backfill Soil Boring
Photograph 55. Confined Space Entry Setup
Photograph 56. Sediment Sampling IA09
Photograph 57. Sanitary Sewer Trench – Air Knife
Photograph 58. Sanitary Sewer Trench – Air Knife
Photograph 59. Sanitary Sewer Trench - Timber Shoring in Former Excavation
Photograph 60. Concrete Encasement and Sample Locations
Photograph 61. Completed Storm Sewer Trench
Photograph 62. Storm Sewer Trench Concrete Encasement and Sample Locations
Photograph 63. IA04-TP0002 Methane Air Sampling In-Progress
Photograph 64. Background Well Installation Surface Completion - BKG-MW0004
Photograph 65. Groundwater Sampling - DM26
Photograph 66. Well Development in Progress - IA04
Photograph 67. View of IA04 Cuyahoga River Bank from IA06
Photograph 68. Glass Jars in Soil with Elevated Radiological Activity - IA07

TABLE OF CONTENTS
(CONTINUED)

VOLUME II. TABLES

Table 2-1. Harshaw AEC/MED Operational Timeline
Table 2-2. Harshaw Chemical Company - Government Contracts Summary
Table 2-3. Historical Use of Constituents of Interest
Table 2-4. Overview of MED-related Feeds, Products, Chemicals, Releases and Wastes at Harshaw
Table 2-5. Groundwater Monitoring Well Inventory

Table 3-1. Summary of Data Collection Activities
Table 3-2. Geochemical Sampling - Kd Value Soil/Groundwater Sample Associations
Table 3-3. Building Material Sample Locations and Rationales
Table 3-4. Building Survey Master Unit Descriptions
Table 3-5. Building Survey Units - Building G-1
Table 3-6. Building Survey Units - IA02 (Other Buildings)
Table 3-7. Phase III Archived Samples Selected for Analysis
Table 3-8. Phase IV Archived Samples Selected for Analysis
Table 3-9. Waste Characterization Sampling Summary - Soil
Table 3-10. Waste Characterization Sampling Summary - Water
Table 3-11. IDW Waste Stream Inventory

Table 4-1. Summary of the On-Site and Off-Site Comparison Data
Table 4-2. Spearman Rank Correlation of On-Site and Off-Site Gamma Spectroscopy Results
Table 4-3. On-Site and Off-Site Gamma Spectroscopy Results and Comparison: Radium-228, Uranium-235, and Uranium-238
Table 4-4. Data Quality Summary - Phase I Groundwater and Surface Water Data
Table 4-5. Data Quality Summary - Phase I Soil, Sediment, and Building Material Data
Table 4-6. Data Quality Summary - Phase II Groundwater and Surface Water Data
Table 4-7. Data Quality Summary - Phase II Soil and Sediment Data
Table 4-8. Data Quality Summary - Phase III Soil and Sediment Data
Table 4-9. Data Quality Summary - Phase IV Soil and Sediment Data
Table 4-10. Data Quality Summary - Phase IV Groundwater Data
Table 4-11. XRF Calibration Standard Results
Table 4-12. XRF Daily Calibration Results
Table 4-13. Summary of XRF Uranium and Molybdenum Results

Table 5-1. Summary of Site-Specific Background and Preliminary Remediation Goals

Table 6-1. Summary of Statistical Evaluation of Uranium in Near-Surface and Surface Soil Samples
Table 6-2. Calculated Uranium-235 to Uranium-238 Ratios in Soil Using Gamma Spectroscopy Results
Table 6-3. Calculated Uranium Ratios in Soil Using Alpha Spectroscopy Results
Table 6-4. Uranium Isotope Concentrations and Isotope Ratios in Surface Soils and Groundwater by ICP-MS
Table 6-5. FIDLER and NaI 2x2 Sample Data
Table 6-6. Spearman Rank Correlation for BEGe, FIDLER, and NaI 2x2
Table 6-7. Stream Water Elevation Measurements
Table 6-8. Source Water Field Blanks Sample Results
Table 6-9. Geochemical Sample Results

TABLE OF CONTENTS
(CONTINUED)

TABLES
(CONTINUED)

Table 6-10. Geotechnical Sample Results
Table 6-11. Background Soil Sample Results
Table 6-12. Background Sediment Sample Results
Table 6-13. Background Surface Water Sample Results
Table 6-14. Background Groundwater Sample Results
Table 6-15. RI Data Summary - Volumetric Building Material Sample Results
Table 6-16. Volumetric Building Material Sample Results - Waste Characterization
Table 6-17. Building G-1 Exterior Survey Data Summary
Table 6-18. Building G-1 Interior Survey Data Summary
Table 6-19. Boiler House Survey Data Summary
Table 6-20. Foundry Survey Data Summary
Table 6-21. Warehouse Survey Data Summary
Table 6-22. Garage Survey Data Summary
Table 6-23. Scale House Survey Data Summary
Table 6-24. Building Radiation Survey Reference Measurement Results
Table 6-25. Historic Soil Data Summary
Table 6-26. RI Data Summary - IA03 Soil COI Results
Table 6-27. RI Data Summary - IA03 Soil Significant COPC Results
Table 6-28. RI Data Summary - IA04 Soil COI Results
Table 6-29. RI Data Summary - IA04 Soil Significant COPC Results
Table 6-30. RI Data Summary - IA05 Soil COI Results
Table 6-31. RI Data Summary - IA05 Soil Significant COPC Results
Table 6-32. RI Data Summary - IA06 Soil COI Results
Table 6-33. RI Data Summary - IA06 Soil Significant COPC Results
Table 6-34. RI Data Summary - IA07 Soil COI Results
Table 6-35. RI Data Summary - IA07 Soil Significant COPC Results
Table 6-36. Soil ICP-MS Results
Table 6-37. RI Data Summary - IA08 Sediment Results
Table 6-38. RI Data Summary - IA08 Surface Water Results
Table 6-39. RI Data Summary - IA09 Sediment Results
Table 6-40. RI Data Summary - IA09 Surface Water Results
Table 6-41. RI Data Summary - IA09 Soil
Table 6-42. Sediment and Surface Water ICP-MS Results
Table 6-43. Summary of Existing Pre-RI Monitoring Well Evaluation
Table 6-44. Groundwater Level Measurement Events
Table 6-45. Slug Test Results
Table 6-46. RI Data Summary - IA10 Groundwater COI Results
Table 6-47. RI Data Summary - IA10 Phase I Groundwater Significant COPC Results
Table 6-48. RI Data Summary - IA10 Phase II Groundwater Significant COPC Results
Table 6-49. Groundwater ICP-MS Results
Table 6-50. Soil IDW Sample Results
Table 6-51. Water IDW Sample Results

Table 7-1. Monitoring Well Potentiometry
Table 7-2. Comparison of Static Water Levels Against Operating Extraction System Levels

TABLE OF CONTENTS
(CONTINUED)

TABLES
(CONTINUED)

Table 7-3. Cuyahoga River, Big Creek, and Sewer-Line Drain Conductance Input
Table 7-4. Geotechnical Input to Model
Table 7-5. Calibration Statistics
Table 7-6. Recharge Rates Input to Model
Table 7-7. Volumetric Flow Budget of Steady-State Model
Table 7-8. Sensitivity Analysis Summary
Table 7-9. Distribution Coefficients of HCC Site Soil Using Site Groundwater

Table 8-1. Hierarchy of Radionuclide Analytical Results Used in the Harshaw BRA for all FUSRAP COIs
Table 8-2. Summary of Analytical Results from Building Material Samples
Table 8-3. Development of EPCs for Fixed Beta Contamination on Building Surfaces
Table 8-4. Development of EPCs for Removable Beta Contamination on Building Surfaces
Table 8-5. Development of EPCs for Dose Rate Measurements on Building Surfaces
Table 8-6. Human Health – Statistical Report
Table 8-7. Background Statistical Report
Table 8-8. Summary of Radiological EPCs (pCi/g), For Use in Dose Assessment
Table 8-9. Chemical-Specific Parameters for Chemical COPCs at Former Harshaw Chemical Site
Table 8-10. Reasonable Maximum Exposure Parameters for Chemical Exposures
Table 8-11. Central Tendency Exposure Parameters for Chemical Exposures
Table 8-12. Reasonable Maximum Exposure RESRAD Parameters
Table 8-13. Central Tendency Exposure RESRAD Parameters for Subsistence Farmer Scenario
Table 8-14. RME Individual Child and Adult Food Ingestion Rates, Used for Adult-Child Averaging
Table 8-15. Toxicity Criteria for FUSRAP COPCs
Table 8-16. Carcinogenic Slope Factors for Radionuclides
Table 8-17. Radiological Dose Conversion Factors for Radionuclides
Table 8-18. Summary of Non-Cancer Risks by Exposure Unit – Hazard Quotient
Table 8-19. Radiological Risk Assessment Summary for Baseline, RME, by Exposure Unit (ILCR)
Table 8-20. EU6 - Radiological Risks and Doses due to Ingestion of Fish and Incidental Ingestion of Surface Water (Cuyahoga River and Big Creek)
Table 8-21. Radiological Risk Assessment Summary for Farmer, CTE, by Exposure Unit (ILCR)
Table 8-22. Harshaw RME Groundwater Ingestion Risk Assessment Results, Using Groundwater Concentrations Measured at the Site
Table 8-23. Radiological Dose Summary for Baseline, RME, by Exposure Unit (mrem/year)
Table 8-24. Radiological Dose Summary for Farmer, CTE, by Exposure Unit (mrem/year)
Table 8-25. Harshaw RME Groundwater Ingestion Dose Assessment Results, Using Groundwater Concentrations Measured at the Site
Table 8-26. List of Significant Radiological and Chemical COPCs, by Medium and EU
Table 8-27. Risk Based PRGs for Chemical Toxicity of Uranium and Lithium
Table 8-28. Preliminary Remediation Goals for Radionuclides in Soils, based on 10 CFR 20 (Total of 25 mrem/year all pathways)
Table 8-29. Preliminary Remediation Goals for Radionuclides in Soils, based on ILCR of 1E-04
Table 8-30. Preliminary Remediation Goals for Groundwater, based on Radiological Risk and Dose
Table 8-31. Beta Activity Ratios
Table 8-32. Harshaw Building Data Exposure Units

TABLE OF CONTENTS
(CONTINUED)

TABLES
(CONTINUED)

Table 8-33. Reasonable Maximum Exposure Parameters for Radiological Exposures in Buildings
Table 8-34. Central Tendency Exposure Parameters for Radiological Exposures in Buildings
Table 8-35. Dose-to-Risk Conversion Factors
Table 8-36. Summary of Dose and Risk Results for the Industrial Worker
Table 8-37. Summary of Dose and Risk Results for the Construction Worker
Table 8-38a. Summary of Dose and Risk Results for the Interior Maintenance Worker
Table 8-38b. Summary of Dose and Risk Results for the Exterior Maintenance Worker
Table 8-38c. Summary of Dose and Risk Results for the Maintenance Worker (Interior and Exterior)
Table 8-39. Summary of Maximum Dose and Risk Results for All Workers
Table 8-40. Predominant Pathway Annual Dose by Building/EU and Receptor
Table 8-41. Predominant Pathway Lifetime Excess Cancer Risk by Building/EU and Receptor
Table 8-42. Preliminary Remediation Goals – Buildings
Table 8-43. Ecological - Statistical Report
Table 8-44. Availability of Ecological Screening Values and/or Toxicity Reference Values for COPCs and ROPCs at the Former Harshaw Chemical Site
Table 8-45. Screening Values and Surface Water Criteria for General Screen
Table 8-46. General Ecological Screening of COIs in Soil (Exposure Units 1-7)
Table 8-47. General Ecological Screening of COIs in Surface Water and Sediment (EU 6)
Table 8-48. Management Goals, Ecological Assessment Endpoints, Measures, and Decision Rules for the Harshaw Site-Specific Analysis Screens
Table 8-49. Exposure Parameters for Ecological Receptors at the Former Harshaw Chemical Site
Table 8-50. Bioconcentration and Bioaccumulation Factors for Plants, Terrestrial Invertebrates, Aquatic Biota, and Benthic Invertebrates
Table 8-51. Uptake Factors and Bioaccumulation Factors for Mammals and Birds
Table 8-52. Summary of Toxicity Reference Values for Exposure of Plants, Invertebrates, and Aquatic Biota to COPECs
Table 8-53. Derivation of Final Toxicity Reference Values (TRVs) for Exposure of Mammals to COPECs
Table 8-54. Derivation of Final Toxicity Reference Values for Exposure of Birds to COPECs
Table 8-55. Site-Specific Analysis of COIs in Soil, Step 2 (Exposure Units 1-7)
Table 8-56. Summary of Chemical SLERA Hazard Indices
Table 8-57. Summary of Incremental Lifetime Cancer Risks and Annual Dose Rate within each EU
Table 8-58. Summary of Incremental Lifetime Cancer Risks and Annual Dose Rate within each Building EU

TABLE OF CONTENTS
(CONTINUED)

VOLUME III. FIGURES

Figure 1-1. General Site Location
Figure 1-2. Site Boundaries and Features

Figure 2-1. Site Pavement Coverage Areas
Figure 2-2. North Process Area - 1948 and 2002 Aerial Photographs
Figure 2-3. Process Area - Summary of Existing and Demolished Buildings
Figure 2-4. USGS 7.5 Minute Quadrangle - Cleveland South 1984
Figure 2-5. USGS 15 Minute Quadrangle - Cleveland 1903
Figure 2-6. Site Geologic Model - Land Surface Topographic Map
Figure 2-7. Site Geologic Model - Bedrock Surface Topographic Map
Figure 2-8. Site Geologic Model - New Fill Isopach Map
Figure 2-9. RI Groundwater Sample Locations
Figure 2-10. Q3 FEMA Flood Hazard Area/RI Staff Gauge Locations

Figure 3-1. Background Soil Sample Locations
Figure 3-2. Background Surface Water/Sediment Locations
Figure 3-3. Building G-1 Interior Material Sample Locations
Figure 3-4. Building G-1 Exterior and Roof Material Sample Locations
Figure 3-5. Foundry and Warehouse Building Material Sample Locations
Figure 3-6. Building Material Informational Sample Locations
Figure 3-7. Building G-1 Exterior (EU B1) Survey Units
Figure 3-8. Building G-1 Interior (EUs B2-B4) Survey Units
Figure 3-9. Boiler House and Foundry Exterior Survey Units
Figure 3-10. Boiler House and Foundry Interior Survey Units
Figure 3-11. Warehouse, Garage and Scale House Exterior Survey Units
Figure 3-12. Warehouse, Garage and Scale House Interior Survey Units
Figure 3-13. Gamma Walkover Survey Coverage Areas
Figure 3-14. IA03 RI Soil Sample Locations
Figure 3-15. IA04 RI Soil Sample Locations
Figure 3-16. IA05 RI Soil Sample Locations
Figure 3-17. IA06 RI Soil Sample Locations
Figure 3-18. IA07 RI Soil Sample Locations
Figure 3-19. IA08 Surface Water/Sediment Sample Locations
Figure 3-20. IA09 Sewer Surface Water/Sediment Sample and Soil Boring Locations

Figure 6-1. Ratio of Uranium-235 to Uranium-238 in Soil Samples
Figure 6-2. Uranium Isotopic Ratio Evaluation - ICP/MS Results and Distribution
Figure 6-3. Uranium Isotopic Ratio Evaluation - Scatter Plots
Figure 6-4. Recycled Uranium Radionuclides - Soil
Figure 6-5. Recycled Uranium Radionuclides - Other Media
Figure 6-6. FIDLER and NaI 2x2 Relationships Measuring Uranium and Thorium
Figure 6-7. Building G-1 Exterior Building Survey Activity Histogram
Figure 6-8. Building G-1 Interior Building Survey Activity Histogram
Figure 6-9. Boiler House Building Survey Activity Histogram
Figure 6-10. Foundry Building Survey Activity Histogram
Figure 6-11. Warehouse Building Survey Activity Histogram

TABLE OF CONTENTS
(CONTINUED)

FIGURES
(CONTINUED)

Figure 6-12. Garage Building Survey Activity Histogram
Figure 6-13. Scale House Building Survey Activity Histogram
Figure 6-14. Building G-1 East Structure Floor Sample
Figure 6-15. Boiler House North Wall Elevated Activity
Figure 6-16. Boiler House East Wall Elevated Activity
Figure 6-17. Foundry Roof and East Wall Areas of Elevated Activity
Figure 6-18. Warehouse Roof and West Wall Areas of Elevated Activity
Figure 6-19. Garage West Wall Area of Elevated Activity
Figure 6-20. Geophysical Survey Results - IA04 EM31 and GPR
Figure 6-21. Geophysical Survey Results - IA06 EM31 and GPR
Figure 6-22. Geophysical Survey Results - IA07 EM31 and GPR
Figure 6-23. Gamma Walkover Survey Results - IA03 and IA04
Figure 6-24. Gamma Walkover Survey Results - IA05
Figure 6-25. Gamma Walkover Survey Results - IA06
Figure 6-26. Gamma Walkover Survey Results - IA07
Figure 6-27. Sitewide Soil PRG Screening: Surface Soil Total Uranium
Figure 6-28. Sitewide Soil PRG Screening: Total Soil Total Uranium
Figure 6-29. Sitewide Soil Background Screening: Deep Soil Total Uranium
Figure 6-30. Sitewide Soil PRG Screening: Surface Soil Thorium-230
Figure 6-31. Sitewide Soil PRG Screening: Total Soil Thorium-230
Figure 6-32. Sitewide Soil Background Screening: Deep Soil Thorium-230
Figure 6-33. Sitewide Soil Background Screening: Lithium
Figure 6-34. Sitewide Soil Background Screening: TPH-DRO
Figure 6-35. Sitewide Soil Background Screening: Molybdenum
Figure 6-36. Groundwater Potentiometric Surface Map: May 2004
Figure 6-37. Groundwater Potentiometric Surface Map: August 2004
Figure 6-38. Cuyahoga River Streamflow and RI Groundwater Level Measurements
Figure 6-39. EU07 Groundwater Results: Total Uranium (Chemical)
Figure 6-40. EU07 Groundwater Results: Lithium (Chemical)
Figure 6-41. EU07 Groundwater Results: Thorium-230

Figure 7-1. Model Domain Area
Figure 7-2. Starting Head Distribution
Figure 7-3. Groundwater Flow Boundaries
Figure 7-4. Overburden Surface
Figure 7-5. Overburden Isopach
Figure 7-6. Bedrock Surface
Figure 7-7. Overburden Hydraulic Conductivity
Figure 7-8. Bedrock Hydraulic Conductivity
Figure 7-9. Recharge Zones
Figure 7-10. Conductance Values - River and Drain Boundaries
Figure 7-11. Overburden Simulated Heads
Figure 7-12. Bedrock Simulated Heads
Figure 7-13. Head Residuals

TABLE OF CONTENTS
(CONTINUED)

FIGURES
(CONTINUED)

Figure 7-14. Scatter Plot of Observed and Calculated Heads
Figure 7-15. MODPATH Particle Tracking
Figure 7-16. Plume Migration - Steady State Flow Model
Figure 7-17. Plume Migration - Low Kd Sensitivity Analysis
Figure 7-18. Plume Migration - High Kd Sensitivity Analysis

Figure 8-1. Selection of Chemical COPCs for Human Health Risk Assessment
Figure 8-2. Selection of Radiological COPCs for Human Health Risk Assessment
Figure 8-3. Uranium Series
Figure 8-4. Actinium Series
Figure 8-5. Thorium Series
Figure 8-6. Conceptual Site Model-Pathways for Human Exposure at the Former Harshaw Chemical Site
Figure 8-7. Potential Human Receptors at the Former Harshaw Chemical Site
Figure 8-8. Selection of Chemical COPECs for Screening Level Ecological Risk Assessment
Figure 8-9. Selection of Radiological COPECs for Screening Level Ecological Risk Assessment
Figure 8-10. Conceptual Site Model for General Screen - Pathways for Ecological Exposure at the Former Harshaw Chemical Site
Figure 8-11. Conceptual Site Model for Site-Specific Screen - Pathways for Ecological Exposure at the Former Harshaw Chemical Site

TABLE OF CONTENTS
(CONTINUED)

VOLUME IV. SHEETS

Sheet 1. IA01 Building G-1 Description
Sheet 2. IA02 Building Descriptions
Sheet 3. IA03 Soil Sample Results: Total Uranium
Sheet 4. IA03 Soil Sample Results: Thorium-230
Sheet 5. IA03 Soil Sample Results: Thorium-232
Sheet 6. IA03 Soil Sample Results: Radium-228
Sheet 7. IA03 Soil Sample Results: Radium-226/Lead-210
Sheet 8. IA04 Soil Results: Total Uranium
Sheet 9. IA04 Soil Results: Thorium-230
Sheet 10. IA04 Soil Results: Thorium-232
Sheet 11. IA04 Soil Results:Radium-226/Lead-210
Sheet 12. IA05 Soil Sample Results: Total Uranium
Sheet 13. IA05 Soil Sample Results: Thorium-228
Sheet 14. IA05 Soil Sample Results: Thorium-230
Sheet 15. IA05 Soil Sample Results: Thorium-232
Sheet 16. IA05 Soil Sample Results: Radium-228
Sheet 17. IA05 Soil Sample Results: Radium-226/Lead-210
Sheet 18. IA06 Soil Sample Results: Total Uranium
Sheet 19. IA06 Soil Sample Results: Thorium-230
Sheet 20. IA06 Soil Sample Results: Radium-226/Lead-210
Sheet 21. IA07 Soil Sample Results: Total Uranium
Sheet 22. IA07 Soil Sample Results: Thorium-228
Sheet 23. IA07 Soil Sample Results: Thorium-230
Sheet 24. IA07 Soil Sample Results: Thorium-232
Sheet 25. IA07 Soil Sample Results: Radium-228
Sheet 26. IA07 Soil Sample Results: Radium-226/Lead-210
Sheet 27. Sitewide Soil Sample Results: Lithium (Chemical)
Sheet 28. Sitewide Soil Sample Results: TPH-DRO (Chemical)

TABLE OF CONTENTS
(CONTINUED)

ACRONYMS AND ABBREVIATIONS

%D	Percent Difference
µg/kg	Micrograms Per Kilogram
µg/L	Micrograms Per Liter
µrem/hr	Micro Rem Per Hour
ABS	Dermal Absorption
ACM	Asbestos Containing Material
ADD	Average Daily Dose
AEC	Atomic Energy Commission
AHA	Activity Hazard Analysis
AL	Action Level
amsl	Above Mean Sea Level
ANL	Argonne National Laboratory
ANSI	American National Standards Institute
ARAR	Applicable or Relevant and Appropriate Requirements
AST	Above Ground Storage Tank
ASTM	American Society for Testing and Materials
ATSDR	Agency for Toxic Substances and Disease Registry
AutoCAD	Automated Computer-Aided Drafting
Bb	Ingestion-to-Beef Transfer Factors
BAF	Bioaccumulation Factor
BAR	Beta Activity Ratio
BCF	Bioconcentration Factors
BCG	Biota Concentration Guides
BCPM	Background Sample Count-Rate
BEGe	Broad Energy Germanium
BERA	Baseline Ecological Risk Assessment
bgs	Below Ground Surface
BRA	Baseline Risk Assessment
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
BW	Body Weight
CCl_4	Carbon Tetrachloride
CAL EPA	California Environmental Protection Agency
CEDE	Committed Effective Dose Equivalents
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CG	Composite Groups
CGI	Combustible Gas Indicator
CLP	Contract Laboratory Program
cm/s	Centimeters Per Second
cm^2	Square Centimeters
COC	Constituent Of Concern
COEC	Constituent of Ecological Concern
COI	Constituent of Interest
COPC	Constituent of Potential Concern
COPEC	Constituent of Potential Ecological Concern
CSF	Cancer Slope Factor

TABLE OF CONTENTS
(CONTINUED)

ACRONYMS AND ABBREVIATIONS
(CONTINUED)

CSM	Conceptual Site Model
CTE	Central Tendency Exposure
CVAA	Cold Vapor Atomic Absorption
CWM	Chemical Waste Management
CX	Center of Expertise
D&D	Decontamination and Decommissioning
DAD	Dermal Absorbed Dose
DCF	Dose Conversion Factor
DoD	United States Department of Defense
DOE	United States Department of Energy
dpm	Disintegrations Per Minute
DQIs	Data Quality Indicators
DQO	Data Quality Objectives
ECSM	Ecological Conceptual Site Models
ED	Exposure Duration
EDD	Electronic Data Deliverables
EDE	Effective Dose Equivalent
EDQL	Ecological Data Quantity Levels
Eh	U-Speciation Driver
EM	Electromagnetic
EM	USACE Engineering Manual
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
EQL	Estimated Quantitation Limit
ERA	Ecological Risk Assessment
ERDC	Engineer Research and Development Center
ERM	Erm-Midwest, Inc.
ESV	Ecological Screening Values
EU	Exposure Unit
F_2	Fluorine Gas
FGR	Federal Guidance Report
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FS	Feasibility Study
FSP	Field Sampling Plan
ft	Feet
ft/day	Feet Per Day
FTP	Field Technical Procedure
FUSRAP	Formerly Utilized Sites Remedial Action Program
FWEC	Foster Wheeler Environmental Corporation
FWS	Fish and Wildlife Service
GC	Clayey Gravel
gal	Gallon
GCPM	Gross Sample Count-Rate
GDP	Gaseous Diffusion Plant

TABLE OF CONTENTS
(CONTINUED)

ACRONYMS AND ABBREVIATIONS
(CONTINUED)

GEL	General Engineering Laboratories, Inc.
GFPC	Gas Flow Proportional Counting
GI	Gastrointestinal
G-M	Geiger Mueller Detector
GMS	Groundwater Modeling System
gpm	Gallons Per Minute
GPR	Ground-Penetrating Radar
GPS	Global Positioning System
GSE	Ground Surface Evaluations
GWS	Gamma Walkover Surveys
HCC	Harshaw Chemical Company
HEAST	Health Effects Assessment Summary Tables
HEPA	High Efficiency Particulate Air
HF	Hydrofluoric Acid
HELP	Hydrologic Evaluation of Landfill Performance
HHRA	Human Health Risk Assessment
HI	Hazard Index
HI	Health Index
HQ	Hazard Quotient
hr	Hour
HTRW	Hazardous, Toxic, and Radioactive Waste
IA	Investigation Area
IAEA	International Atomic Energy Agency
IBI	Index of Biotic Integrity
ICI	Invertebrate Community Index
ICP-MS	Inductively Coupled Plasma – Mass Spectrometry
ICRP	International Commission on Radiological Protection
ID	Identification Number
IDW	Investigation-Derived Waste
ILCR	Incremental Lifetime Cancer Risk
IRIS	Integrated Risk Information System
K	Hydraulic Conductivity
K_d	Partition Coefficient
Kz	Vertical Conductivity
kg/day	Kilograms Per Day
KPA	Kinetic Phosphorescence Analyzer
lbs/day	Pounds Per Day
LCS	Laboratory Control Sample
LCSD	Laboratory Control Sample Duplicate
LOAEL	Lowest Observed Adverse Effects Level
LOD	Limits of Detection
LOOW	Lake Ontario Ordinance Works
LQAP	Laboratory Quality Assurance Plan
M	Molar

TABLE OF CONTENTS
(CONTINUED)

ACRONYMS AND ABBREVIATIONS
(CONTINUED)

m	Meter
m^2	Square Meter
MARLAP	Multi-Agency Radiological Laboratory Analytical Protocols Manual
MARSSIM	Multi-Agency Radiation Site Survey Investigation Manual
MCL	Maximum Concentration Level
MDA	Minimum Detectable Activity
MDC	Minimum Detectable Concentration
MDCR	Minimum Detectable Count Rate
MDL	Method Detection Limit
MCW	Mallinckrodt Chemical Works
MED	Manhattan Engineer District
mg/kg	Milligrams Per Kilograms
mg/L	Milligrams Per Liter
MHz	Megahertz
ML-CL	Soil Samples Silty Clay
MRL	Minimal Risk Level
MS	Matrix Spike
MSD	Matrix Spike Duplicate
MT3DMS	Modular 3-D Transport for Multi-Species Model
MTU	Metric Tons of Uranium
MU	Master Unit
MVUE	Minimum-Variance Unbiased Estimators
NAD	Normalized Absolute Difference
NaI	Sodium Iodide
NBS	National Bureau of Standards
NCDC	National Climatic Data Center
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCPM	Net Count-Rate
NGVD	National Geodetic Vertical Datum
NIFW	Non-Intrusive Field Work
NIST	National Institute of Standards and Technology
NMSS	Nuclear Material Safety and Safeguards
NOAA	National Oceanic and Atmospheric Administration
NOAEL	No Observed Adverse Effects Level
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
NUREG	US Nuclear Regulatory Commission Regulation
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
Ohio DoH	Ohio Department of Health
Ohio EPA	Ohio Environmental Protection Agency
OSRD	Office of Scientific Research and Development
OSTI	Office of Science Technical Information
PA	Preliminary Assessment
PAH	Polycyclic Aromatic Hydrocarbon

TABLE OF CONTENTS
(CONTINUED)

ACRONYMS AND ABBREVIATIONS
(CONTINUED)

PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PBT	Persistent, Bioaccumulative, and Toxic
PCB	Polychlorinated Biphenyls
pCi	Picocurie
pCi/g	Picocurie Per Gram
pCi/L	Picocurie Per Liter
PEST	Parameter Estimating Software Tool
pH	Potential of Hydrogen
PID	Photoionization Detector
POA	Plan of Action
PPE	Personal Protective Equipment
PPM	Parts Per Million
PPRTV	Provisional Peer Reviewed Toxicity Values
PQL	Practical Quantitation Limit
PRG	Preliminary Remediation Goals
p-value	Probability Value
PVC	Polyvinyl Chloride
PWP	Project Work Plan
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
QCP	Quality Control Plan
QCSR	Quality Control Summary Report
QHEI	Qualitative Habitat Evaluation Index
r	Correlation Coefficient
R	rejected
rad	Unit of Radiation Dose
RAGS	Risk Assessment Guidance for Superfund
RAM	Radioactive Material
RAMSA	Radioactive Material Storage Area
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RESRAD	Residual Radioactivity Computer Code
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RIR	Remedial Investigation Report
RL	Reporting Limit
RM	River Mile
RME	Reasonable Maximum Exposure
RMSA	Radioactive Material Storage Areas
ROD	Record of Decision
ROPC	Radionuclide of Potential Concern
RPD	Relative Percent Difference
RPM	Radiation Protection Manager

TABLE OF CONTENTS
(CONTINUED)

ACRONYMS AND ABBREVIATIONS
(CONTINUED)

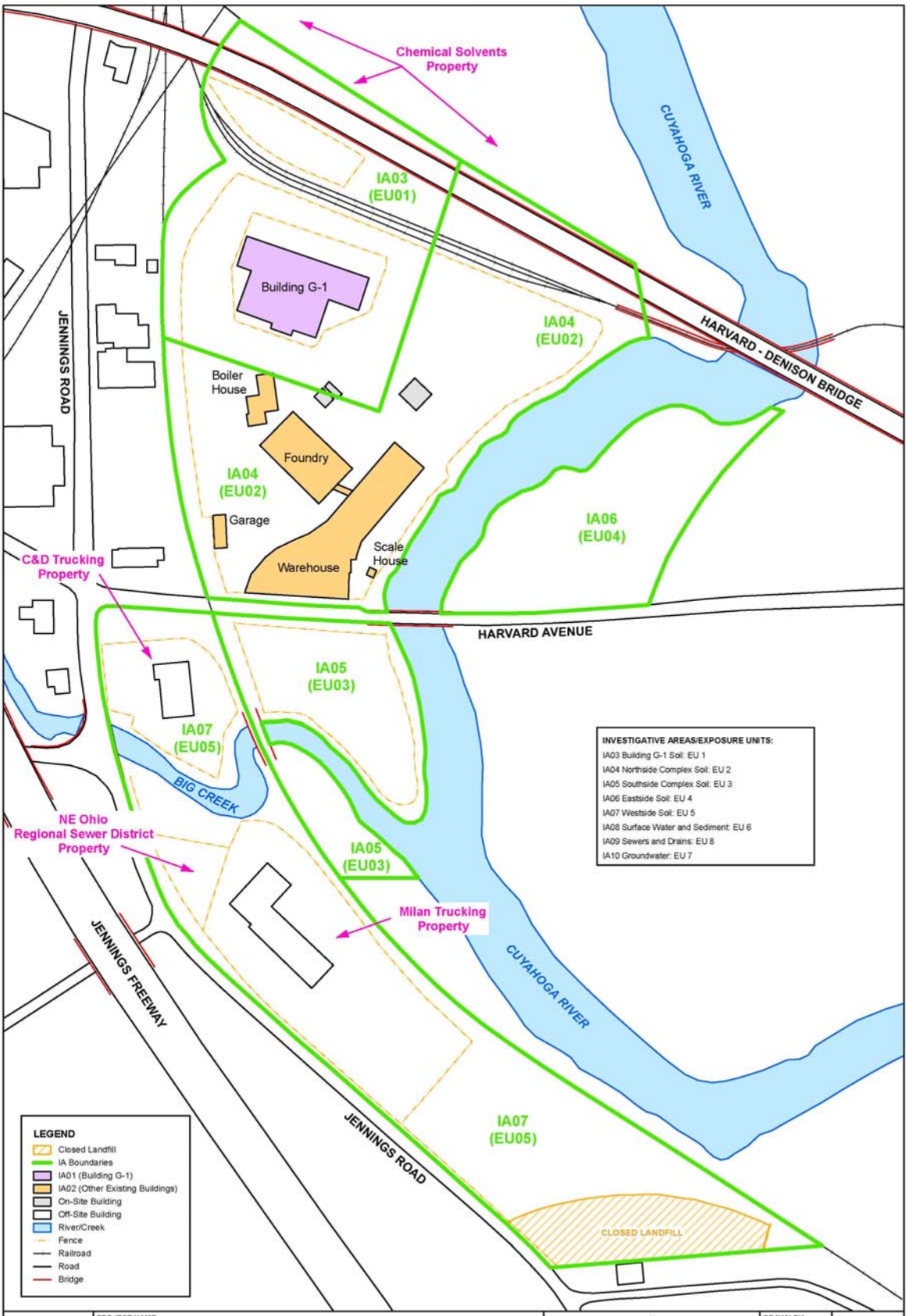
RPP	Radiation Protection Plan
RU	Recycled Uranium
SAIC	Science Applications International Corporation
SAP	Sampling and Analysis Plan
SDG	Sample Delivery Group
SLERA	Screening Level Ecological Risk Assessment
SMDP	Scientific Management Decision Point
SOP	Standard Operating Procedures
SPv	Soil-to-Plant Bioconcentration Factor
SP-SM	Soil Samples Gravelly Sand
SRC	Site-Related Constituents
SRV	Sediment Reference Value
SSHP	Site Safety and Health Plan
STL	Severn Trent Laboratories
STSC	Superfund Health Risk Technical Support Center
SU	Survey Unit
SVOC	Semi-Volatile Organic Compound
T&E	Threatened And Endangered
TA	Test America
TAL	Target Analyte List
TBD	To Be Determined
TBP-kerosene	Tributyl Phosphate in Kerosene
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TEC	Threshold Effect Concentration
TEDE	Total Effective Dose Equivalent
TOC	Top of Casing
TPH	Total Petroleum Hydrocarbons
TPH-DRO	Total Petroleum Hydrocarbons – Diesel Range Organics
TPP	Technical Project Planning
TRV	Toxicity Reference Values
TSDF	Treatment, Storage and Disposal Facilities
TSS	Total Suspended Solids
U_3O_8	Uranium Oxide
Ub	Urban Land
UCL	Upper Confidence Limit
UF_4	Uranium Tetrafluoride
UF_6	Uranium Hexafluoride
UCl_4	Uranium Tetrachloride
UI	Uncertain Identification
UO_2	Uranium Dioxide
UO_3	Uranium Trioxide
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture

TABLE OF CONTENTS
(CONTINUED)

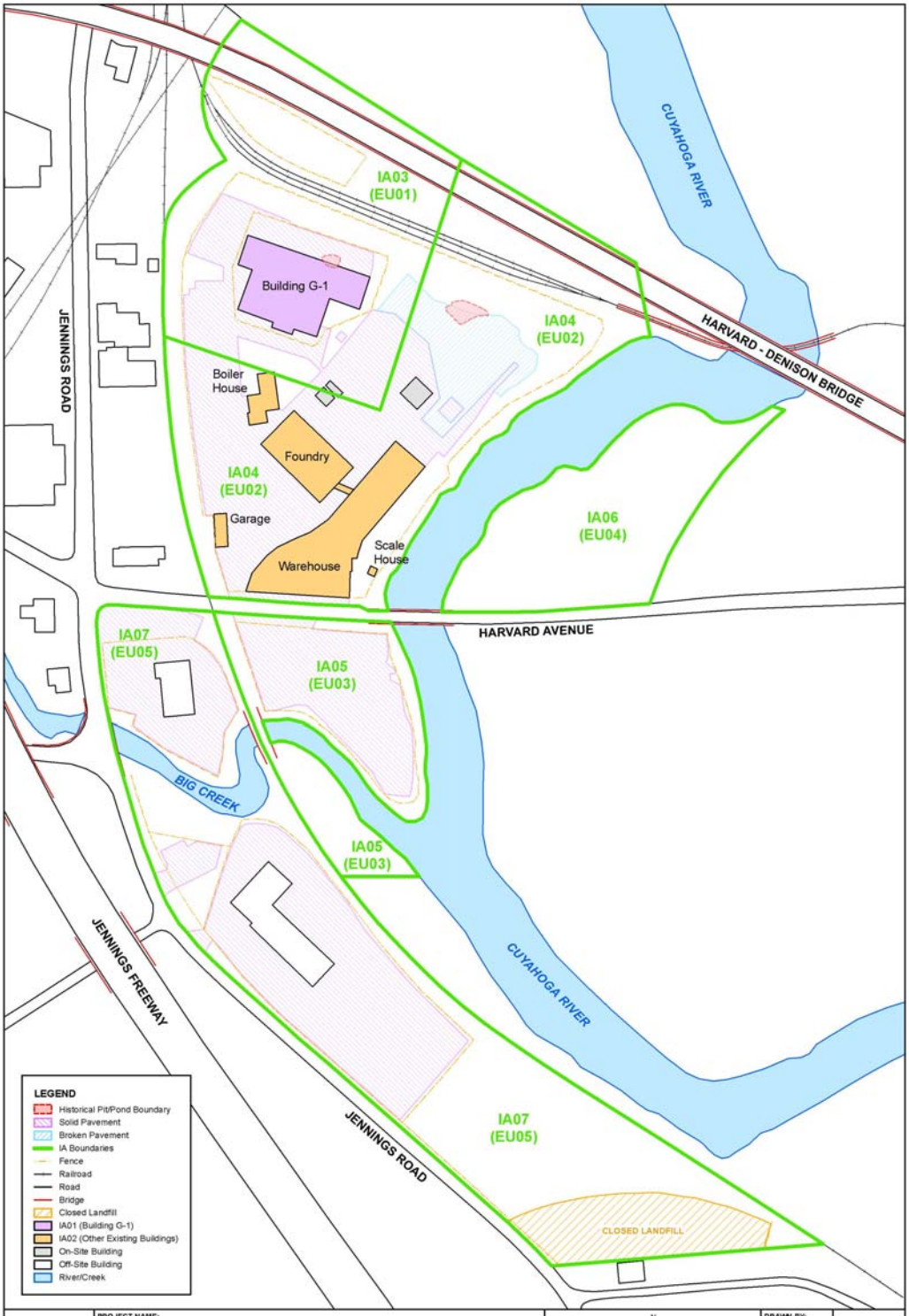
ACRONYMS AND ABBREVIATIONS
(CONTINUED)

USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
UTL	Upper Tolerance Limit
VOC	Volatile Organic Compounds
WAC	Waste Acceptance Criteria
WSDE	Washington State Department of Ecology
WWH	Warm Water Habitat
XRF	X-ray Fluorescence Spectrometry
yr	Year

SAIC From Science to Solutions™	**PROJECT NAME:** Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 5 10 20 30 40 Miles	**DRAWN BY:** JDV 5/9/08	1-1
	DRAWING TITLE: Figure 1-1 General Site Location	**DATUM:** Ohio State Plane North Zone, NAD83, US Survey Feet	**CHECKED BY:** JG 5/9/08	



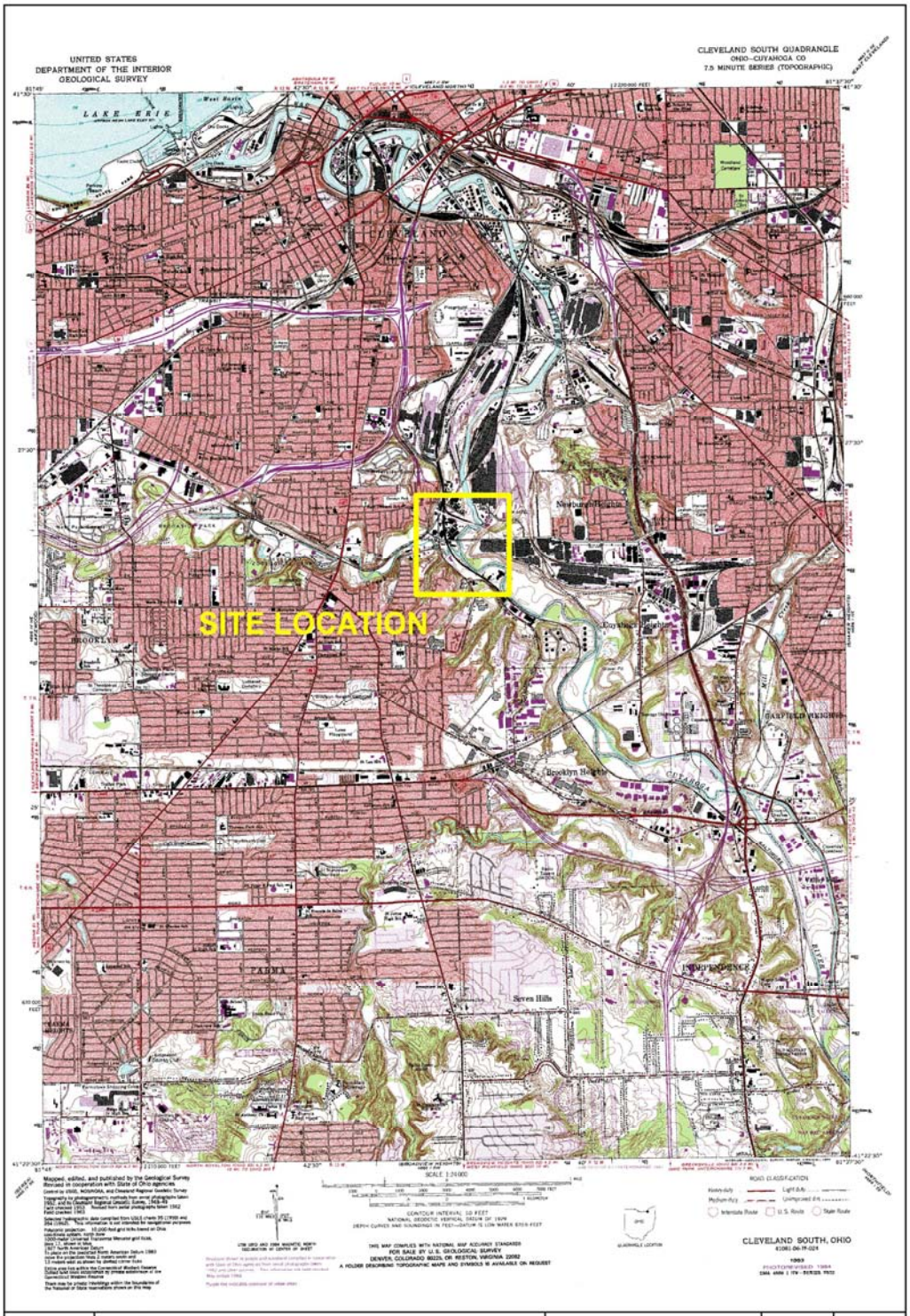
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 60 120 240 360 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 9/22/08
	DRAWING TITLE: Figure 1-2. Site Boundaries and Features		CHECKED BY: JG 9/23/08
			1-2



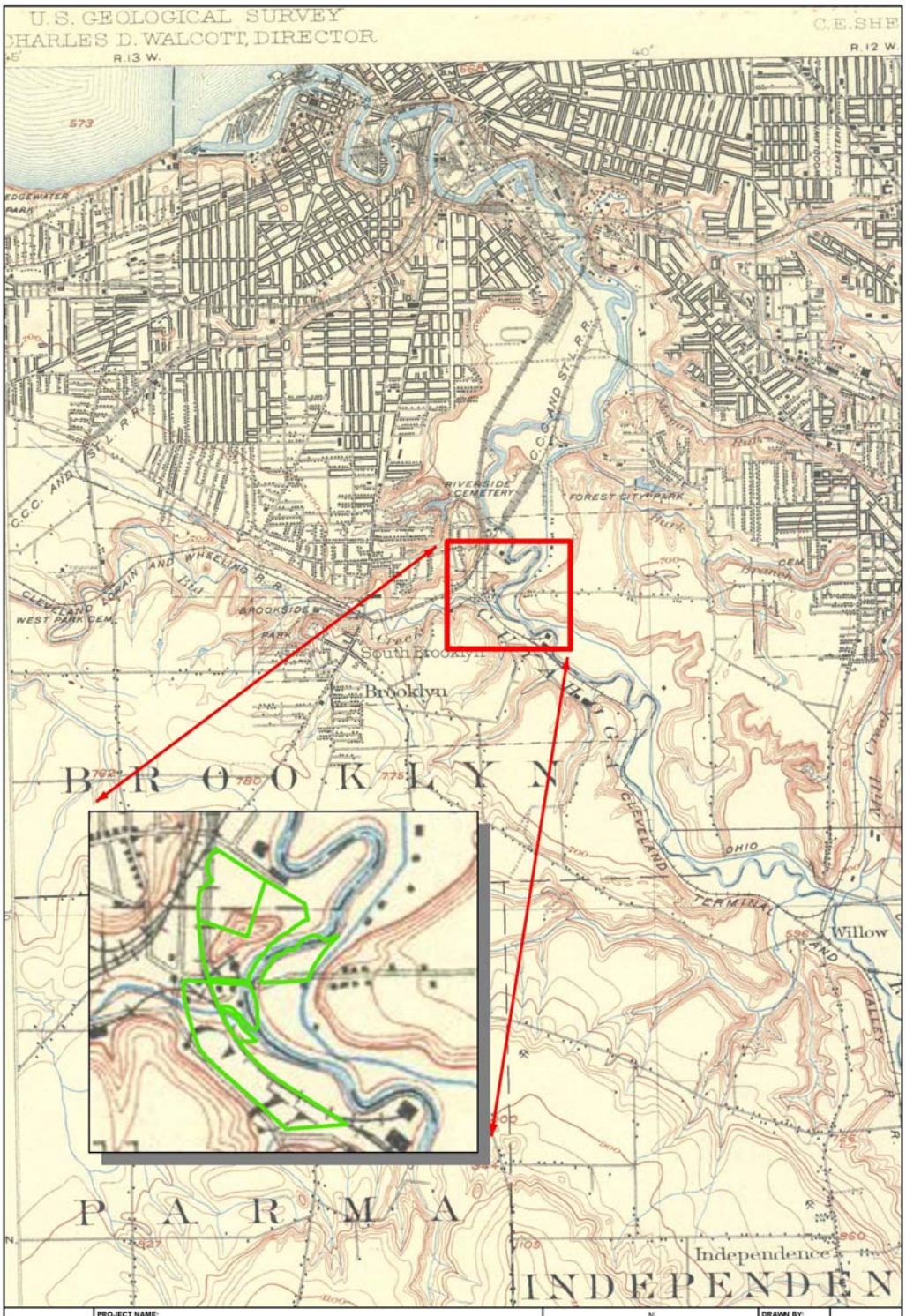
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 60 120 240 360 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 9/22/08
	DRAWING TITLE: Figure 2-1. Site Boundaries and Features		CHECKED BY: JG 9/23/08
			2-1

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 62.5 125 250 Feet (Approximate Scale)	DRAWN BY: JDV 5/9/08	2-2
	DRAWING TITLE: Figure 2-2. North Process Area - 1948 and 2002 Aerial Photographs		CHECKED BY: JG 5/9/08	

SAIC	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	0 25 50 100 Feet	DRAWN BY: JDV 9/23/08	2-3
	DRAWING TITLE: Figure 2-3. Process Area - Summary of Existing and Demolished Buildings		CHECKED BY: JG 9/23/08	



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 2-4. USGS 7.5 Minute Quadrangle - Cleveland South 1984	0 1,100 2,200 4,400 6,600 Feet	CHECKED BY: JG 5/9/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	2-4



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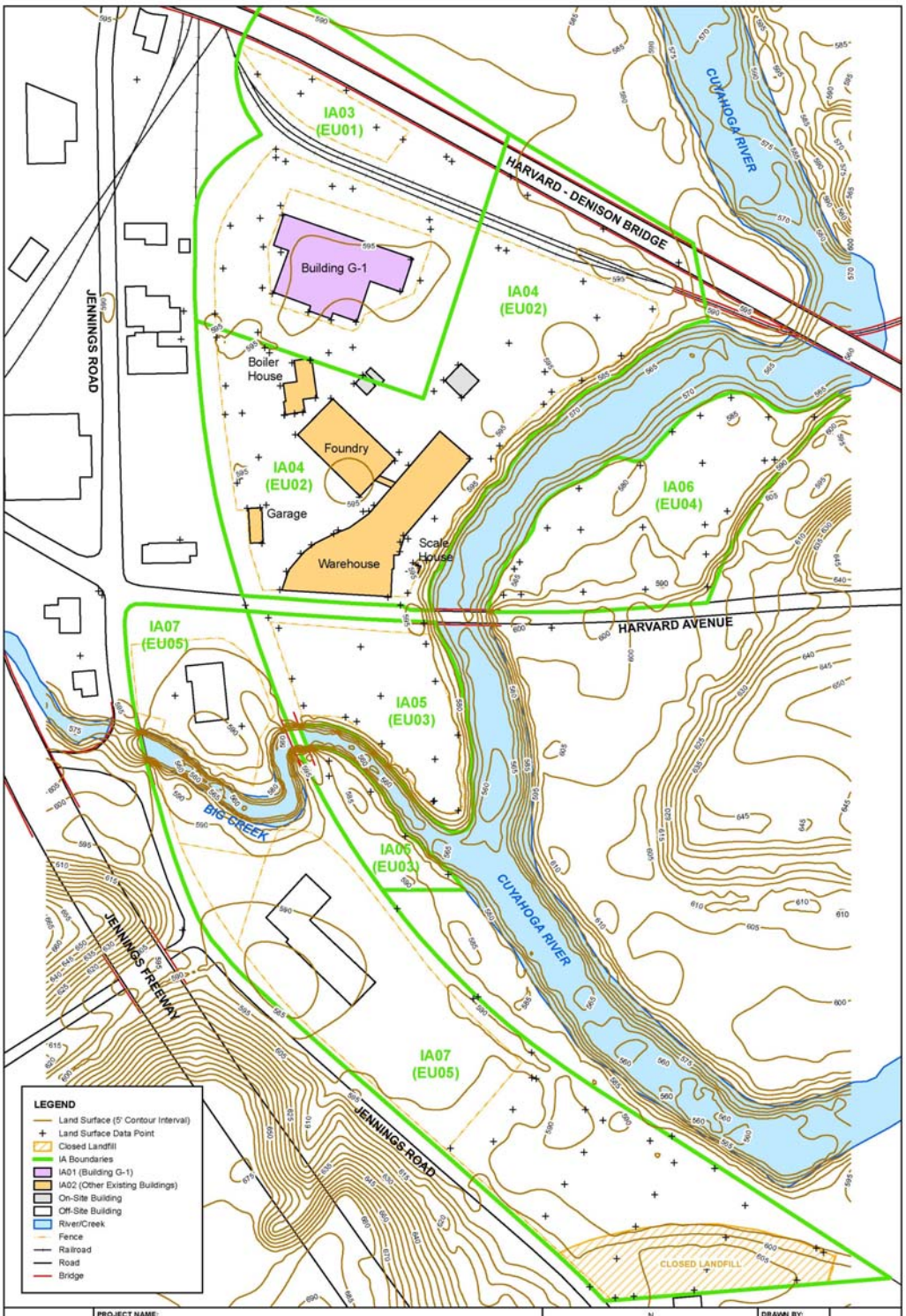
	DRAWING TITLE: Figure 2-5. USGS 15 Minute Quadrangle - Cleveland 1903		CHECKED BY: JG 5/9/08

2-5



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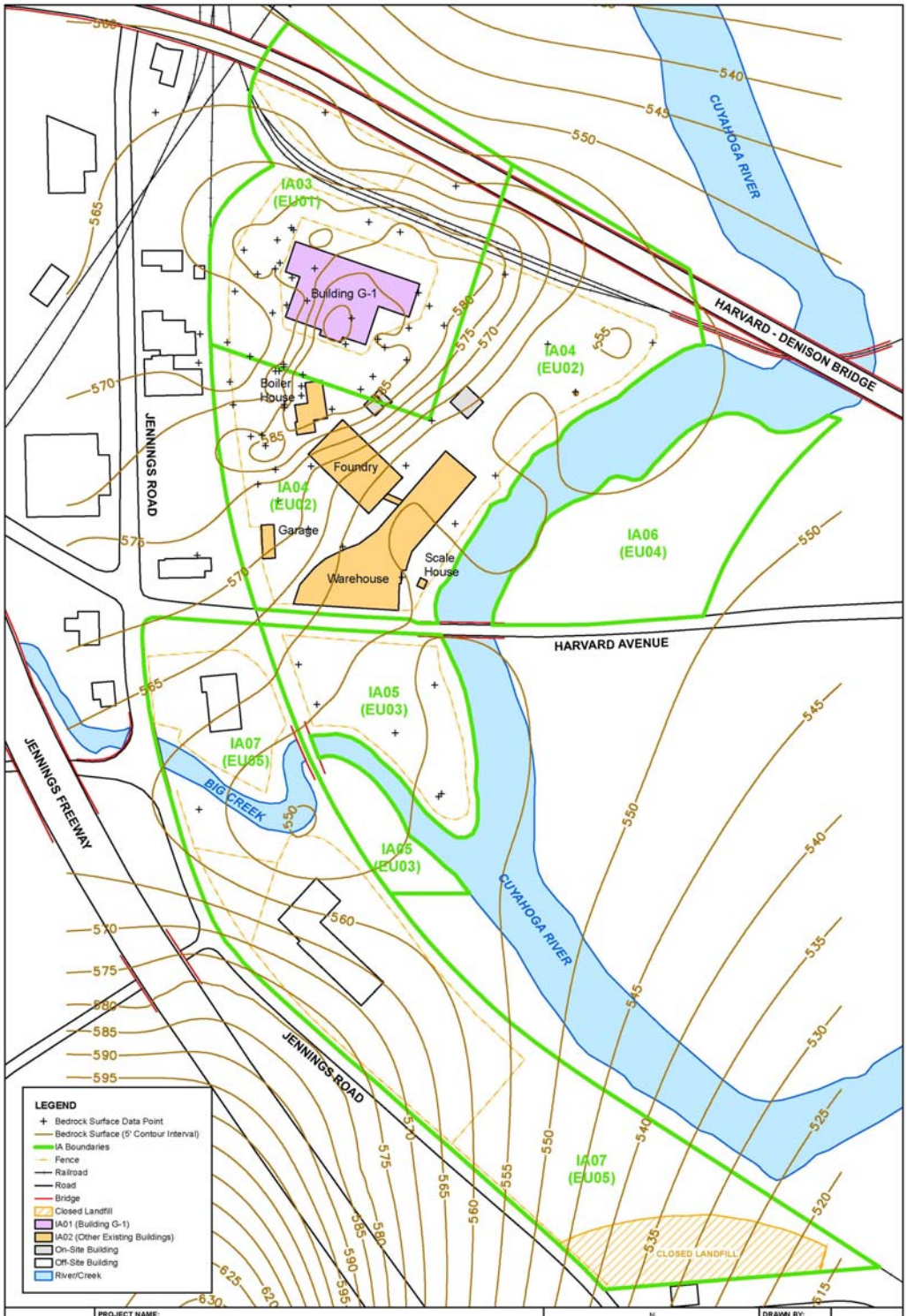
	DRAWING TITLE: Figure 2-6. Site Geologic Model - Land Surface Topographic Map	0 55 110 220 330 Feet	CHECKED BY: JG 9/23/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	2-6

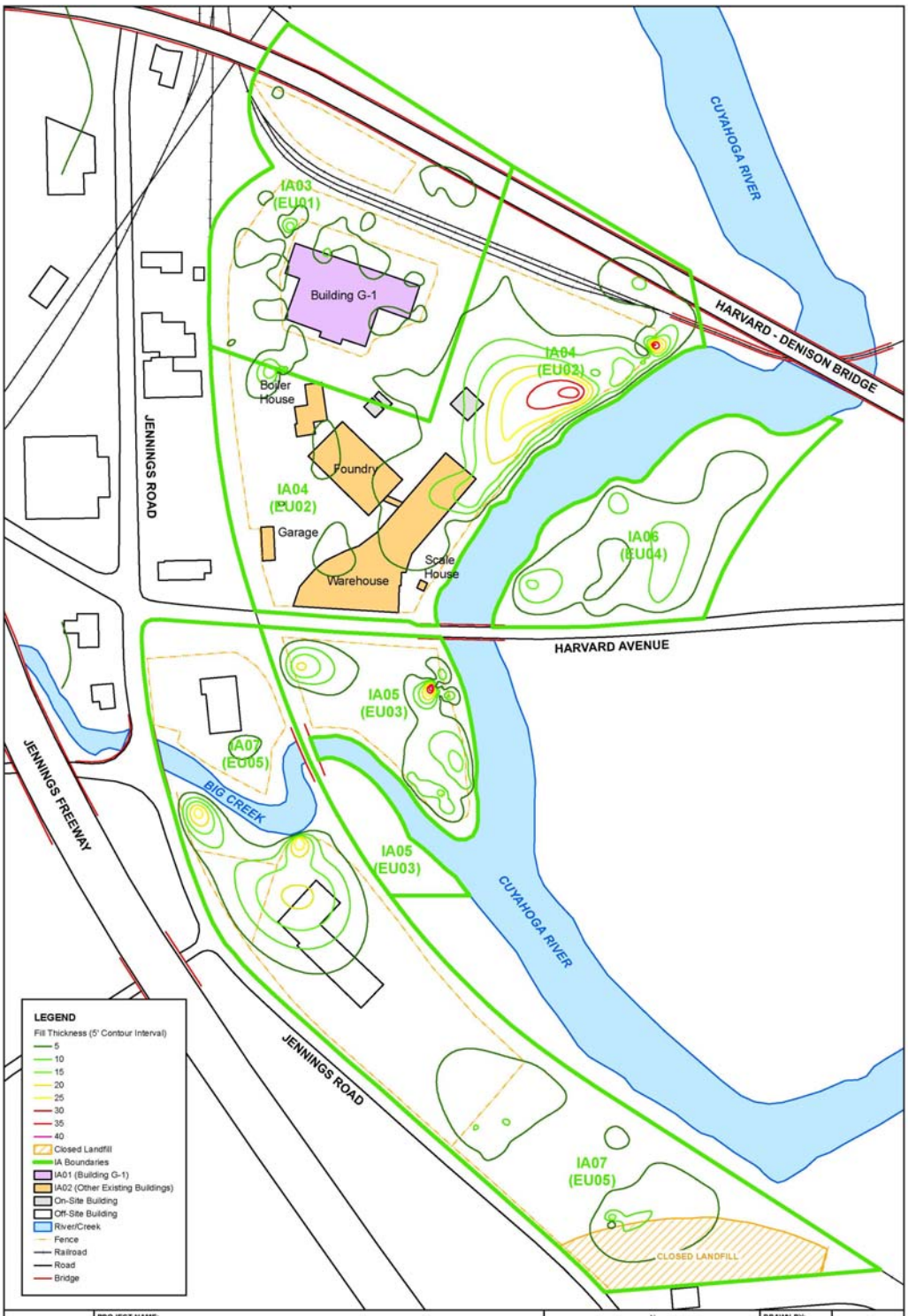


SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	DRAWN BY: JDV 9/22/08	2-7
	DRAWING TITLE: Figure 2-7. Site Geologic Model - Bedrock Surface Topographic Map	CHECKED BY: JG 9/23/08	

N W E S

0 60 120 240 360 Feet

DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet



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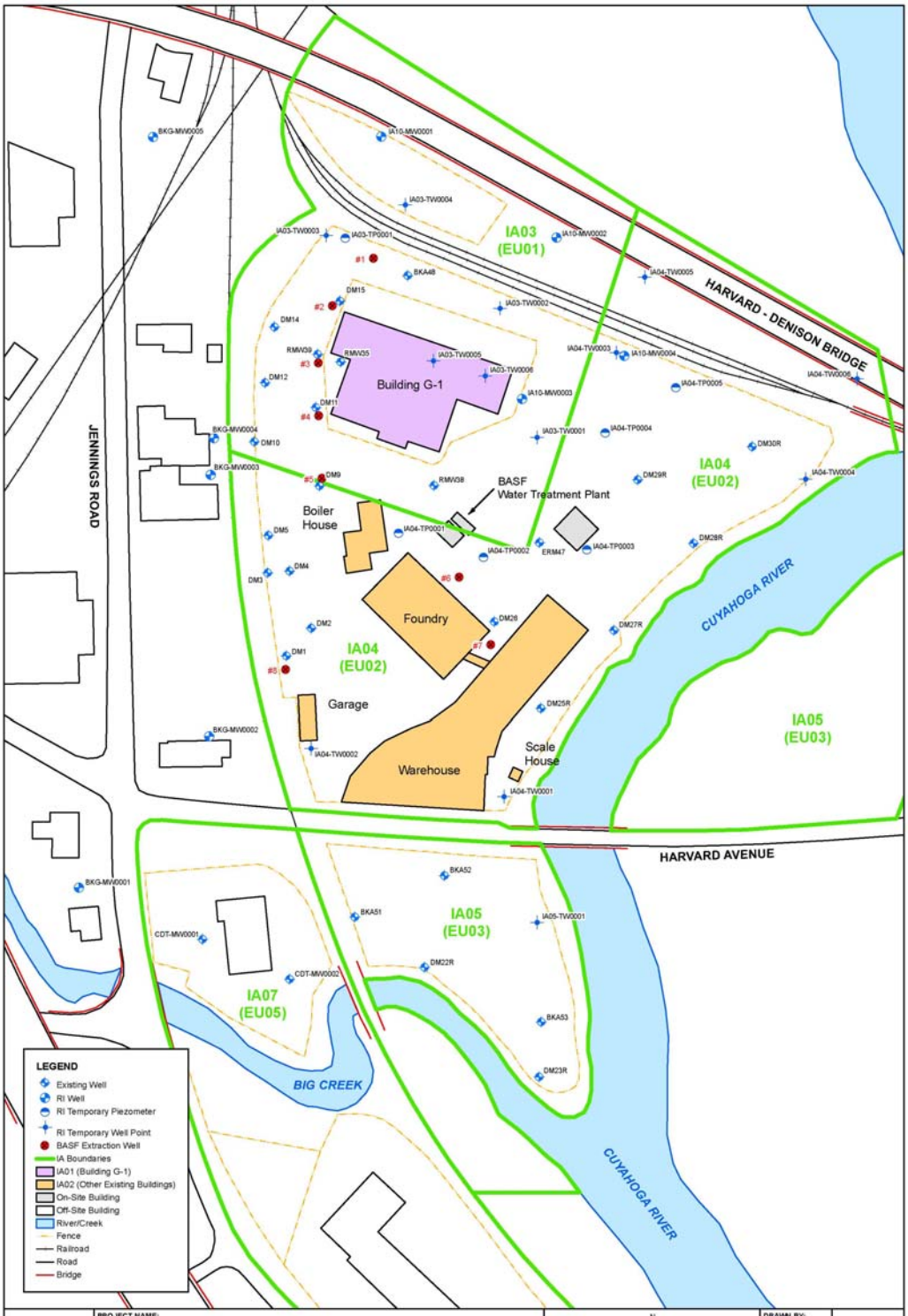
	DRAWING TITLE: Figure 2-8. Site Geologic Model - New Fill Isopach Map		CHECKED BY: JG 5/9/08
			2-8



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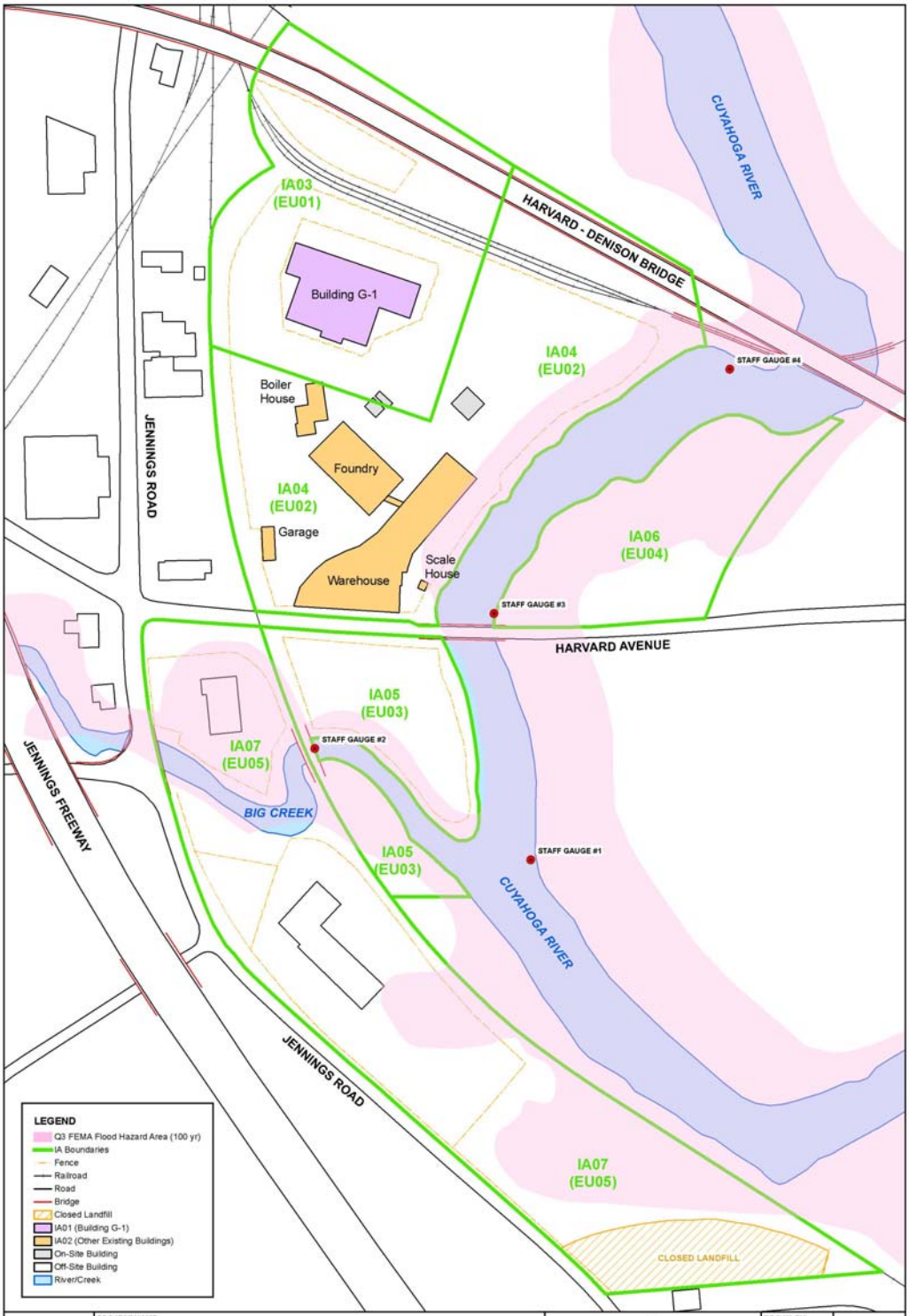
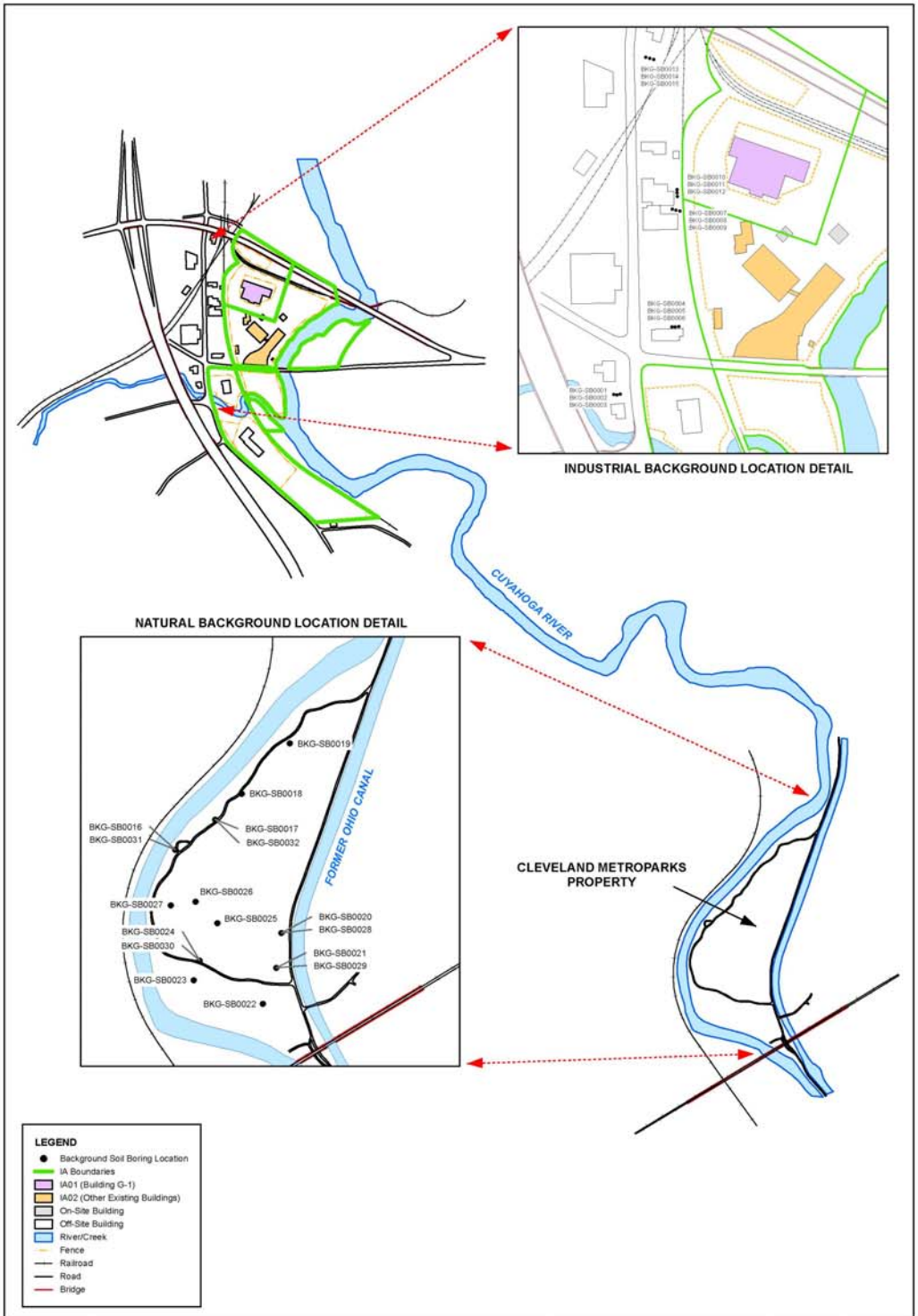
	DRAWING TITLE: Figure 2-9. RI Groundwater Sample Locations		CHECKED BY: JG 9/23/08

2-9



SAIC From Science to Solutions®	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 2-10. Q3 FEMA Flood Hazard Area/RI Staff Gauge Locations	0 60 120 240 360 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			2-10



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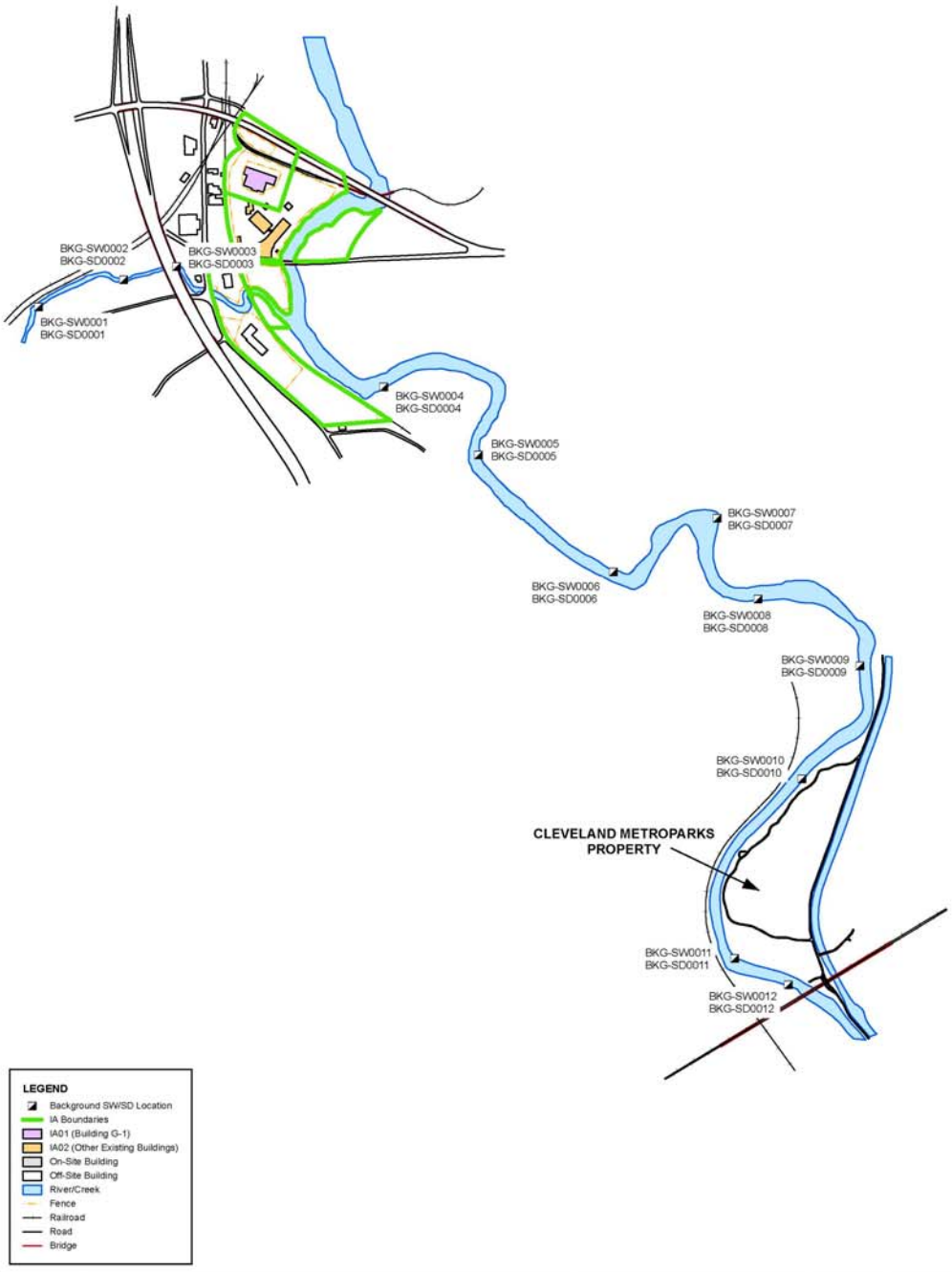
	DRAWING TITLE: Figure 3-1. Background Soil Boring Locations		CHECKED BY: JG 10/20/08
			3-1



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08	3-2
	DRAWING TITLE: Figure 3-2. Background Surface Water/Sediment Locations	0 387.5 575 1,150 1,725 Feet	CHECKED BY: JG 5/9/08	
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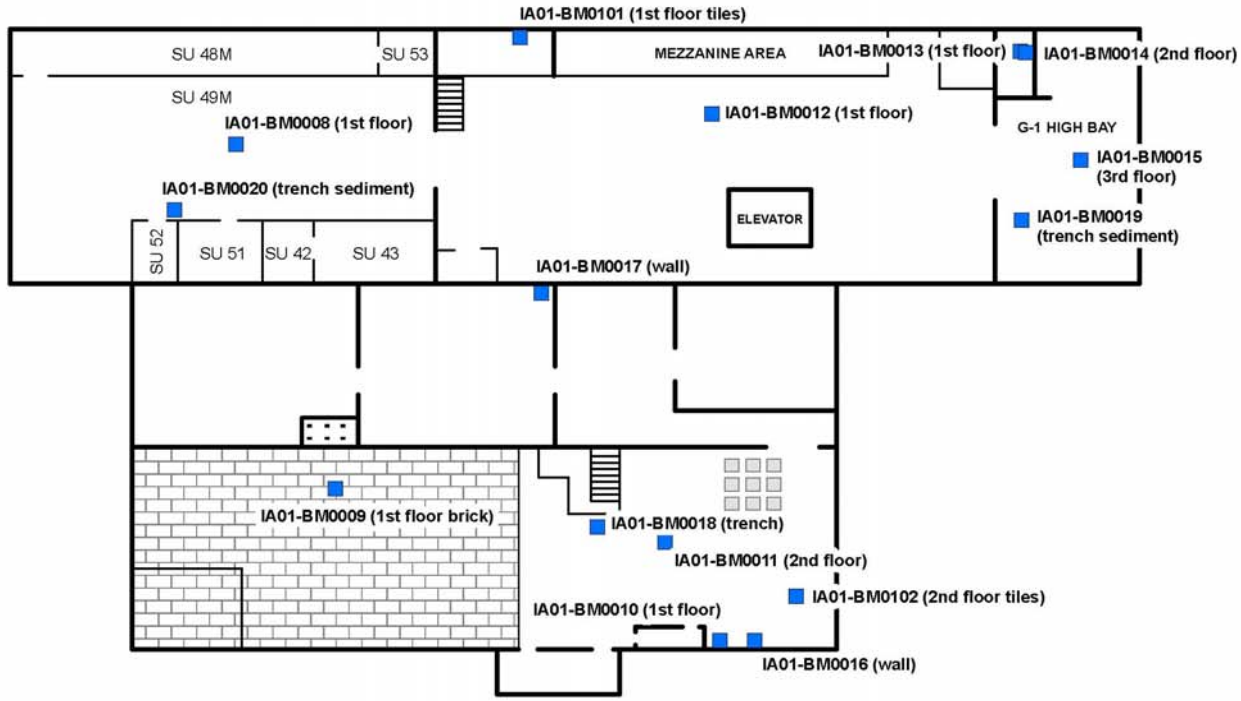
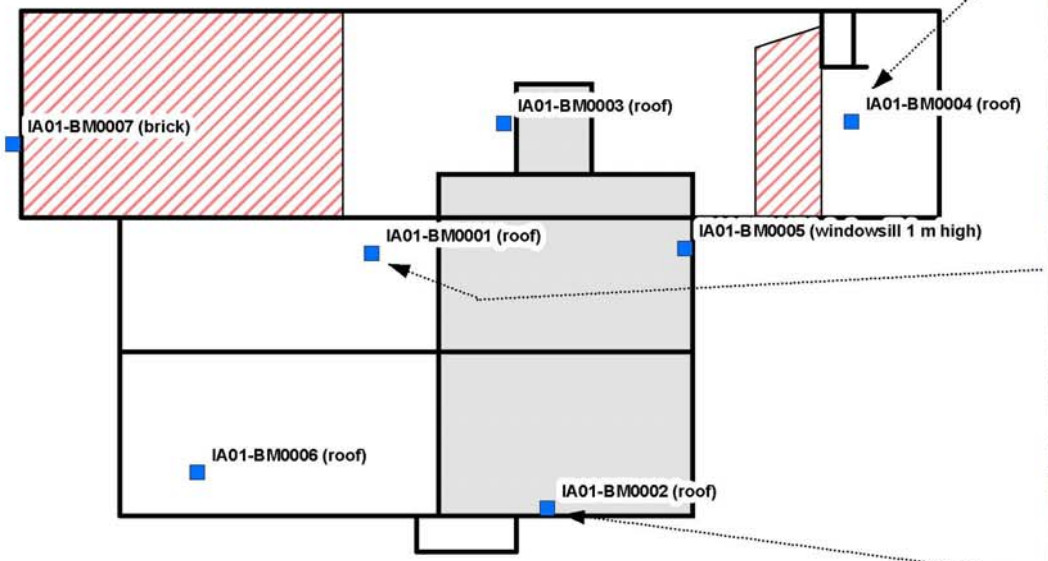


Building Material Sample Location
Brick Floor
Equipment

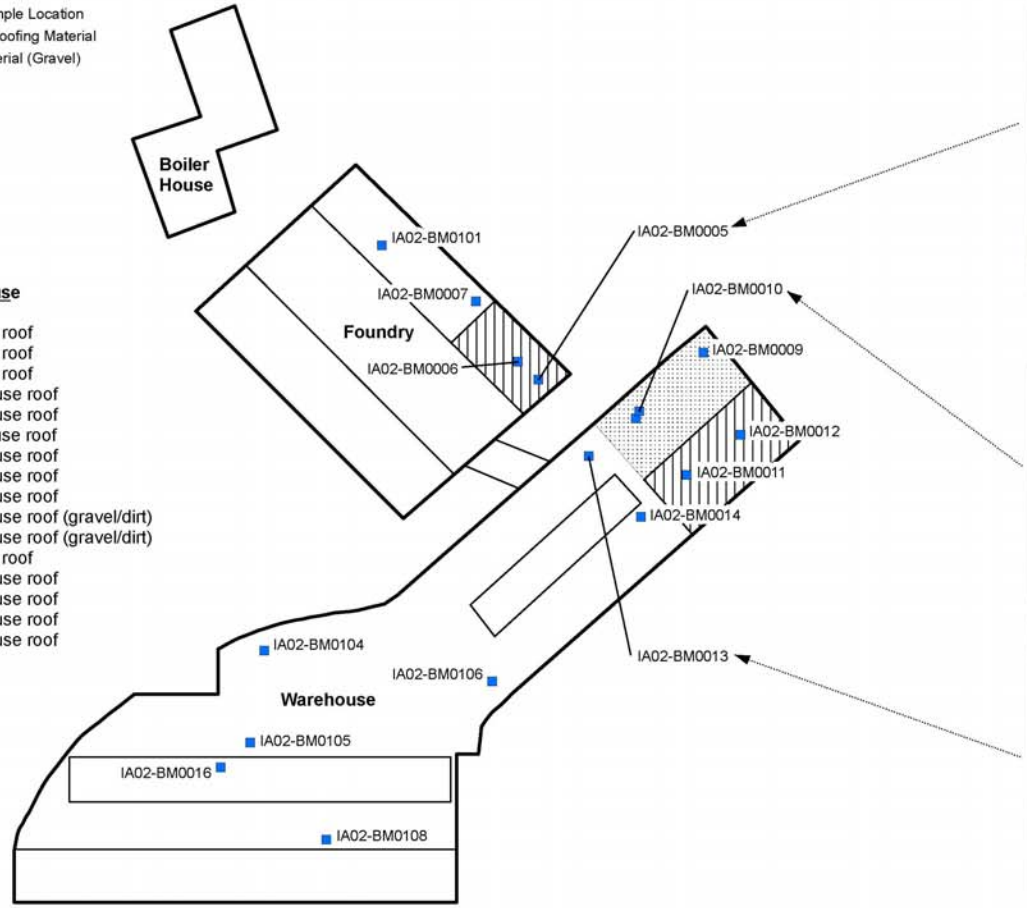
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N E S W Not To Scale	DRAWN BY: HRM 4/13/06	3-3
	DRAWING TITLE: Figure 3-3. Building G-1 Interior Material Sample Locations		CHECKED BY: JDV 5/14/08	



Legend

- Building Material Sample Location
- Inaccessible Area

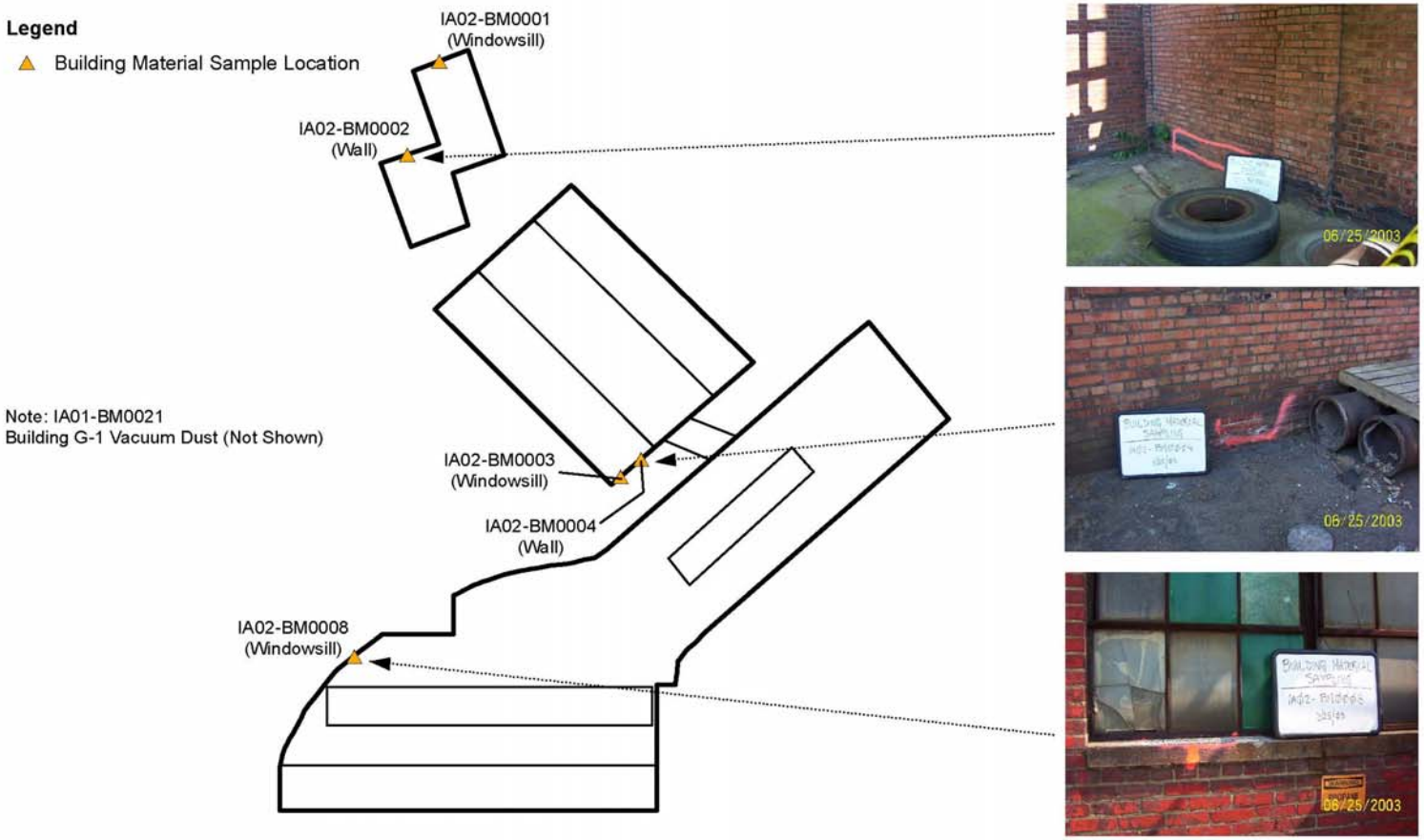
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N E S W Not To Scale	DRAWN BY: JDV 9/23/08	3-4
	DRAWING TITLE: Figure 3-4. Building G-1 Exterior and Roof Material Sample Locations		CHECKED BY: JG 9/23/08	



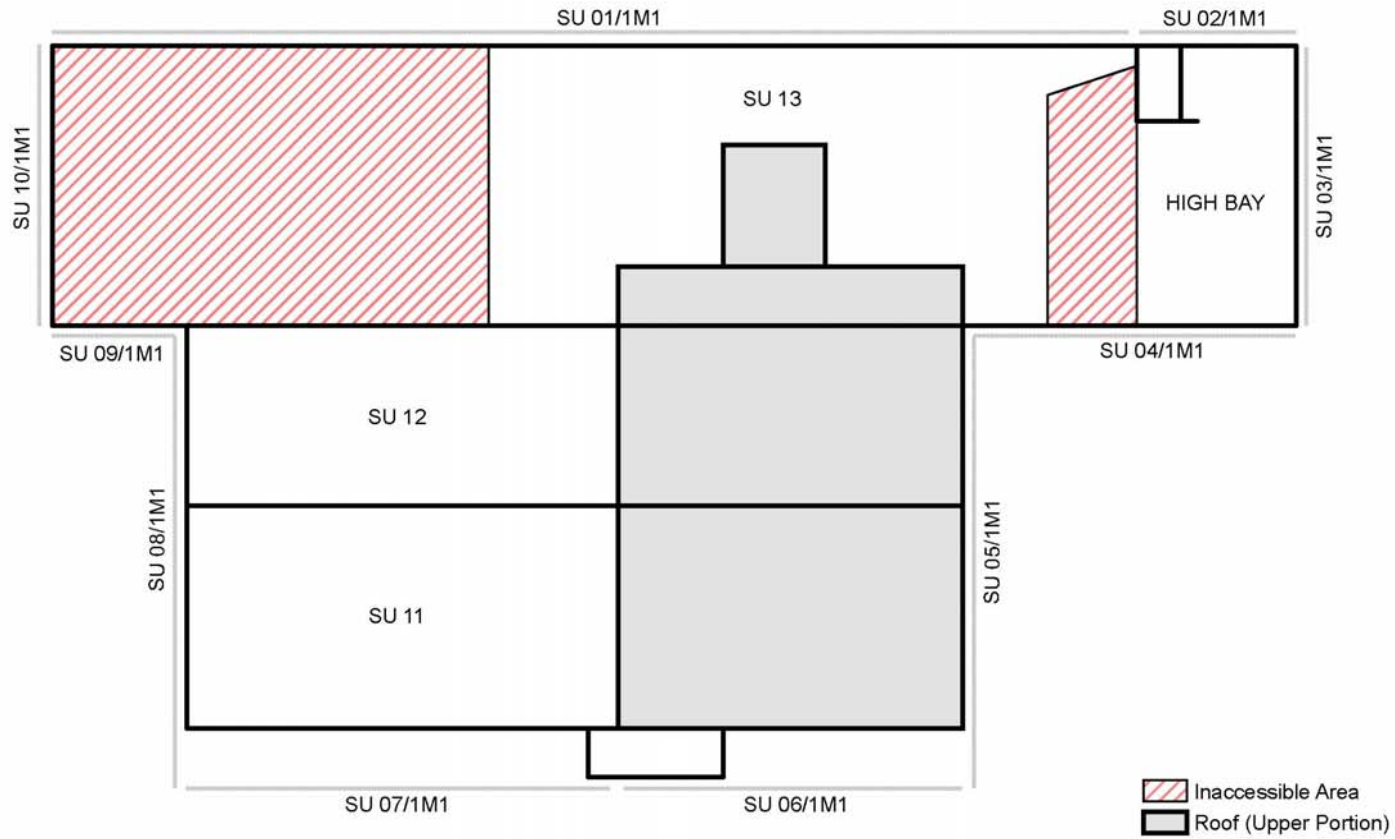
Foundry and Warehouse

IA02-BM0005: Foundry roof
IA02-BM0006: Foundry roof
IA02-BM0007: Foundry roof
IA02-BM0009: Warehouse roof
IA02-BM0010: Warehouse roof
IA02-BM0011: Warehouse roof
IA02-BM0012: Warehouse roof
IA02-BM0013: Warehouse roof
IA02-BM0014: Warehouse roof
IA02-BM0015: Warehouse roof (gravel/dirt)
IA02-BM0016: Warehouse roof (gravel/dirt)
IA02-BM0101: Foundry roof
IA02-BM0104: Warehouse roof
IA02-BM0105: Warehouse roof
IA02-BM0106: Warehouse roof
IA02-BM0108: Warehouse roof

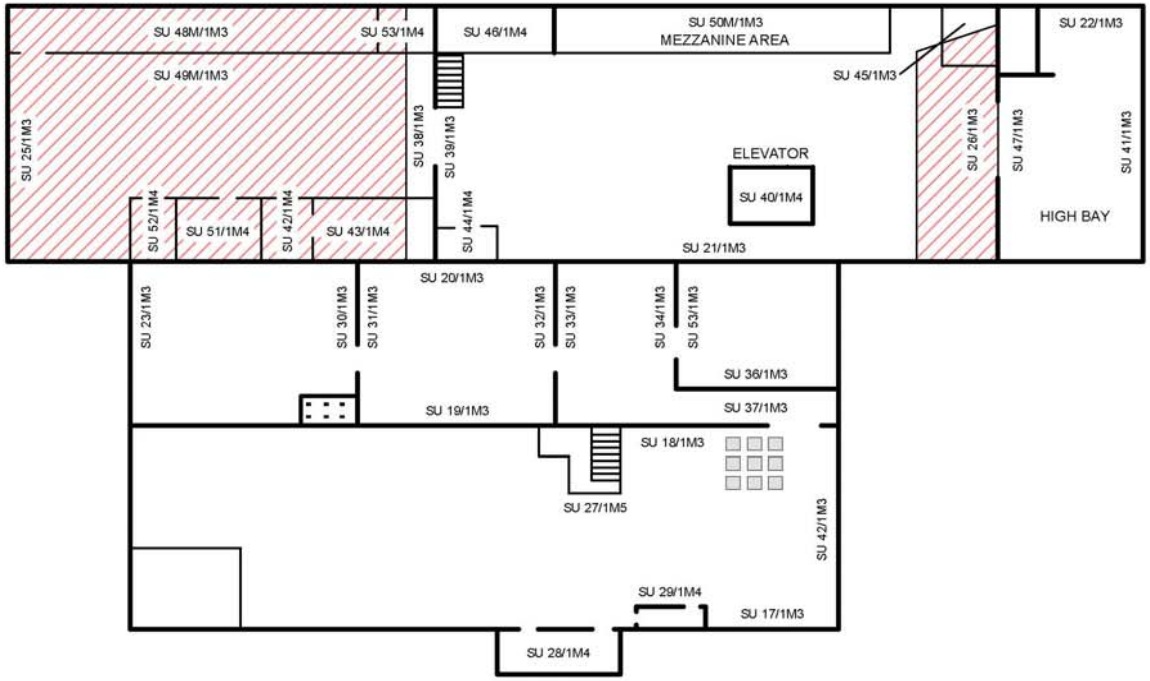
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: JDV 5/9/08	3-5
	DRAWING TITLE: Figure 3-5. Foundry and Warehouse Building Material Sample Locations		CHECKED BY: JG 5/9/08	



SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: JDV 5/7/08	3-6
	DRAWING TITLE: Figure 3-6. Building Material Informational Sample Locations		CHECKED BY: JG 5/7/08	



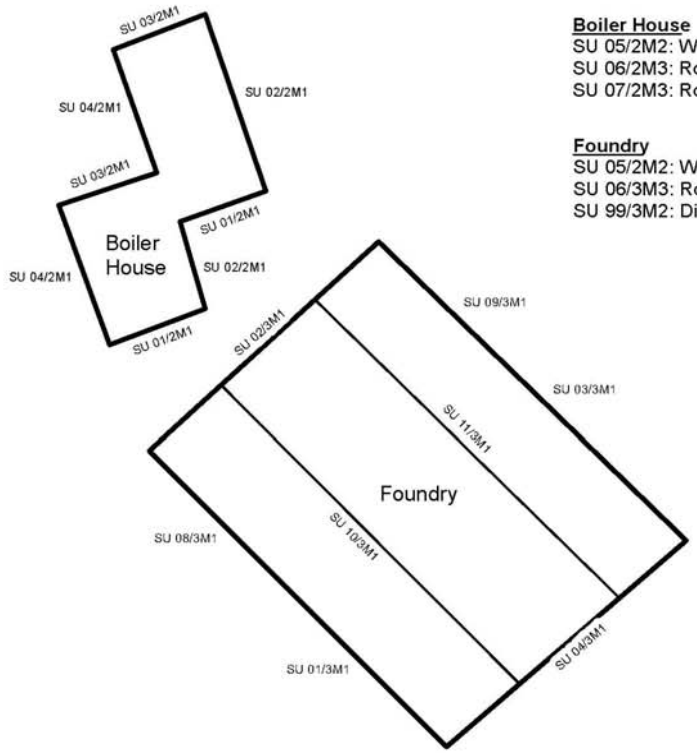
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N E W S Not To Scale	DRAWN BY: JDV 5/7/08	3-7
	DRAWING TITLE: Figure 3-7. Building G-1 Exterior (EU B1) Survey Units		CHECKED BY: JG 5/7/08	



Inaccessible Area

Equipment

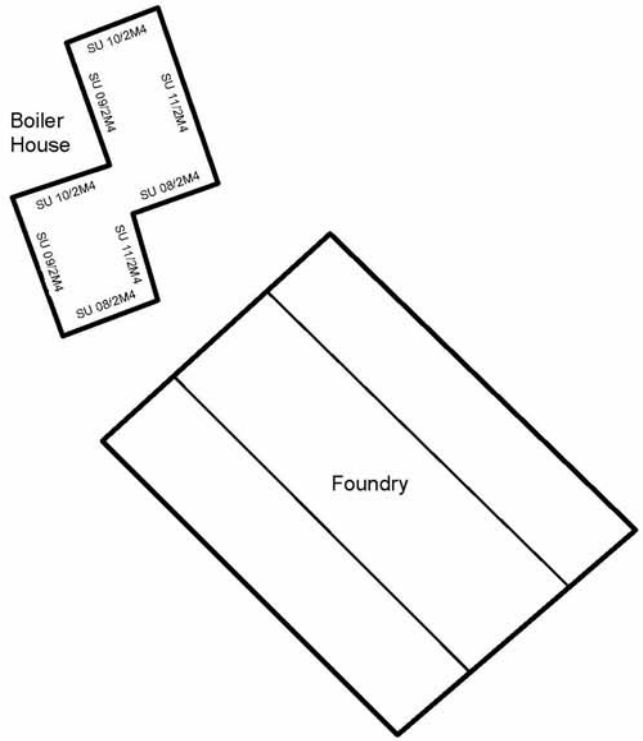
SAIC From Science to Solutions	**PROJECT NAME:** Former Harshaw Chemical Site Remedial Investigation Report	N E S W Not To Scale	**DRAWN BY:** HRM 4/13/06	**3-8**
	DRAWING TITLE: Figure 3-8. Building G-1 Interior (EUs B2-B4) Survey Units		**CHECKED BY:** JDV 5/14/08	



Boiler House
SU 05/2M2: Windowsills
SU 06/2M3: Roof
SU 07/2M3: Roof Structures, Dividing Wall and Stacks

Foundry
SU 05/2M2: Windowsills
SU 06/3M3: Roof
SU 99/3M2: Discretionary Points

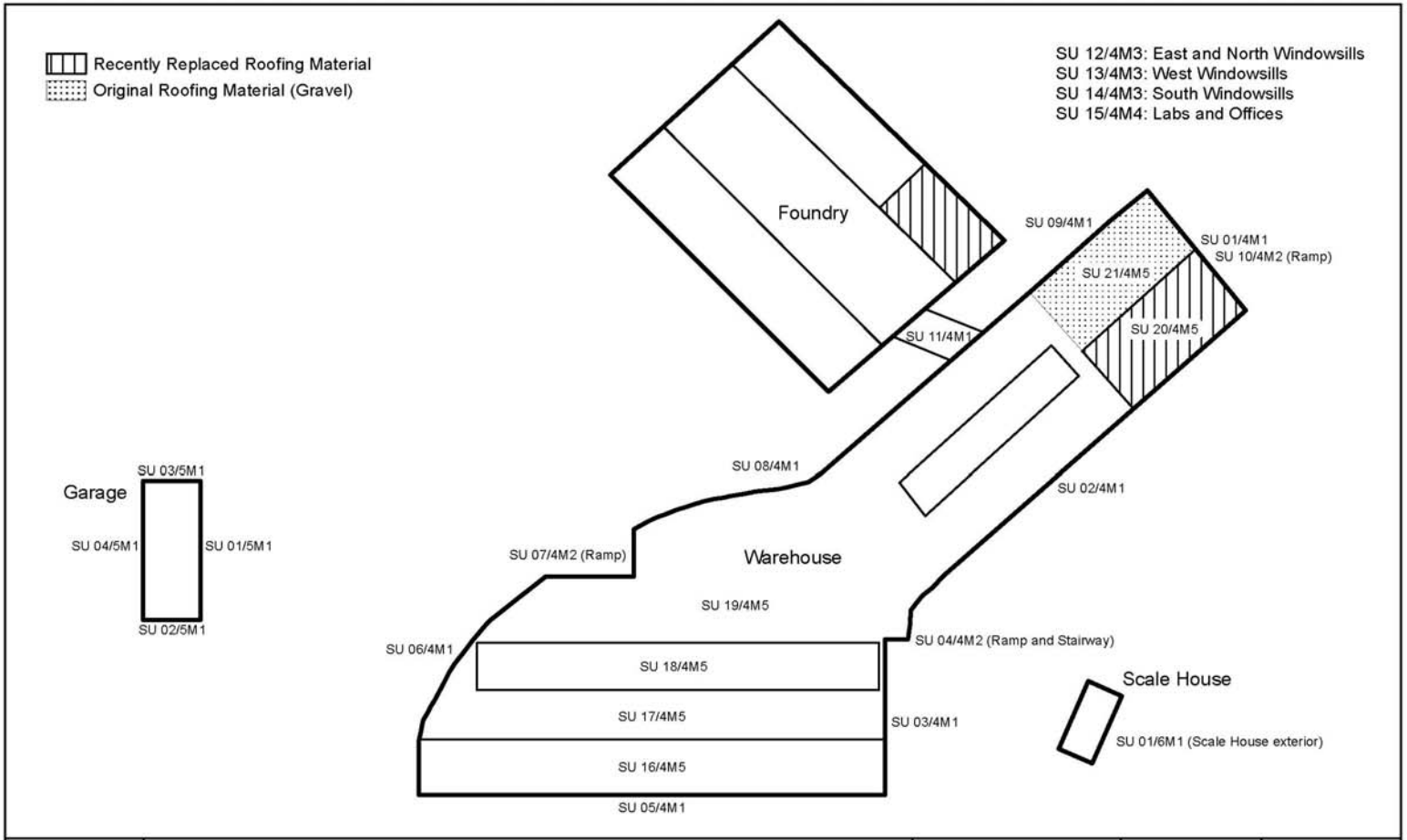
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: HRM 4/13/06	3-9
	DRAWING TITLE: Figure 3-9. Boiler House and Foundry Exterior Survey Units		CHECKED BY: JDV 5/14/08	



Boiler House
SU 12/2M5: Boiler House Floor
SU 13/2M6: Boiler House Mezzanine

Foundry
No interior points were collected

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: HRM 4/13/06	3-10
	DRAWING TITLE: Figure 3-10. Boiler House and Foundry Interior Survey Units		CHECKED BY: JDV 5/14/08	



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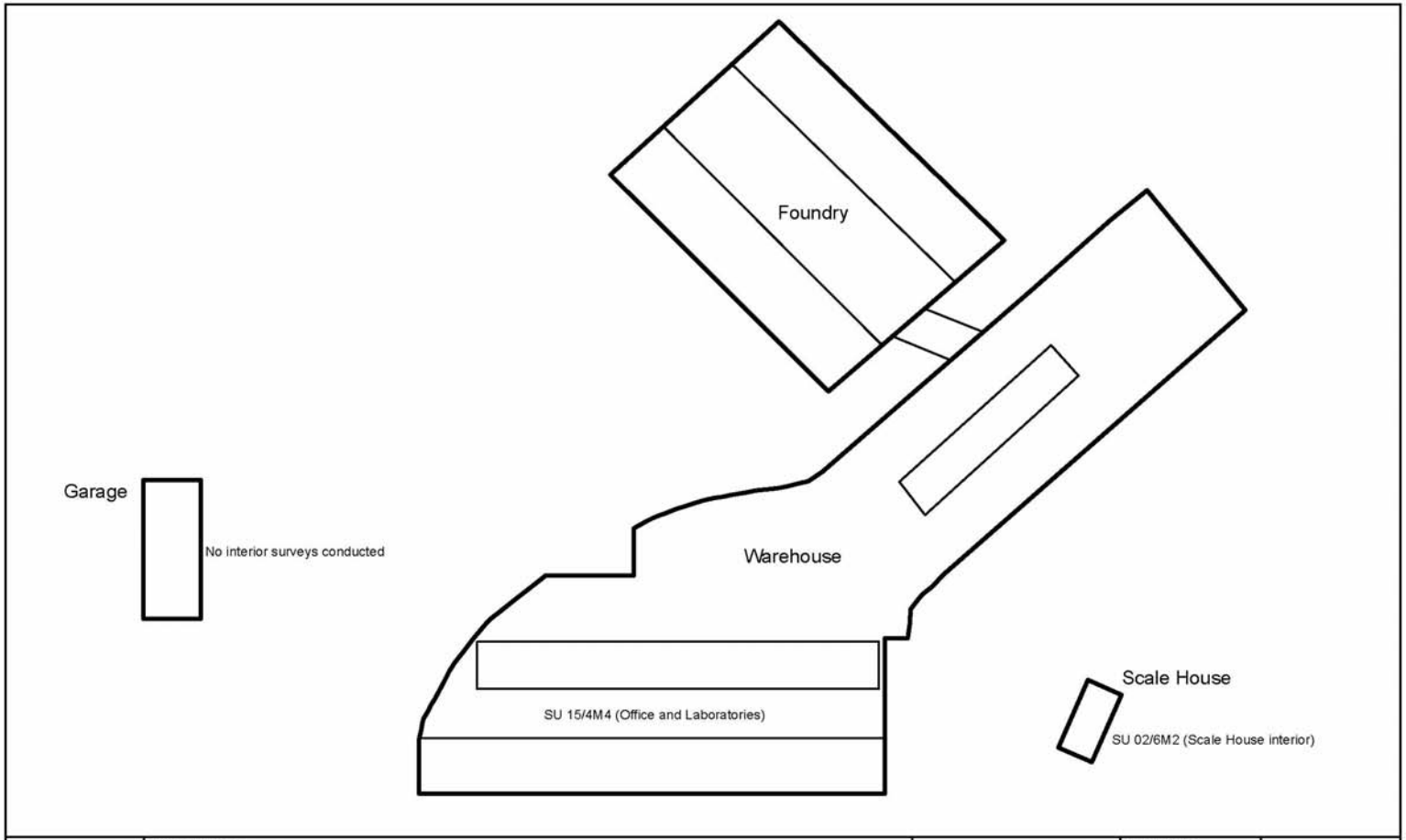
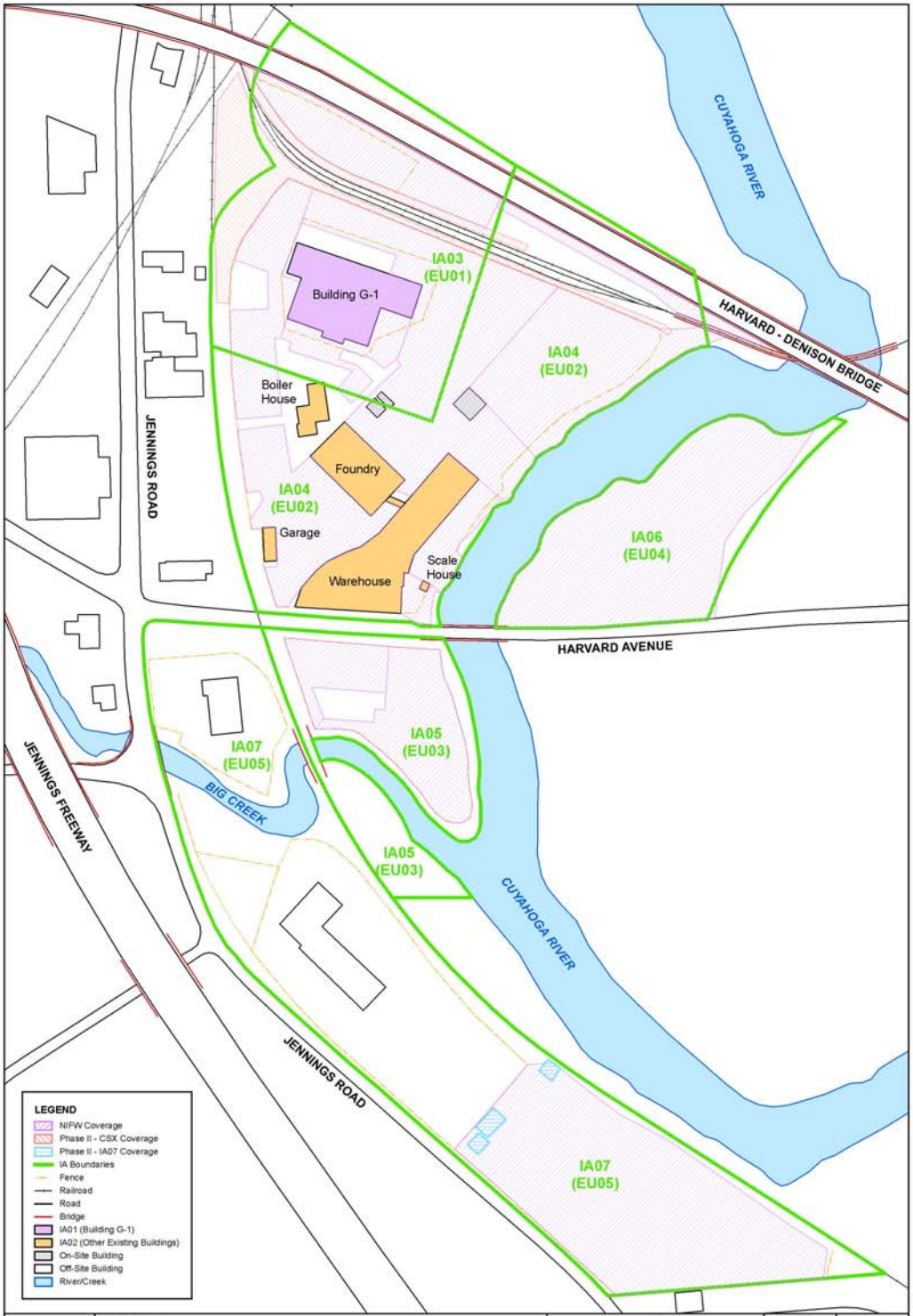
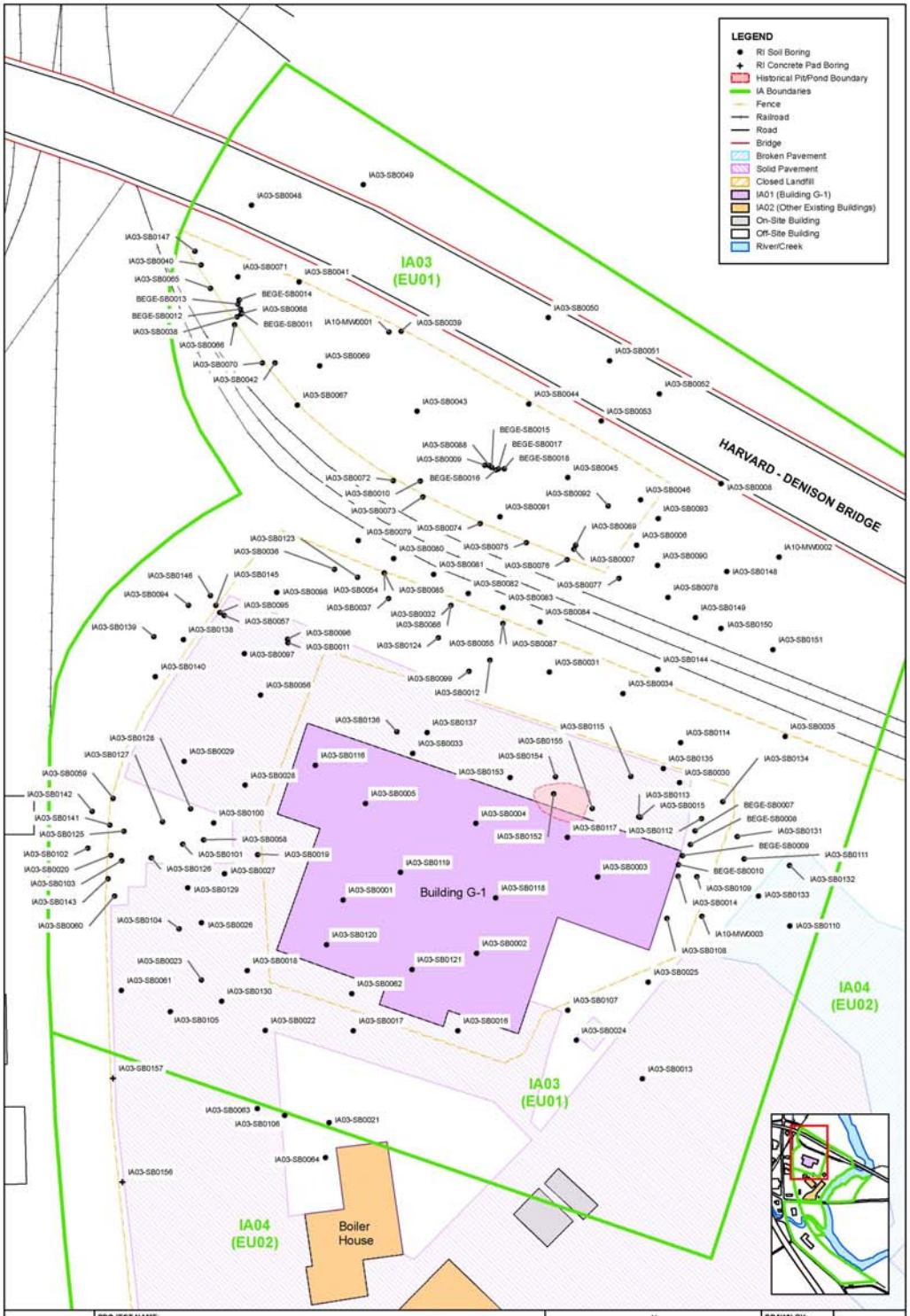
	DRAWING TITLE: Figure 3-11. Warehouse, Garage and Scale House Exterior Survey Units		**CHECKED BY:** JDV 5/14/08	



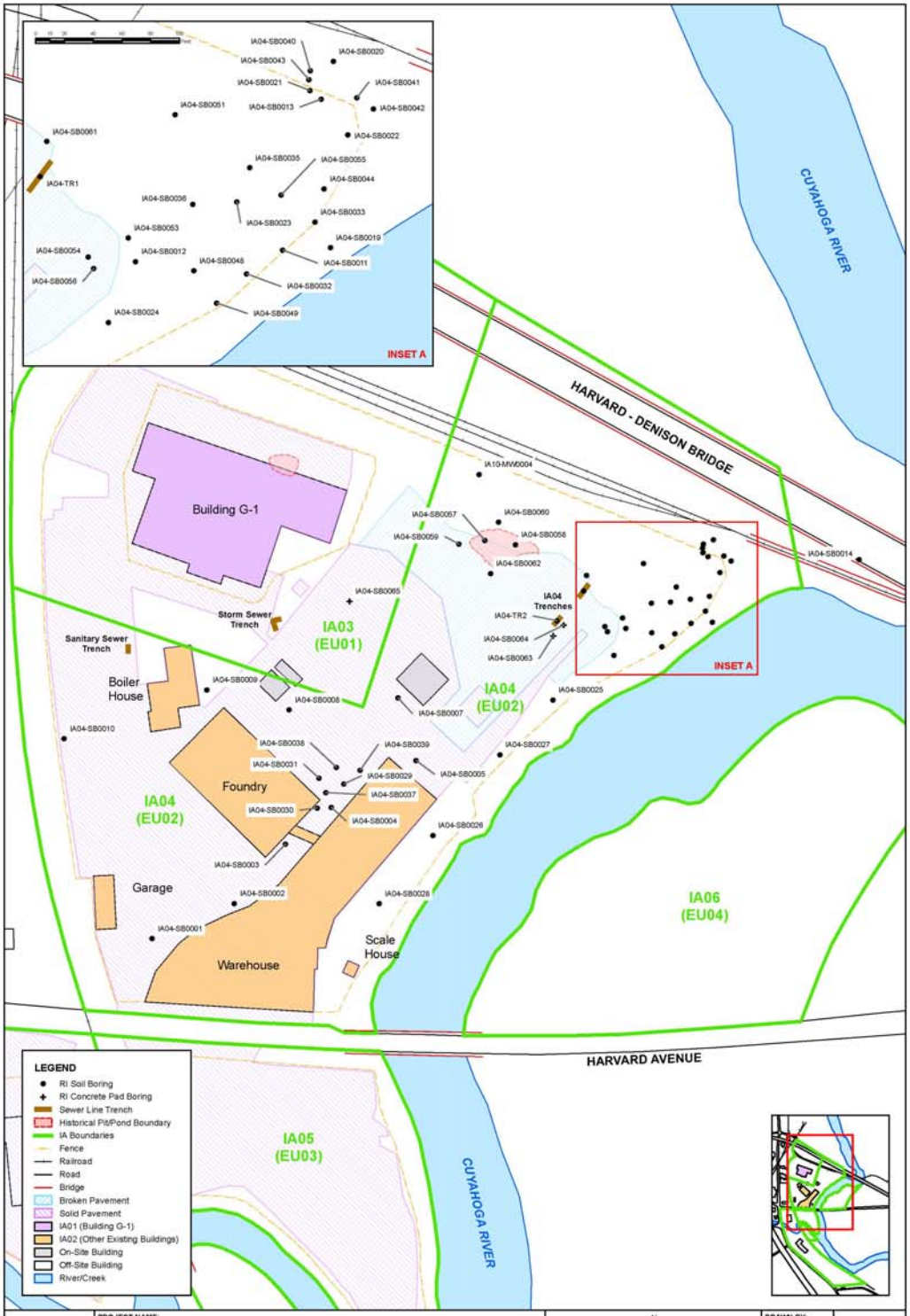
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: HRM 4/13/06	3-12
	DRAWING TITLE: Figure 3-12. Warehouse, Garage and Scale House Interior Survey Units		CHECKED BY: JDV 5/14/08	



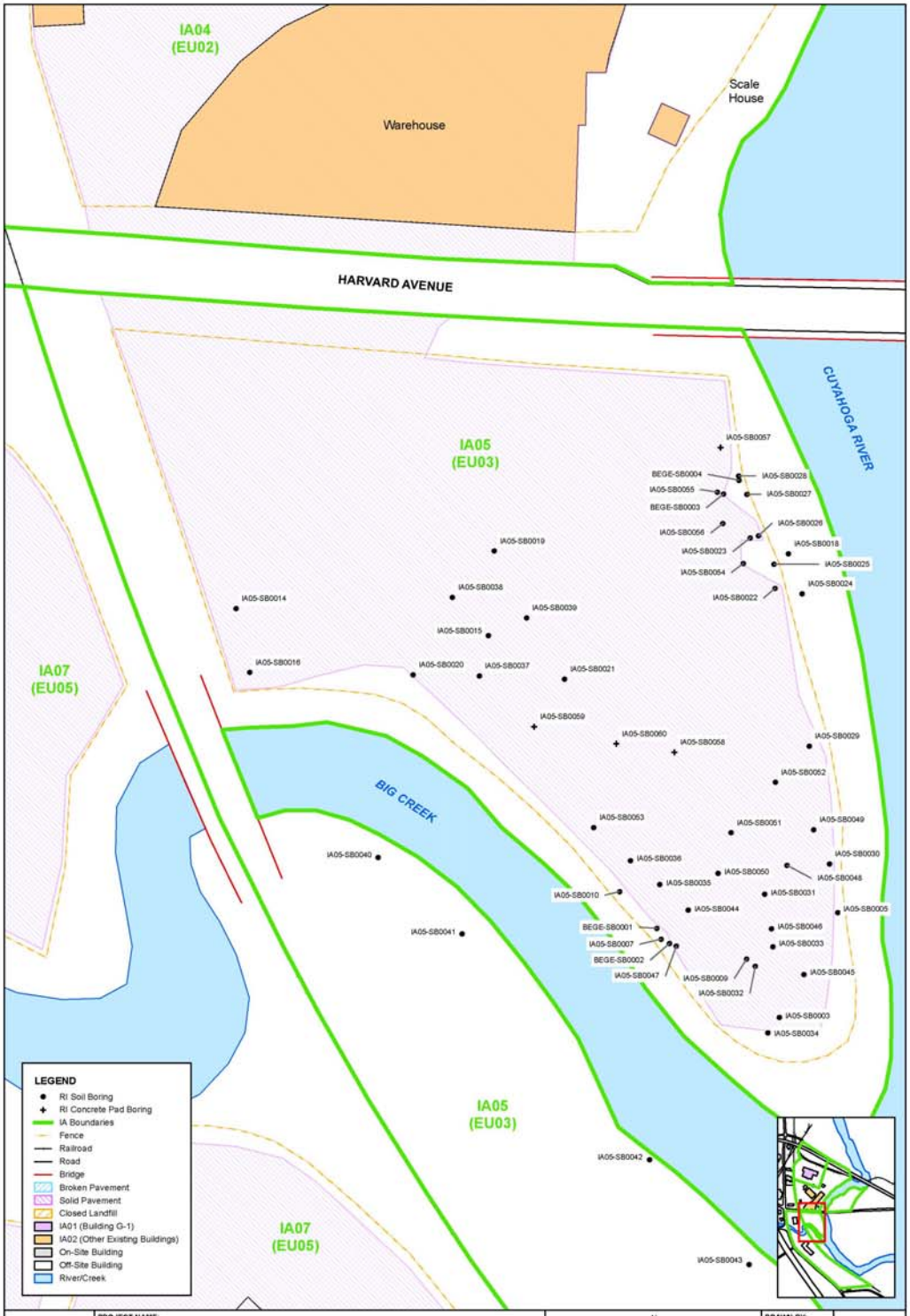
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 3-13. Gamma Walkover Survey Coverage Areas	0 60 120 240 360 Feet	CHECKED BY: JG 5/9/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	3-13



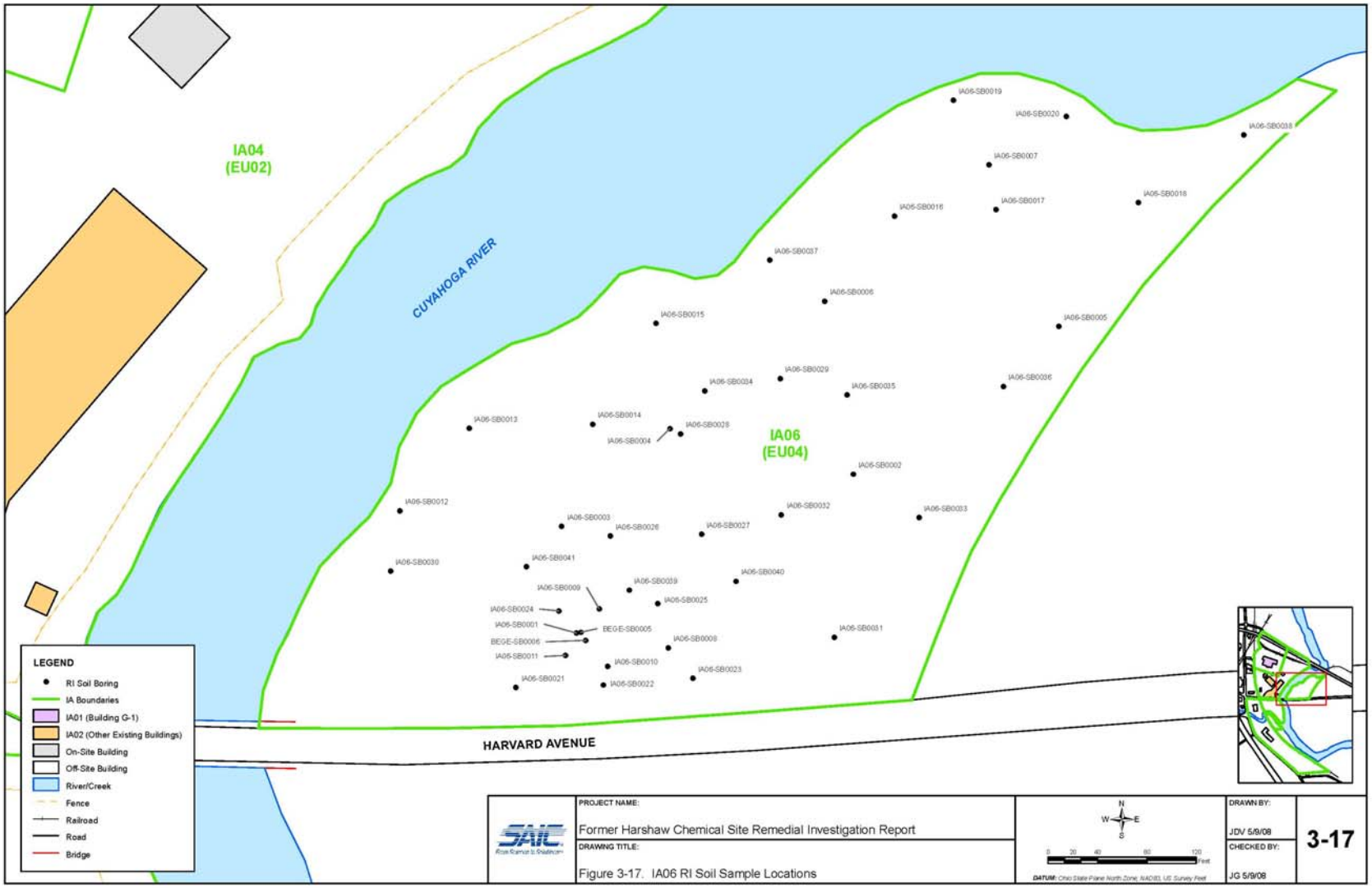
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 20 40 80 120 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 9/24/08
	DRAWING TITLE: Figure 3-14. IA03 Soil Sample Locations		CHECKED BY: JG 9/24/08
			3-14



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 9/24/08
	DRAWING TITLE: Figure 3-15. IA04 Soil Sample Locations	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 9/24/08
			3-15

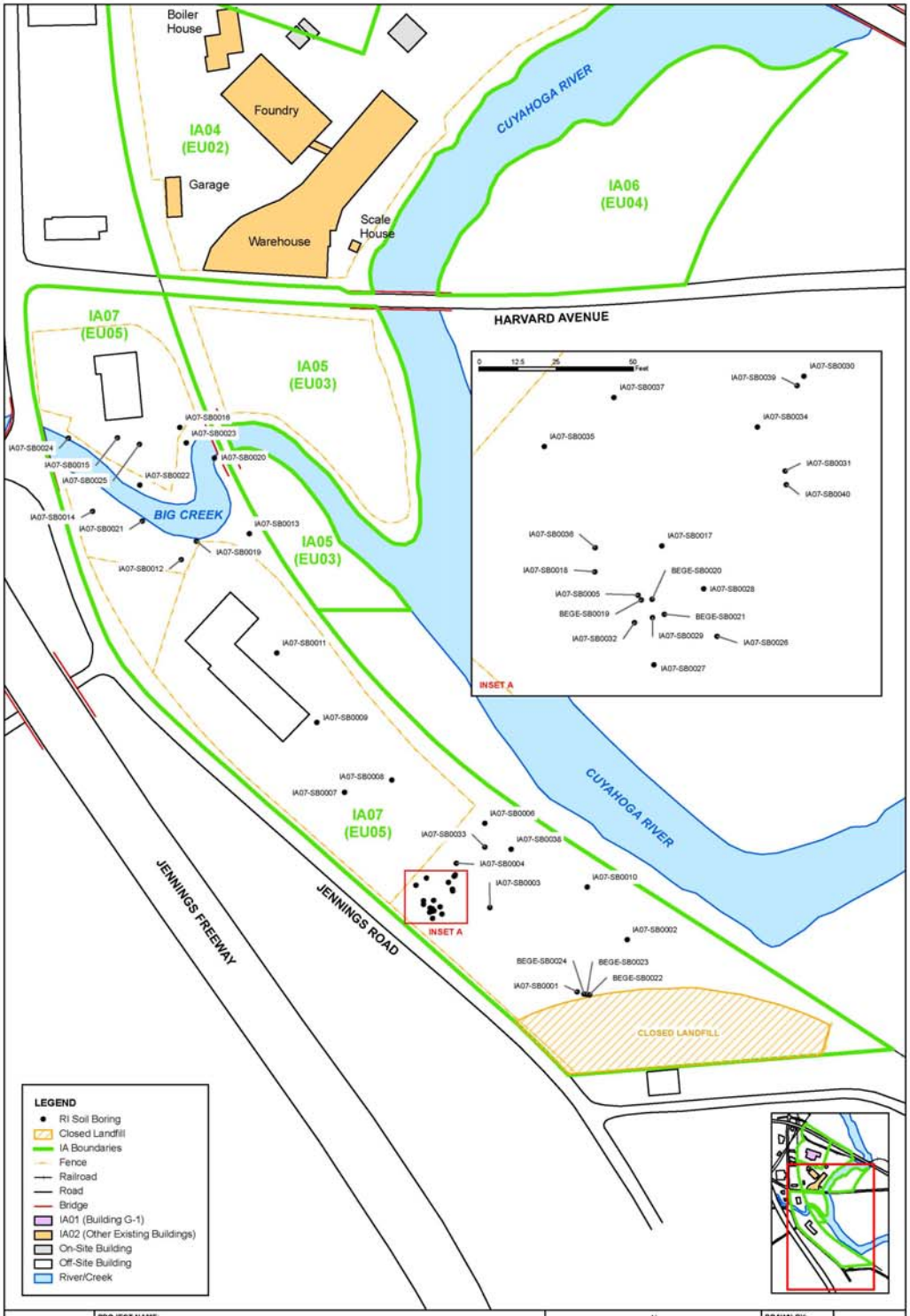


SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 9/25/08
	DRAWING TITLE: Figure 3-16. IA05 RI Soil Sample Locations	0 15 30 60 90 Feet	CHECKED BY: JG 9/25/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	3-16



SAIC	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 3-17. IA06 RI Soil Sample Locations		CHECKED BY: JG 5/9/08

3-17



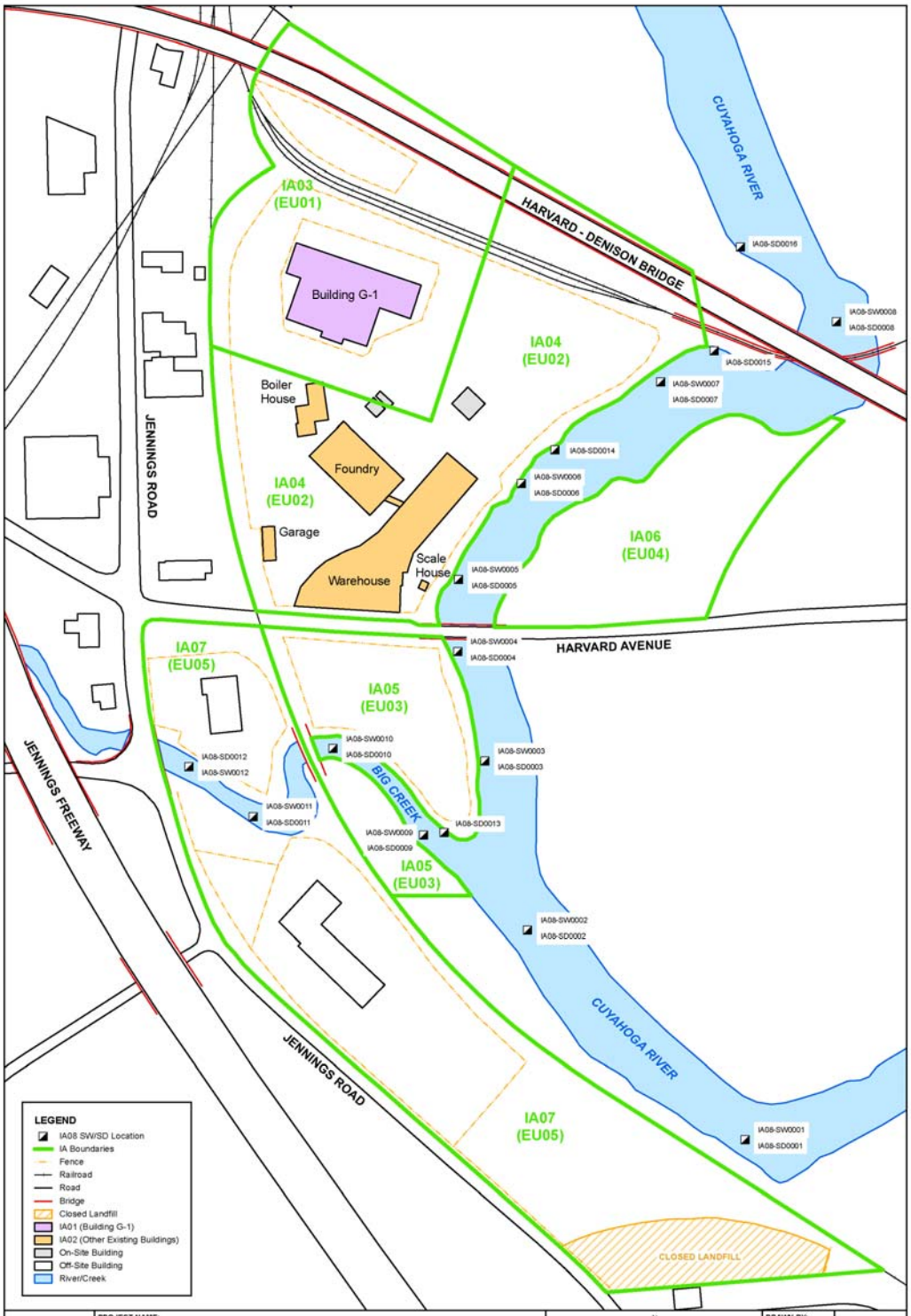
PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report

DRAWING TITLE: Figure 3-18. IA07 RI Soil Sample Locations

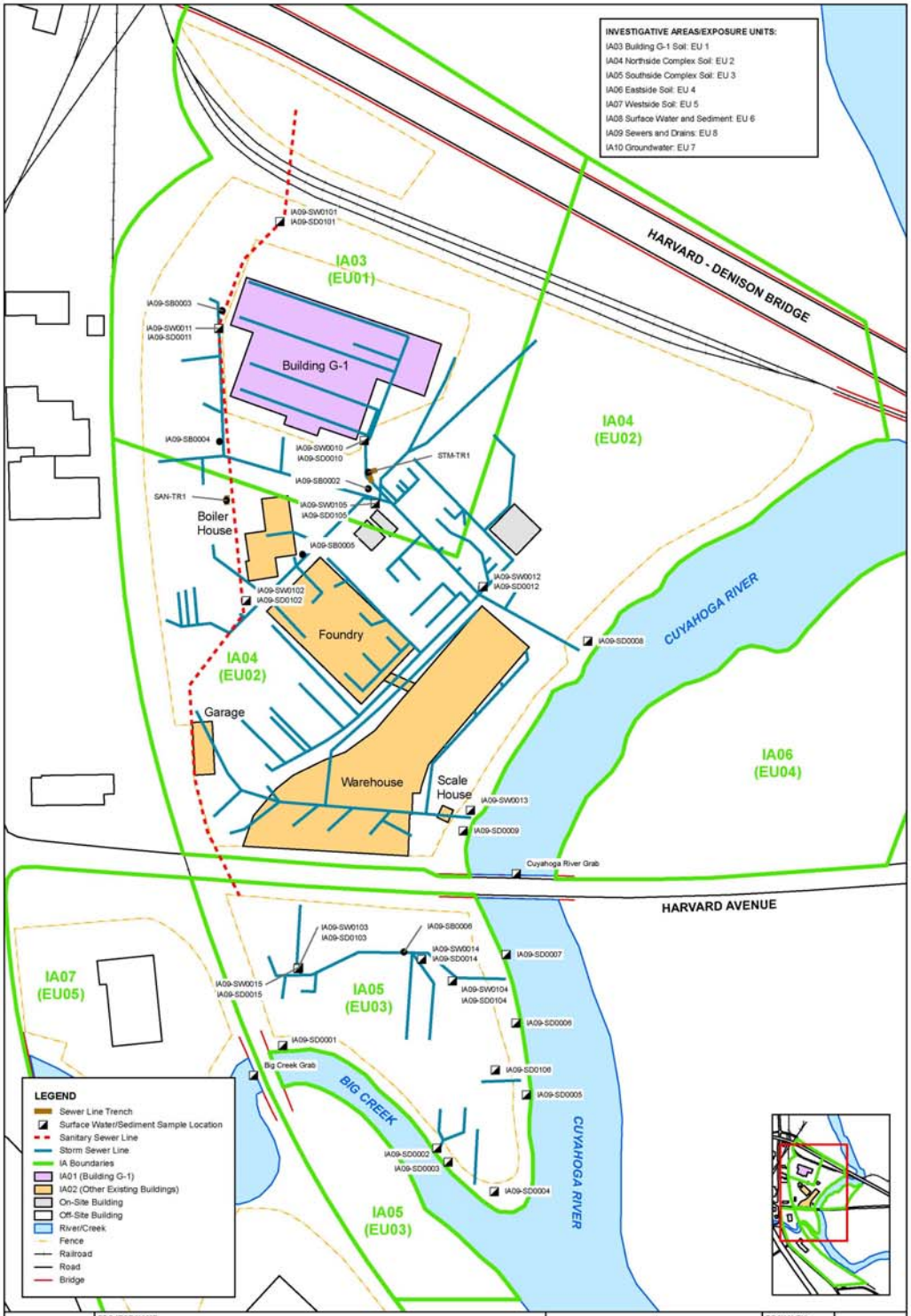
DRAWN BY: JDV 5/9/08

CHECKED BY: JG 5/9/08

3-18



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 3-19. IA08 Surface Water/Sediment Sample Locations	0 60 120 240 360 Feet	CHECKED BY: JG 5/9/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	3-19



PROJECT NAME:

Former Harshaw Chemical Site Remedial Investigation Report

DRAWING TITLE:

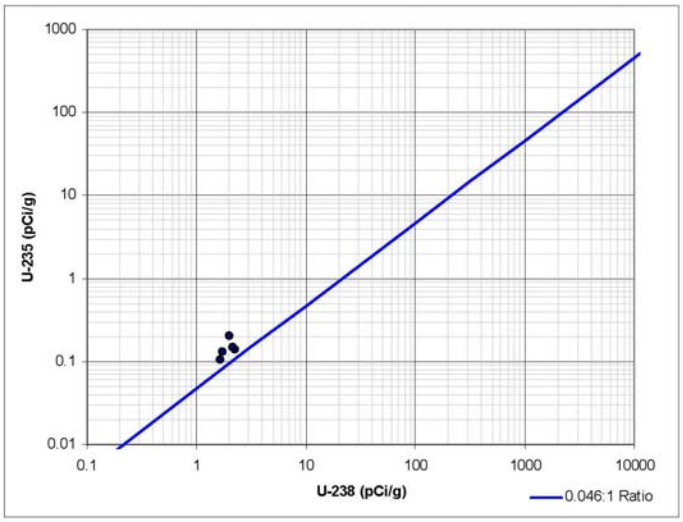
Figure 3-20. IA09 Sewer Surface Water/Sediment/Soil Sample Locations

DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet

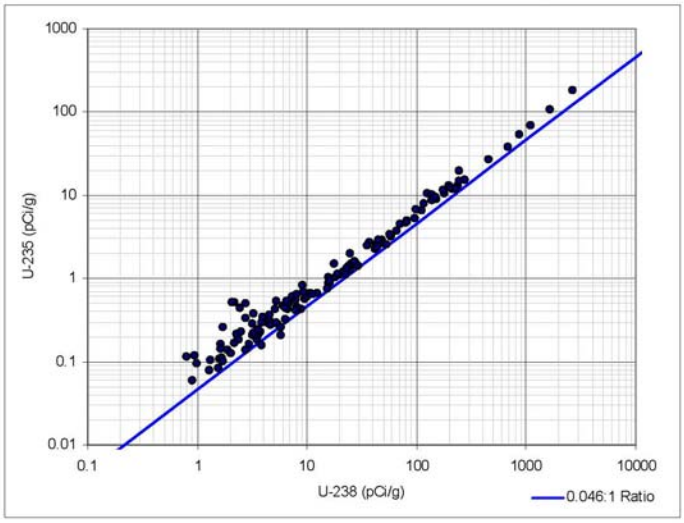
DRAWN BY: JDV 9/22/08

CHECKED BY: JG 9/23/08

3-20



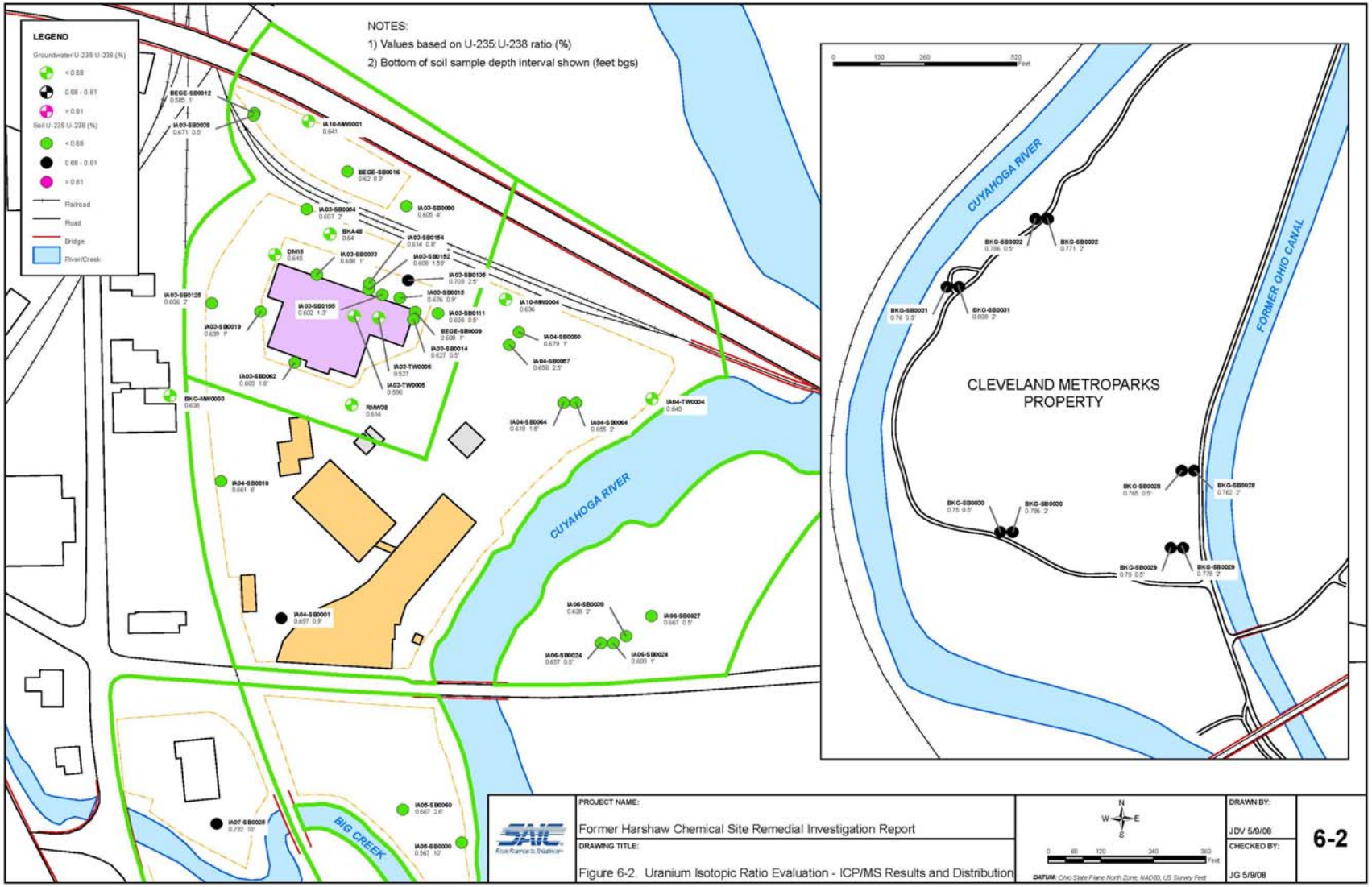
U-235:U-238 RATIO DISTRIBUTION FOR OFF-SITE BACKGROUND SAMPLES

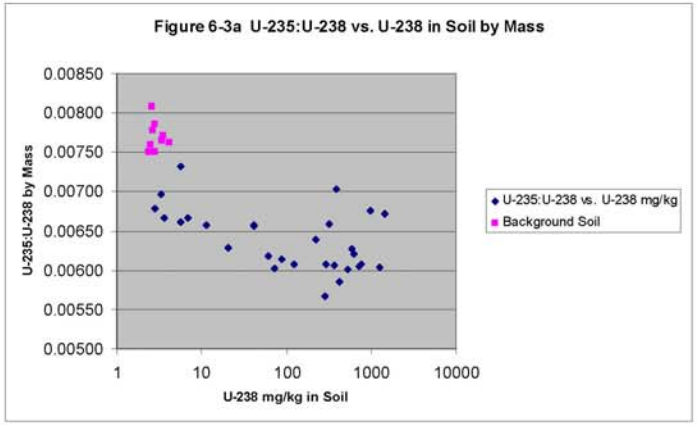


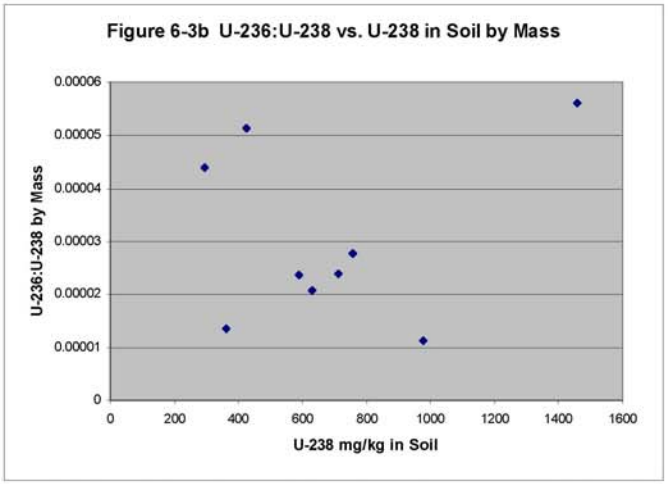
U-235:U-238 RATIO DISTRIBUTION FOR ON-SITE SAMPLES

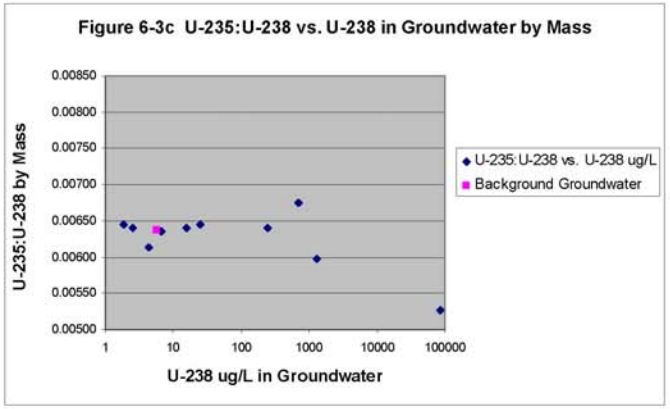
NOTE: All results from gamma spectroscopy analyses (Table 6-2)

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 1/22/09	6-1
	DRAWING TITLE: Figure 6-1 Ratio of Uranium-235 to Uranium-238 in Soil Samples		CHECKED BY: JG 1/22/09	


LEGEND
Groundwater U-235:U-238 (%)
< 0.68
0.68 - 0.81
> 0.81
Soil U-235:U-238 (%)
< 0.68
0.68 - 0.81
> 0.81
Railroad
Road
Bridge
River/Creek
NOTES:
1) Values based on U-235:U-238 ratio (%)
2) Bottom of soil sample depth interval shown (feet bgs)
CUYAHOGA RIVER
BIG CREEK
CLEVELAND METROPARKS PROPERTY
FORMER OHIO CANAL
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-2. Uranium Isotopic Ratio Evaluation - ICP/MS Results and Distribution
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 5/9/08
CHECKED BY:
JG 5/9/08
6-2

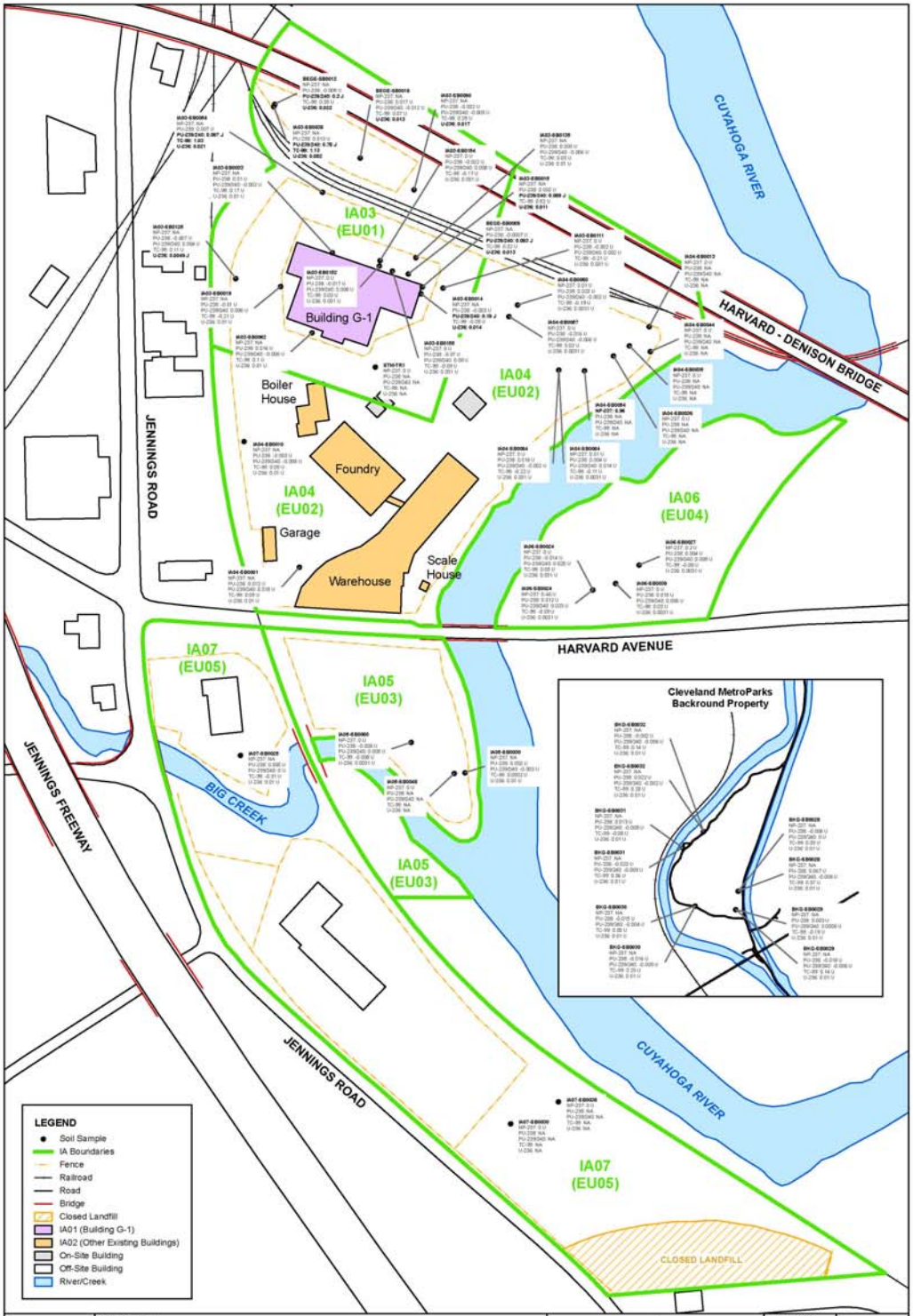




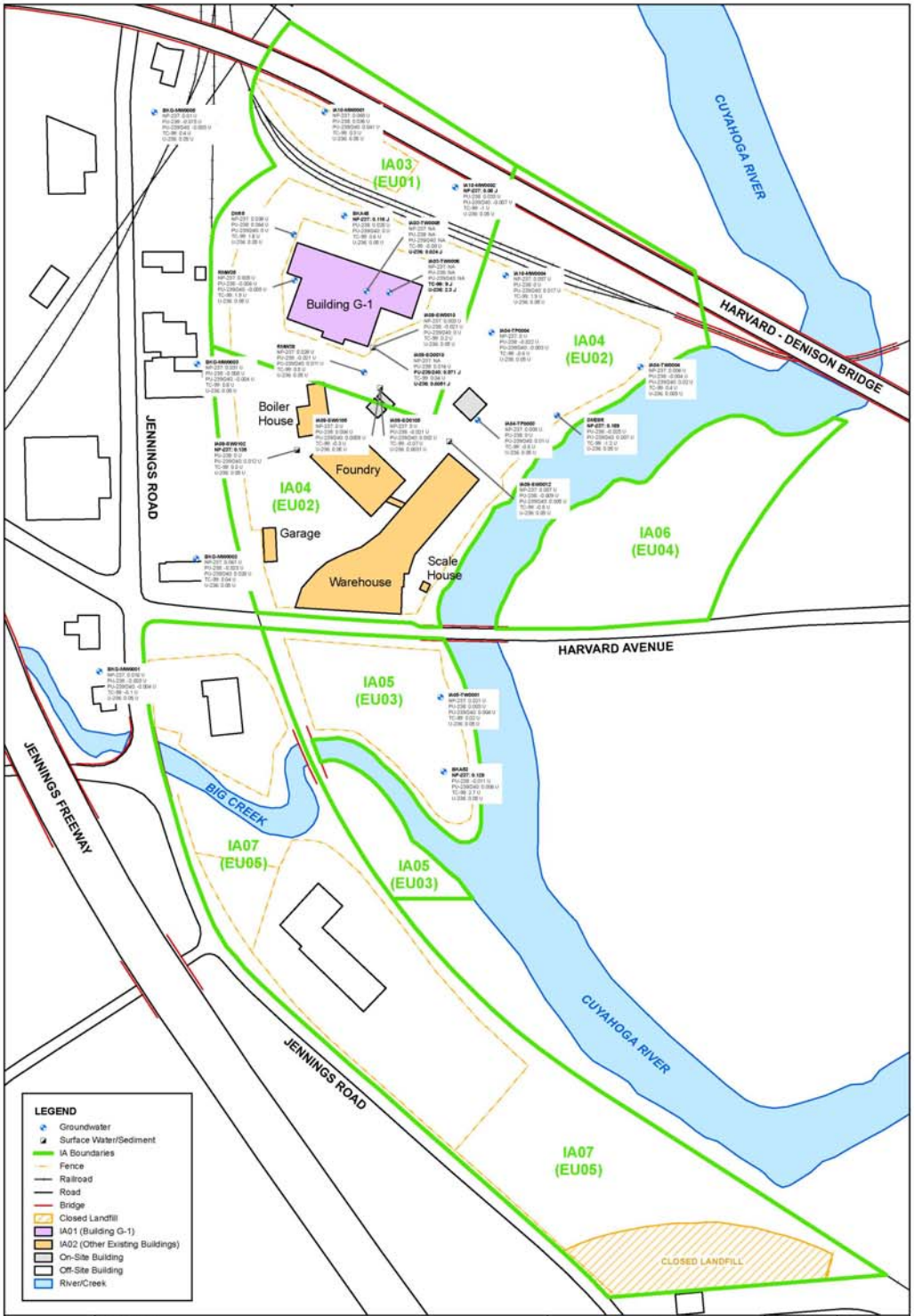


NOTE: All results from ICP-MS analyses

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	Not To Scale	DRAWN BY: JDV 10/17/08	6-3
	DRAWING TITLE: Figure 6-3. Uranium Isotopic Ratio Evaluation - Scatter Plots		CHECKED BY: JG 10/17/08	

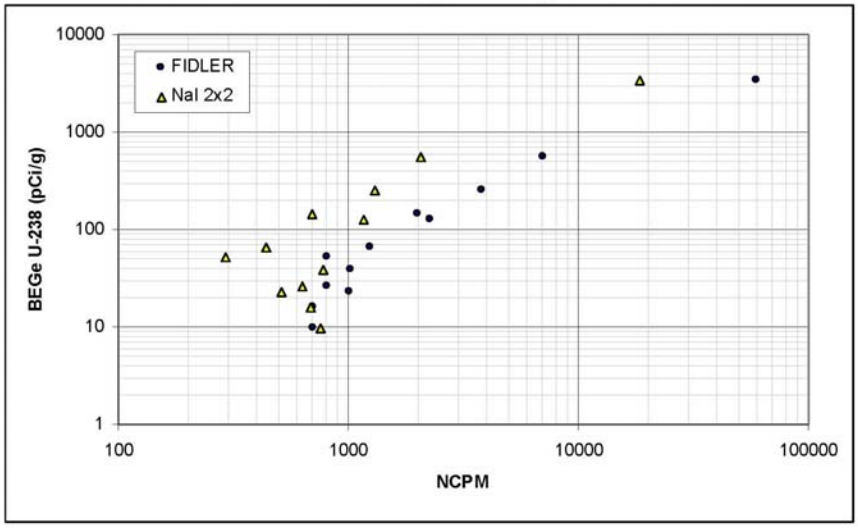


SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 60 120 240 360 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 9/23/08
	DRAWING TITLE: Figure 6-4. Recycled Uranium Radionuclides - Soil		CHECKED BY: JG 9/23/08
			6-4

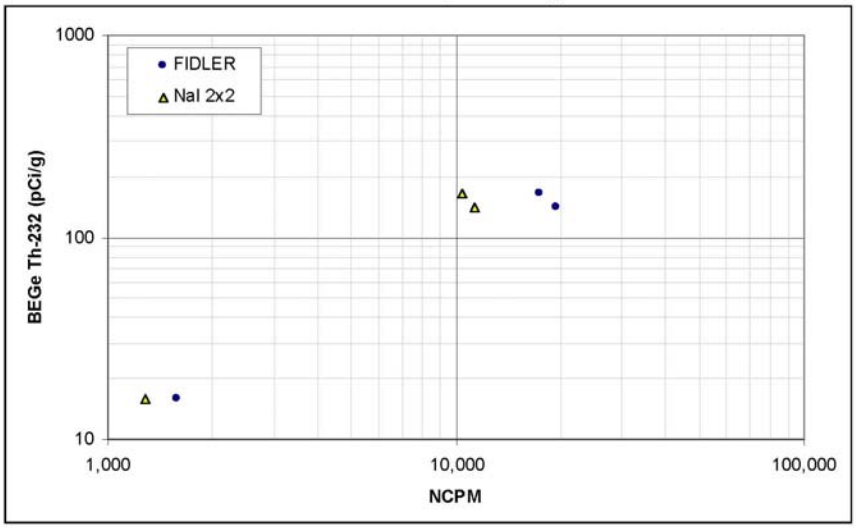


PROJECT NAME:		DRAWN BY:	
Former Harshaw Chemical Site Remedial Investigation Report	N W E S	JDV 9/23/08	6-5
DRAWING TITLE:	0 60 120 240 360 Feet	CHECKED BY:	
Figure 6-5. Recycled Uranium Radionuclides - Other Media	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	JG 9/23/08	

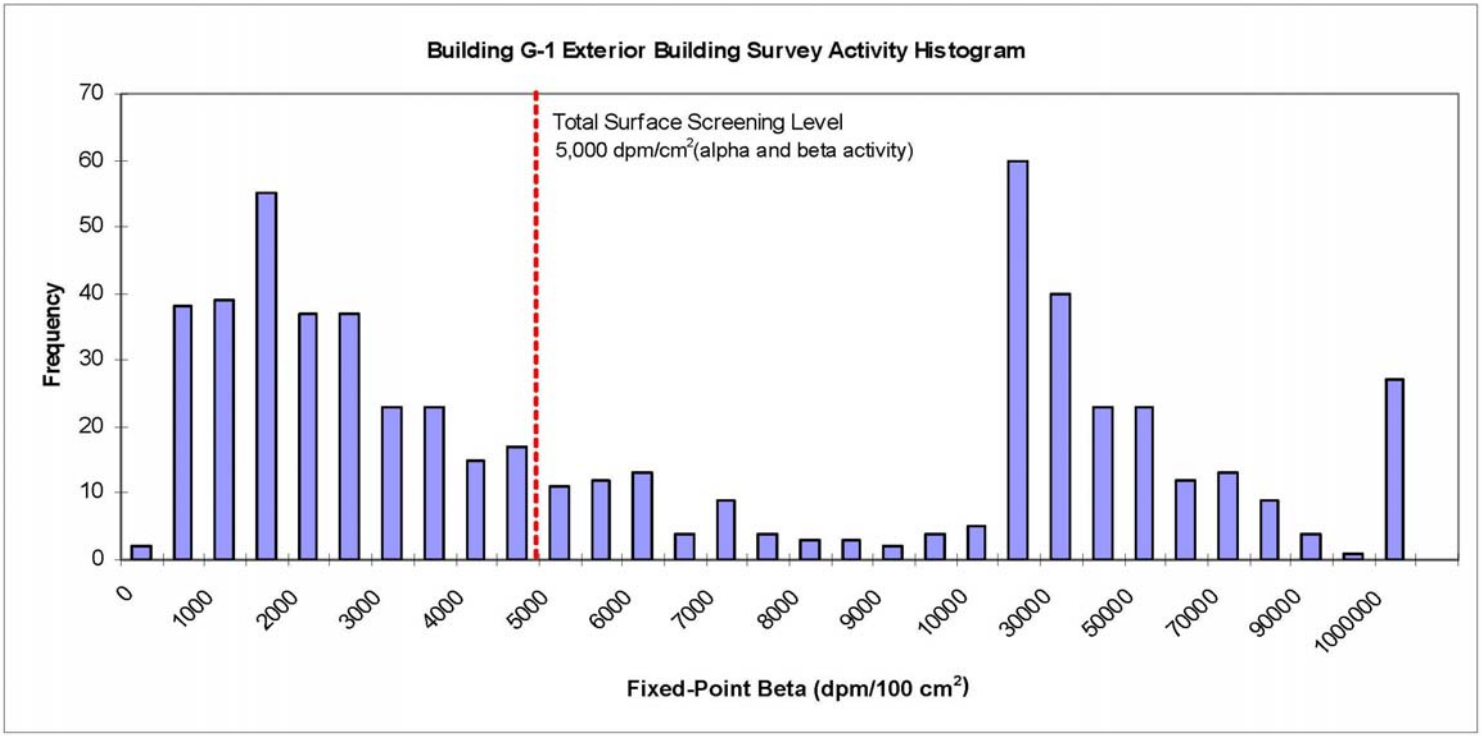
FIDLER and NaI 2x2 Relationship Measuring Processed Uranium



FIDLER and NaI 2x2 Relationship Measuring Natural Thorium

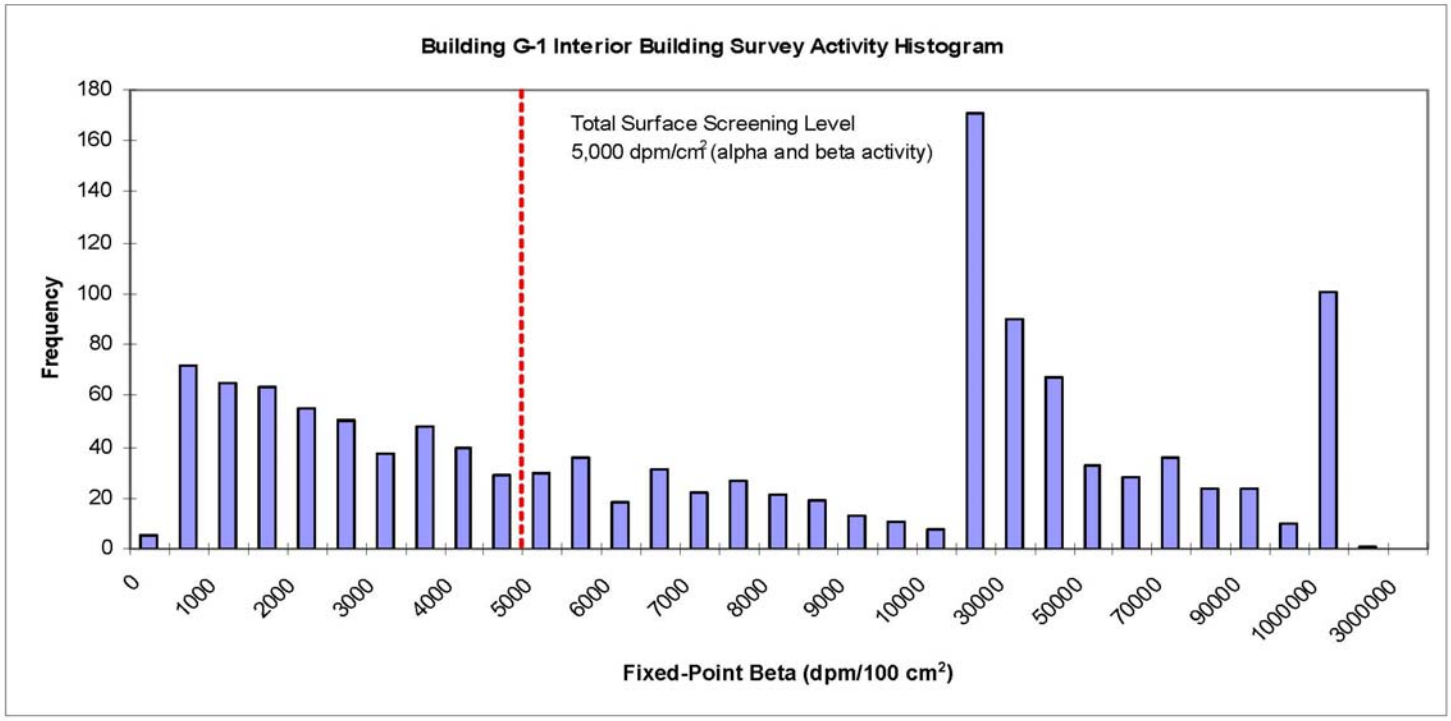


SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	NOT TO SCALE	DRAWN BY: JDV 5/7/08	6-6
	DRAWING TITLE: Figure 6-6 FIDLER & NaI 2x2 Relationships Measuring Uranium and Thorium		CHECKED BY: JG 5/7/08	



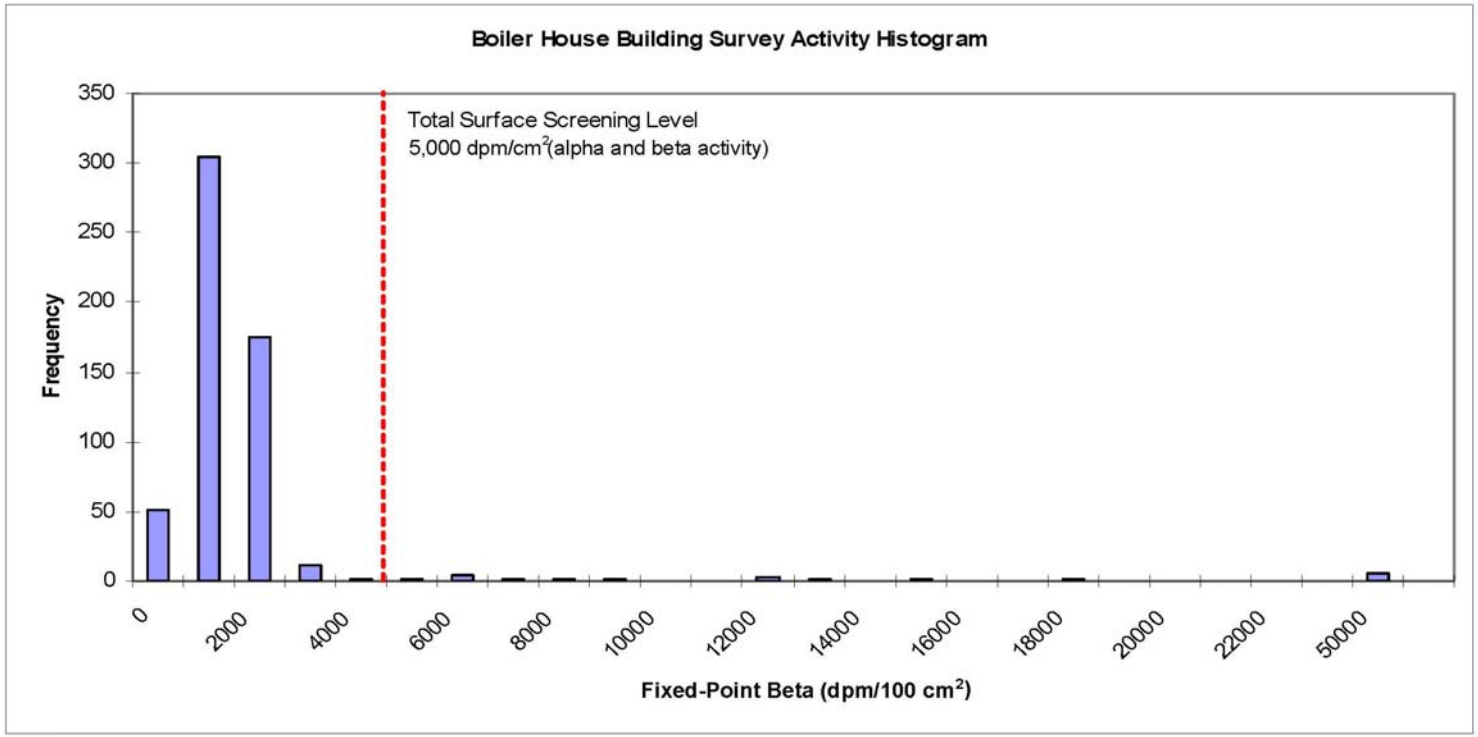
NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-7
	DRAWING TITLE: Figure 6-7. Building G-1 Exterior Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	



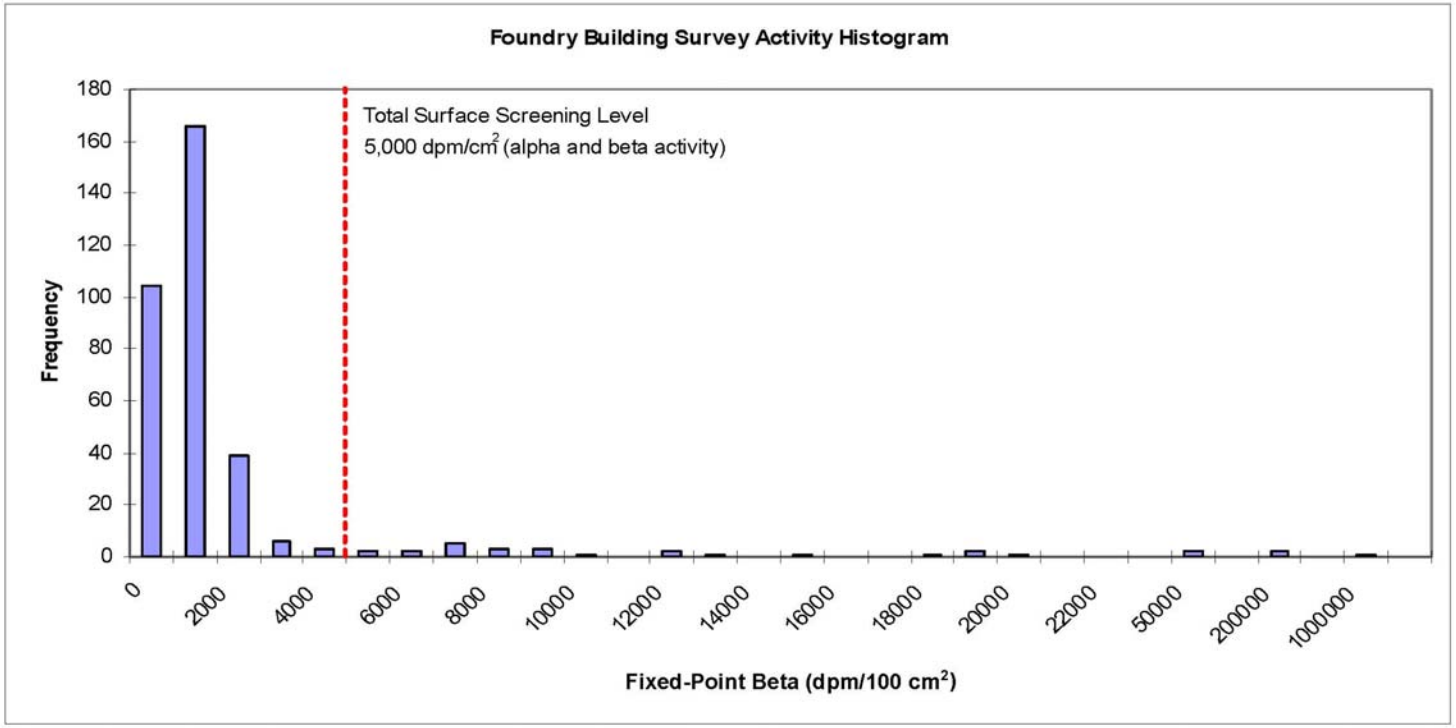
NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-8
	DRAWING TITLE: Figure 6-8. Building G-1 Interior Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	



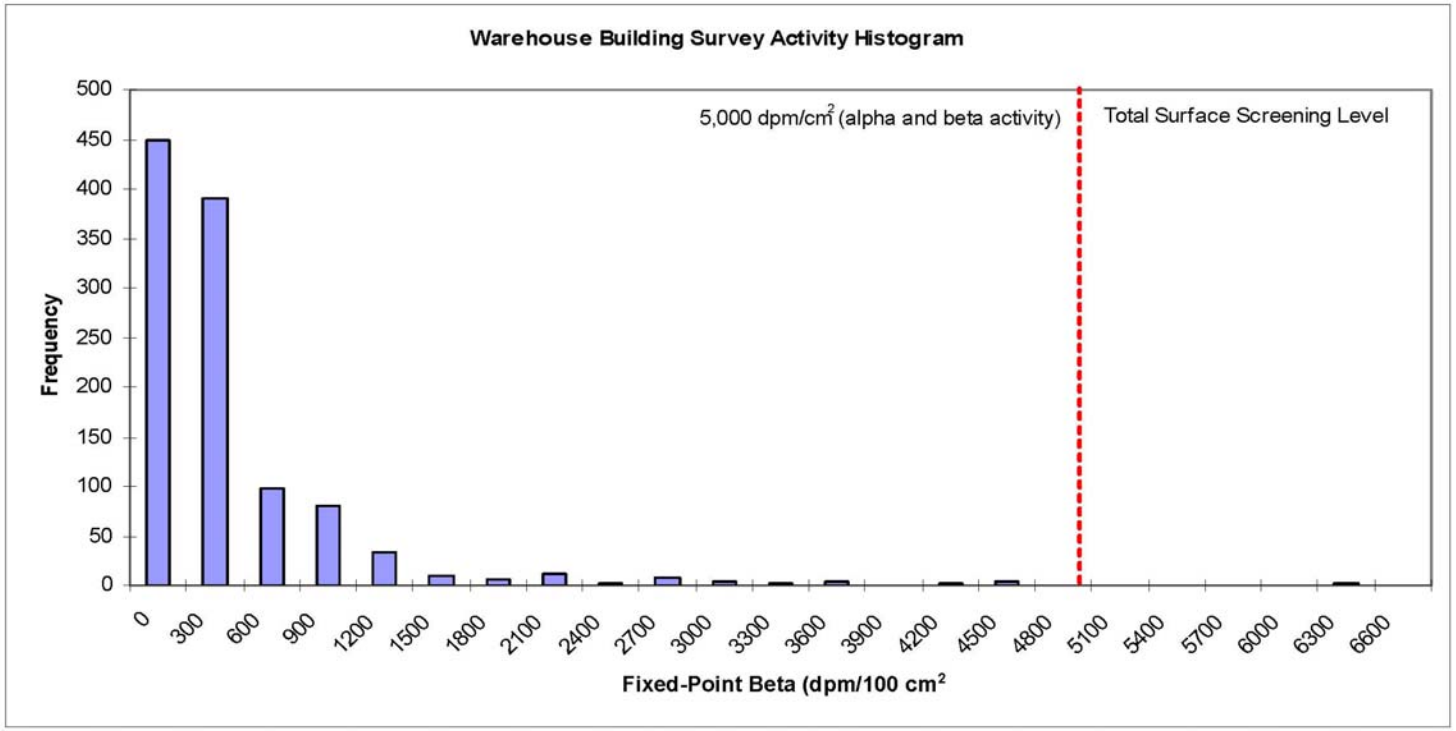
NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-9
	DRAWING TITLE: Figure 6-9. Boiler House Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	



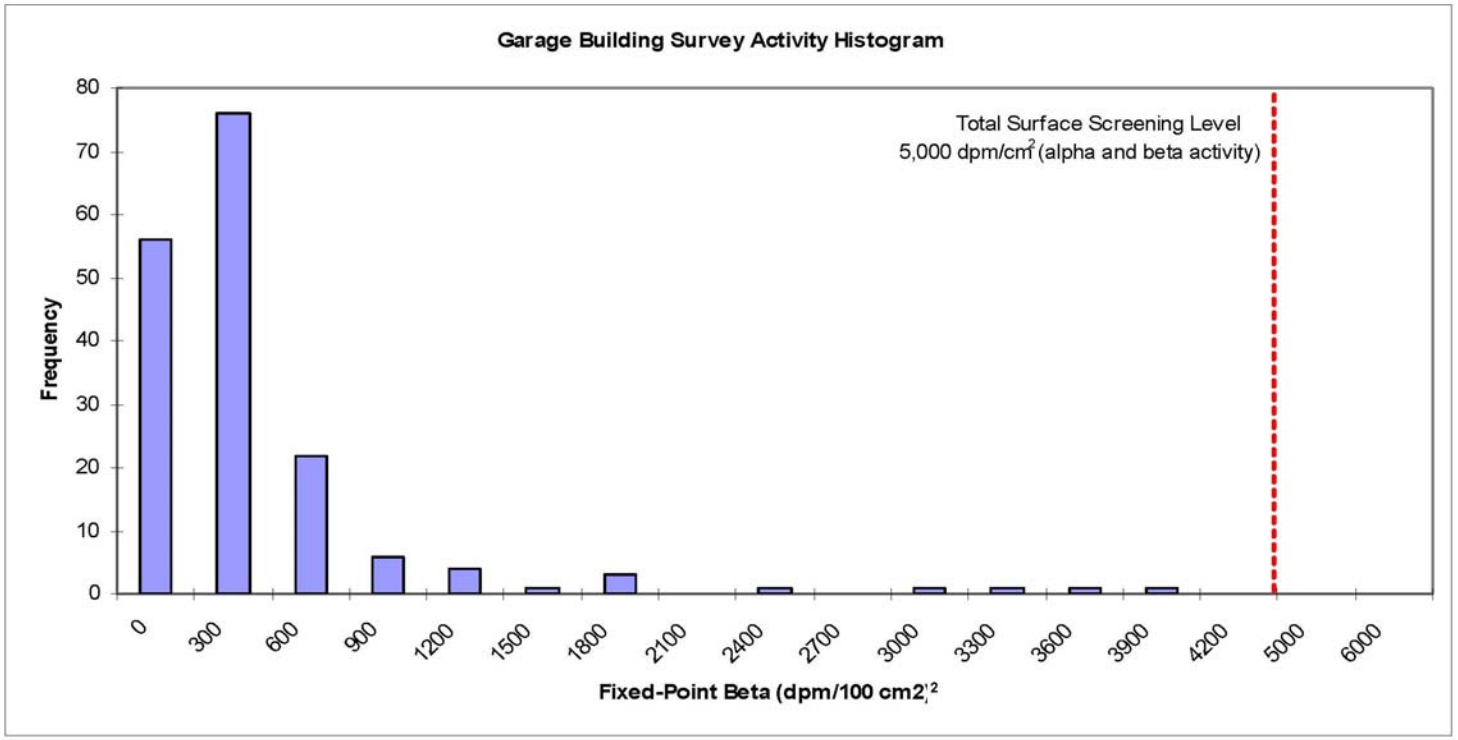
NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-10
	DRAWING TITLE: Figure 6-10. Foundry Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	



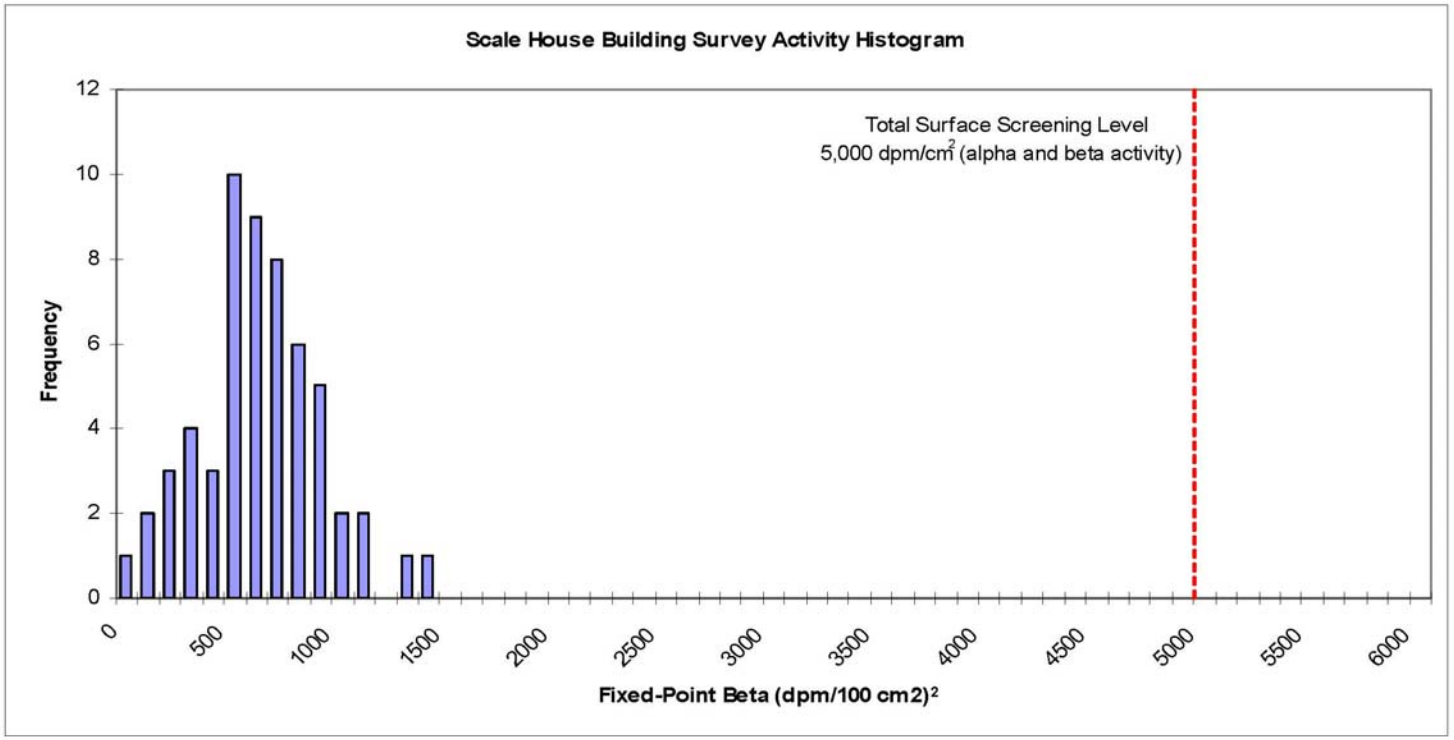
NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-11
	DRAWING TITLE: Figure 6-11. Warehouse Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	



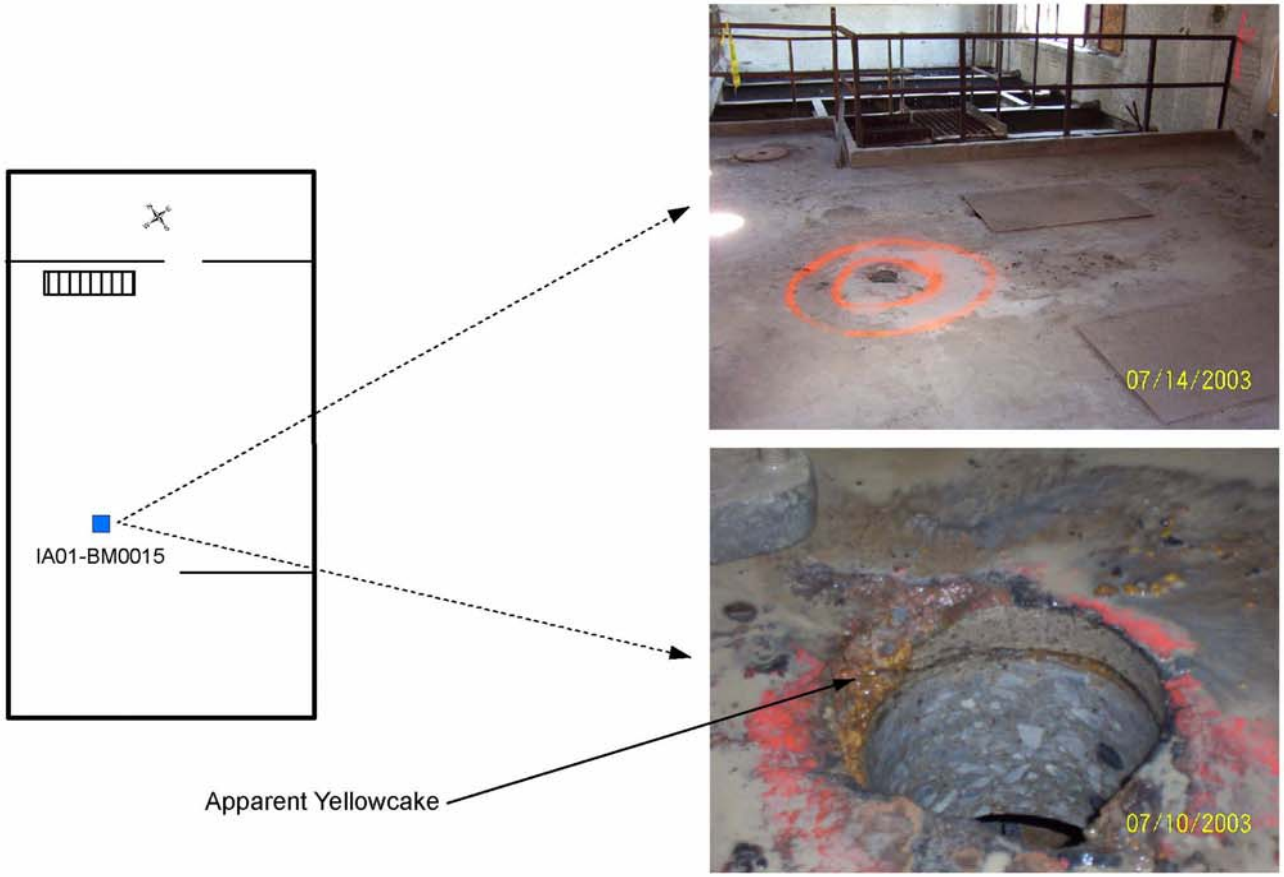
NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-12
	DRAWING TITLE: Figure 6-12. Garage Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	

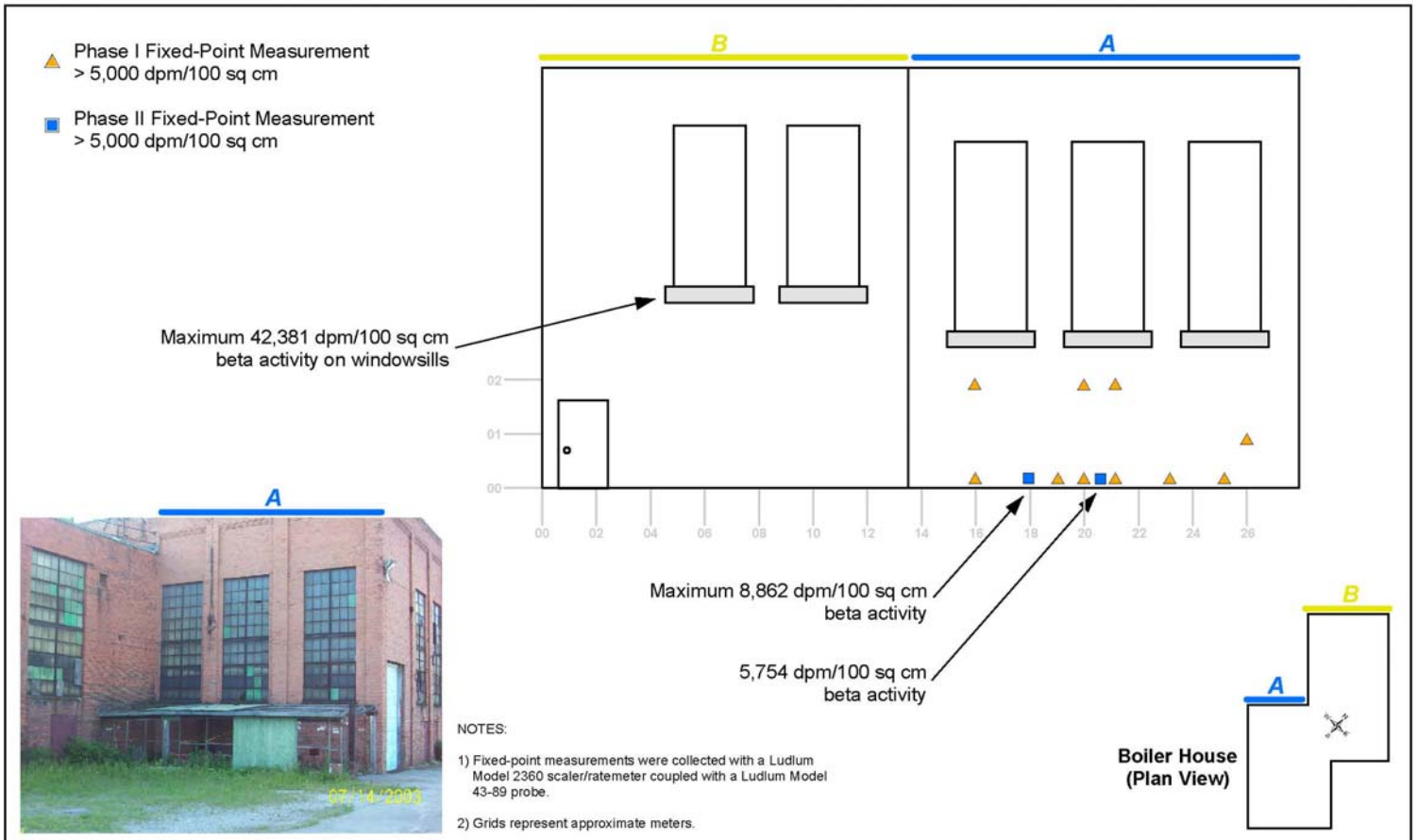


NOTES:
Fixed-point beta measurements were performed with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 10/17/08	6-13
	DRAWING TITLE: Figure 6-13. Scale House Building Survey Activity Histogram		CHECKED BY: JG 10/17/08	



SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	Not To Scale	DRAWN BY: JDV 5/7/08	6-14
	DRAWING TITLE: Figure 6-14. Building G-1 East Structure Floor Sample		CHECKED BY: JG 5/7/08	

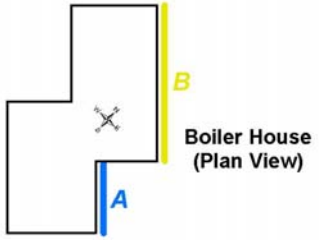


NOTES:

1) Fixed-point measurements were collected with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

2) Grids represent approximate meters.

SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	Not To Scale	DRAWN BY: JDV 10/17/08	6-15
	DRAWING TITLE: Figure 6-15. Boiler House North Wall Elevated Activity		CHECKED BY: JG 10/17/08	



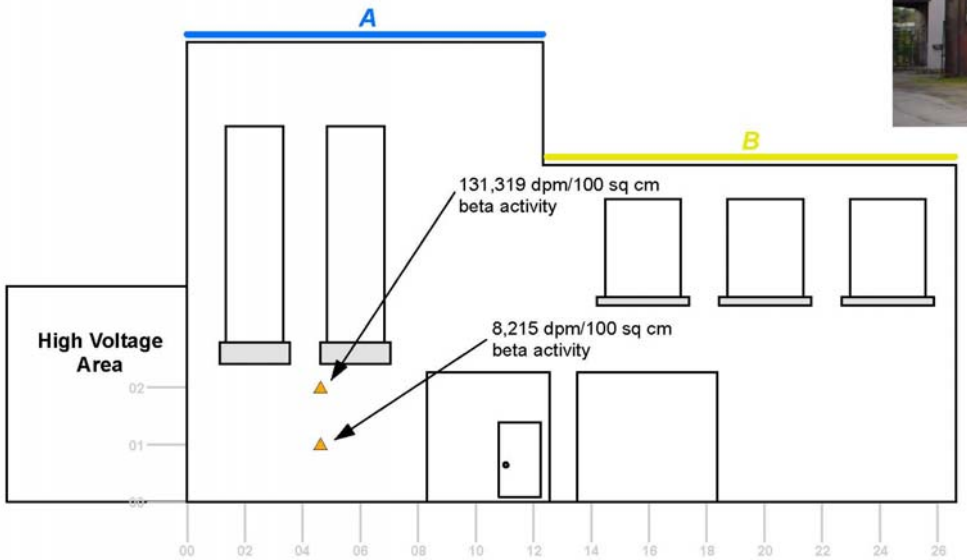
Boiler House
(Plan View)

NOTES:

1) Fixed-point measurements were collected with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

2) Grids represent approximate meters.

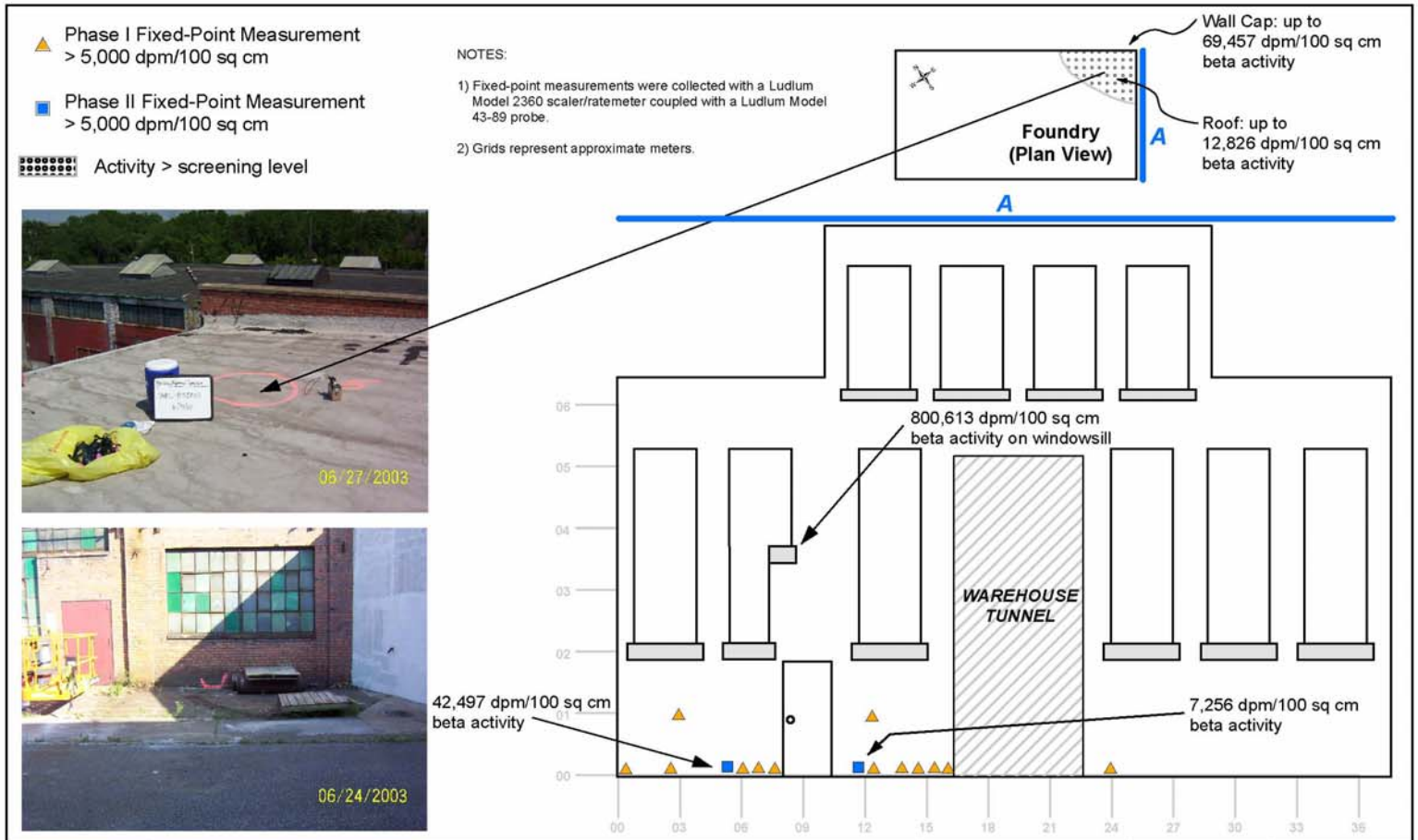
Maximum 7,344 dpm/100 sq cm
beta activity (scan follow-up)



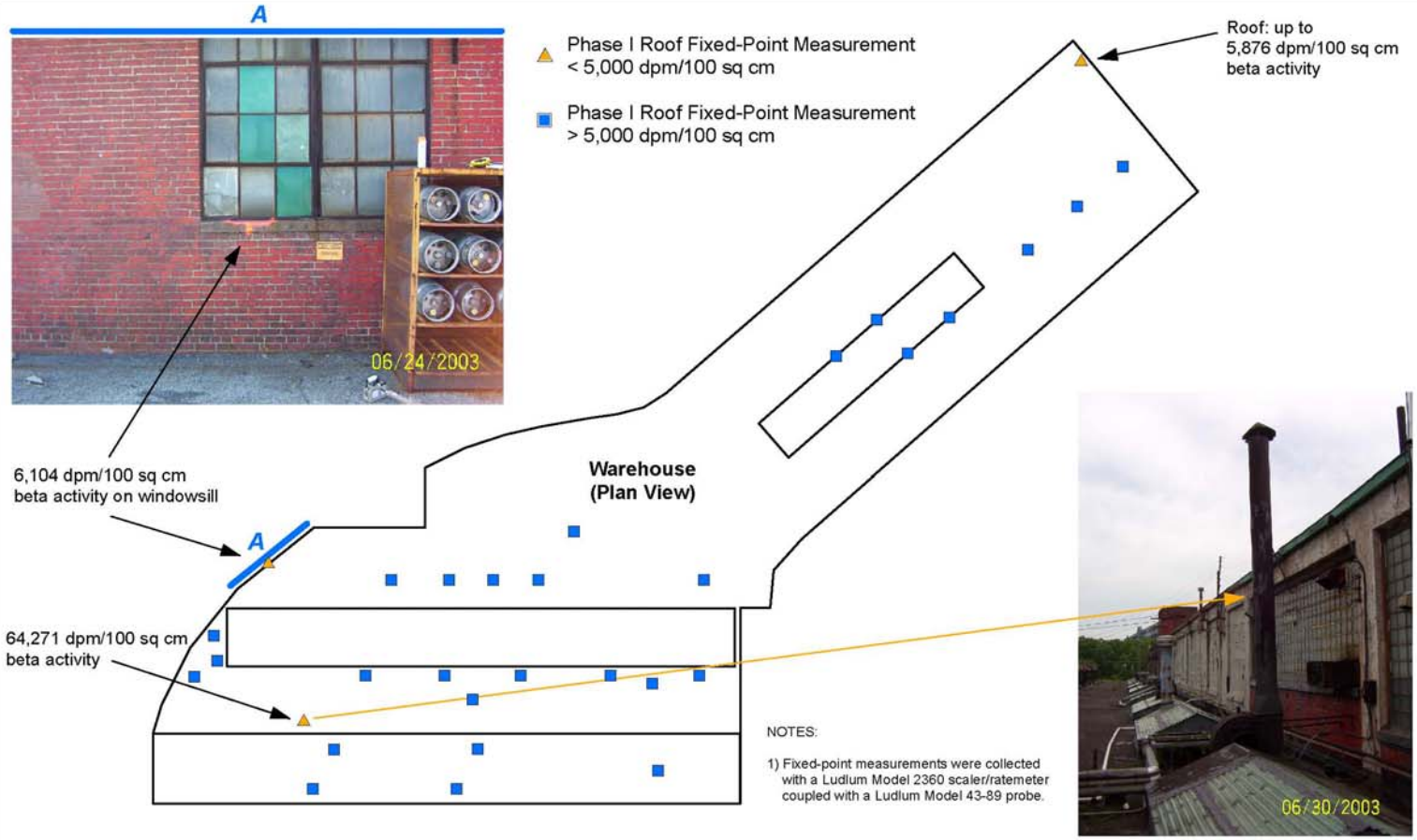
Phase I Fixed-Point Measurement
> 5,000 dpm/100 sq cm

Phase II Fixed-Point Measurement
> 5,000 dpm/100 sq cm

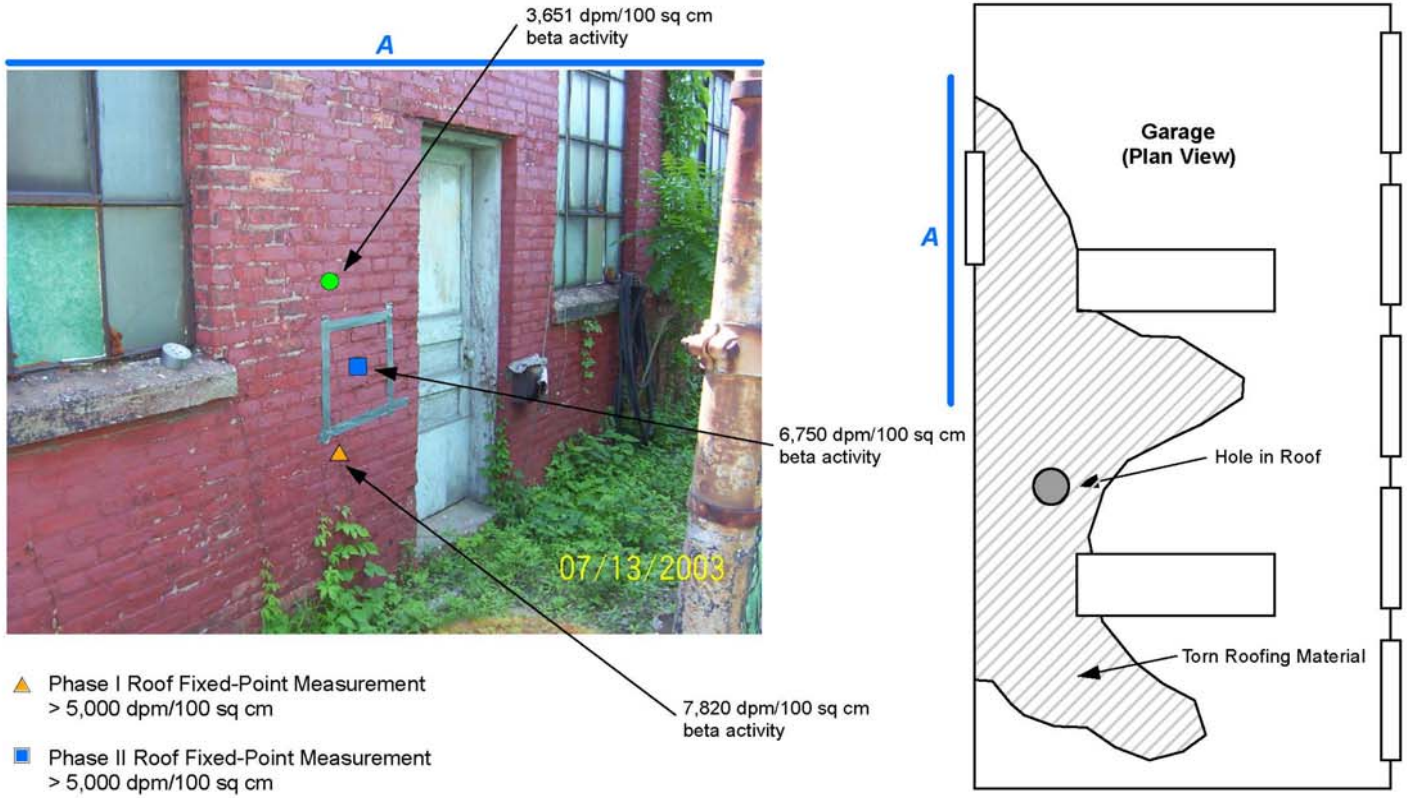
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	Not To Scale	DRAWN BY: JDV 10/17/08	6-16
	DRAWING TITLE: Figure 6-16. Boiler House East Wall Elevated Activity		CHECKED BY: JG 10/17/08	



SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	Not To Scale	DRAWN BY: JDV 10/17/08	6-17
	DRAWING TITLE: Figure 6-17. Foundry Roof and East Wall Elevated Activity		CHECKED BY: JG 10/17/08	



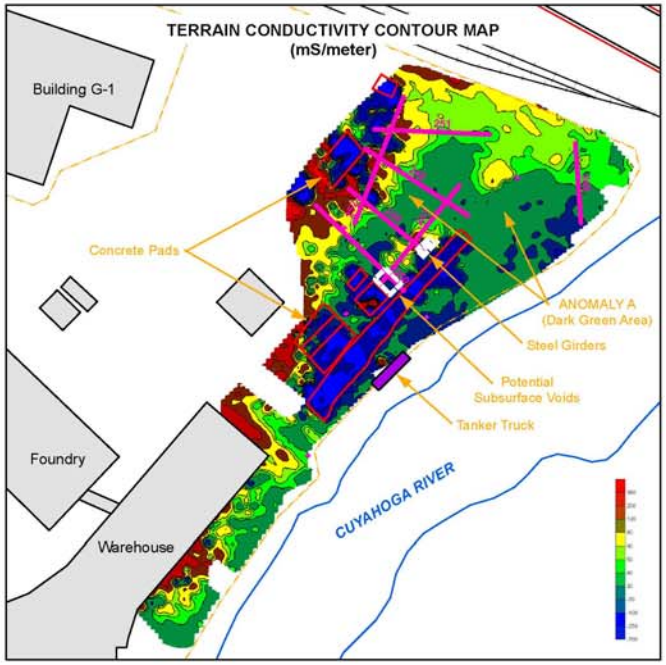
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: JDV 10/17/08	6-18
	DRAWING TITLE: Figure 6-18. Warehouse Roof and West Wall Areas of Elevated Activity		CHECKED BY: JG 10/17/08	

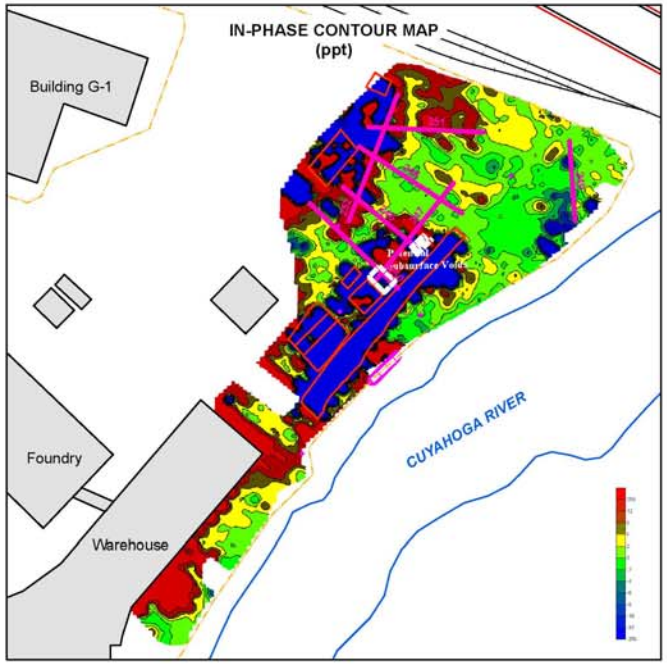


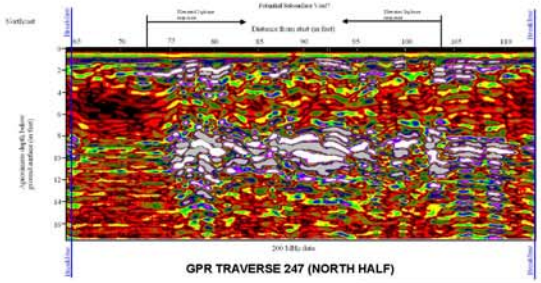
NOTES:

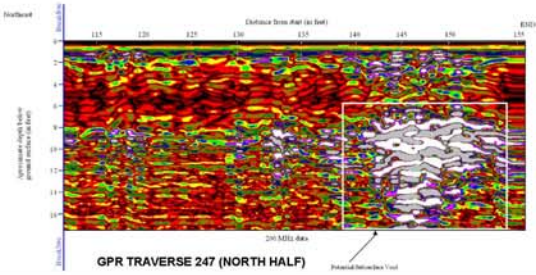
1) Fixed-point measurements were collected with a Ludlum Model 2360 scaler/ratemeter coupled with a Ludlum Model 43-89 probe.

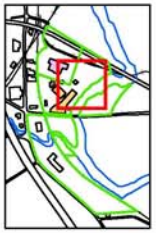
SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S Not To Scale	DRAWN BY: JDV 10/17/08	6-19
	DRAWING TITLE: Figure 6-19. Garage West Wall Area of Elevated Activity		CHECKED BY: JG 10/17/08	



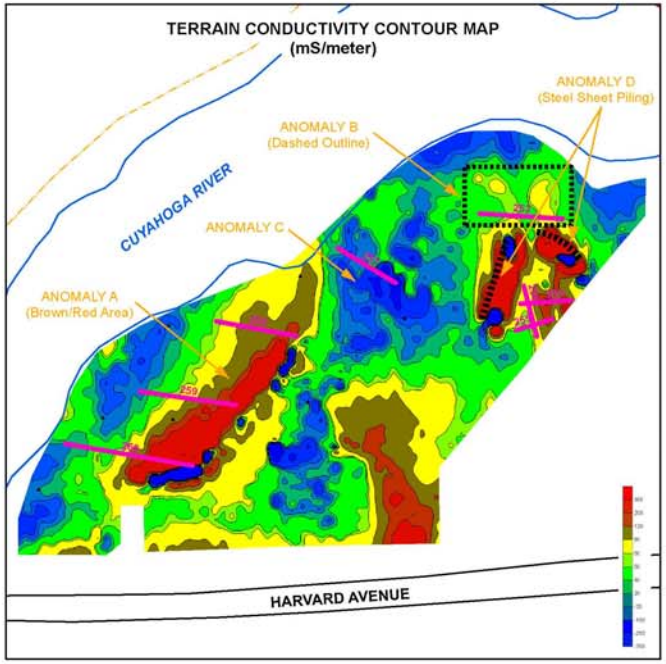


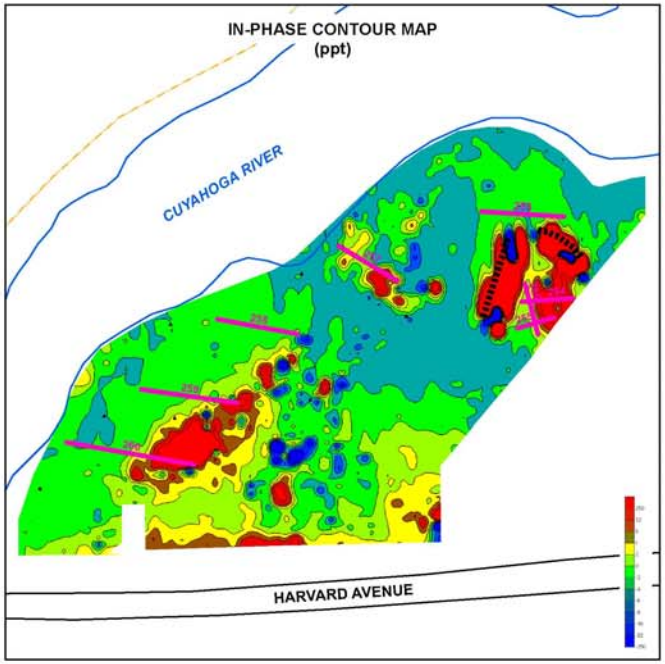


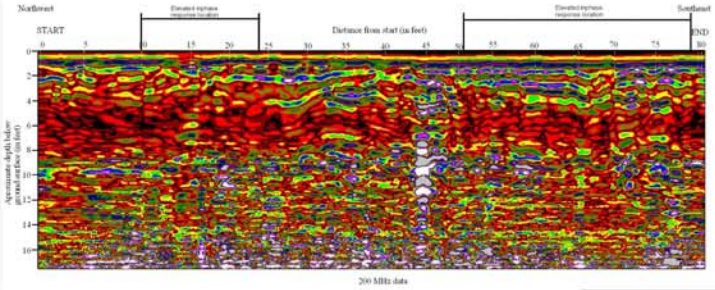




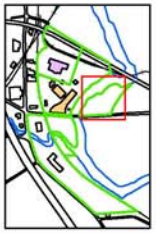
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 6-20. Geophysical Survey Results - IA04 EM31 and GPR	0 325 650 1,300 1,950 Feet	CHECKED BY: JG 5/9/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	6-20





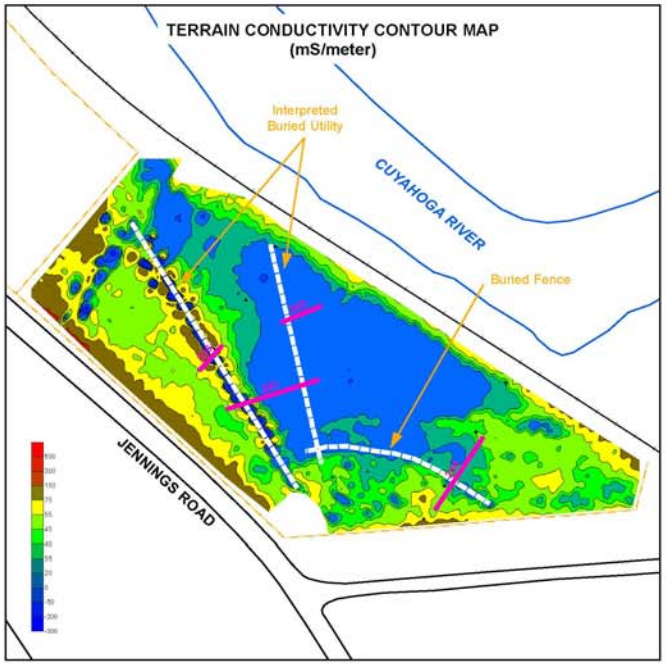


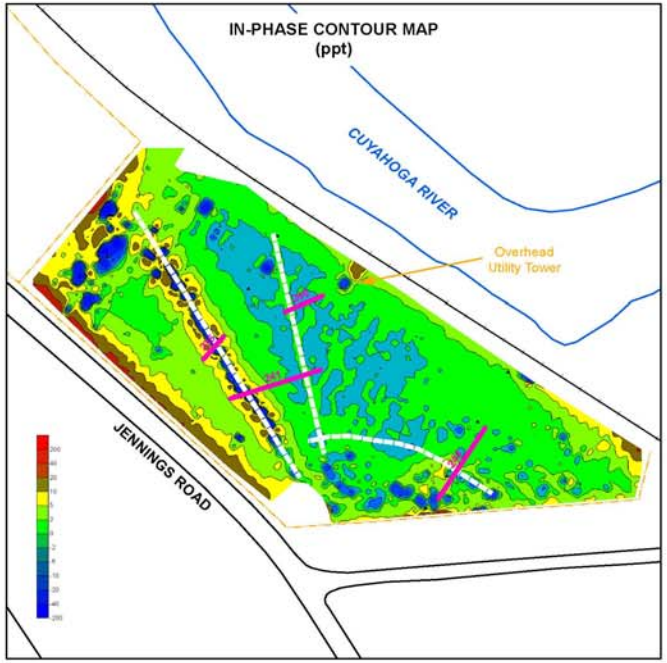
GPR TRAVERSE 257

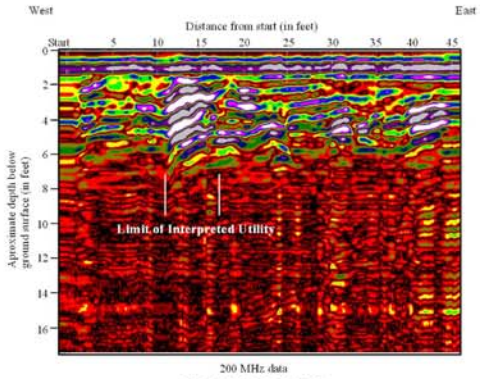


SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 320 640 1,280 1,920 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 6-21. Geophysical Survey Results - IA06 EM31 and GPR		CHECKED BY: JG 5/9/08

6-21



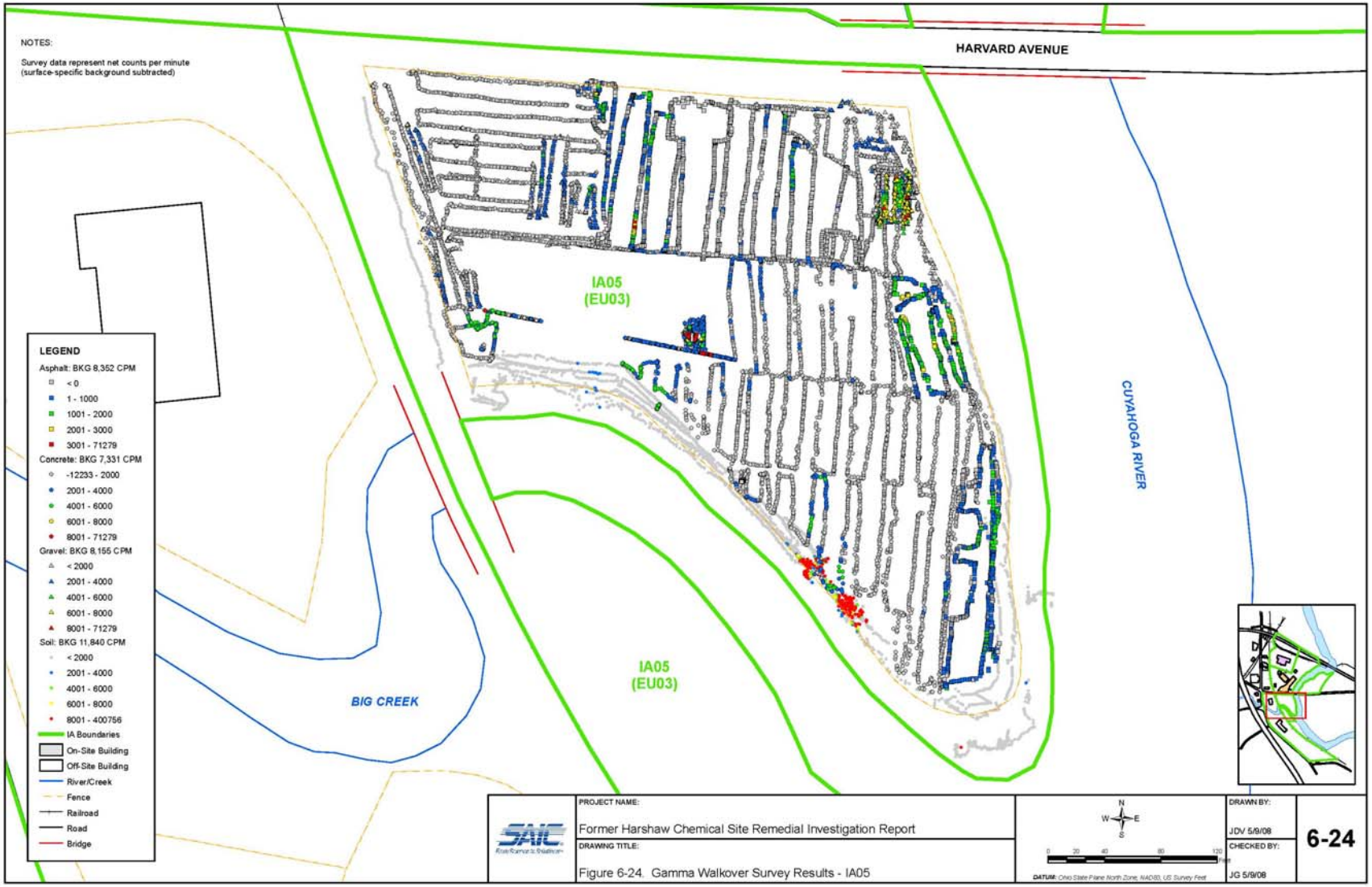


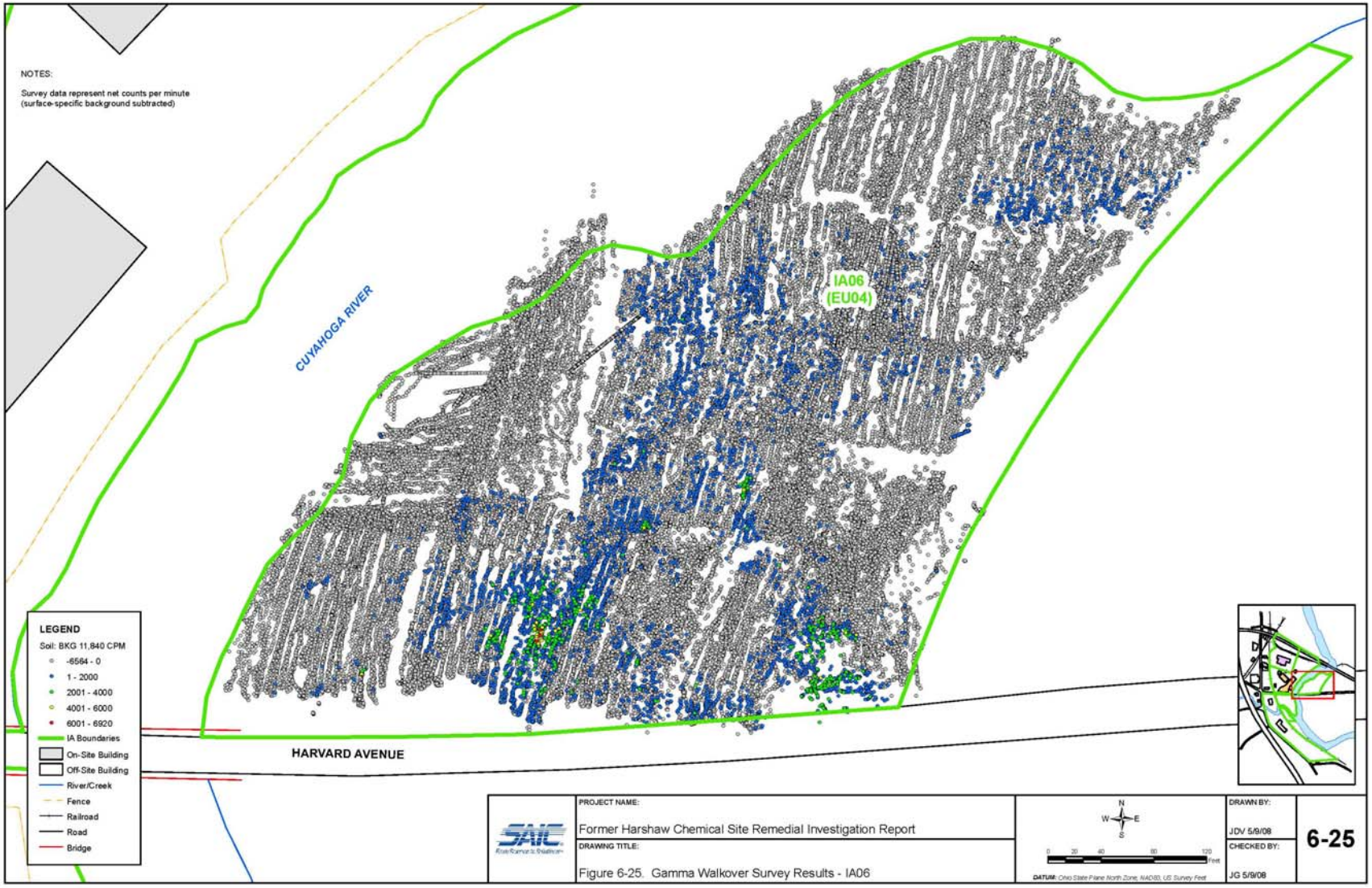


GPR TRAVERSE 235/237

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 325 650 1,300 1,950 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 5/9/08	6-22
	DRAWING TITLE: Figure 6-22. Geophysical Survey Results - IA07 EM31 and GPR		CHECKED BY: JG 5/9/08	

NOTES:
Survey data represent net counts per minute (surface-specific background subtracted)
LEGEND
Asphalt: BKG 8,352 CPM
< 2000
2001 - 4000
4001 - 6000
6001 - 8000
8001 - 127469
Concrete: BKG 7,331 CPM
< 2000
2001 - 4000
4001 - 6000
6001 - 8000
8001 - 50968
Gravel: BKG 8,155 CPM
< 1000
1001 - 3000
3001 - 5000
5001 - 7000
7001 - 30836
Soil: BKG 11,840 CPM
< 0
1 - 2000
2001 - 4000
4001 - 6000
6001 - 6092
Gravel: BKG 7,654 CPM
< 1000
1001 - 3000
3001 - 5000
5001 - 7000
7001 - 6233
Soil/Gravel: BKG 8,339 CPM
< 0
0 - 2000
2001 - 4000
4001 - 6000
6001 - 28798
IA Boundaries
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
IA03 (EU01)
IA04 (EU02)
IA04 (EU02)
IA06 (EU04)
CUYAHOGA RIVER
CUYAHOGA RIVER
JENNINGS ROAD
HARVARD AVENUE
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-23. Gamma Walkover Survey Results - IA03 and IA04
N
W
E
S
0 50 100 200 300 Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 5/9/08
CHECKED BY:
JG 5/9/08
6-23


NOTES:
Survey data represent net counts per minute (surface-specific background subtracted)
HARVARD AVENUE
CUYAHOGA RIVER
BIG CREEK
IA05 (EU03)
IA05 (EU03)
LEGEND
Asphalt: BKG 8,352 CPM
< 0
1 - 1000
1001 - 2000
2001 - 3000
3001 - 71279
Concrete: BKG 7,331 CPM
-12233 - 2000
2001 - 4000
4001 - 6000
6001 - 8000
8001 - 71279
Gravel: BKG 8,155 CPM
< 2000
2001 - 4000
4001 - 6000
6001 - 8000
8001 - 71279
Soil: BKG 11,840 CPM
< 2000
2001 - 4000
4001 - 6000
6001 - 8000
8001 - 400756
IA Boundaries
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-24. Gamma Walkover Survey Results - IA05
N
W
E
S
0 20 40 80 120 Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 5/9/08
CHECKED BY:
JG 5/9/08
6-24

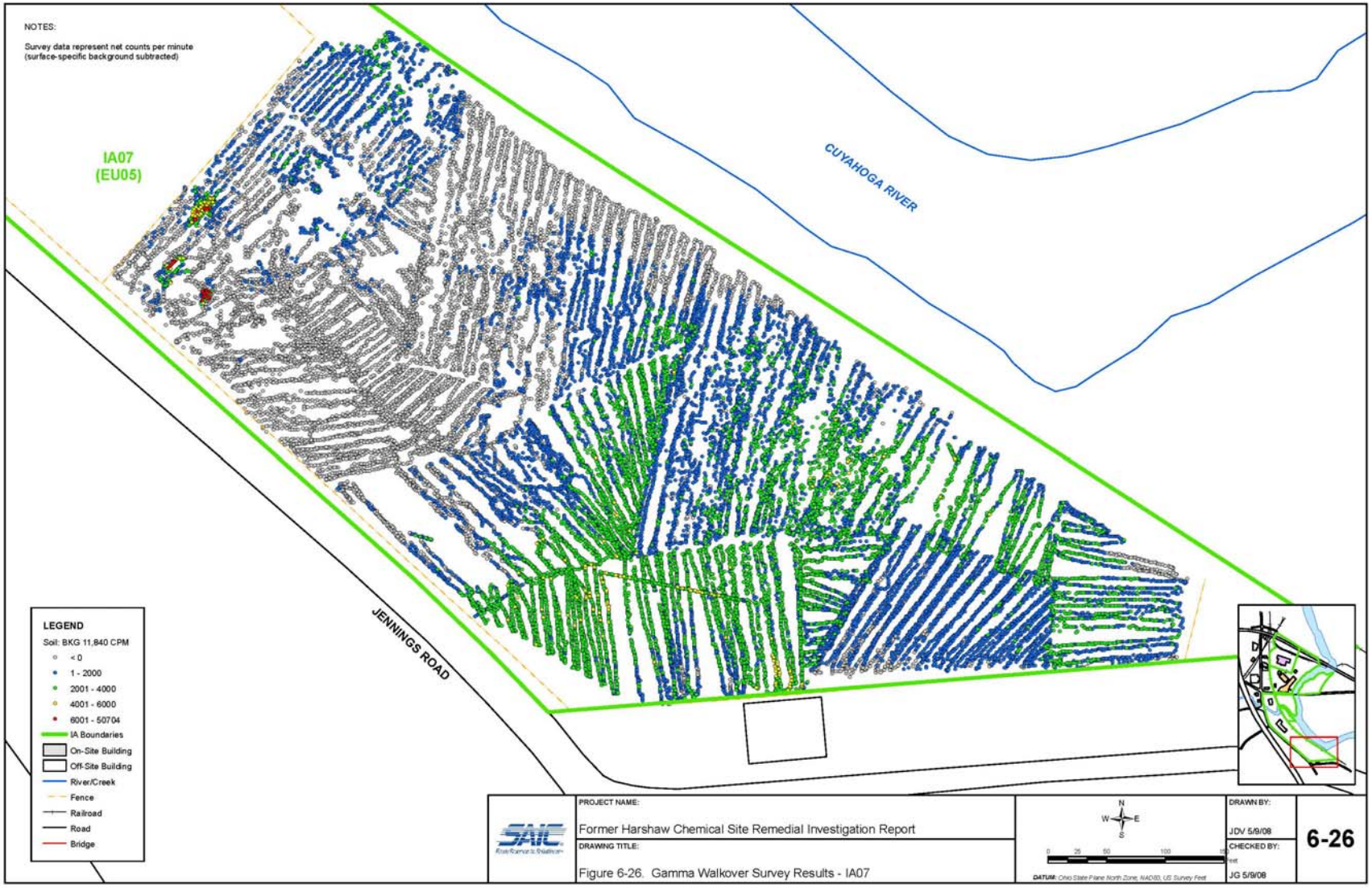


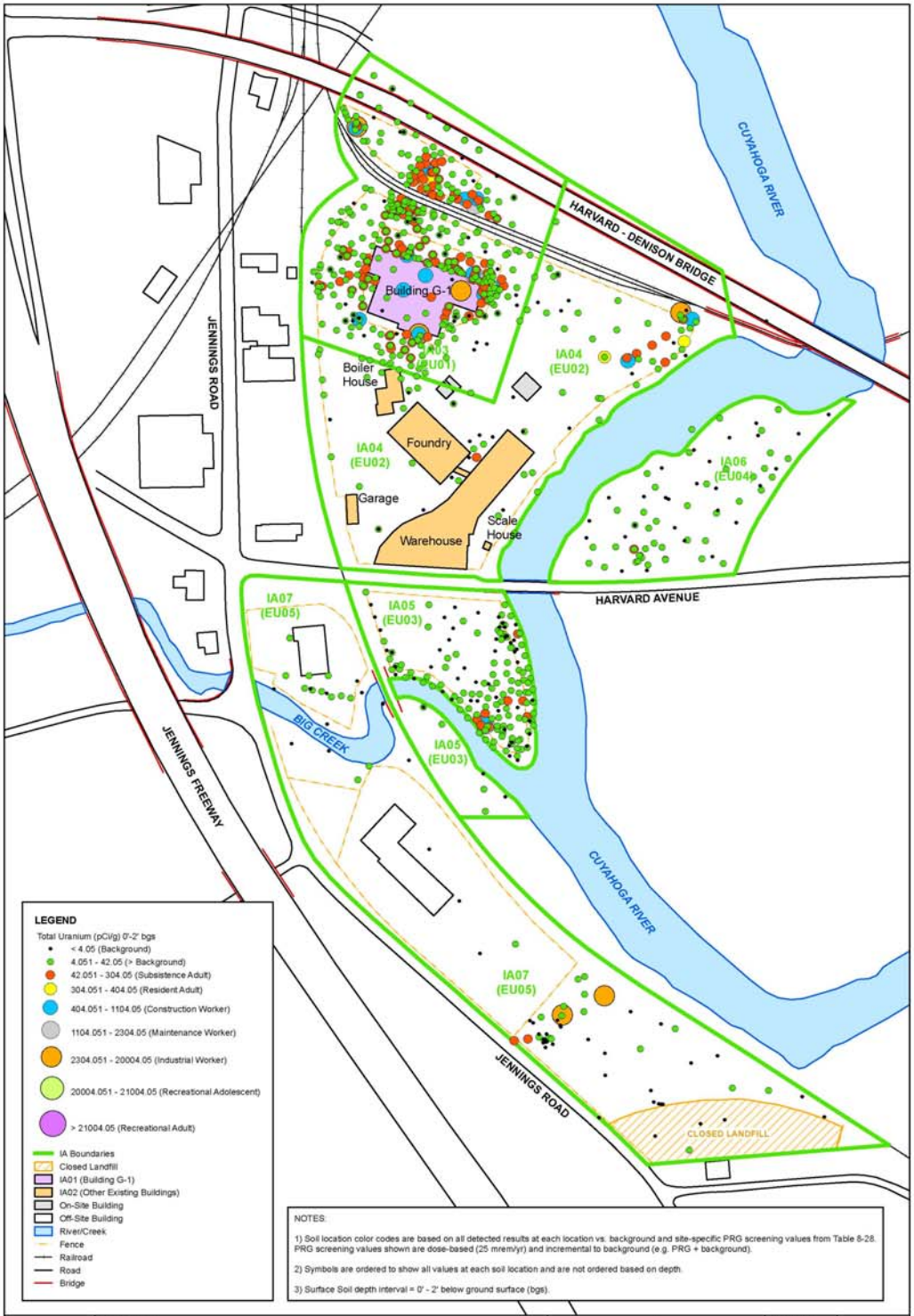
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report

DRAWING TITLE:
Figure 6-25. Gamma Walkover Survey Results - IA06

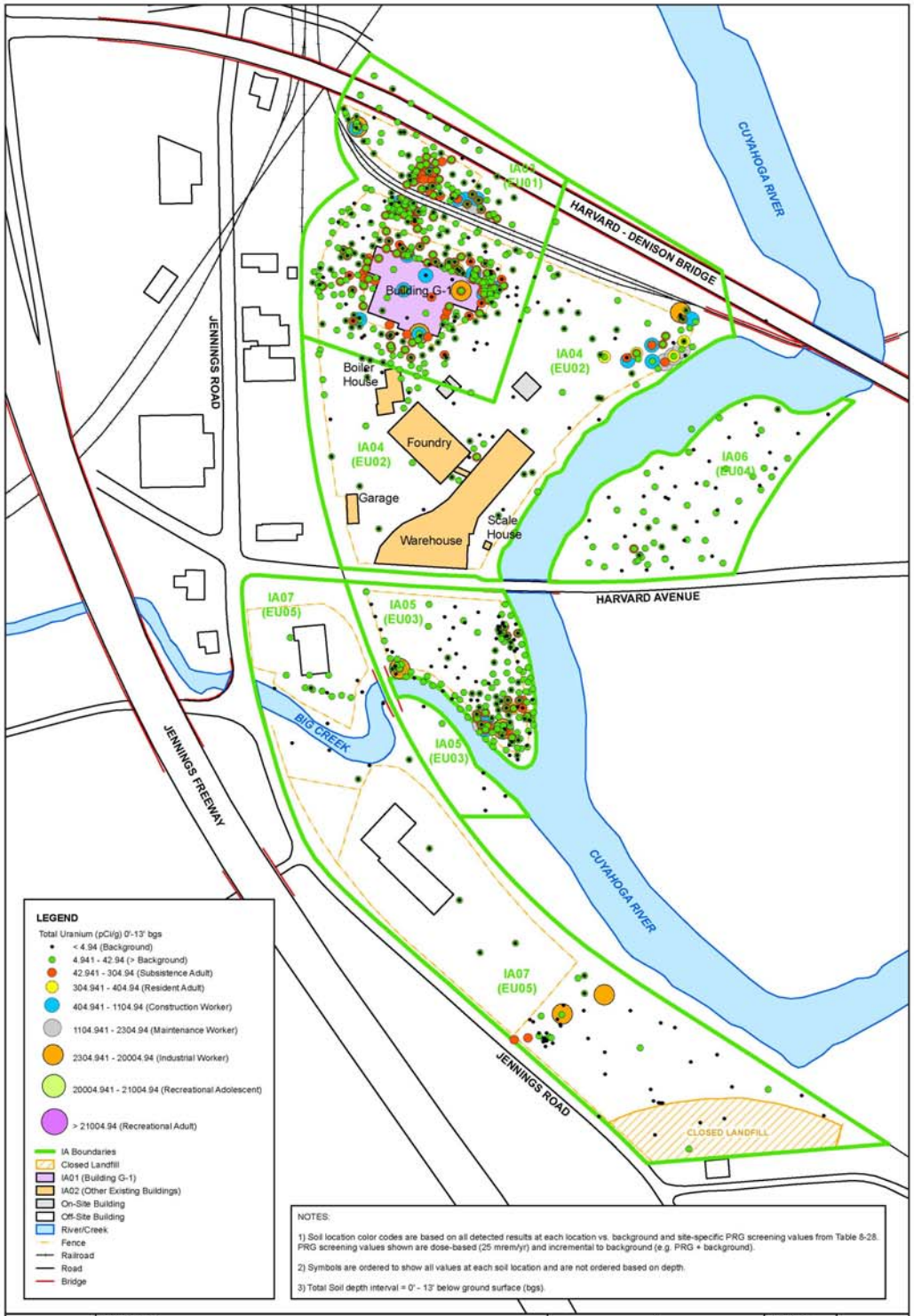
DRAWN BY: JDV 5/9/08
CHECKED BY: JG 5/9/08

6-25


NOTES:
Survey data represent net counts per minute (surface-specific background subtracted)
IA07 (EU05)
CUYAHOGA RIVER
JENNINGS ROAD
LEGEND
Soil: BKG 11,840 CPM
< 0
1 - 2000
2001 - 4000
4001 - 6000
6001 - 50704
IA Boundaries
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-26. Gamma Walkover Survey Results - IA07
N
W
E
S
0 25 50 100 150
Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 5/9/08
CHECKED BY:
JG 5/9/08
6-26



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 70 140 280 420 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 9/24/08
	DRAWING TITLE: Figure 6-27. Sitewide Soil PRG Screening: Surface Soil Total Uranium		CHECKED BY: JG 9/24/08
			6-27



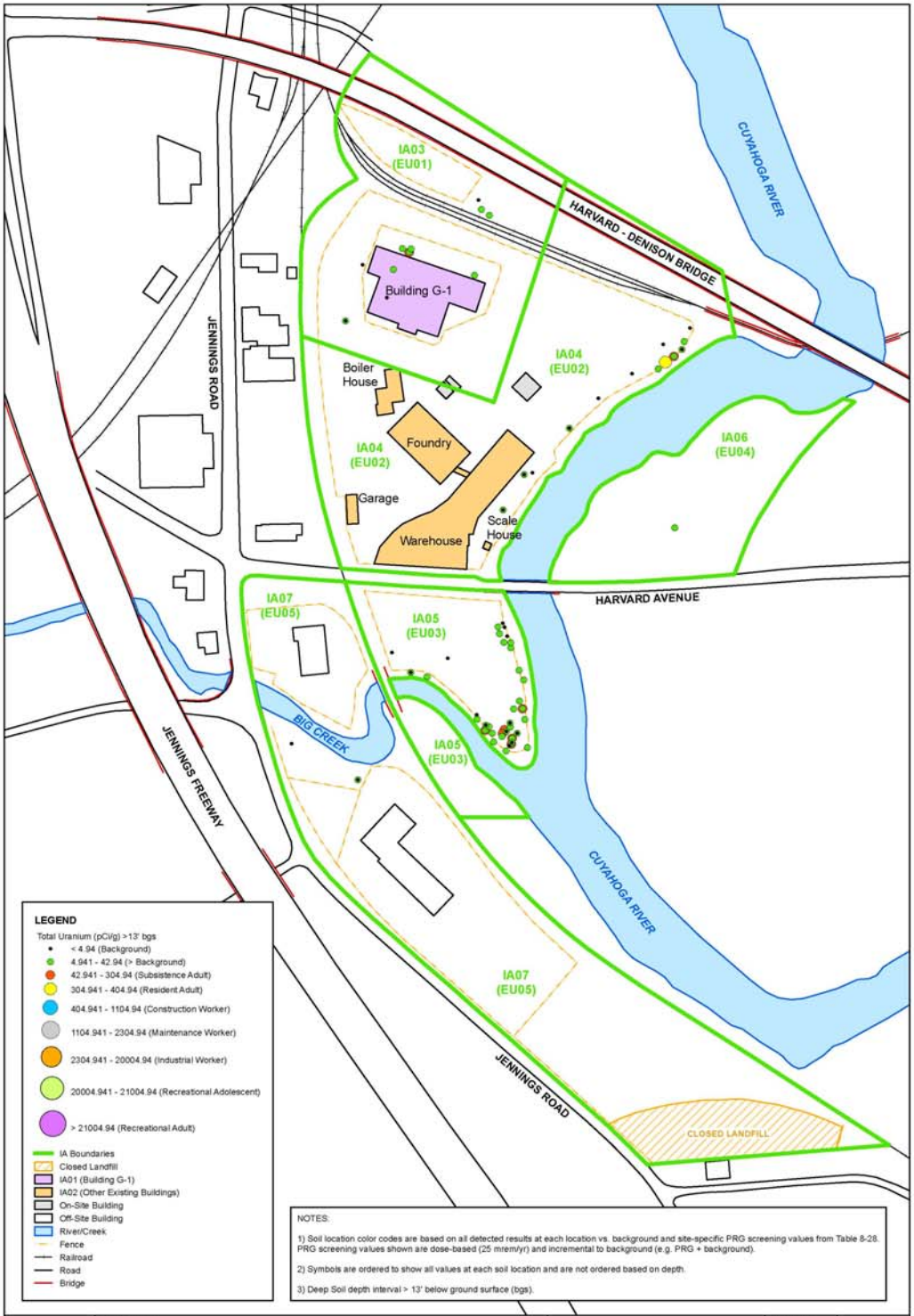
NOTES:

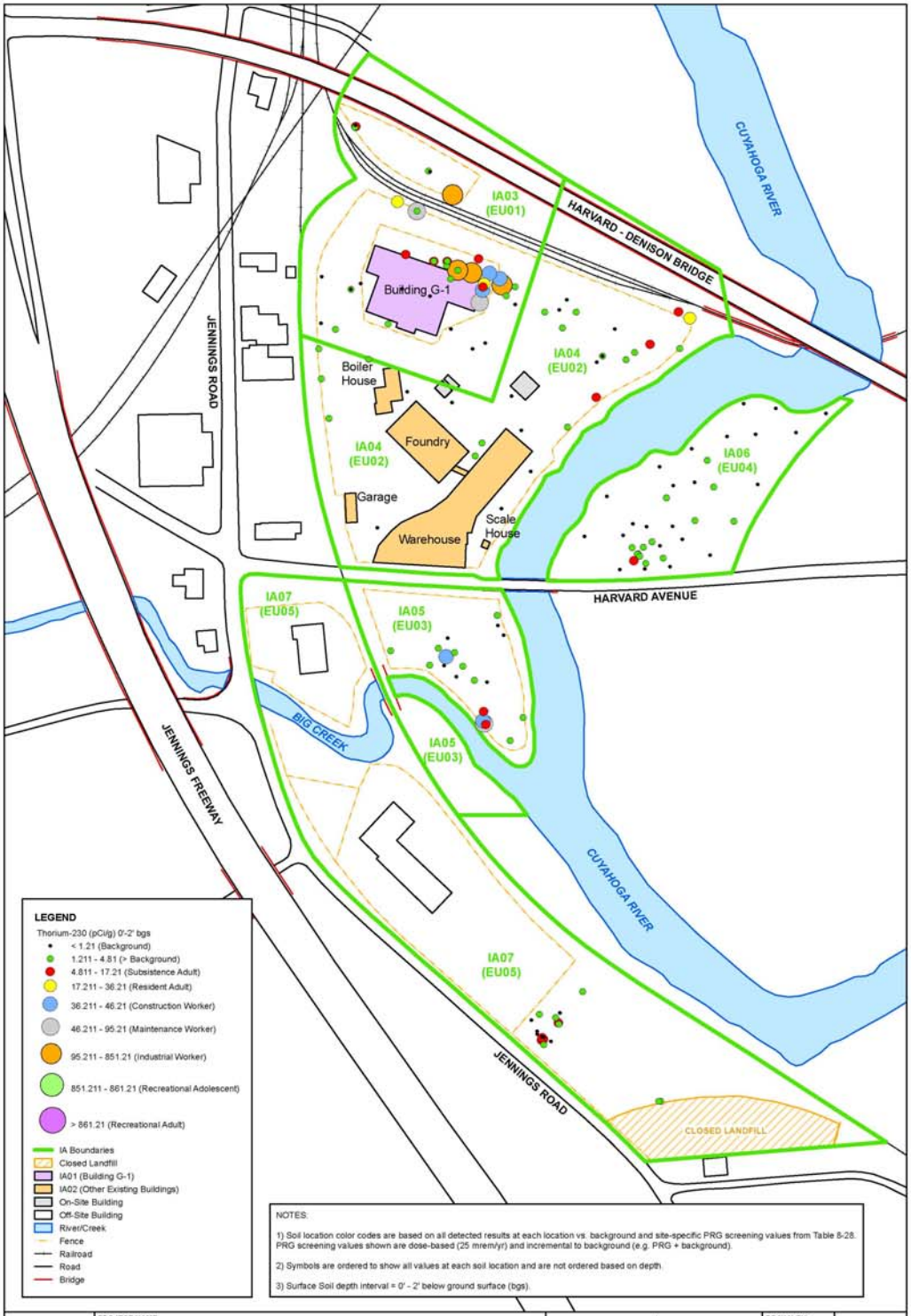
1) Soil location color codes are based on all detected results at each location vs. background and site-specific PRG screening values from Table 8-28. PRG screening values shown are dose-based (25 mrem/yr) and incremental to background (e.g. PRG + background).

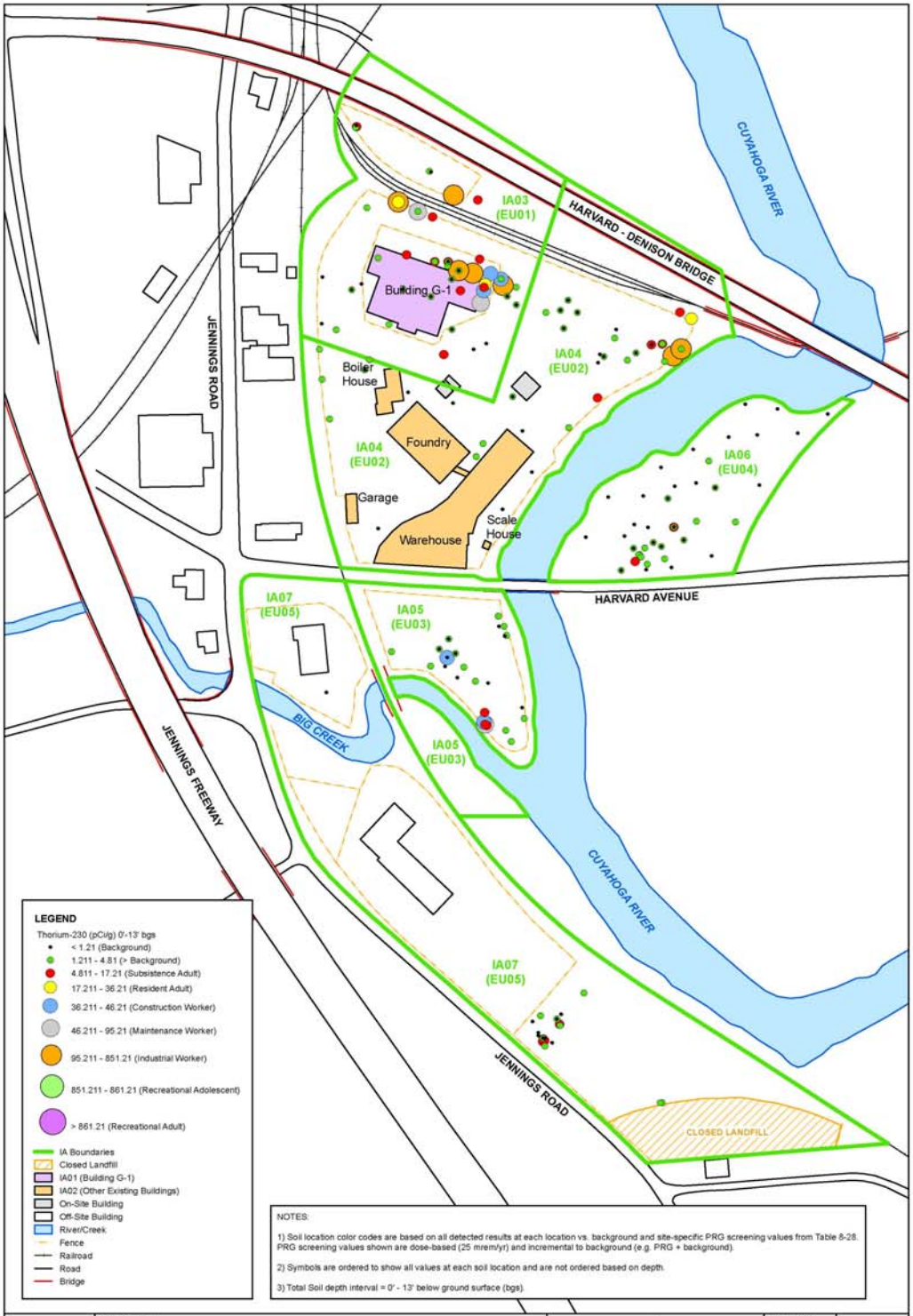
2) Symbols are ordered to show all values at each soil location and are not ordered based on depth.

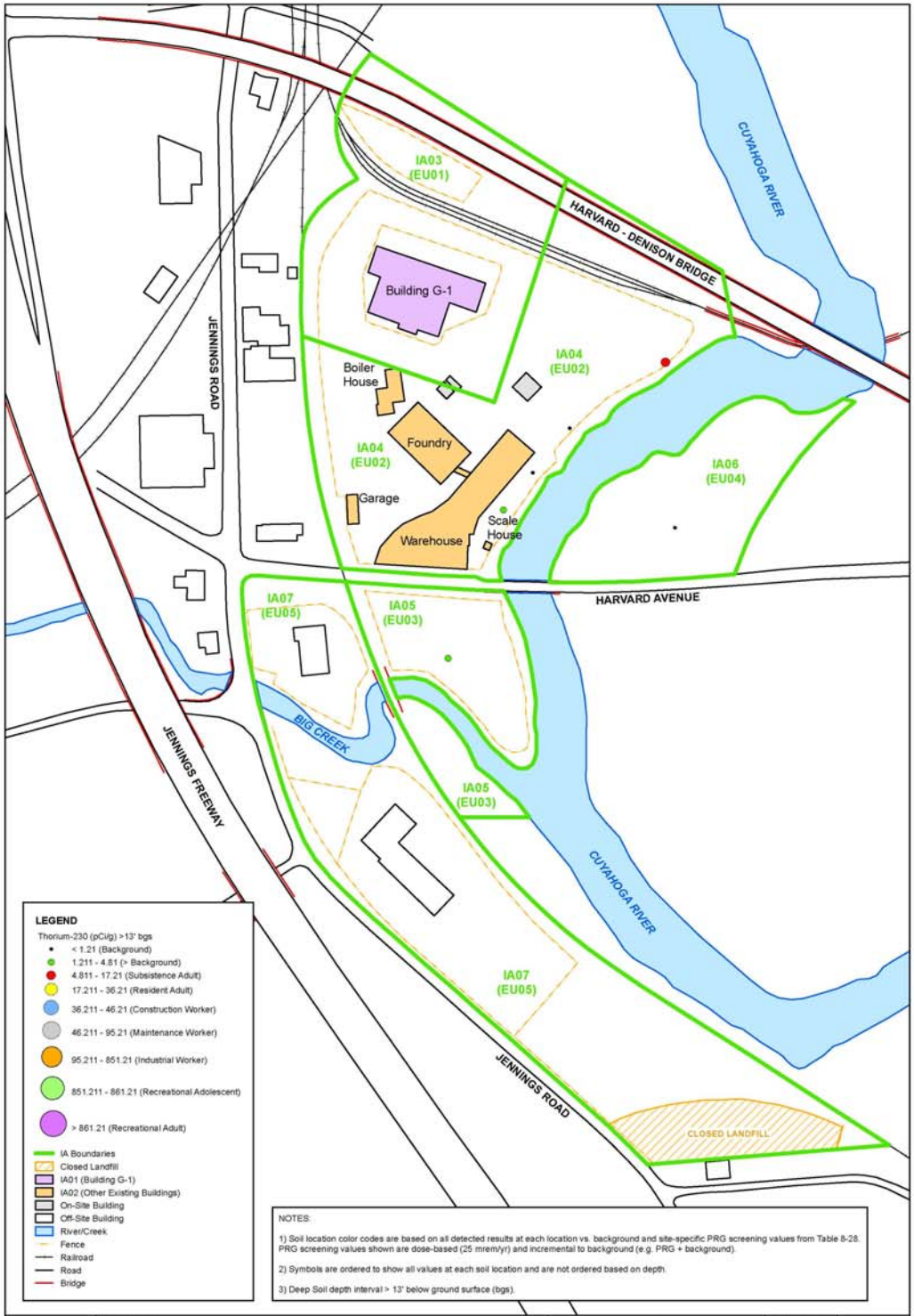
3) Total Soil depth interval = 0' - 13' below ground surface (bgs).

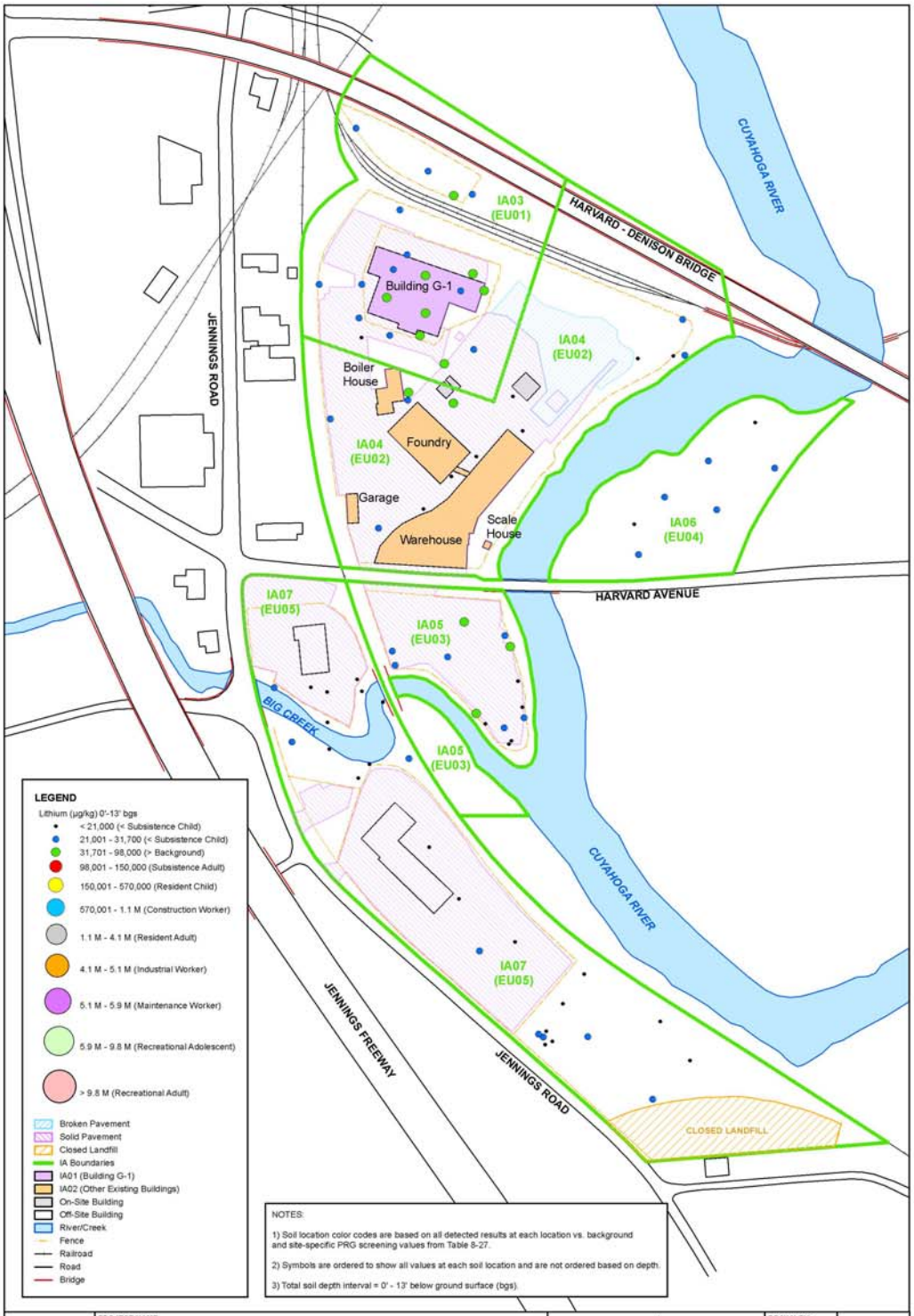
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 9/24/08
	DRAWING TITLE: Figure 6-28. Sitewide Soil PRG Screening: Total Soil Total Uranium	0 70 140 280 420 Feet	CHECKED BY: JG 9/24/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	6-28


IA03
(EU01)
HARVARD - DENISON BRIDGE
CUYAHOGA RIVER
Building G-1
JENNINGS ROAD
IA04
(EU02)
Boiler
House
Foundry
IA04
(EU02)
IA06
(EU04)
Garage
Scale
House
Warehouse
HARVARD AVENUE
IA07
(EU05)
IA05
(EU03)
BIG CREEK
IA05
(EU03)
JENNINGS FREEWAY
CUYAHOGA RIVER
IA07
(EU05)
JENNINGS ROAD
CLOSED LANDFILL
LEGEND
Total Uranium (pCi/g) >13' bgs
< 4.94 (Background)
4.941 - 42.94 (> Background)
42.941 - 304.94 (Subsistence Adult)
304.941 - 404.94 (Resident Adult)
404.941 - 1104.94 (Construction Worker)
1104.941 - 2304.94 (Maintenance Worker)
2304.941 - 20004.94 (Industrial Worker)
20004.941 - 21004.94 (Recreational Adolescent)
> 21004.94 (Recreational Adult)
IA Boundaries
Closed Landfill
IA01 (Building G-1)
IA02 (Other Existing Buildings)
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
NOTES:
1) Soil location color codes are based on all detected results at each location vs. background and site-specific PRG screening values from Table 8-28. PRG screening values shown are dose-based (25 mrem/yr) and incremental to background (e.g. PRG + background).
2) Symbols are ordered to show all values at each soil location and are not ordered based on depth.
3) Deep Soil depth interval > 13' below ground surface (bgs).
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-29. Sitewide Soil Background Screening: Deep Soil Total Uranium
N
W
E
S
0 70 140 280 420
Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 9/24/08
CHECKED BY:
JG 9/24/08
6-29

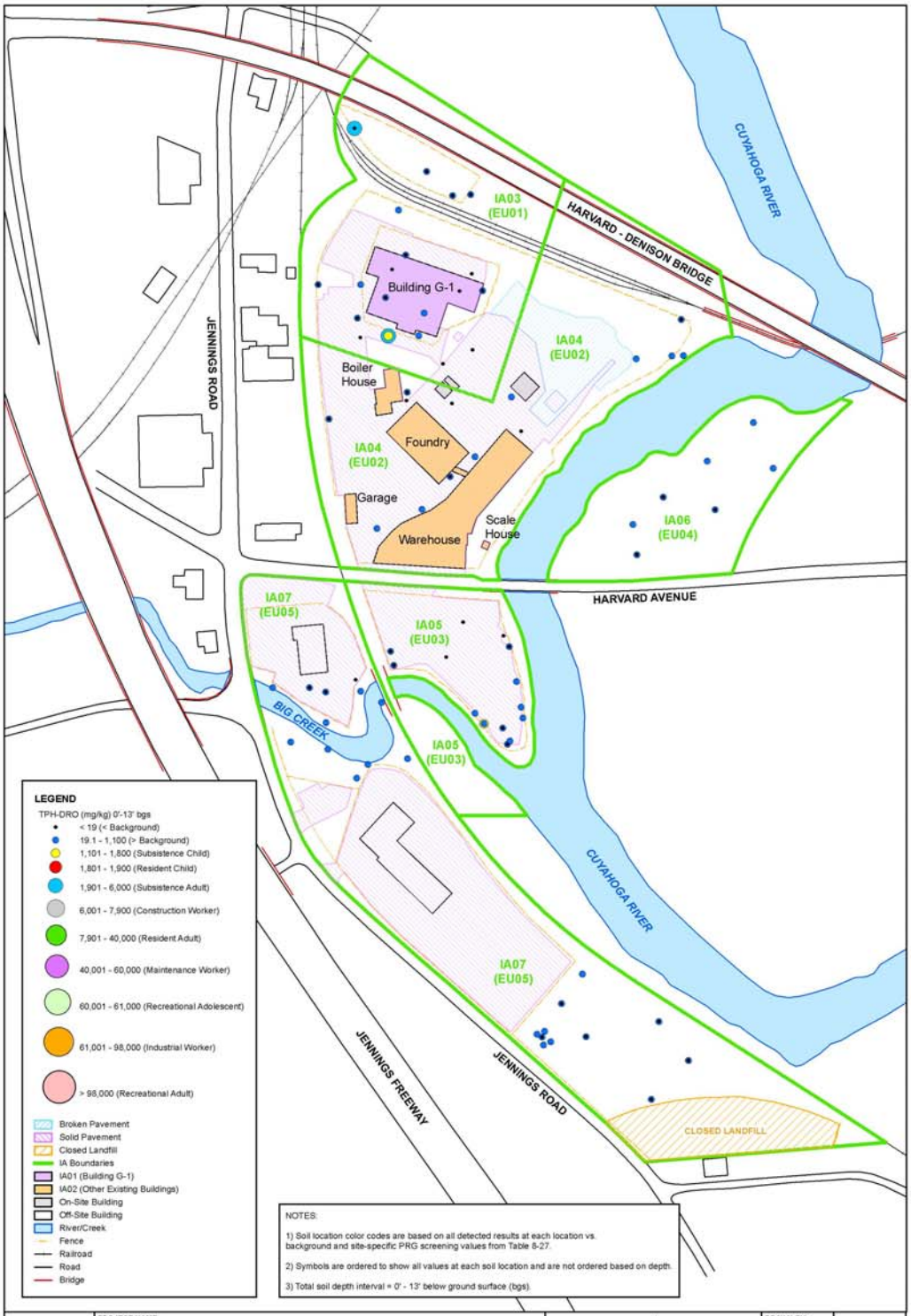

CUYAHOGA RIVER
HARVARD - DENISON BRIDGE
IA03 (EU01)
Building G-1
JENNINGS ROAD
IA04 (EU02)
Boiler House
Foundry
IA04 (EU02)
Garage
Warehouse
Scale House
IA06 (EU04)
HARVARD AVENUE
IA07 (EU05)
IA05 (EU03)
BIG CREEK
IA05 (EU03)
JENNINGS FREEWAY
CUYAHOGA RIVER
IA07 (EU05)
JENNINGS ROAD
CLOSED LANDFILL
LEGEND
Thorium-230 (pCi/g) 0'-2' bgs
< 1.21 (Background)
1.211 - 4.81 (> Background)
4.811 - 17.21 (Subsistence Adult)
17.211 - 36.21 (Resident Adult)
36.211 - 46.21 (Construction Worker)
46.211 - 95.21 (Maintenance Worker)
95.211 - 851.21 (Industrial Worker)
851.211 - 861.21 (Recreational Adolescent)
> 861.21 (Recreational Adult)
IA Boundaries
Closed Landfill
IA01 (Building G-1)
IA02 (Other Existing Buildings)
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
NOTES:
1) Soil location color codes are based on all detected results at each location vs. background and site-specific PRG screening values from Table 8-28. PRG screening values shown are dose-based (25 mrem/yr) and incremental to background (e.g. PRG + background).
2) Symbols are ordered to show all values at each soil location and are not ordered based on depth.
3) Surface Soil depth interval = 0' - 2' below ground surface (bgs).
SAIC
From Science to Solutions
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-30. Sitewide Soil PRG Screening: Surface Soil Thorium-230
N
W
E
S
0 70 140 280 420 Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 9/24/08
CHECKED BY:
JG 9/24/08
6-30


CUYAHOGA RIVER
HARVARD - DENISON BRIDGE
IA03 (EU01)
Building G-1
JENNINGS ROAD
IA04 (EU02)
Boiler House
Foundry
IA04 (EU02)
Garage
Warehouse
Scale House
IA06 (EU04)
HARVARD AVENUE
IA07 (EU05)
IA05 (EU03)
BIG CREEK
IA05 (EU03)
JENNINGS FREEWAY
CUYAHOGA RIVER
IA07 (EU05)
JENNINGS ROAD
CLOSED LANDFILL
LEGEND
Thorium-230 (pCi/g) 0'-13' bgs
< 1.21 (Background)
1.211 - 4.81 (> Background)
4.811 - 17.21 (Subsistence Adult)
17.211 - 36.21 (Resident Adult)
36.211 - 46.21 (Construction Worker)
46.211 - 95.21 (Maintenance Worker)
95.211 - 851.21 (Industrial Worker)
851.211 - 861.21 (Recreational Adolescent)
> 861.21 (Recreational Adult)
IA Boundaries
Closed Landfill
IA01 (Building G-1)
IA02 (Other Existing Buildings)
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
NOTES:
1) Soil location color codes are based on all detected results at each location vs. background and site-specific PRG screening values from Table 8-28. PRG screening values shown are dose-based (25 mrem/yr) and incremental to background (e.g. PRG + background).
2) Symbols are ordered to show all values at each soil location and are not ordered based on depth.
3) Total Soil depth interval = 0' - 13' below ground surface (bgs).
SAIC
From Science to Solutions
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-31. Sitewide Soil PRG Screening: Total Soil Thorium-230
N
W
E
S
0 70 140 280 420
Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 9/24/08
CHECKED BY:
JG 9/24/08
6-31

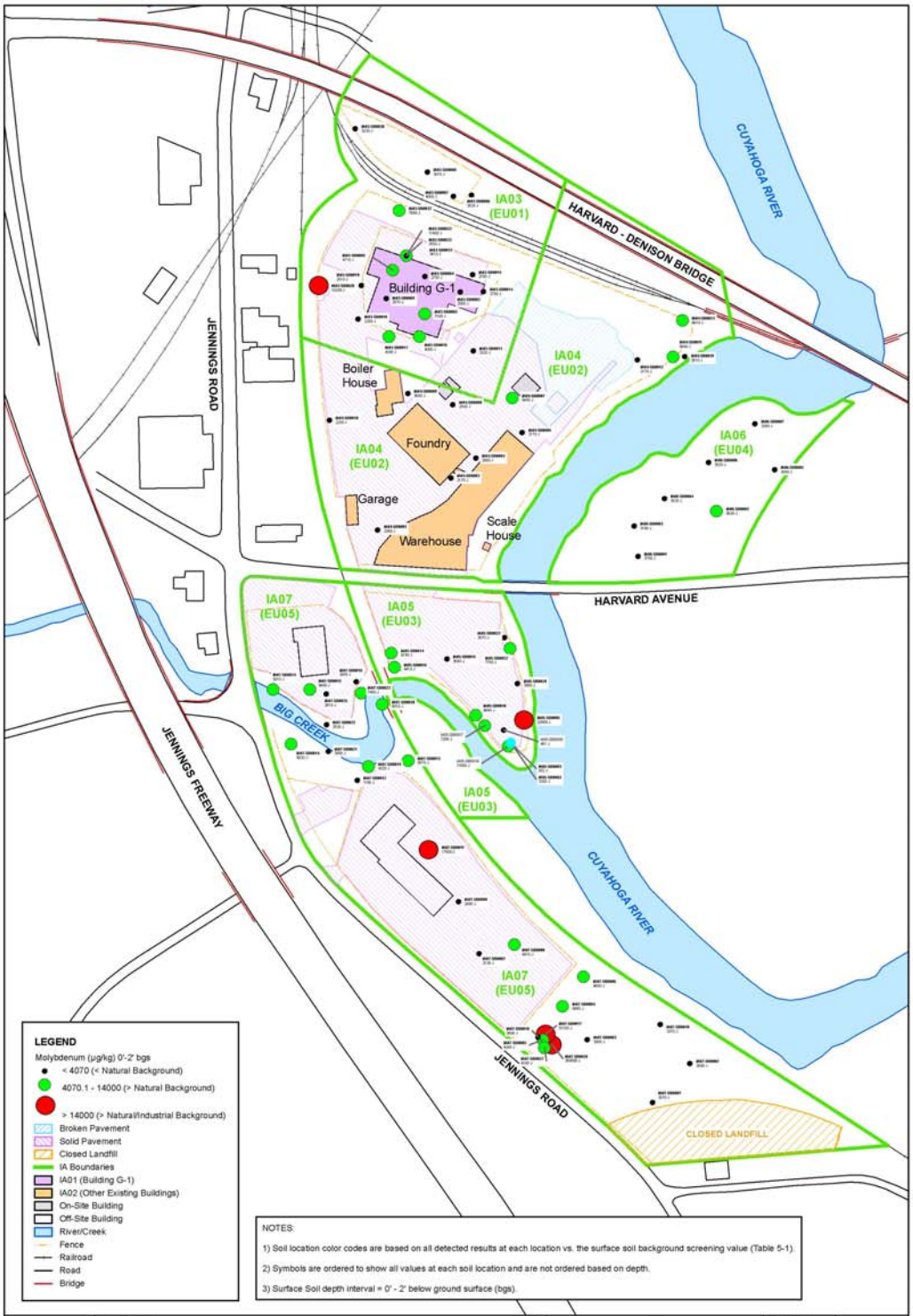

IA03
(EU01)
HARVARD - DENISON BRIDGE
CUYAHOGA RIVER
Building G-1
JENNINGS ROAD
IA04
(EU02)
Boiler
House
Foundry
IA04
(EU02)
IA06
(EU04)
Garage
Scale
House
Warehouse
HARVARD AVENUE
IA07
(EU05)
IA05
(EU03)
BIG CREEK
JENNINGS FREEWAY
IA05
(EU03)
CUYAHOGA RIVER
IA07
(EU05)
JENNINGS ROAD
CLOSED LANDFILL
LEGEND
Thorium-230 (pCi/g) >13' bgs
< 1.21 (Background)
1.211 - 4.81 (> Background)
4.811 - 17.21 (Subsistence Adult)
17.211 - 36.21 (Resident Adult)
36.211 - 46.21 (Construction Worker)
46.211 - 95.21 (Maintenance Worker)
95.211 - 851.21 (Industrial Worker)
851.211 - 861.21 (Recreational Adolescent)
> 861.21 (Recreational Adult)
IA Boundaries
Closed Landfill
IA01 (Building G-1)
IA02 (Other Existing Buildings)
On-Site Building
Off-Site Building
River/Creek
Fence
Railroad
Road
Bridge
NOTES:
1) Soil location color codes are based on all detected results at each location vs. background and site-specific PRG screening values from Table 8-28. PRG screening values shown are dose-based (25 mrem/yr) and incremental to background (e.g. PRG + background).
2) Symbols are ordered to show all values at each soil location and are not ordered based on depth.
3) Deep Soil depth interval > 13' below ground surface (bgs).
SAIC
From Science to Solutions
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report
DRAWING TITLE:
Figure 6-32. Sitewide Soil Background Screening: Deep Soil Thorium-230
N
W
E
S
0 70 140 280 420
Feet
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet
DRAWN BY:
JDV 9/24/08
CHECKED BY:
JG 9/24/08
6-32



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	DRAWN BY: JDV 11/24/08	6-33
	DRAWING TITLE: Figure 6-33. Sitewide Soil Background Screening: Lithium	CHECKED BY: JG 11/24/08	



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	DRAWN BY: JDV 11/24/08	6-34
	DRAWING TITLE: Figure 6-34. Sitewide Soil PRG Screening: TPH-DRO	CHECKED BY: JG 11/24/08	



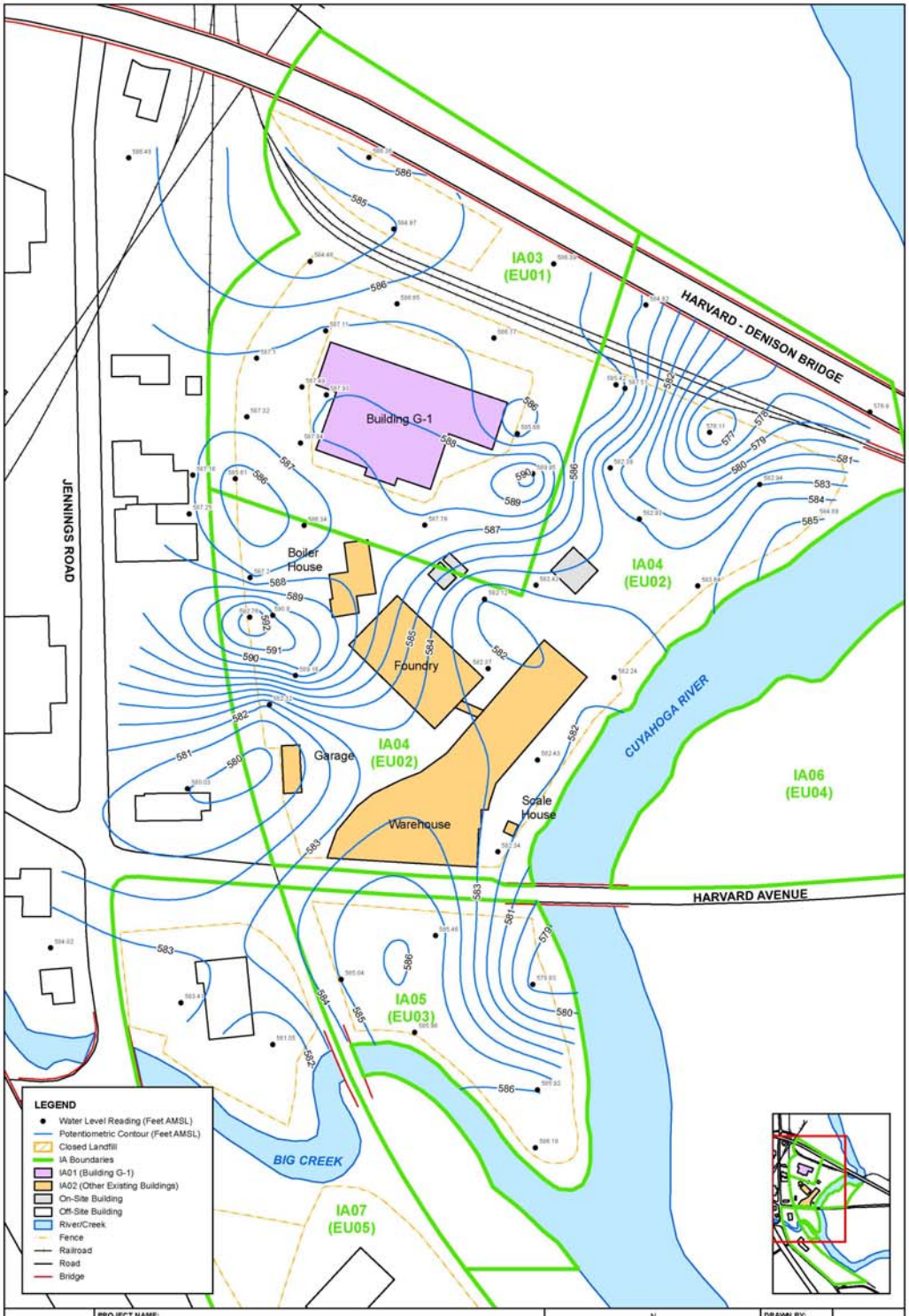
NOTES:

1) Soil location color codes are based on all detected results at each location vs. the surface soil background screening value (Table 5-1).

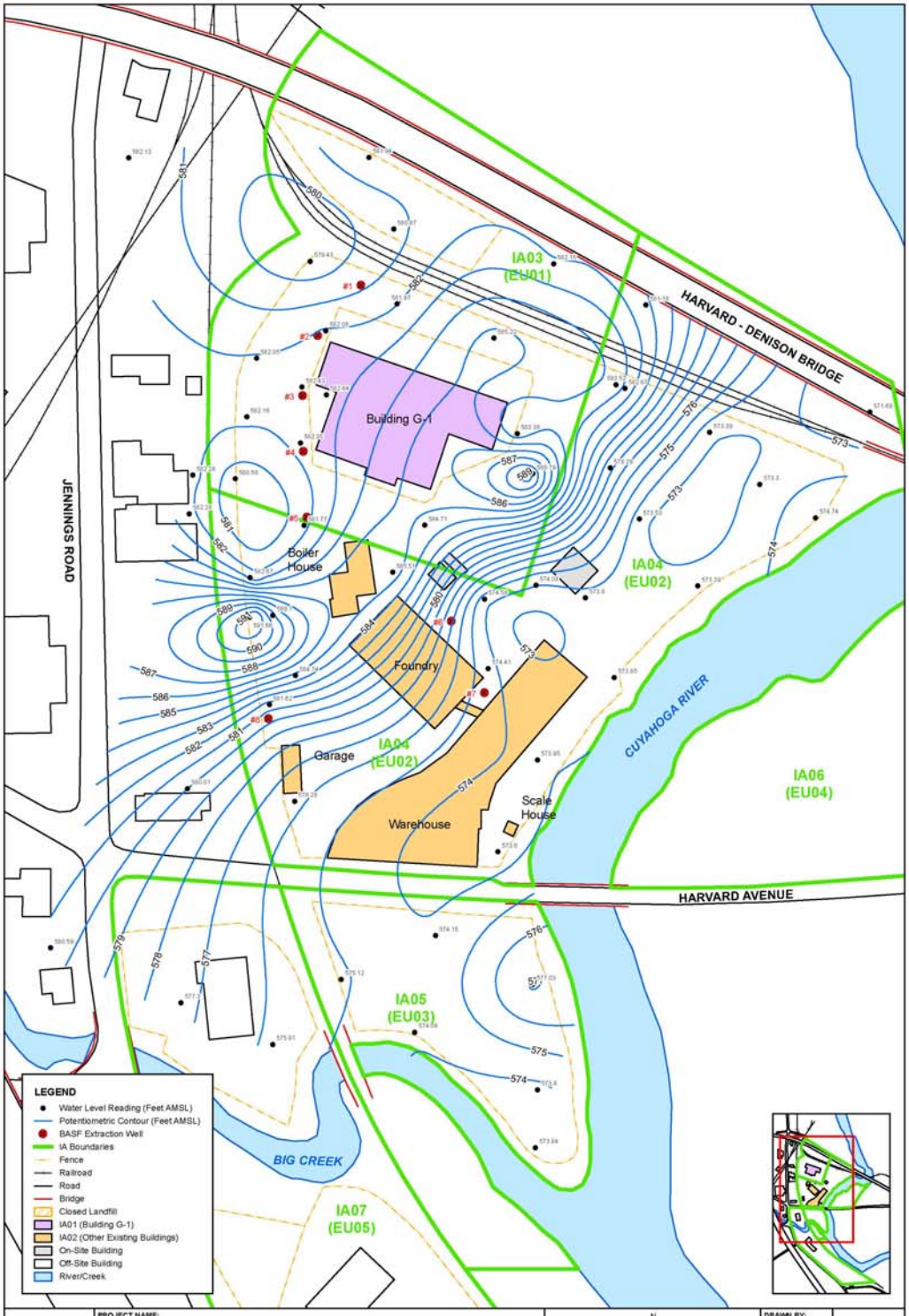
2) Symbols are ordered to show all values at each soil location and are not ordered based on depth.

3) Surface Soil depth interval = 0' - 2' below ground surface (bgs).

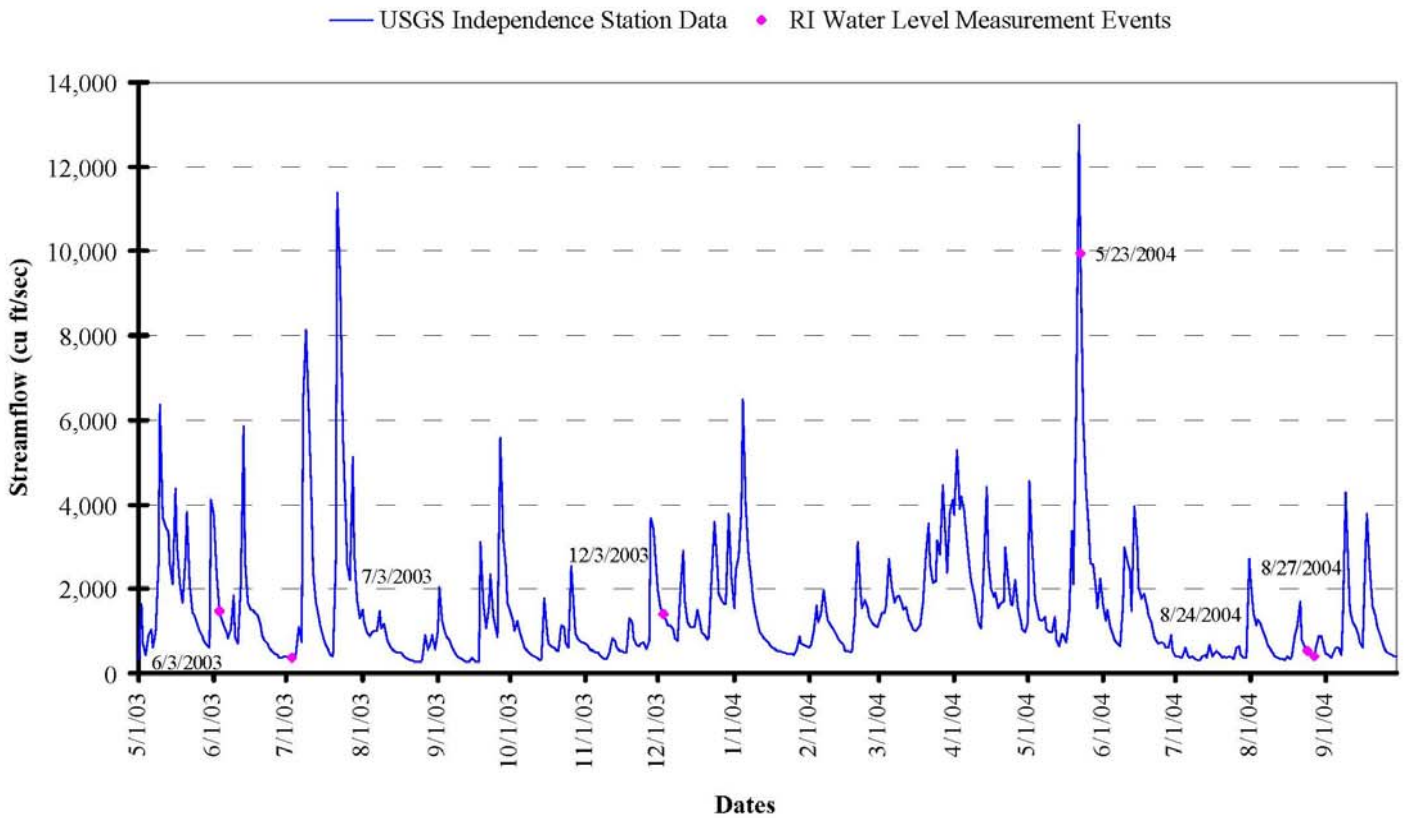
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 70 140 280 420 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	DRAWN BY: JDV 11/24/08
	DRAWING TITLE: Figure 6-35. Sitewide Soil Background Screening: Molybdenum		CHECKED BY: JG 11/24/08
			6-35



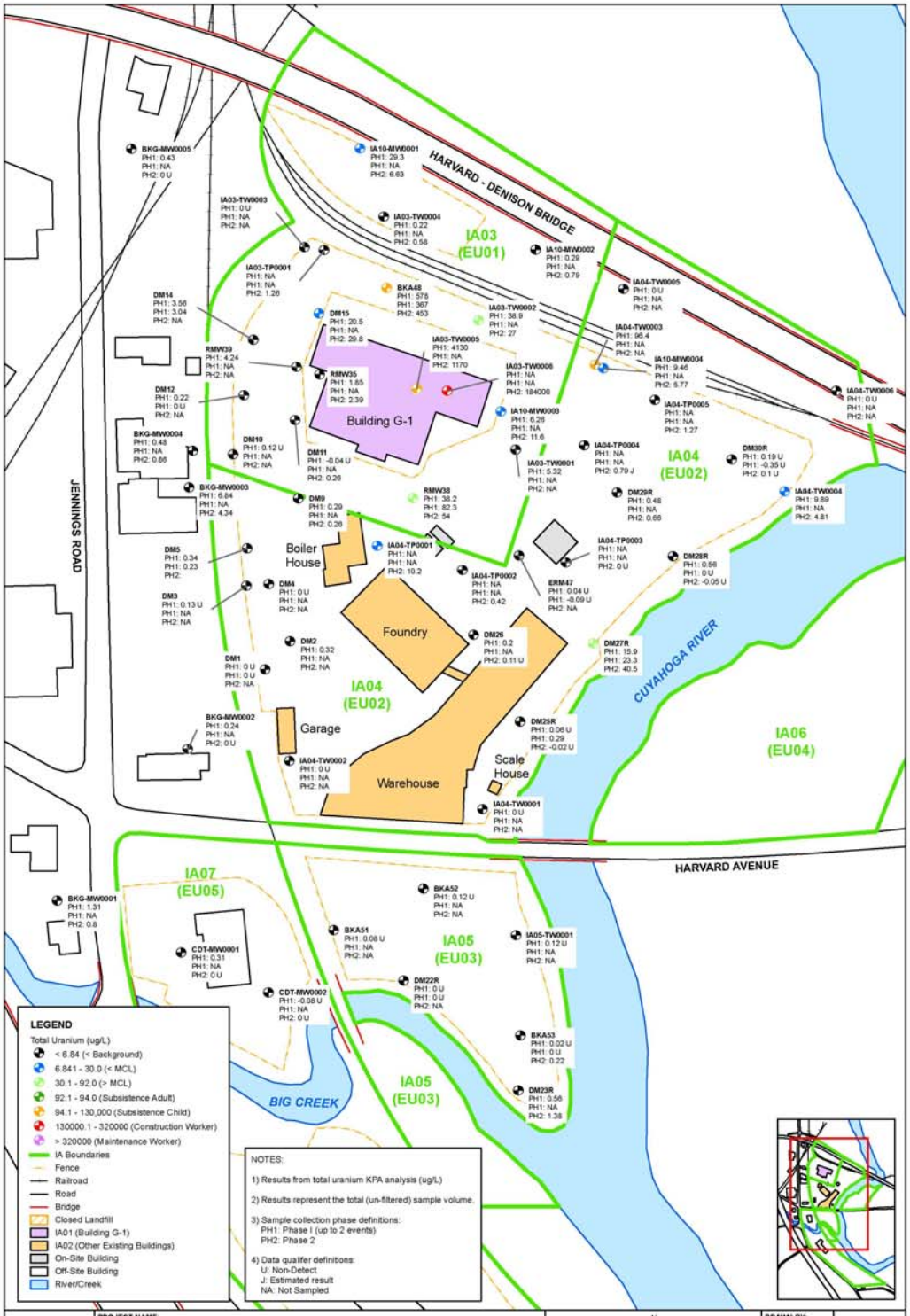
PROJECT NAME:		DRAWN BY:	
Former Harshaw Chemical Site Remedial Investigation Report	N W E S	JDV 10/17/08	6-36
DRAWING TITLE:	0 45 90 180 270 Feet	CHECKED BY:	
Figure 6-36. Groundwater Potentiometric Surface Map: May 2004	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	JG 10/17/08	



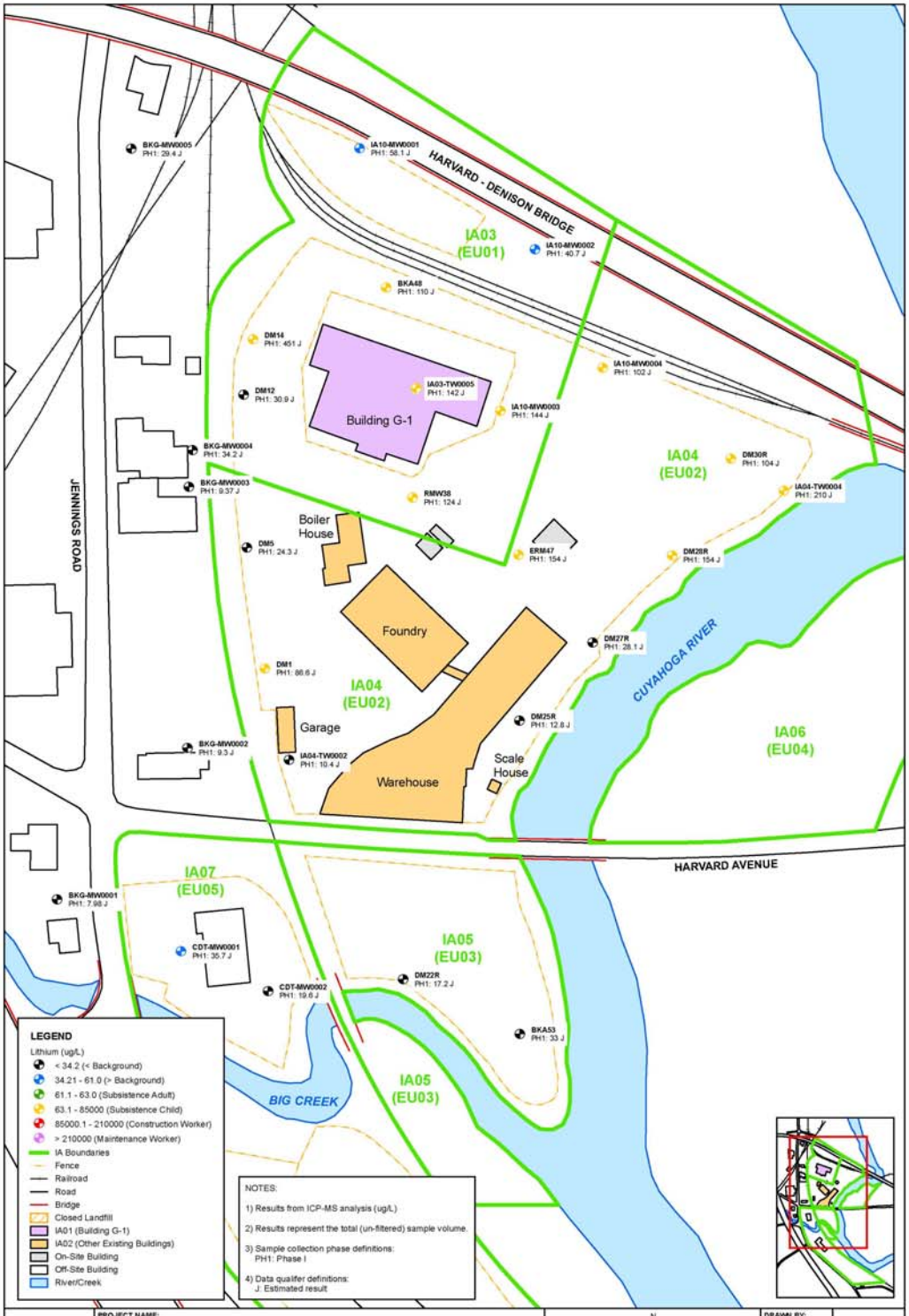
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 10/17/08
	DRAWING TITLE: Figure 6-37. Groundwater Potentiometric Surface Map: August 2004	0 45 90 180 270 Feet	CHECKED BY: JG 10/17/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	6-37



SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	DRAWN BY: JDV 11/24/08	6-38
	DRAWING TITLE: Figure 6-38. Cuyahoga River Streamflow and RI Groundwater Level Measurements	CHECKED BY: JG 11/24/08	



PROJECT NAME:		DRAWN BY:	
SAIC From Science to Solutions	Former Harshaw Chemical Site Remedial Investigation Report	JDV 11/4/08	6-39
DRAWING TITLE:		CHECKED BY:	
	Figure 6-39. EU07 Groundwater Results: Total Uranium (Chemical)	JG 11/4/08	



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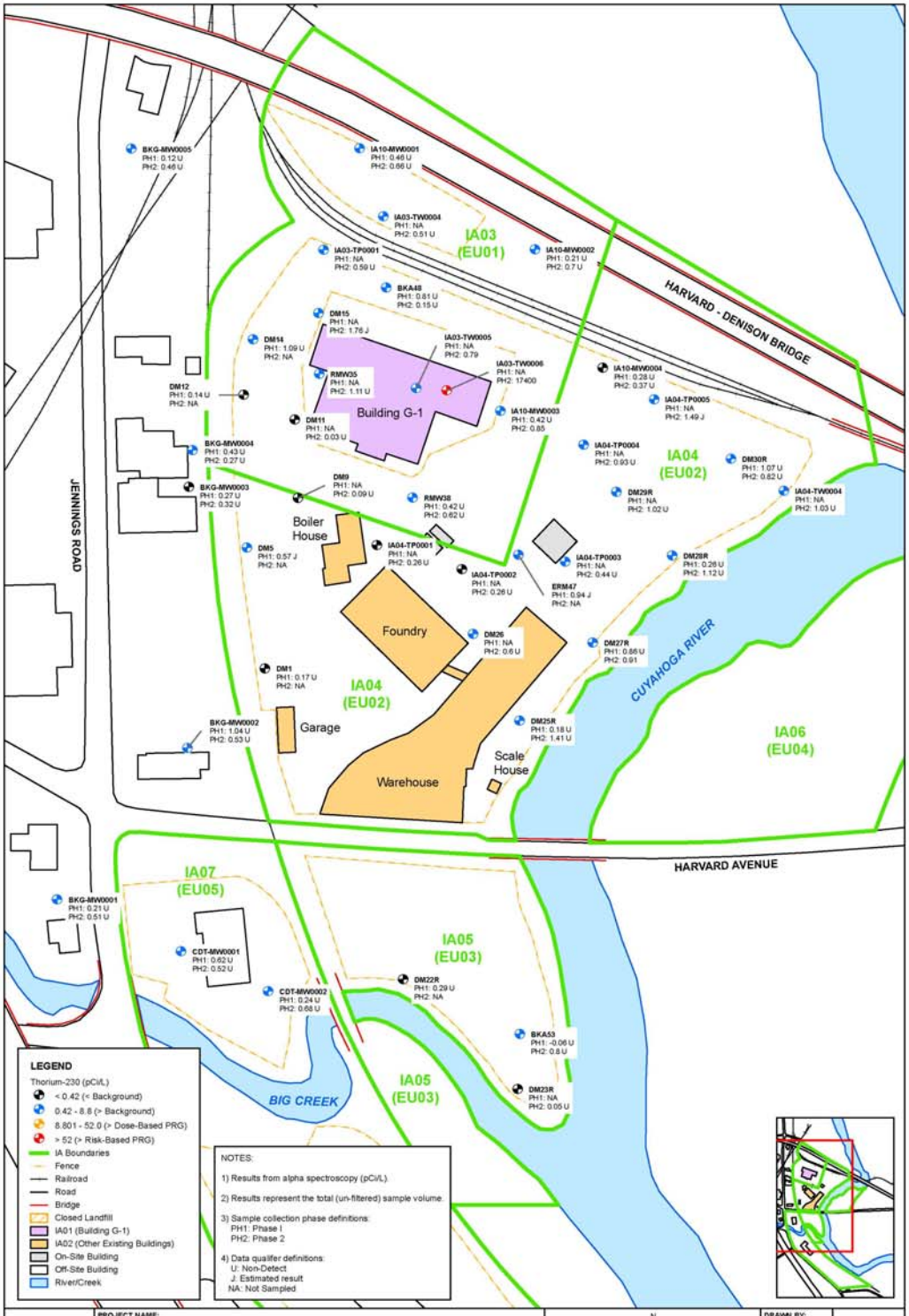
PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report

DRAWING TITLE:
Figure 6-40. EU07 Groundwater Results: Lithium (Chemical)

DRAWN BY: JDV 11/4/08
CHECKED BY: JG 11/4/08

6-40



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	DRAWN BY: JDV 9/25/08	6-41
	DRAWING TITLE: Figure 6-41. EU07 Groundwater Results: Thorium-230	CHECKED BY: JG 9/25/08	

PROJECT NAME:

Former Harshaw Chemical Site Remedial Investigation Report

DRAWING TITLE:

Figure 7-1. Model Domain Area

N
W E
S

0 85 170 340 510 Feet

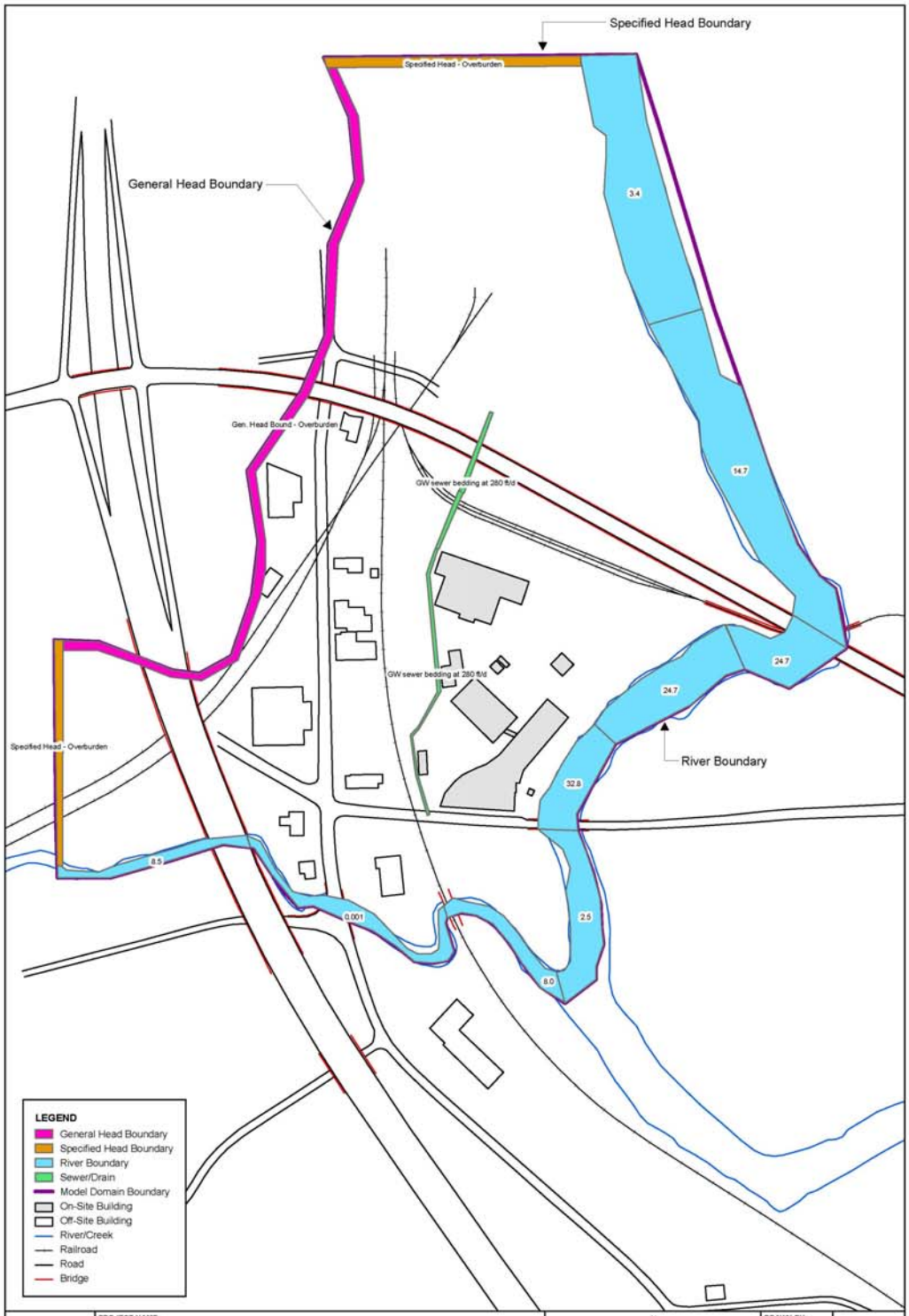
DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet

DRAWN BY: JDV 5/9/08

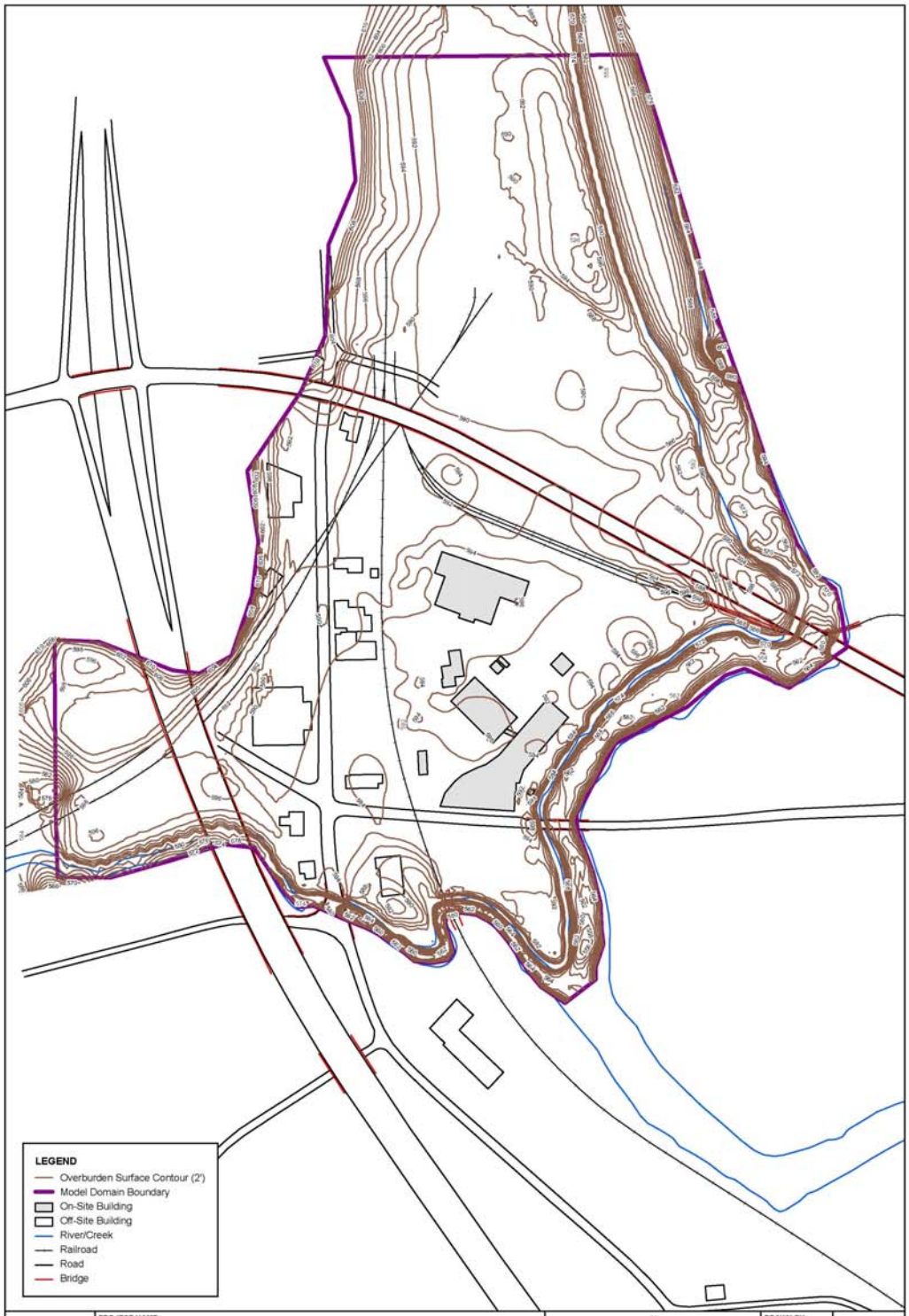
CHECKED BY: JG 5/9/08

7-1

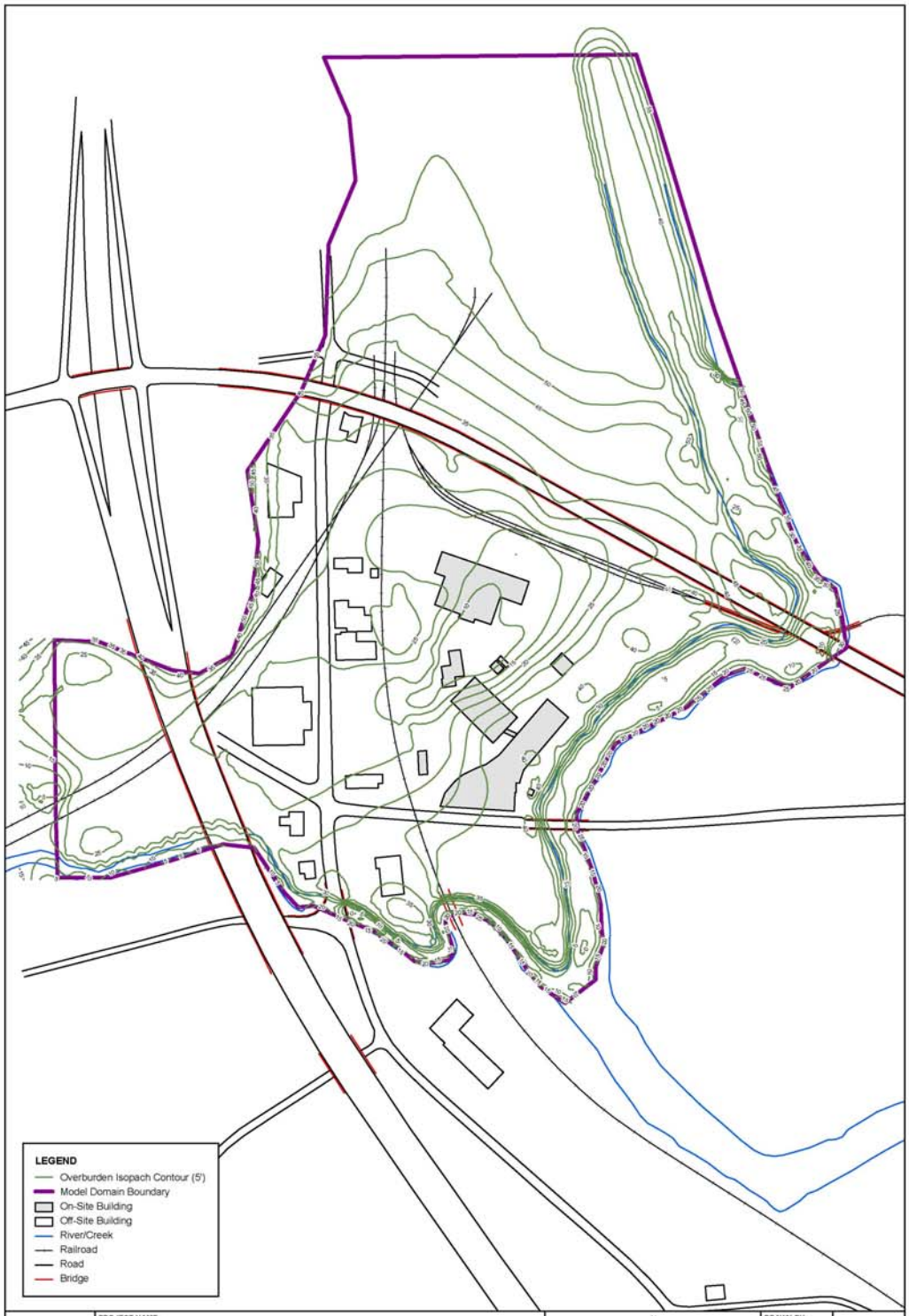
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-2. Starting Head Distribution	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-2



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-3. Groundwater Flow Boundaries	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-3



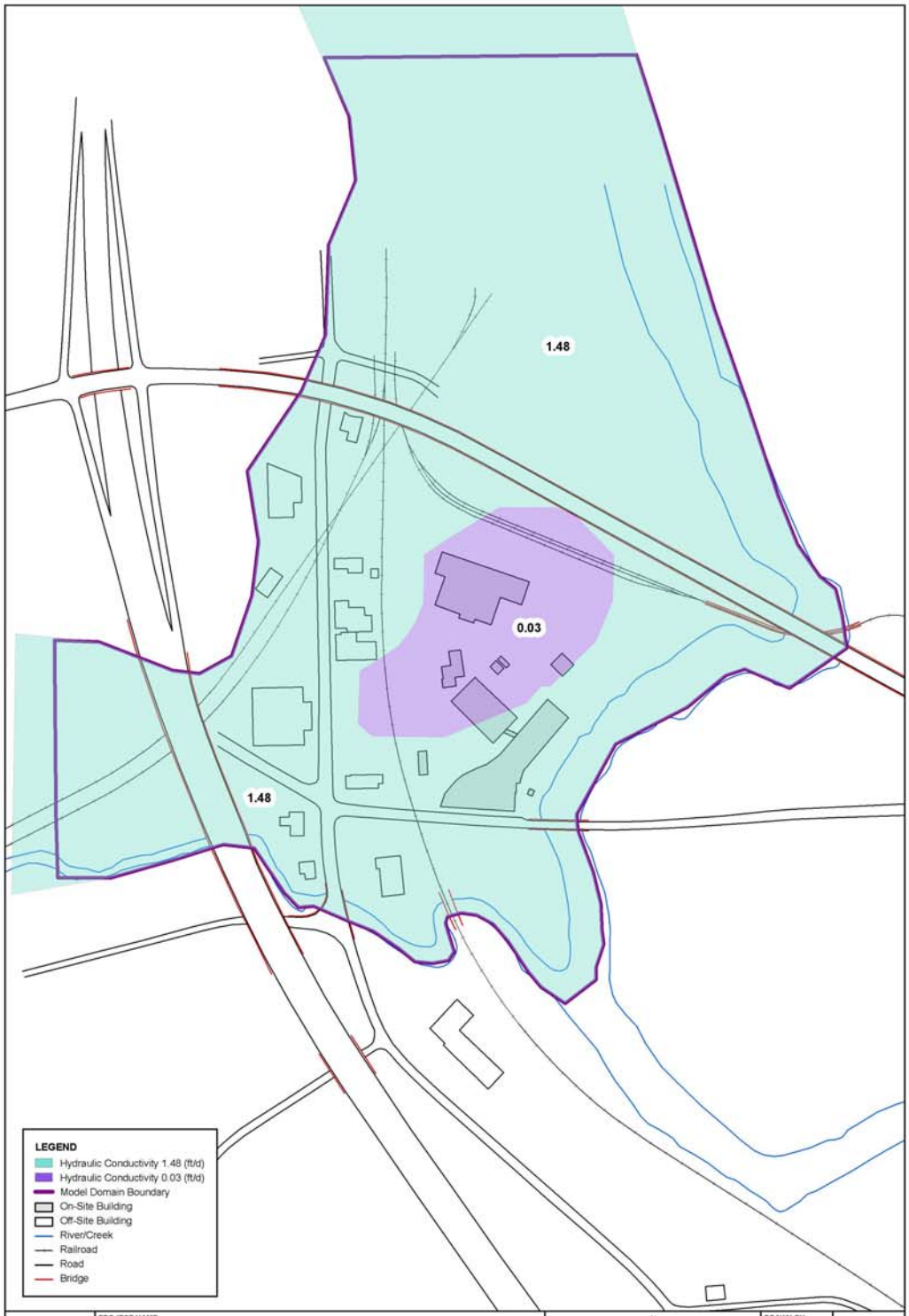
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-4. Overburden Surface	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-4



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-5. Overburden Isopach	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-5

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-6. Bedrock Surface	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-6

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-7. Overburden Hydraulic Conductivity	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-7



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-8. Bedrock Hydraulic Conductivity	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-8

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-9. Recharge Zones	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
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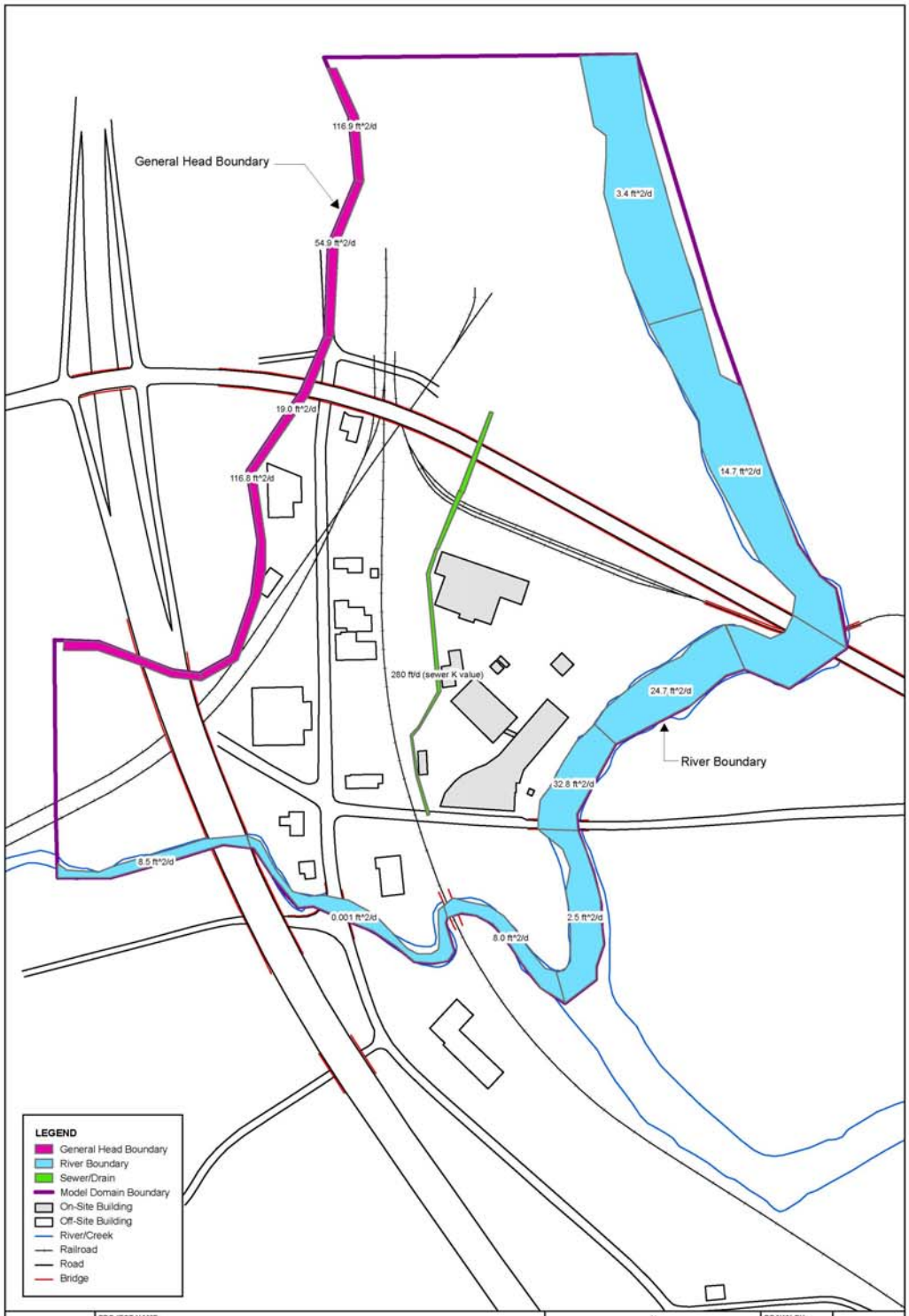
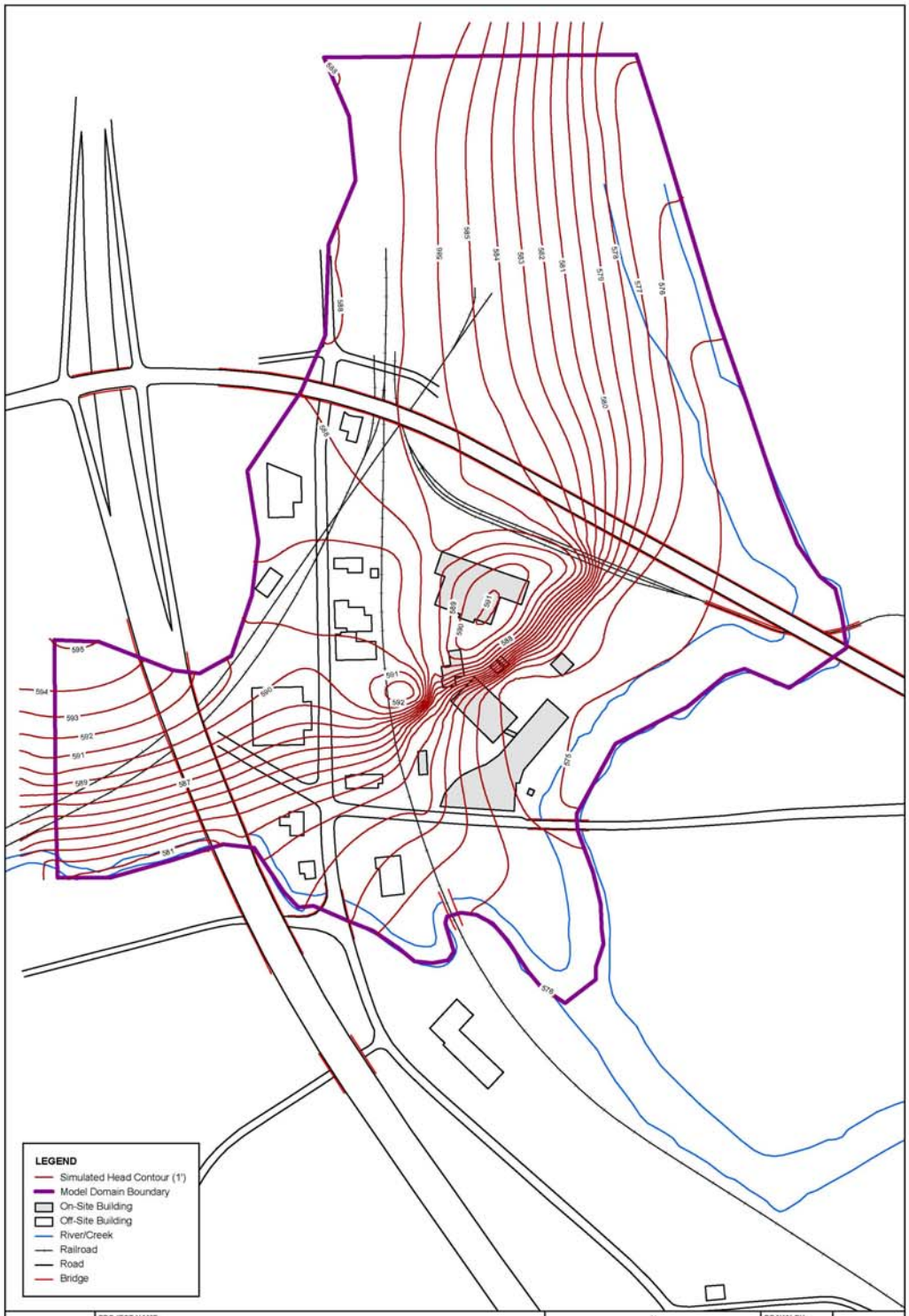


SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-10. Conductance Values - River and Drain Boundaries	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
			7-10

SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-11. Overburden Simulated Heads	0 90 180 360 540 Feet	CHECKED BY: JG 5/9/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	7-11



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-12. Bedrock Simulated Heads	0 90 180 360 540 Feet DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08
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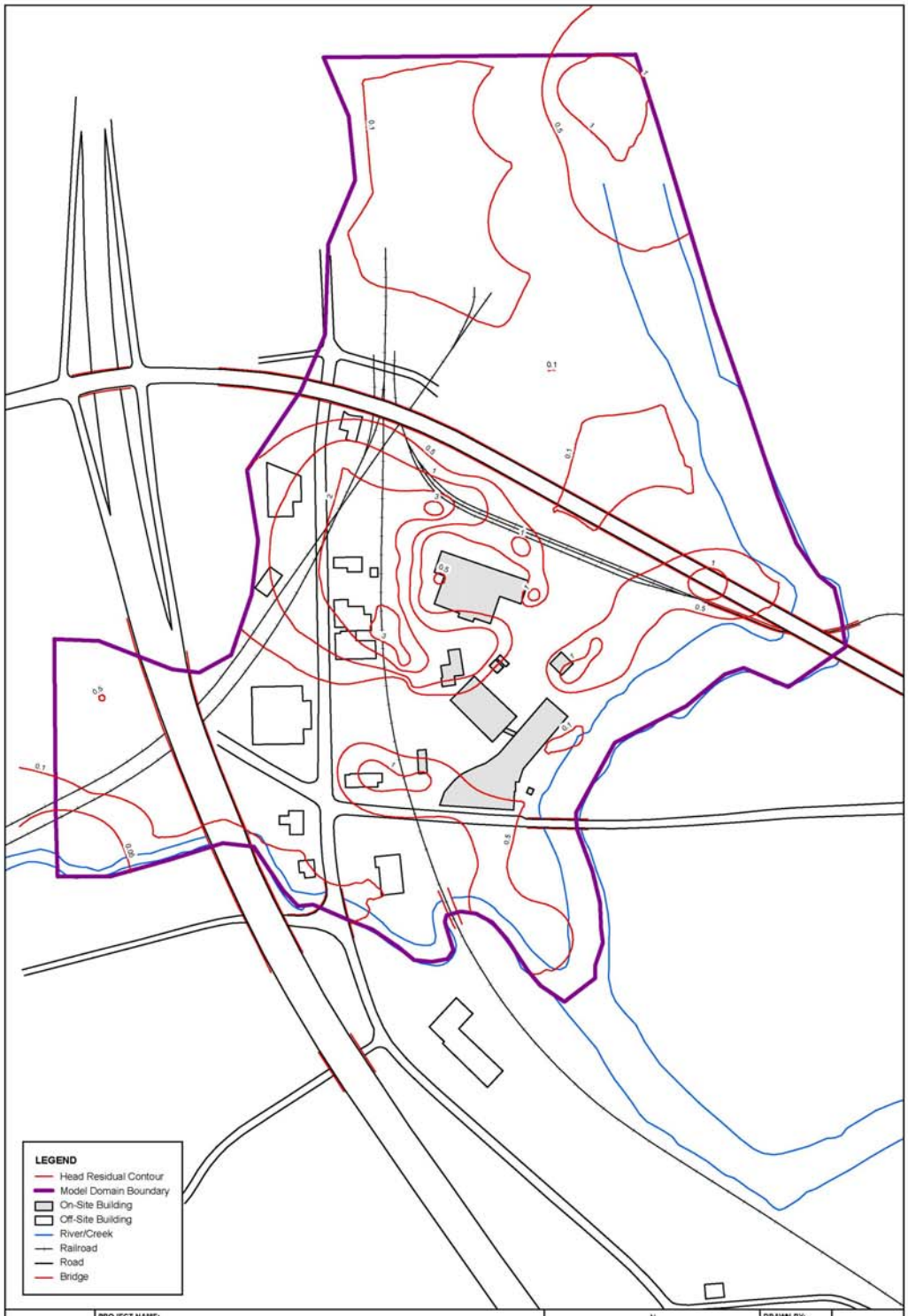
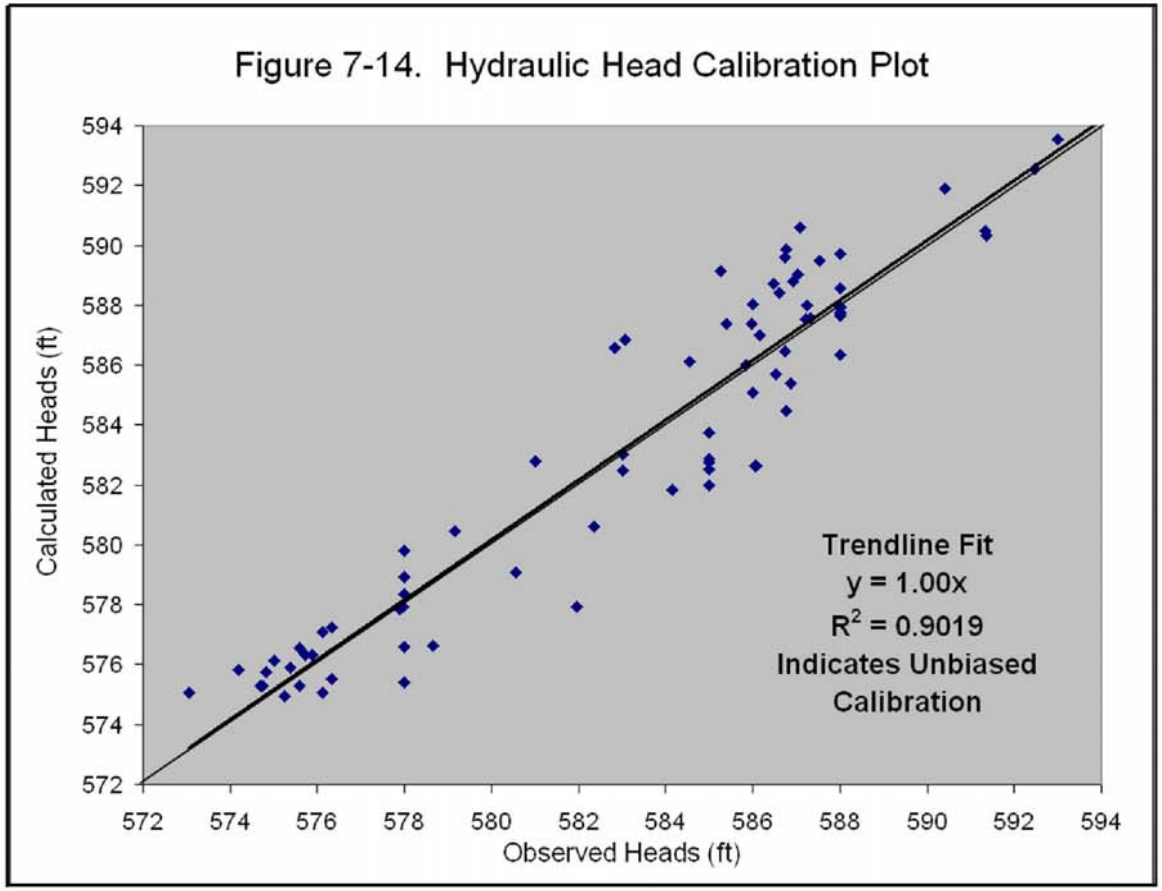


SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-13. Head Residuals	0 90 180 360 540 Feet	CHECKED BY: JG 5/9/08
		DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	7-13



SAIC From Science to Solutions™	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report		DRAWN BY: JDV 5/7/08	7-14
	DRAWING TITLE: Figure 7-14. Scatter Plot of Observed and Calculated Heads		CHECKED BY: JG 5/7/08	

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PROJECT NAME:
Former Harshaw Chemical Site Remedial Investigation Report

DRAWING TITLE:
Figure 7-15. MODPATH Particle Tracking

N
W E
S

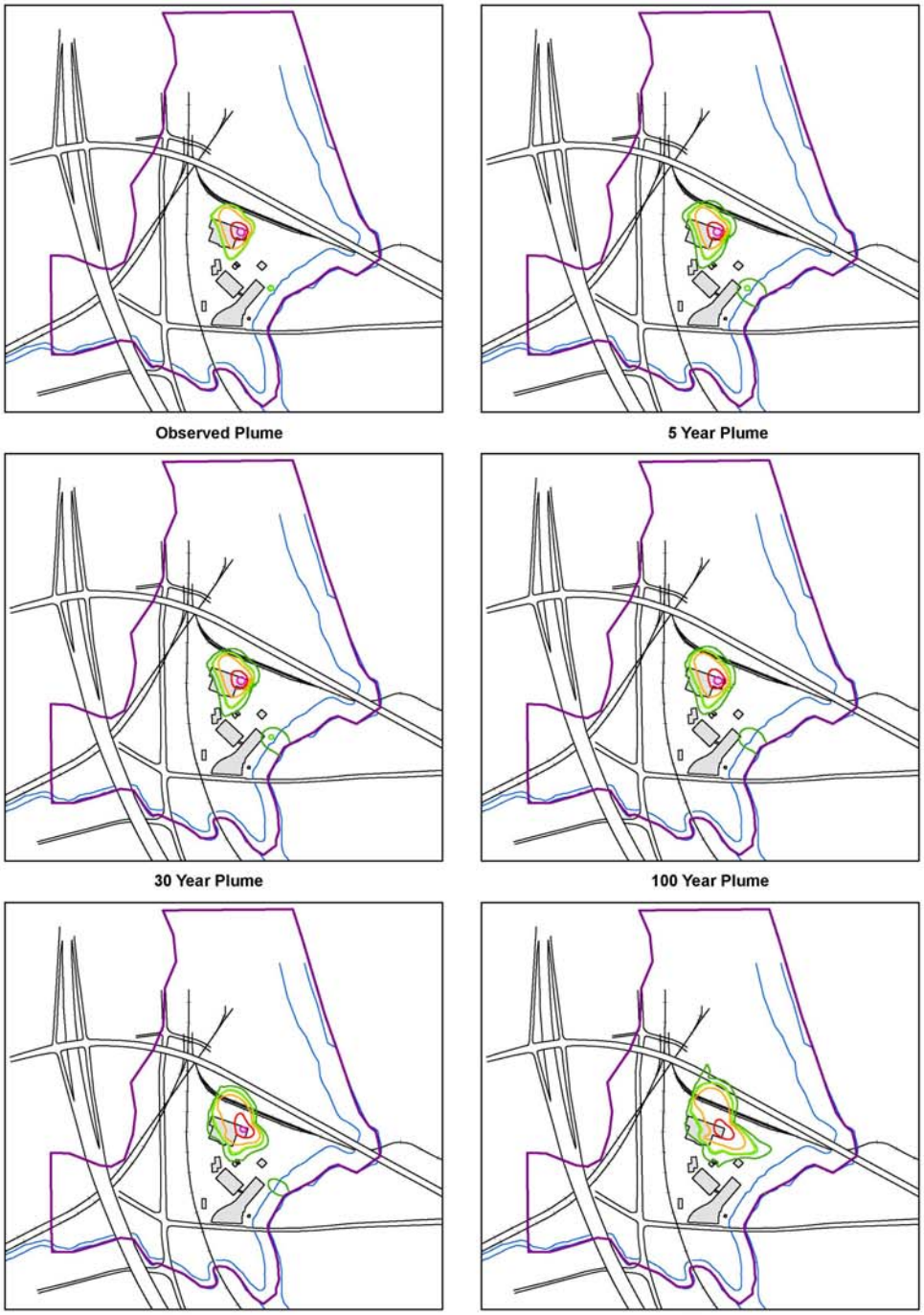
0 85 170 340 510 Feet

DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet

DRAWN BY:
JDV 5/9/08

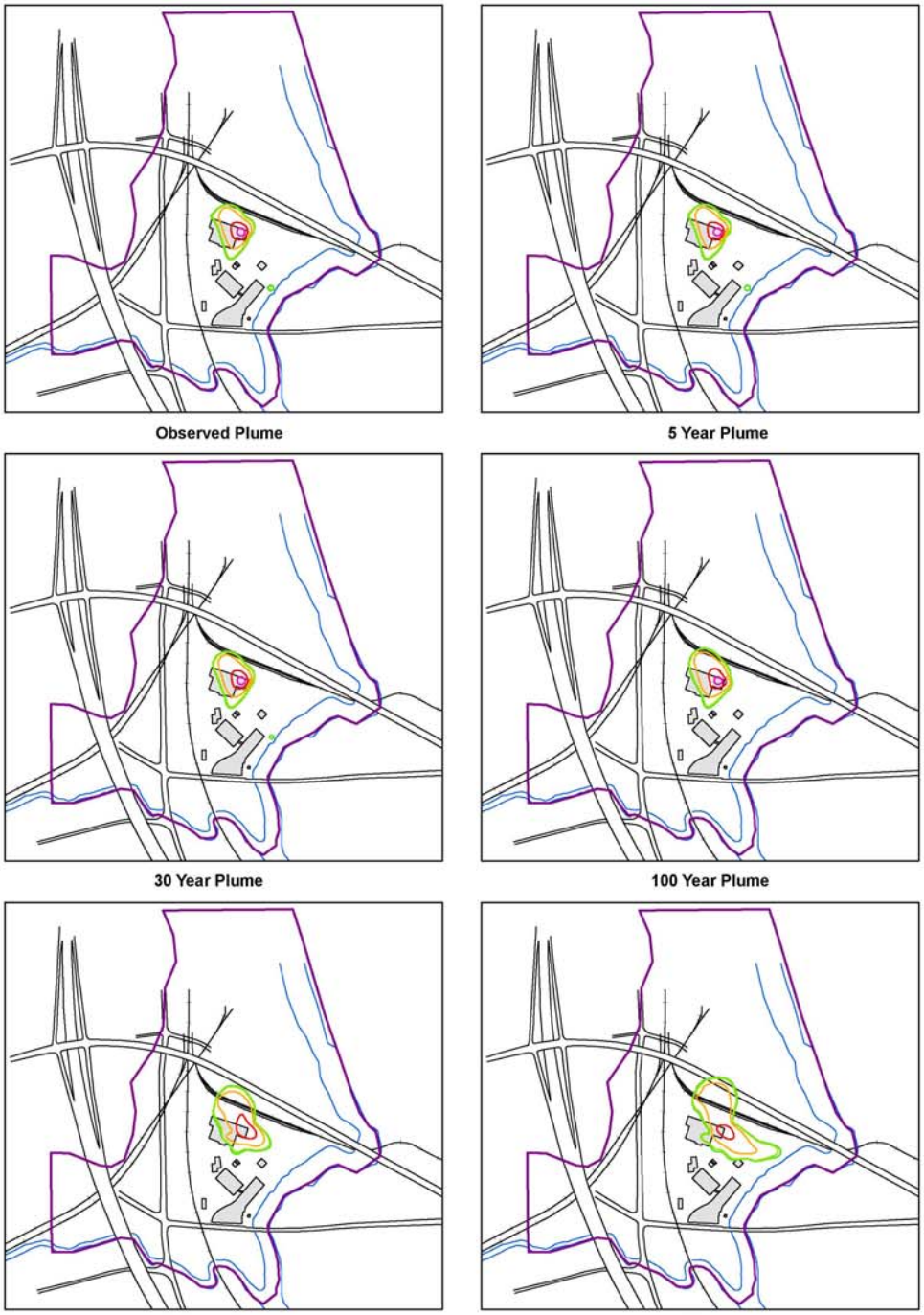
CHECKED BY:
JG 5/9/08

7-15



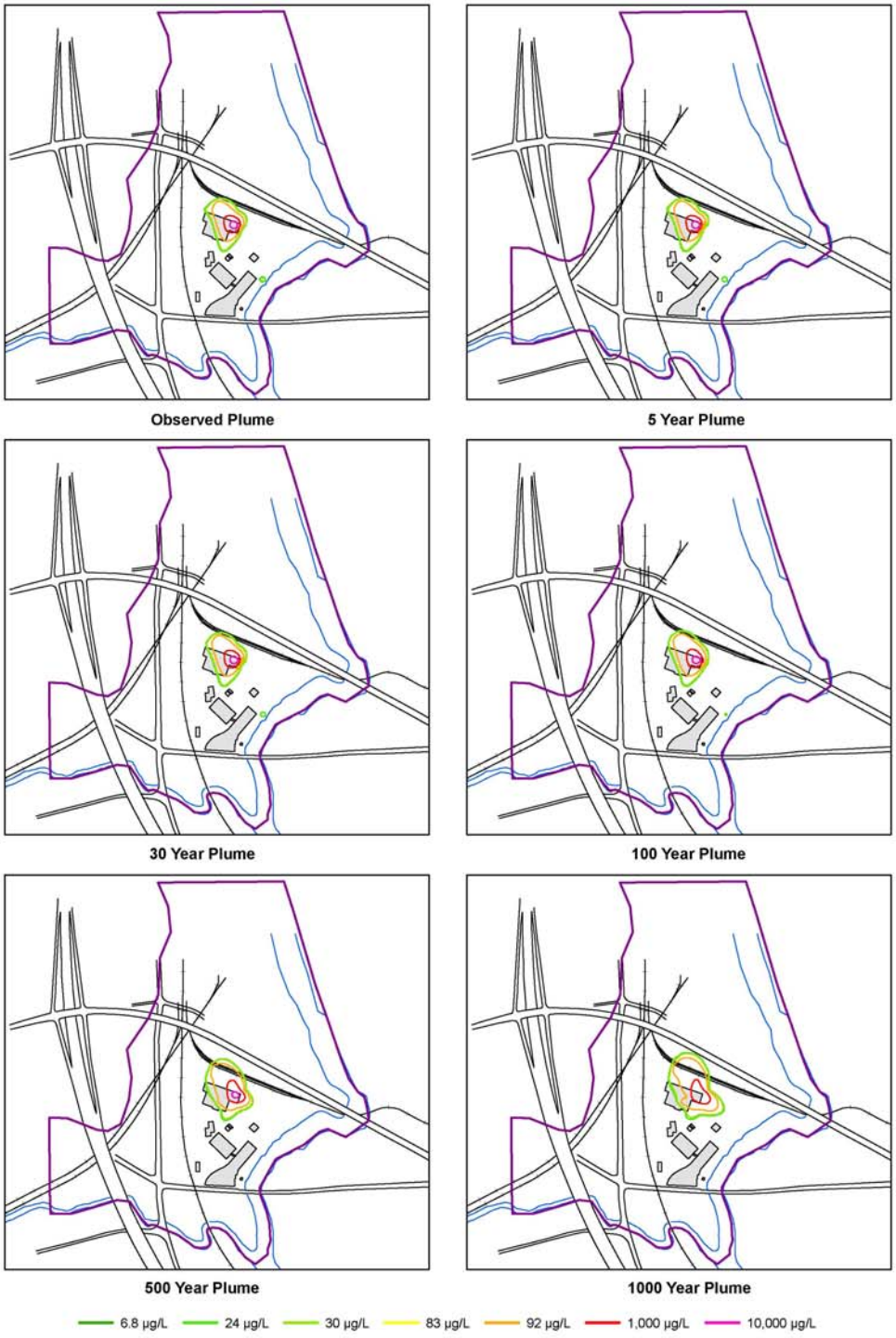
SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 80 120 240 360 Feet	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-16. Plume Migration - Steady State Flow Model	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08

7-16



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 80 120 240 360 Feet	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-17. Plume Migration - Low Kd Sensitivity Analysis	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08

7-17



SAIC From Science to Solutions	PROJECT NAME: Former Harshaw Chemical Site Remedial Investigation Report	N W E S 0 80 120 240 360 Feet	DRAWN BY: JDV 5/9/08
	DRAWING TITLE: Figure 7-18. Plume Migration - High Kd Sensitivity Analysis	DATUM: Ohio State Plane North Zone, NAD83, US Survey Feet	CHECKED BY: JG 5/9/08

7-18

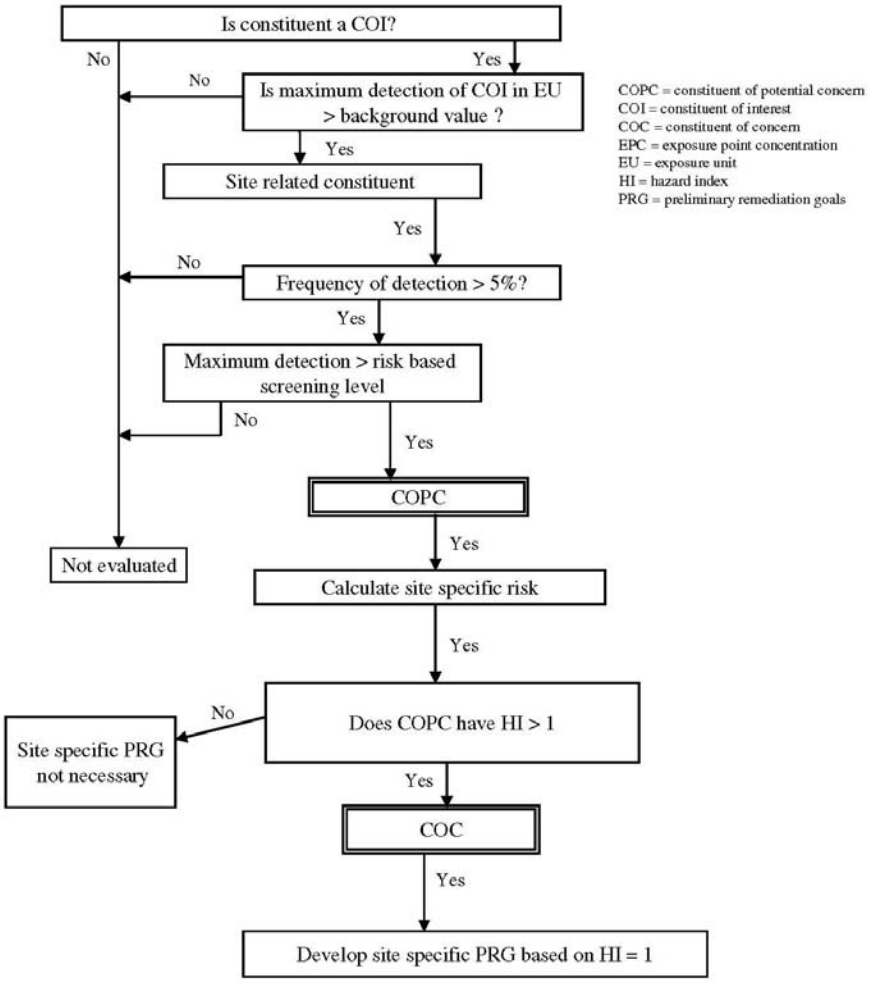


Figure 8-1. Selection of Chemical COPCs for Human Health Risk Assessment

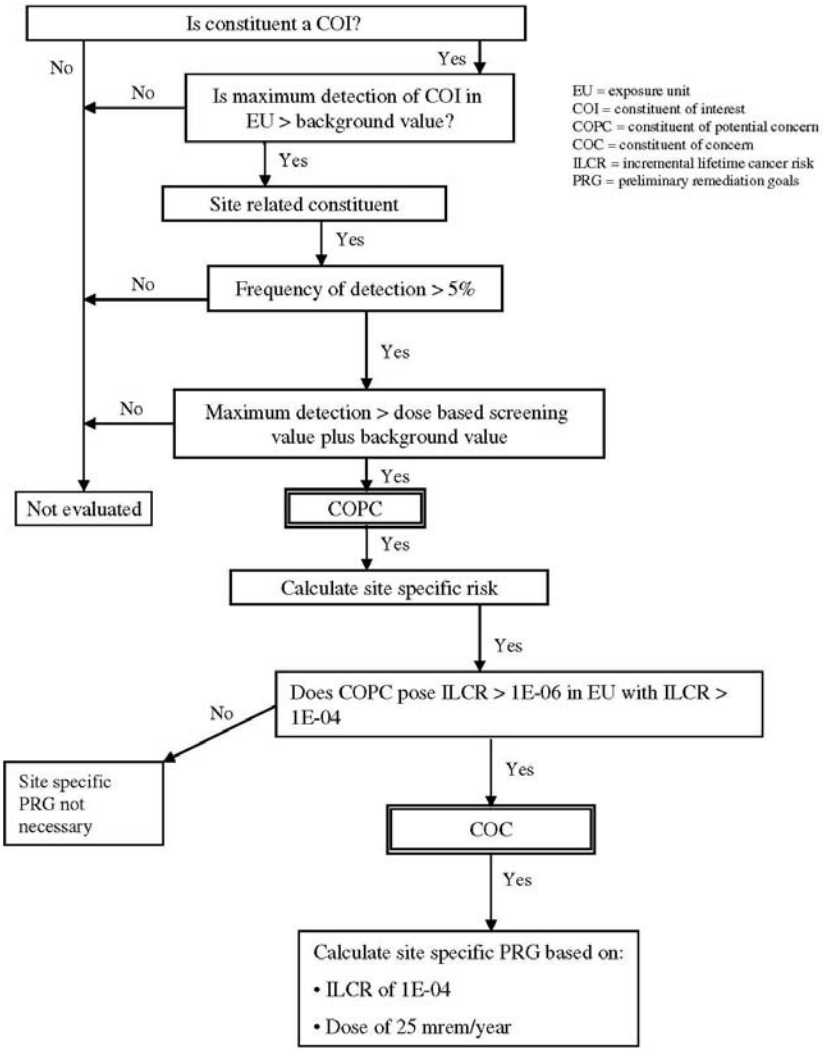


Figure 8-2. Selection of Radiological COPCs for Human Health Risk Assessment

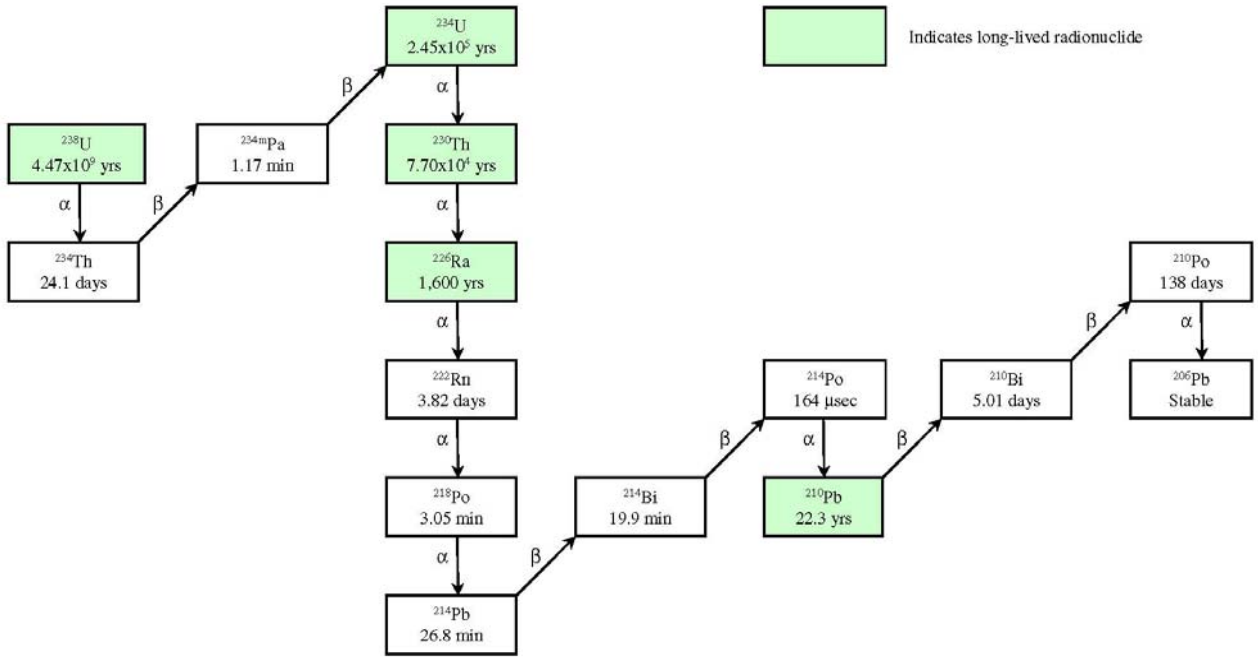


Figure 8-3. Uranium Series

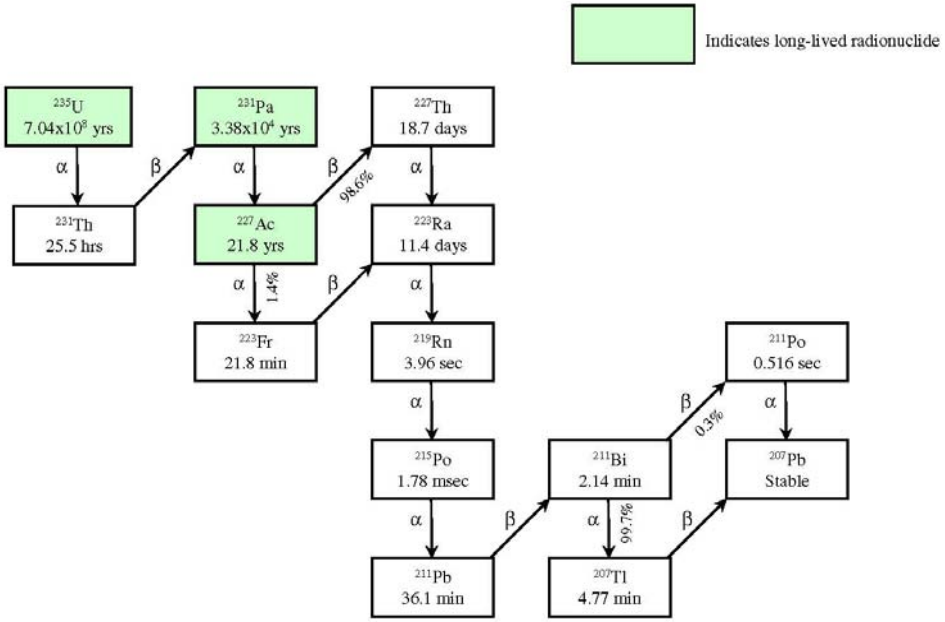


Figure 8-4. Actinium Series

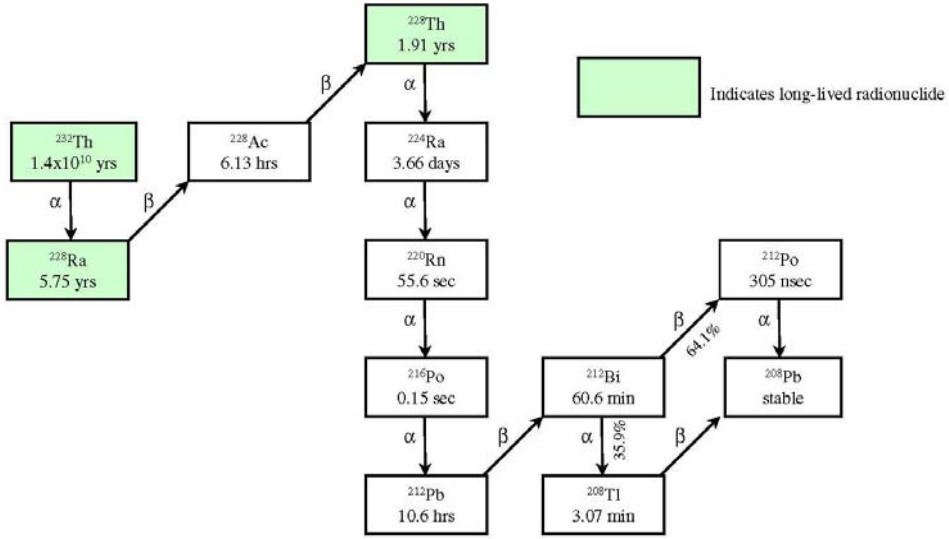


Figure 8-5. Thorium Series

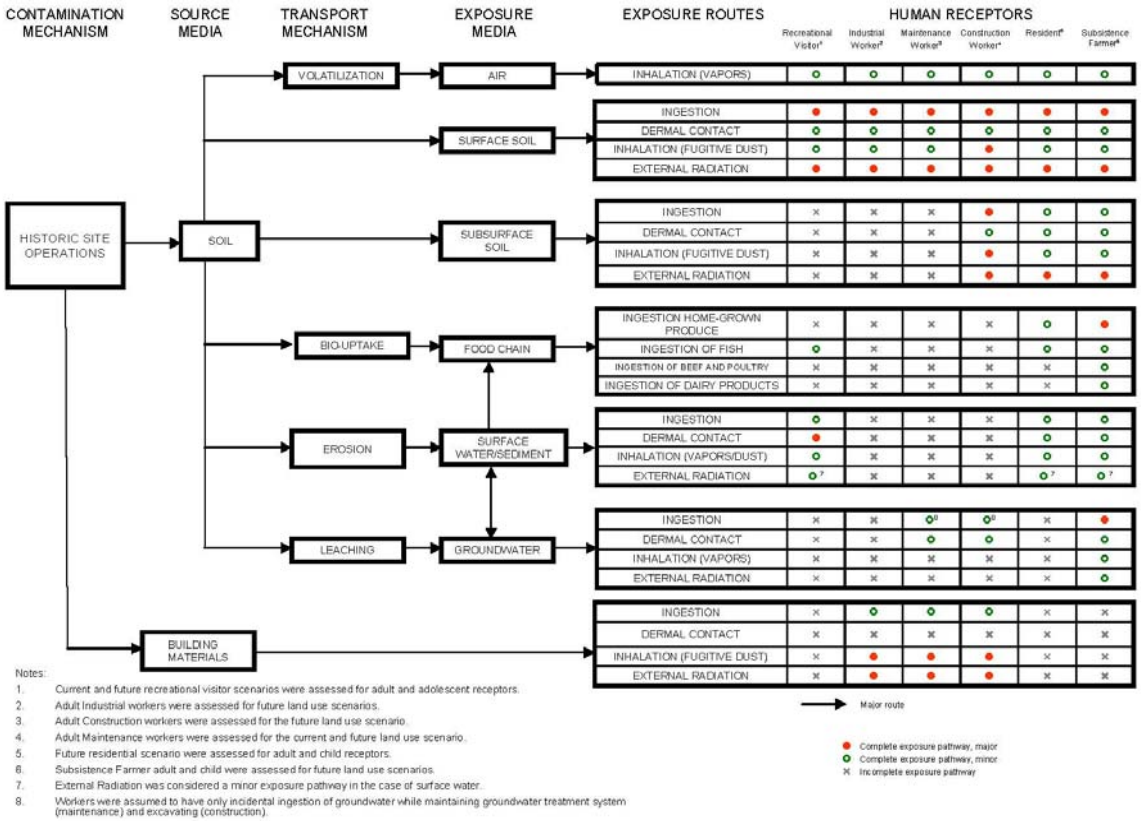


Figure 8-6. Conceptual Site Model – Pathways for Human Exposure at the Former Harshaw Chemical Site

Exposure Units	Human Receptors					
	Recreational Visitor[1]	Industrial Worker	Maintenance Worker	Construction Worker	Resident	Subsistence Farmer
EU 1 – Building G-1 (IA01) and surrounding soil (IA03)	X	X	X	X	X	X
EU 2 – Other Existing Buildings (IA02) and Northside Complex Soil (IA04)	X	X	X	X	X	X
EU 3 – Southside Complex Soil (IA05)	X	X	X	X	X	X
EU 4 – Eastside Soil (IA06)	X	X	X	X	X	X
EU 5 – Westside Soil (IA07)	X	X	X	X	X	X
EU 6 – Sediment and surface water (IA08) in the Cuyahoga River and Big Creek adjacent to the site	X				X	X
EU 7 – Area groundwater (IA10) within unconsolidated aquifer, north of Big Creek/west of the Cuyahoga River			X		X	X
EU 8 – Surface water, sediments, and soils associated with sewers and drains (IA09)				X		
EU B1 through B12 – Existing On-site Buildings (see Table 8-32)		X	X	X		

[1] Recreational visitor (trespasser), and maintenance workers evaluated under current and future conditions. All others were evaluated for potential future exposures.

Figure 8-7. Potential Human Receptors at the Former Harshaw Chemical Site

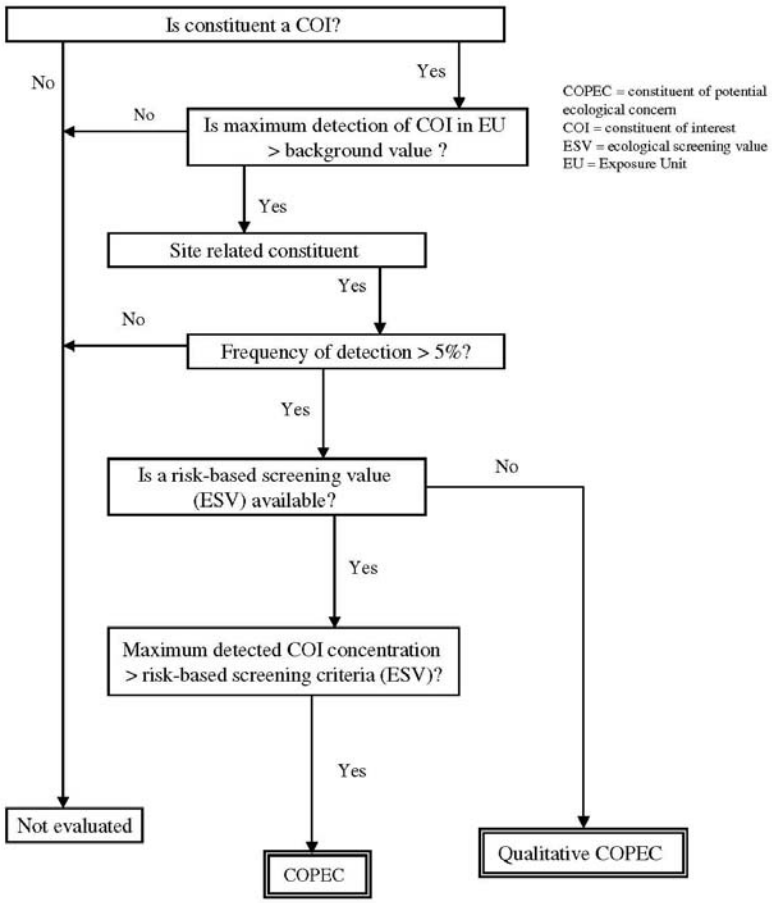


Figure 8-8. Selection of Chemical COPECs for Screening Level Ecological Risk Assessment

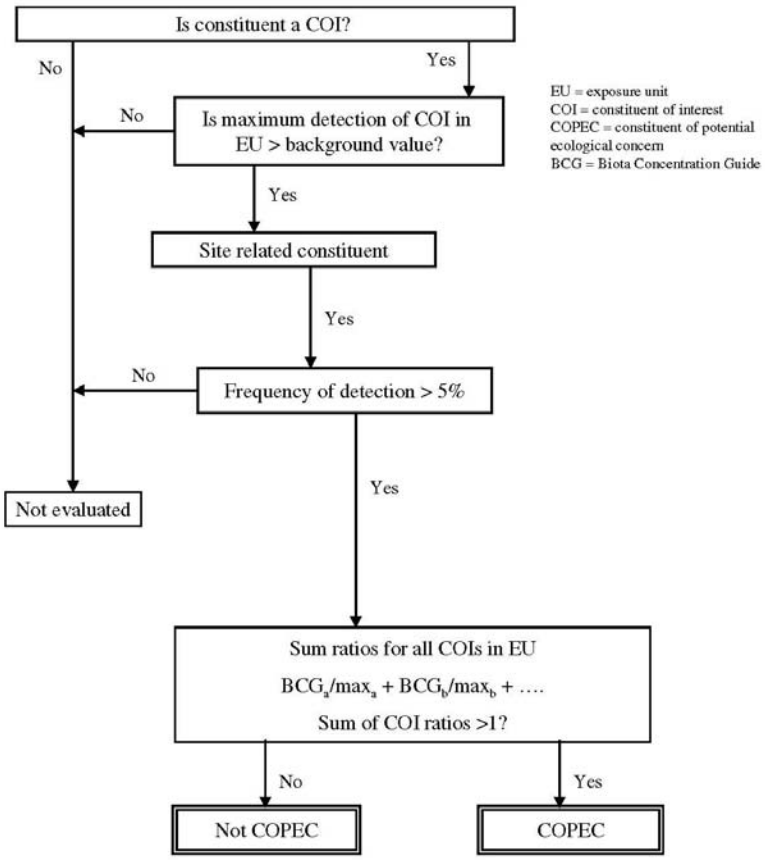


Figure 8-9. Selection of Radiological COPECs for Screening Level Ecological Risk Assessment

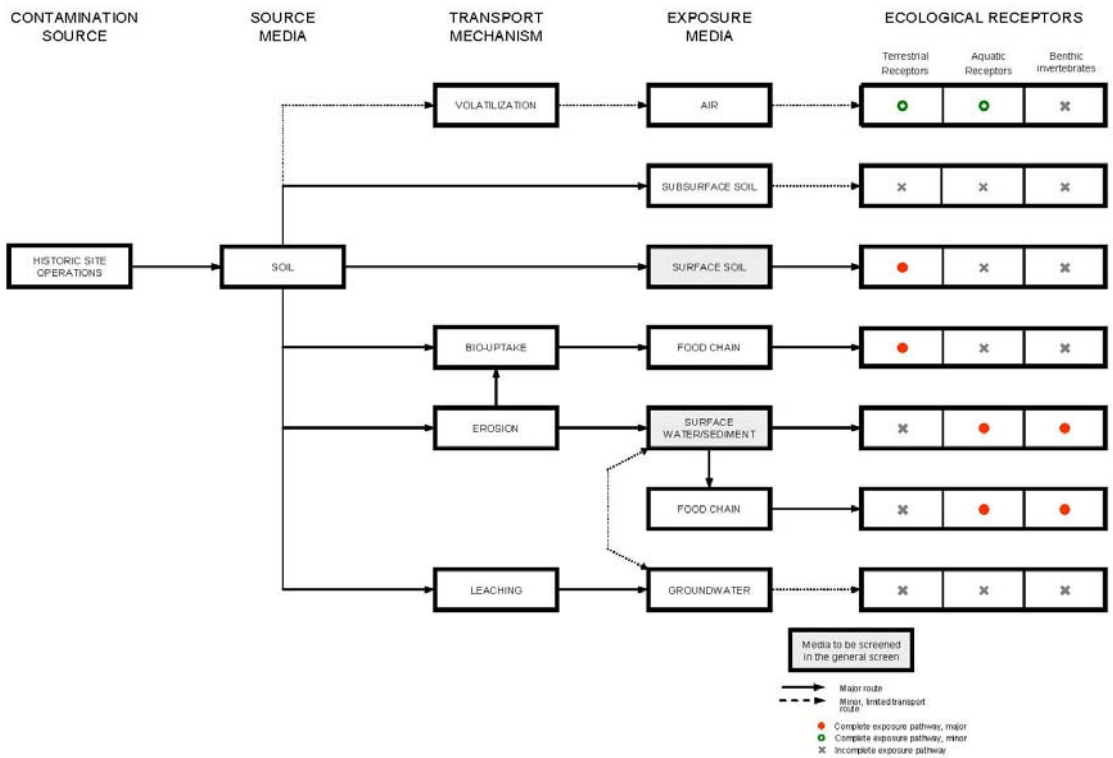


Figure 8-10. Conceptual Site Model for General Screen – Pathways for Ecological Exposure at the Former Harshaw Chemical Site

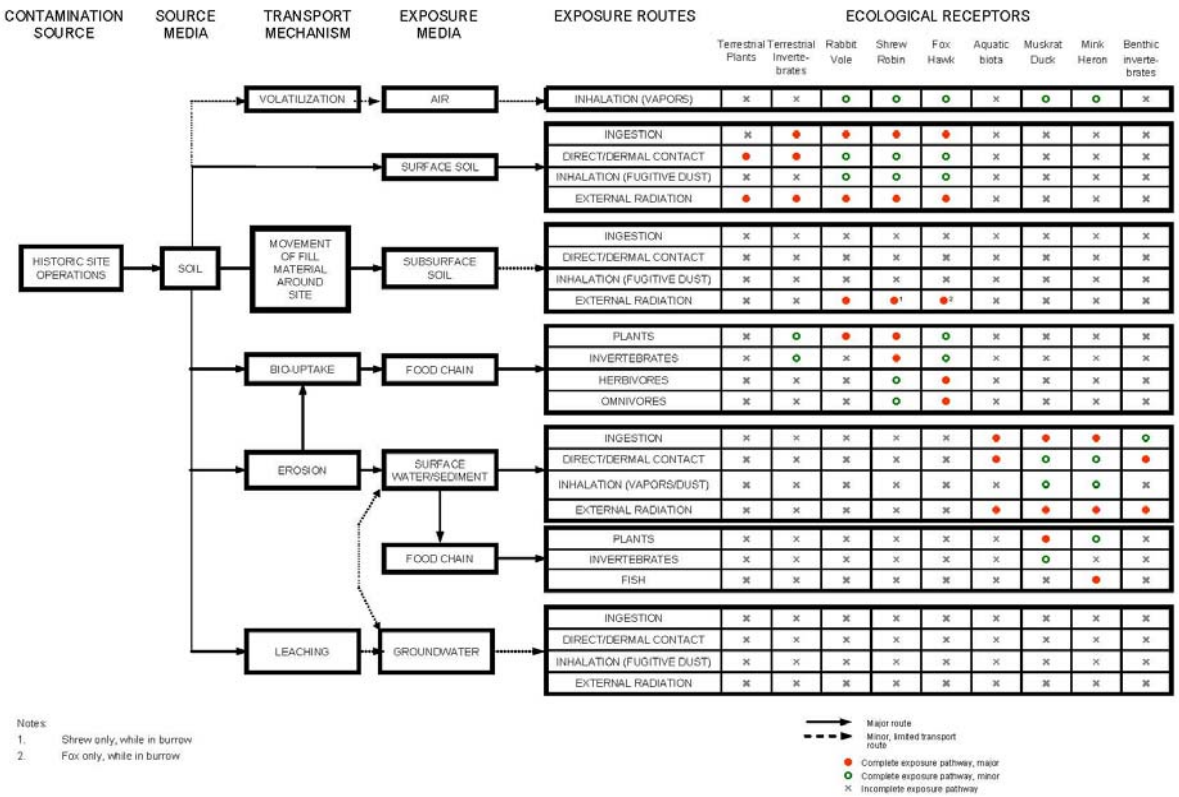


Figure 8-11. Conceptual Site Model for Site-Specific Screen – Pathways for Ecological Exposure at the Former Harshaw Chemical Site