

"Reseeding Our Brownfields, A Community Effort"



PROJECT PLAN - Part 2:

**Phase II Environmental Site Assessment
Data Quality Objectives and
Generic Quality Assurance Project Plan**

Revision No. 2.3

**EPA Region 7
BROWNFIELDS ASSESSMENT DEMONSTRATION PILOT**

**1st AVENUE REVITALIZATION PROJECT
CORALVILLE, IOWA
PROJECT NO. 42997048-C**

Electronic Planning Portfolio Copy

PREPARED FOR:

**THE CITY OF CORALVILLE
CORALVILLE, IOWA**

BY

**TERRACON, Inc.
Revised July 2000**

April 21, 2000

City of Coralville
1512 7th Street
P.O. Box 5127
Coralville, Iowa 52241-0127

Attention: Mr. Lanny M. VanDaele
Brownfield Project Coordinator

RE: Project Plan: Part 2 – Revision 2.3
EPA Region 7 Brownfields Assessment Demonstration Pilot
1st Avenue Revitalization Project
Coralville, Iowa
Project No. 42997048-C

Dear Mr. VanDaele:

Terracon, Inc. presents to the City of Coralville this revised Project Plan for the United States Environmental Protection Agency (EPA) Region 7 Brownfields Assessment Demonstration Pilot project known as the 1st Avenue Revitalization Project. The Project Plan provides a baseline for planning and implementation of assessment and evaluation activities described in the Consulting Services Agreement negotiated at award.

This document version has been prepared and optimized consistent with EPA's Data Quality Objectives (DQO) process. EPA DQO training was conducted interim to assist in the final development of this document. The Project Plan is comprised of three (3) separate but inter-dependent parts;

PROJECT PLAN - Part 1:
General Project Management and Phase I Environmental Site Assessment

PROJECT PLAN - Part 2:
Phase II Environmental Site Assessment Data Quality Objectives and Generic Quality Assurance Project Plan

PROJECT PLAN - Part 3:
Property-Specific Phase II Sampling and Analysis Checklists

UNIQUE PLAN DEVELOPMENT: BROWNFIELDS FEASIBILITY vs. SINGLE USE

This Brownfields study results in no specific re-construction project. This Brownfields study does not yet know what specific properties or environmental conditions the DQO/QAPP will have to address.

This Brownfields Assessment demonstration Pilot differs from most in that it is intended to produce a feasibility inventory of properties within the Pilot area. Land use in the study area ranges from industrial to residential, corner gas station to former landfill – all of which can exercise their voluntary option to enroll in the study. The extreme variability of a generic plan to properly address any one of the approximately 74 properties with 50+ owners of the 200-acre Pilot Study area which might enroll was difficult compared to a traditional single-site DQO/QAPP.

On December 17, 1999 EPA Region 7 conducted on-site training at the City of Coralville as part of an EPA Project check visit. Training was to enhance project planning and development through presentation and an interactive workshop for “*Systematic Planning Process and Quality Assurance Project Plans (8 Hours)*” as part of the 1st Avenue Brownfields Pilot. The intent was to enhance the quality of the final DQO/QAPP and to best integrate the document into Brownfields-specific issues for the 1st Avenue Revitalization Project, a Region 7 EPA Brownfields Assessment Demonstration Pilot. In participatory attendance were multiple representatives of EPA7-Brownfields, EPA7-Quality Assurance, Iowa DNR Uncontrolled Sites, the City of Coralville, the U.S. Army Corps of Engineers, the laboratory and consultants.

Project Plan - Part (v2.3) provides the resultant technical and management “roadmap” to control the quality of data collected as Phase II assessment occurs on the 1st Avenue Revitalization Project, a USEPA7 Brownfields Assessment Demonstration Pilot Grant study.

SEQUENCE OF DEVELOPMENT

Part 1 was previously reviewed, approved by EPA 7 and implemented by Terracon. This information assisted in the development of Part 2. Properties continue to enroll in the study for Part 1 study.

Part 2 of the Project Plan had to be truly generic to address any one of the properties which might enroll, excluding the availability of a conceptual site model approach to assist in development. Simultaneously, the DQO/QAPP had to be very explicit to provide quality data in assessing and making the feasibility decision by the City of Coralville.

The January 19th v2.1 revision was formatted to segregate General and Phase I environmental site assessment activities into Part 1, separate from Phase II activity. The format change was consistent with USEPA7 preferences and guidance. This version removed the conceptual site model element as requested by EPA7. Considering the December planning session, v2.1 attempted to meet the DQOs on the premise of a prescriptive sample-to-volume approach under Iowa Administrative Code [567, 455H] *Chapter 137: Iowa Land Recycling Program and Response Action Standards (IAC137)*. Terracon conducted testing of the approach by application to ranked and theoretical properties within the Pilot study area which might enroll. Terracon observed the following;

- The approach was reasonable for soils for smaller properties with historical Phase I data showing localized potential for release.
- The approach was reasonably cost-effective for properties of less than one (<1) acre in size or which required simple chemistry requirements.
- The statistical process used to offset the subjective nature of the IAC137 characterization criteria to rely on professional judgment, produced sampling strategies that were not cost-effective within the strictures of the Brownfields Grant for most sizes of properties.
- For properties of greater size or for which comprehensive chemistry became necessary, the prescriptive sample-to-volume approach quickly exceeded reasonable funding within the context of the Brownfields Grant process.

It was confirmed that the simple sample-per-volume criteria for data gathering under IAC137 is not achievable for all properties under the strictures of the Brownfields Pilot Grant funding or likely sustainable funding beyond. v2.1 could not be optimized sufficiently to meet both the data quality objectives and needs of the project. v2.1 was internal draft and not delivered to EPA7 for review.

v2.2 was developed in February and March 2000 by returning to the DQOs and further refining the explicit objectives, decision and end user criteria of the Brownfields Pilot Grant. Thereafter adjusted technical elements to better control data quality explicit to the City decision of feasibility and less toward direct future usability of data by the City or future landowners. The approach retained as a primary premise a decision relating IAC137 response action standards and generally included;

- A modification to the decision-tree logic to address sites identified from Phase I assessment as non-point- or point-source releases.
- A workable blend of statistical and judgmental sampling based on the findings of the Phase I assessments that more clearly sets to writing the Brownfields decision and a City "roadmap" for properties which may enroll in the future or for which additional funding is obtained.
- The Phase II Brownfields Pilot assessments and reports, though addressing IAC137 issues and deriving comparisons which can be used under the Land Recycling program, is not a complete IAC137 site assessment report and is solely for the use of the City of Coralville in deciding feasibility for consideration of redevelopment related to recognized environmental conditions.

Terracon ran trial optimization studies by applying the sampling designs on known and theoretically enrolled properties. v2.2 was considered internal draft and not submitted to the agency.

v2.3 was developed in April 2000 and incorporates optimized sampling designs of v2.2 trials. Terracon again ran trial studies by applying the optimized sampling designs on known and

theoretically enrolled properties. This version incorporates routine revisions of both the laboratory Quality Assurance Plan and Terracon Standard Operating Procedures (TSOPs) related to the Pilot study. v2.3 is considered internal final for review by agency and is attached with signatures.

Part 3 will follow under separate cover to the agency to assist in Part 2 review and for comment. Internal draft Property-Specific Sampling and Analysis Checklists (Checklists) included in Part 2 were completed as part of trial optimization studies. Additional properties have been enrolled and assessed under Part 1 of the Project Plan during the development of Part 2. The ranking of the top 6 properties for assessment has changed. Terracon is completing Checklists for the current top 6 ranked sites from Phase I studies.

GENERAL COMMENTS

The analysis presented in this plan is based upon data obtained from field activities and from other information discussed. This report does not reflect any variations in information which may as yet be undiscovered. Actual conditions for development may vary.

This document is prepared for the exclusive use of our client for the specific application to the project discussed and has been prepared in accordance with generally accepted environmental engineering practices. No warranties, either express or implied are intended or made. In the event any changes in conditions as outlined in this plan are observed, the conclusions contained in this document cannot be considered valid unless the changes are reviewed and the conclusions of this document are modified or verified in writing by the environmental professional.

If you have any questions regarding this information, please do not hesitate to contact the Terracon Project Manager below at (309) 788-1500 or dekoch@terracon.com.

Sincerely,
TERRACON, Inc.

John F. Brimeyer, Iowa PE
Phase II Coordinator

David E. Koch, Iowa CGP#1200
Project Manager

JFB/DEK/dk2
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cc: Per section A3.

A1 TITLE AND APPROVAL PAGE
EPA BROWNFIELDS DEMONSTRATION ASSESSMENT PILOT – Region 7
1st AVENUE REVITALIZATION PROJECT
Coralville, Iowa

**TITLE: PROJECT PLAN – Part 2: Phase II Environmental Site Assessment
Data Quality Objectives and Generic Quality Assurance Project Plan
Revision 2.3 – April 21, 2000**

PREPARED BY:

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(Signature) Kelly M. Hayworth / City of Coralville (Date)

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(Signature) David E. Koch / TERRACON 4/21/00

U.S. EPA PROJECT MANAGER APPROVAL:

(Signature) Cecelia Tapia / Region 7 Brownfields _____
Date

U.S. EPA QA OFFICER APPROVAL:

(Signature)

(Printed Name/Affiliation) _____ Date

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- C.2 Terracon Log of Boring
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Appendix D: Terracon Standard Operating Procedures

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- Attachment 2: General Policy Statement
- Attachment 3: Laboratory Facility, Equipment and Materials
- Attachment 4: Organization and Responsibilities
- Attachment 5: Sample Collection, Preservation and Storage
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Appendix F: Property-Specific Sampling and Analysis Checklist Form

- F.1 Blank Checklist Form
- F.2 Attachments (Examples - Not For Implementation)
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 - Attachment 8: Optimized Site Sampling Coordinates – Soils & Groundwater

A3 DISTRIBUTION LIST

Numbered copies of *Project Plan: Part 2 - Phase II Environmental Site Assessment Data Quality Objectives and Generic Quality Assurance Project Plan* will be distributed as follows. These persons will also receive copies of routine report distributions as set forth in section C2.

A3.1 United States Environmental Protection Agency, Region 7
Superfund Division
901 North 5th Street
Kansas City, KS 66101
Cecelia Tapia, Branch Chief/Brownfields Project Manager (1 copy)

A3.2 City of Coralville
1512 7th Street
P.O. Box 5127
Coralville, Iowa 52241-0127
Lanny VanDaele, Brownfields Coordinator (1 copy)

A3.3 Central Project File of Record
Terracon, Inc.
4470 48th Avenue Court
Rock Island, Illinois 61201
Project File 42997048/Admin Section
Dave Koch, Project Manager (1 copy)

A3.4 Engineering Manager Project File
Terracon, Inc.
5855 Willow Creek Drive SW
Cedar Rapids, Iowa 52404
Andre Gallet, Engineering Manager (1 copy)

A3.5 Field / Project Use
Terracon, Inc.
4470 48th Avenue Court
Rock Island, Illinois 61201
John Brimeyer, Phase II Coordinator (1 copy)
Field Captain (1 copy per crew)
Mike Fisher/ HRG (1 copy)

A3.6 Quality Assurance Review
Terracon, Inc.
477 South Nicolet Road, Suite 7
Appleton, Wisconsin 54914-8270
Vickie Moy, Reviewer (1 copy)

A3.7 Prairie Analytical Systems, Inc.
1265 Capital Airport Drive
Springfield, Illinois 62707-8413
James R. Johnson, Quality Assurance/Quality Control Officer(1 copy)

Consistent with outreach and agency sharing of information, copies of the project Electronic Planning Portfolio (EPP) on compact disk will be distributed to the parties above and the following agencies.

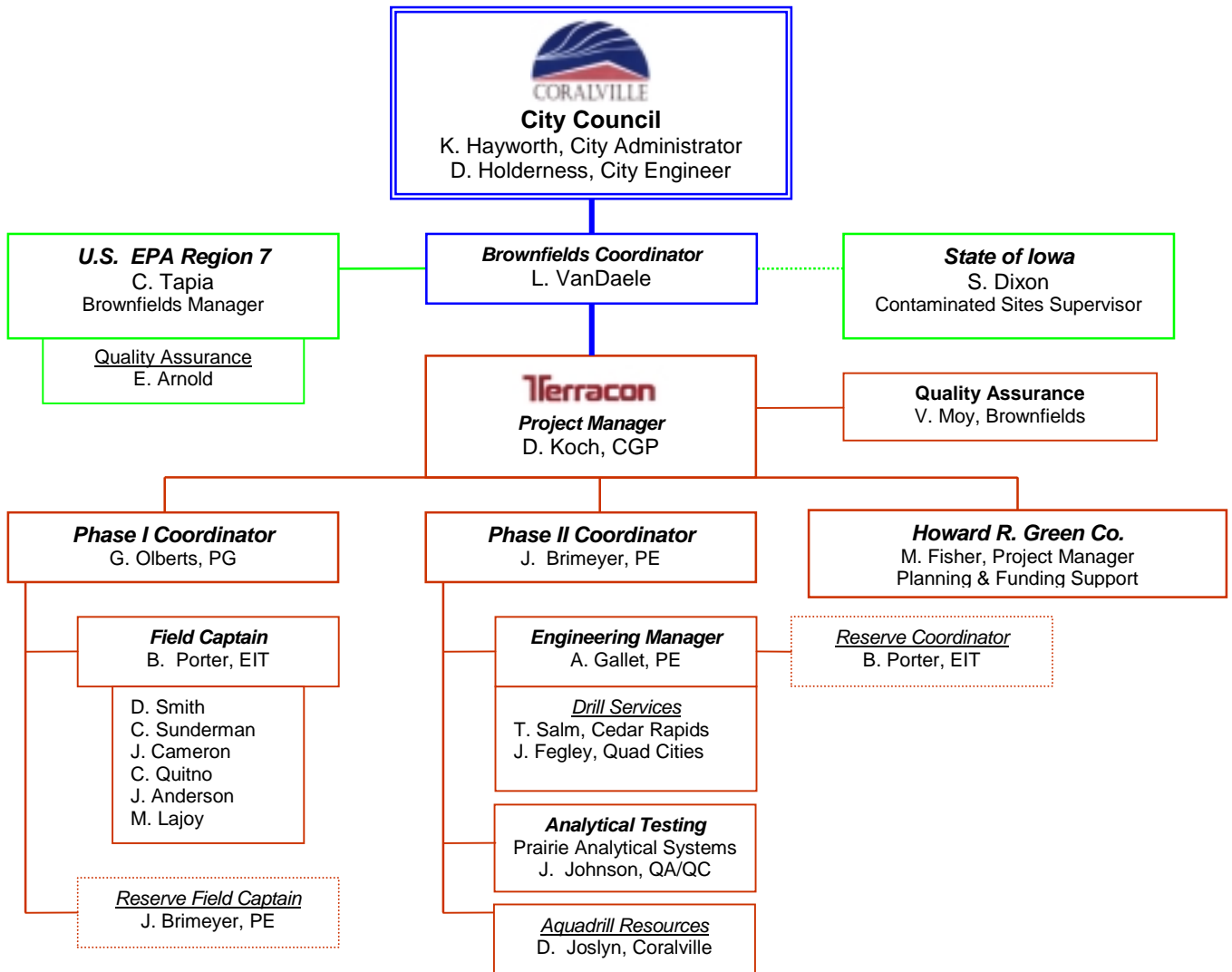
A3.8 Iowa Department of Natural Resources
Contaminated Sites Section
Iowa Land Recycling Program
Susan Dixon, Section Supervisor
Henry A. Wallace Building
502 East 9th Street
Des Moines, IA 50319-0034
(515)242-6346

A3.9 United States Army Corps of Engineers
Rock Island District
P.O Box 2004
Clock Tower Building
Rock Island, IL 61204-2004
Kayla A. Eckert, Environmental Projects Manager
(309) 794-5923

A4 PROJECT ORGANIZATION

A preliminary organizational chart was developed for the Project during selection interview and prior to project award. The current Project chart reflects minor revisions to incorporate subcontractors and is reproduced herein as Inset 1.

Inset 1.



Jointly representing the City of Coralville as issuing agency are Mr. Kelly Hayworth, City Manager, and Mr. Dan Holderness, City Engineer. The City Brownfields Coordinator reports to the Manager and coordinates with the City Engineer.

The City Brownfields Coordinator, Mr. VanDaele, is charged with coordinating efforts between the consultant and state and federal reviewers. Project Manager for Terracon is Mr. David Koch. Mr. Koch oversees all consultant activities within the Project. Mr. Koch reports to the City Brownfields Coordinator and on special issues to the City Manager and City Engineer, as directed by the Coordinator

Phase I Environmental Site Assessments (ESAs) and Transaction Screens were overseen and managed by Terracon Phase I Coordinator Mr. Gregg Olberts. Mr. Olberts supervises the Phase I Team Captain Mr. Brian Porter and the field team, who performed the initial non-intrusive assessment portion of the Project.

Intrusive Phase II assessment and non-intrusive Phase II evaluation are overseen by Terracon Phase II Coordinator Mr. John Brimeyer, PE. Mr. Brimeyer, working with Mr. Porter and Aquadrill and Terracon drill resources, will direct the Phase II evaluation effort. Mr. Andre Gallet serves as Phase II engineering manager to coordinate drill and local resources for field activity and assist in document reviews.

Vickie Moy, Quality Assurance Reviewer will assist in document and project reviews relative to the Project Plan.

A5 PROBLEM DEFINITION / BACKGROUND

The City of Coralville is looking at the feasibility of redevelopment within a project area of approximately 200 acres of mixed land use. The City intends to promote voluntary redevelopment of these properties as part of a long term community redevelopment plan. One significant element necessary to determine feasibility of acquisition prior to opening negotiations is the degree to which environmental impacts affect financing. The type and magnitude of impairment directly relate to the City decision to include a property for consideration of redevelopment.

The Project intends to evaluate the preliminary feasibility of bringing to organized redevelopment mixed-use properties enrolled by owners in the Brownfields Project and assessed by Phase I environmental site assessment in Coralville, Iowa.

A5.1 Purpose/Background

The City of Coralville has initiated an active program of improvement and restoration of the 1st Avenue Corridor connecting to Interstate I-80. The City applied for and received a U.S. Environmental Protection Agency (EPA) Region 7 Brownfields Assessment Demonstration Pilot Grant to evaluate properties adjacent to the transportation corridor. The City intends to acquire and redevelop properties which appear feasible for reuse and redevelopment.

The City of Coralville, alone cannot purchase and restore all impaired properties which appear feasible for redevelopment. The City must attract and partner with private developers or public works agencies to bring about most redevelopment projects. These discussions require a preliminary understanding of the financial and construction limitations which environmental impairment and associated public risk may attach to a property.

The Grant and Pilot Project provide a mechanism to supplement existing City efforts to evaluate parcels for redevelopment and stimulate economic reuse of the area.

A5.2 Problem Statement and Background

This Pilot Project is evaluating 1st Avenue area properties which have voluntarily enrolled in the Project and have a high probability of proceeding to redevelopment. The Brownfields grant to the Project is for collection of data through EPA federal funding and this information is subject to specific requirements of quality assurance and control.

Ongoing and second-round enrollment by property owners with subsequent Phase I ESA assessment is likely to occur. This may alter the ranking and selection of the final sites for Phase II assessment. The Project requires a comprehensive and generic enough Project Plan to potentially consider all properties within the Pilot study area. Yet the Project Plan must be specific enough to produce accurate, meaningful and useful information. The Project Plan takes the approach of a comprehensive generic Data Quality Project Plan that provides for use of a property-specific Phase II sampling and analysis checklist to activate appropriate elements of the generic QAPP when a specific site is identified.

The State of Iowa has in place through Iowa Administrative Code and rules, programs for evaluation of environmental impairment. These include risk-based corrective action programs and a voluntary Land Recycling Program administered by the Iowa Department of Natural Resources (IDNR). The appropriate programs overlap in some instances regarding regulation of environmental impairment and releases to soil, groundwater and air. The Project involves a number of properties having potential environmental issues that overlap regulatory programs. These overlaps must be resolved for evaluation. In the December 1999 project meeting, IDNR indicated a department preference to conduct soil and groundwater evaluations for public risk

relative to Iowa Administrative Code (457B) *Chapter 137: Iowa Land Recycling program and Statewide response Action Standards (IAC137)*.

It is the purpose of the Project and Part 2 of the Project Plan to provide a program of decision and assessment that provides data that sufficiently balances the data quantity and quality needed by EPA under the Grant with that required by state programs. This must be done with limited funds on the maximum number of Project sites to provide sufficient value to the City of Coralville to be meaningful for planning.

A5.2.1 Prior Work and Program Considerations

Terracon revised Phase II elements of the original Project Plan to better use USEPA data quality objectives formats and guidance. Version 2.2 incorporates the discussions of the December 1999 on-site project working session.

A5.2.1.1 Part 2, Version 2.1

A preliminary working draft of Part 2 (Revision 2.1) was developed January 23, 2000. Terracon conducted an internal test of the sampling design strategy.

Part 2 (Version 2.1) considered a purely statistical, project-wide sampling strategy that would deliver an equivalent sampling density to that of the prescriptive sample-to-volume compliance option under IAC137. The January draft made use of industry protocols for statistical source sampling design. In a preliminary trial application incorporating DEFT¹, the approach appeared to produce large, but not unrealistic sample sets for such land use areas as the landfill, coal storage and rail yard areas. The approach produced large soil sample sets for very small property-specific RECs. The approach produced large groundwater sample sets for all property-specific RECs.

Taken in cumulative effect relative to the Brownfields project and intent, this approach produced laboratory and field costs which likely exceeded available and potential near-future funding to accomplish established measures of success usable by the City. Optimization within the statistical approach could not address the problem. Project Plan Part 2, Version 2.1 was not forwarded for agency review.

A5.2.1.2 Part 2, Version 2.2

Terracon revisited the Brownfields and considered further the final criteria for probable future land reuse, IAC 137, the Iowa Land Recycling Program. IAC137 targets affected areas defined

¹ EPA QA/G-4D: *Decision Error Feasibility Trials (DEFT)* Software for the Data Quality Objectives Process, Final – EPA/600/R-96/056, October 1994.

by previous assessment, not entire properties. The sampling requirements are intended to address only portions of a property. Terracon determined in version 2.1 that the full sampling and analyses on any enrolled property cannot conduct the full scope of sampling and analysis that assessment and demonstration of compliance require under IAC137. The Brownfields Pilot decision regarding feasibility for consideration of redevelopment land use is preliminary, a screening process, and does not require a final nor complete IAC137 demonstration of compliance. This is generally consistent with the IDNR's own approach of using the IAC137 statewide standards as a screening process for unregulated releases or IAC137 applicant sites to determine if properties belong in the Land Recycling Program².

Terracon next considered a statistical sampling design procedure which produces a grid sample set, within a target probability, that a grid point will identify a "hot spot" resulting from an ASTM recognized environmental condition (REC) identified in Phase I assessment. Terracon applied preliminary calculations³ using theoretical estimates to predict grid sizes and apply them to potential Brownfields properties. Trial calculations seemed to produce reasonable and fundable sample sets for condition-specific, potentially point-source related RECs for which physical size of operations on a property allowed an estimate of a radius for a potential hotspot. However, this too produced levels of effort for property-specific RECs inconsistent with project funding.

Terracon re-visited the Brownfields Phase I assessments of properties within the Pilot study area, both ranked and unranked and enrolled and as yet not enrolled. Terracon considered them within the context of Phase decision logic to produce a hybrid design to meet the needs of the City of Coralville within the strictures of data quality needs and limited funding. Terracon next worked through properties using logic assistance from the Quality Assurance Division (QAD) of the U.S. Environmental Protection Agency. Terracon applied SampTOOL to guide the selection of theoretical property-specific sampling strategies. The tool poses a series of questions to the user, and based on the property-specific responses, the set of feasible designs is narrowed down. This type of sequential search lends itself to a decision tree format, where tree branches are components of the problem (e.g., site characteristics, problem being addressed, amount of information already available) that point to one design over another. SampTOOL acknowledges that in most actual situations, the sampling design problem is not simple, as site conditions are uncertain and there are often multiple sampling objectives. It recognizes the need to find a hybrid design that combines components of several designs to meet all the objectives and constraints.

The process identified that the variability of sites and limits of the Brownfields study does produce two (2) distinctive baselines driving sampling design. The 1st Avenue Revitalization Brownfields Pilot Project generic strategy for Phase II assessment on properties which might be

² Iowa Environmental Protection, Department of Natural Resources, Emergency Response Unit and Contaminated Sites Unit.

enrolled cannot be addressed with a single approach. With this document, Project Plan-Part 2, version 2.3, Terracon has revised the Generic Quality Assurance Project Plan (QAPP) to the balanced approach discussed hereafter for agency review.

A5.2.1.3 Technical Innovations

Terracon considered use of a number of alternative sampling and assessment approaches used on other projects, including remote sensing, portable field laboratories and push-probe technology. However, in view of probable end use under IAC137, the need for fixed-laboratory analyses and groundwater monitoring wells was required. This provides for the most direct application of the data produced to address state-level issues without multi-phase

A5.2.2 Principal User

The principal end user of Project information will be the City of Coralville, further reliance by others will be beyond the scope of the Grant and EPA funding.

The City will make primary use of the data to aid in decision-making relative to considering properties for redevelopment. The data will not be the sole nor final determinant in the positive or negative determination of feasibility of a property for redevelopment. It is anticipated that Phase II evaluation done for preliminary characterization and feasibility for a property will be used as the basis for secondary phases of remedial investigation by other parties. Funding by those parties will likely be external to federal programs.

The information produced by implementation of this and other Project plan is for the sole benefit of the City in determining feasibility for economic and physical redevelopment and restoration of the Pilot study area. The information and funding expended to produce it does not provide windfall nor extraneous benefits to property owners.

A6 PROJECT/TASK DESCRIPTION AND SCHEDULE

The Project moves to first exploring and analyzing those enrolled properties with identified recognized environmental conditions. The task is to determine if those conditions have actually produced environmental impairment. Those conditions involve properties having the potential to produce impairment from both point and non-point sources of contaminants. The properties involved are highly variable with regard to size and land use. This being a preliminary study for feasibility of development, the future land use for properties is not yet determined.

³ U.S. States Environmental protection Agency, Guidance for Data Useability in Risk Assessment (Part A), *Appendix IV: Calculation Formulas For The Statistical Evaluation Of The Detection Of Hot Spots - Probability Hot Spot Will Be Identified and Probability No Hot Spot Exists*, April 1992.

The Project intends to make use of this Generic Data Quality Assurance Project Plan to address any and all, currently and future enrolled properties within the study having recognized environmental conditions and for which funding is available. Project work to date has not identified regulatory conflicts that prevent the expenditure of Grant funds to collect data on properties within the project.

Properties within the Pilot study area include a variety of current and historical land uses. These have been generally categorized from Phase I assessments and observations as;

Table 1. Pilot Study Land Use Identified Through Phase I ASTM E-1527/1528 Practice

Land Use Categories	Enrolled	Potential Enrollment
Railroad: Rail sidings, right of ways and associated storage areas.		✓
Landfill: Uncontrolled or unregulated historical municipal and construction demolition fill operations.	✓	
Mixed Commercial: Small retail and service businesses.	✓	
Commercial Painting: Paint booth or commercial operation as part of business, other than in private consumer quantities.	✓	
Junk/Salvage Areas: Storage of abandoned vehicles or materials but not with the intent of dismantling for resale or re-smelting as a commercial enterprise.	✓	
Commercial Waste: Transfer station of sanitary waste or dumpster cleaning area in association with similar operations same.		
Gas Station / Automotive Repair: Commercial dispensing of fuels and services involving petroleum fuels and lubricants regulated by Iowa Code Chapter 135.	✓	
Petroleum: Petroleum fuels or lubricants not regulated under Iowa Code Chapter 135 such aboveground fuel storage, heating oil or general lubricants.	✓	
Coal Storage: On-grade outdoor storage of coal as fuel source.		✓
Power Generation: Former electrical power generation facility.		✓
Power Distribution: Substations or primary distribution transformer areas other than small commercial or residential on-property transformers.		✓
Pipeline: Underground distribution of bulk petroleum products and easements with structures transporting these materials .	✓	
Light Industrial: Small to moderate manufacturing industries.		✓
General: Undeveloped areas without evidence of historical commercial activity.	✓	
Public Use: Greenspace or public areas of intermittent use and without permanently occupied structures.	✓	
Residential: Private homes, single family dwellings and associated land.	✓	

A6.1 Purpose/Background

The work to be performed is the determination and preliminary characterization of environmental impairment on enrolled properties with recognized environmental conditions. The work is not intended to produce a final remedial design. The work is intended to provide information on potential types and extent of impairment on these properties.

The data is only one part of City planning for redevelopment in the 1st Avenue Revitalization corridor. Redevelopment of a specific property becomes an economic decision by the City and other parties. Environmental restoration or remedy of impairment is only one of many issues which, in sum total, may or may not make it feasible to redevelop a property.

An EPA Region 7 Brownfields Assessment Demonstration Pilot Grant is used to fund the Phase II evaluations. The Grant goals are to assess between three and six (3-6) properties with recognized environmental conditions relative to feasibility of redevelopment. The work is proposed to achieve these primary goals. The relative site-specific work effort from one site to another can, and will likely, vary.

A6.2 Description Of Work To Be Performed

The Pilot study area of 200 acres involves approximately 170 city tax parcels. The City has conducted Phase I environmental site assessments using ASTM guidance on 47 enrolled parcels having 13 owners. The Phase I environmental assessments were conducted pursuant to ASTM E-1517 and E-1528 guidance under Part 1 of Project Plan. The Phase I activity resulted in;

- Completed assessment and reporting for 47 enrolled parcels, or approximately 35% of all parcels as 27 individual reports. This comprises approximately 40% of Pilot acreage, or
 - 20 Phase I ASTM E-1527 Reports for grouped parcels (a single owner and commercial operation usually involved multiple tax parcels) of land use.
 - 7 Transaction Screen ASTM E-1528 Reports for grouped parcels of land use.
- 21 parcels, or 43% of enrolled parcels producing 12 individual reports were identified as having ASTM recognized environmental conditions of varying types and magnitude.
- The Phase I activity made use of a project scoring-and-ranking method in Part 1 of the Project Plan to identify six (6) sites most likely to have impairment on the basis of Phase I.
- Based on available Grant funding, more or less than six (6) properties will be evaluated for impairment and feasibility for redevelopment.

A6.2.1 Anticipated Measurements

Future remedy of environmental impairment for redevelopment will be considered under the auspices of Iowa Administrative Code (455H) *Chapter 137: Iowa Land Recycling Program And Response Action Standards* (IAC137). The measurements must provide information toward this end. The program considers and addresses soil, groundwater and soil vapor as media of concern. The program sets statewide standards for chemicals of concern in soil and

groundwater. Phase II will require measurement of both physical and chemical parameters relating to the media of concern.

Iowa has elected in the development of IAC137 rules not to address ambient air unless the other media in combination with a chemical of concern produce a hazardous condition or material threat to the immediate health and welfare of the public and the environment. Phase I activity did not identify conditions of current or imminent material threat regarding contaminants and ambient air.

Chemical parameters will be measured in both a field and laboratory setting. Field measurements will be made to help direct the selection of samples for laboratory testing and will not be used except as qualitative indicators in evaluation.

A6.2.1.1 Geophysical Measurements

Phase II of the Project will require drilling and sampling of soils. The Phase II activity will involve constructing monitoring wells and sampling groundwater. Measurements of groundwater chemical and physical properties must be analyzed under IAC137 for classification. Physical testing of soil properties may be required. The relative physical position and thickness of media affect the evaluation under IAC137. Table 2 summarizes the necessary physical measurements.

Table 2. Necessary Physical Measurements

Physical Measurements		
Media	Parameter	Method
Soil	Unified Soil Classification System	ASTM D2487
Soil	Moisture Content	ASTM D2216/D4643
Soil	Density	ASTM D4292/D2937
Soil	Organic Carbon Content	ASTM D2974
Soil	Field pH	Terracon SOP E.500
Groundwater	Hydraulic Conductivity (k)	Iowa RBCA – IAC135
Groundwater	Field pH	Terracon SOP E.530
Soil Vapor	Ionizable Organic Compounds	Terracon SOP E.550
Soil Vapor	IAC135 Petroleum Compounds	Iowa RBCA – IAC135
Soil Vapor	Landfill Gas, Field Screening	Terracon SOPs E.600/605

A6.2.1.2 Other Physical Measurements

Soil vapor may contain chemicals of concern if sufficient matrix material was placed as a result of disposal (i.e., old landfill waste) or historic loss of quantities of chemicals of concern which approached a condition of free-phase product materials (e.g., petroleum release, drum leakage).

Chemical Measurements

The Phase II assessments will require measuring chemical concentrations in soil and groundwater media for IAC137 comparison. Phase II assessment may require *in-situ* or *ex-situ* sampling and measuring of soil vapor. Table 3 summarizes the necessary measurements.

Table 3. Necessary Chemical Measurements

Target Chemical Measurements		
Media	Parameter	Method
Soil	Volatile Organic Compounds (VOCs)	EPA SW-846 5035/8260B
Soil	Semi-volatile Organic Compounds (SVOCs)	EPA SW-846 8270C
Soil	RCRA Metals, Total	EPA SW-846 6010A/6020
Soil	pH	EPA OSW – 9040A
Soil	IAC135 Volatile Petroleum Compounds	Iowa OA-1
Soil	IAC135 Low-Volatile Petroleum Compounds	Iowa OA-2
Soil	IAC135 Petroleum MTBE	EPA SW-846
Water	Volatile Organic Compounds (VOCs)	SW-846 8260B
Water	Semi-volatile Organic Compounds (SVOCs)	SW-846 8032*/8081*/8270C
Water	RCRA Metals, Total	SW-846 6010A
Water	IAC135 Volatile Petroleum Compounds	Iowa OA-1
Water	IAC135 Low-Volatile Petroleum Compounds	Iowa OA-2
Water	IAC135 Petroleum MTBE	EPA SW-846

A6.2.2 Applicable Technical Standards and Criteria

Phase I findings indicate these could include unregulated petroleum fuels or lubricants. Under Iowa rules deferral and cross-application by IAC137 of IAC135 petroleum methods and standards for similar chemical compounds for corrective action (i.e., OA-2 for heating oils) could occur. In such instances, field methods, sampling, analysis and limiting criteria will be as set forth in IAC135.16(455B) *Laboratory Analytical Methods For Petroleum Contamination Of Soil And Water*.

In instances where the cross-program comparison under IAC137 to site chemistry is needed, the methods of drilling and sampling will be as set forth in IAC135 and Iowa Department of Natural Resource's *TIER 1 GUIDANCE Site Assessment of Leaking Underground Storage Tanks (LUST) Using Risk-Based Corrective Action (RBCA)*, Version 1.0, November 1996 or version current at time of field assessment.

A6.2.3 Special Personnel and Equipment

The project requires field personnel experienced in the sampling of contaminated sites. These personnel must have an understanding and practical experience in obtaining and handling contaminated soil and groundwater samples. Staff must be trained in hazardous waste site safety and be able to recognize hazards in the field. Field staff will be currently trained and documented as to Hazardous Waste Site Worker training under OSHA1910.120, both base 40-hour training and 8-hour annual refresher certificates.

The application of IAC137 and the parameters of the Iowa Land Recycling Program requires oversight and application of assessment by an Iowa certified groundwater professional. The Project Manager and Phase II Coordinator must be Iowa certified groundwater professionals pursuant to Iowa Administrative Code *Chapter 134: Certification Of Groundwater Professionals*.

A6.2.4 Assessment Techniques For Project

The primary management of data quality and its assessment will be through this document, Part 2 of the Project Plan, and the parties and roles described in Section A.4. The project will be of relatively short duration for the purpose of evaluating ranked Phase I properties under available Grant funding. However, this document must provide directive and continuity for assessment of future enrolled properties which might be evaluated with additional public or private funding. This document will provide the generic basis of quality assessment through its structure, while Property-specific Sampling and Analysis Checklists (Appendix F) will implement the assessment within the limits and criteria of this document. This will produce ongoing data and decisions of similar quality within limits set for the Brownfields project.

Terracon management staff will implement project quality through the management processes and procedures of Part 1 of Project Plan, Appendix D - *Terracon Corporate Quality Program Manual (July 1998)*. Levels of review and qualifications of staff will be as described. Requirements as set forth will be implemented by the Project Manager and Quality Assurance Reviewer using methods and forms set forth hereafter.

Field methods for quality assessment are required to produce viable field data, these will be implemented through the Phase II Coordinator and Field Captain using audit methods and forms set forth later to monitor Terracon and industry Standard Operating Procedures (SOP).

Laboratory assessment of quality are necessary. These will be enacted by the procedures and processes described in Appendix E, Prairie Analytical Systems, Inc. *Quality Assurance Plan, Revision 8 - March 21, 2000*.

In instances where the IAC137 would defer to IAC135 and the Tier 1 value as the threshold parameters for comparison, data quality assessment and requirements will defer to Iowa DNR's *Leaking Underground Storage Tank Quality Assurance Plan* current revision as of the time of assessment.

A6.2.5 Work Schedule

Property-Specific Phase II Sampling and Analysis Checklists, or Part 3 of the Project Plan, will be submitted separate this Part 2 of the Project Plan. These will contain specific schedules unique to the defined property ranked for Phase II assessment. The length of time to evaluate is dependent on the type and number of samples determined in the sampling and analysis strategy and applied to a specific property.

In general, Checklists will activate their respective schedules with date of agency approval and follow the following anticipated schedule. Property-specific deviations will be described on the individual Checklists.

The clearance of public utilities and preliminary mobilization will begin within five (<5) working days and be complete by ten (10) working days after agency approval of the Checklist.

The field assessments will begin on-property within fifteen (<15) working days following EPA approval of a Property-Specific Phase II Sampling and Analysis Checklist. Completion of the field work will be property dependent.

Samples will be shipped daily from the job site to the laboratory by overnight courier. Special provisions will be made for Saturday receipt of samples.

Analytical chemistry of samples will begin following receipt and be completed as per the protocols for each method, target date for report delivery not to exceed fifteen (15) working days. Actual times will be method-dependent and described on the property-specific Checklist.

Internal Draft reports will be delivered to Terracon reviewers pursuant to the Quality Management Plan set forth in Part 1 of Project Plan within nine (9) working days of receipt of laboratory reports. Reviews will be completed in four (4) working days.

Final reports to City will be delivered within seven (7) working days of return from review.

Phase II completion of field work on enrolled sites and reporting is anticipated by September 30, 2000.

A6.2.6 Critical Documentation

The following documentation must be maintained as essential to tracking and controlling the quality of project work. The documents will be essential in documenting corrections and identifying compliance to Part 2 of the Project Plan. The documents are shown hereafter with the assigned responsibility.

A6.2.6.1 Electronic Status Reports

The Project Manager will deliver by electronic e-mail, electronic status reports to members of the management team through Coordinators project summaries on weekly to monthly basis depending on the status of overall Pilot activity. During periods of field assessment, the electronic status reports will be prepared and distributed no less than weekly. Copies of the status reports will be printed and filed with project documents at Terracon's Rock Island, Illinois location. Copies will show the time, date and distribution.

A6.2.6.2 Daily Field Reports

During field activities the Phase II Field Captain will compile and complete Form C.13: Daily Job Report, attached in Appendix C. This will be appended with logs of intrusive sampling as Form C.2, Appendix C. These will be forwarded to the Phase II Coordinator on no less than a weekly schedule.

A6.2.6.3 Field Logbook

During field activities the Phase II Field Captain will compile and complete a daily logbook. The Field Captain will maintain the logbook with Copy #8 of Part 2 of the Project Plan. Copies of the field logbook will be delivered to the Phase II Coordinator and Project Manager on no less than a weekly schedule. Between field activities, the logbook will be maintained at central files by the Phase II Coordinator in Rock Island, Illinois. The Field Logbook will contain no less than, but not be limited to;

- Approved copy of Property-specific Sampling and Analysis Checklist
- Site sketch or map with location of each sample point
- Current copy of access agreement negotiated with enrolled property owner
- Current copy of public utility clearance for property with location sketch
- Full descriptions of deviation from standard operating procedures, the Sampling and Analysis Checklist and the QAPP
- Description of daily field sampling conditions and physical parameters as appropriate to the methods and media involved for that
- Daily calibration of any field instruments appropriate to the methods and media involved

A partial example is shown as C.10, Appendix C.

A6.2.6.4 Quality Assurance Project Plan

The QAPP will be maintained and distributed as indicated in section A3 previous. The generic QAPP shall contain the elements set forth herein and have been approved by the EPA prior to implementation. A Property-Specific Sampling and Analysis Checklist (Checklist) will identify elements of the QAPP pertinent to determining feasibility under the study for a specific target property. Approval of the Checklist by EPA will activate the elements of the QAPP for field activity.

A6.2.6.5 Field Standard Operating Procedures

Standard procedures for sampling, physical measurements, decontamination, construction of wells and calibration procedures for field equipment will be used. These will accompany Sampling Teams. Checklists will specify from Appendix D file appropriate Terracon Standard Operating Procedures (TSOPs). Discrepancies and corrections in the field will be recorded via the Field Logbook.

A6.2.6.6 Analytical Standard Operating Procedures

The Quality Assurance designee of the analytical laboratory shown in section A4 will maintain standard procedures on file that include, but are not limited to, procedures used, sample tracking and log-in procedures pertinent to activities under the QAPP. Details are found in Appendix E: Prairie Analytical Systems, Inc. *Quality Assurance Plan, Revision 8 - March 21, 2000*.

A6.2.6.7 Laboratory Deliverables

The Quality Assurance designee of the analytical laboratory shown in section A4 will maintain the narrative descriptions and explanations deliverables. These will be maintained consistent with requirements of record retention found in 40CFR Subpart O. These will contain the following, but shall not be limited to the following. Details of record keeping are found in Appendix E: Prairie Analytical Systems, Inc. *Quality Assurance Plan, Revision 8 - March 21, 2000*.

- Level of analytical data review used by the laboratory and resulting data qualifiers, indicating direction of bias based on the assessment of Quality Control samples (e.g., blanks, field and laboratory spikes)
- Results of each analyte and sample quantified for analytical limitations

- Sample quantitation limits and detection limits reported, with any qualifications
- Instrument printouts and logbooks, spectragraphics and raw data
- Laboratory notebook with full descriptions of all deviations from ASOPs and the QAPP

A6.2.6.8 Custody Records

The Field Captain will maintain a copy of completed chain-of-custody (COC) records, Form C.8 - Appendix C, for samples during field activity. COCs will be maintained with the Field Logbook. The Field Captain will be deliver to the Phase II Coordinator these copies on no less than a weekly schedule. After field activities, COCs will be maintained at central files by the Phase II Coordinator in Rock Island, Illinois.

The Quality Assurance designee of the analytical laboratory will maintain the original COCs with sample data and annotate with laboratory custody information. The original COC with a record of laboratory custody will be provided to the Phase II Coordinator with written laboratory reports.

A7 QUALITY OBJECTIVES AND CRITERIA FOR MEASUREMENT DATA

Because of the limited funding for Brownfields site assessments, it is often not possible to collect data sufficient to achieve a desired level of certainty in site decisions. This becomes especially true for the 1st Avenue Revitalization Project involved in a preliminary feasibility study of the potential for redevelopment for numerous and varied properties within the study area. By following a systematic planning process the Brownfields Team can strike the best balance between what they want to know about a property and what they can afford to know about a property given the realities of their Grant budget.

Part 2 of the Project Plan sets forth generic objectives to address as yet unknown property-specific needs within the Pilot Study area. The early discussion and determination of focused goals allows the Brownfields Team to focus on immediate implementation as funding is available for a Pilot Study property with an ASTM recognized ASTM environmental condition.

The specific assessment design criteria for any enrolled site will be set forth in a separate Property-Specific Sampling And Analysis Checklist approved by EPA which activates specific elements of this project document.

A7.1 Purpose/Background

The purpose of this element is to document the data quality objectives of the project and to establish performance criteria for the mandatory process of implementing EPA Brownfields

funding in the collection of data. This element sets pre-defined objectives and decisions to clarify objectives for a feasibility study of this nature and avoid vagueness of the process.

A7.2 Specifying Quality Objectives

This element of the QAPP discusses the desired quality of the study results to provide that the City of Coralville's goals as Grant recipient are met. The objectives are a blend of qualitative and quantitative statements that;

- Clarify the intended use of the data relative to the 1st Avenue Revitalization Brownfields Assessment Demonstration Pilot
- Preemptively define the type of data which may be required to support the primary decision on any site within the Pilot study that may enroll and identify a recognized environmental condition through Phase I efforts.
- Identify conditions under which specific types of data should be collected relative to goals of the Pilot study and future redevelopment.
- Specify tolerable limits appropriate for the use of data for the 1st Avenue Revitalization study which address the probability and effect of making a decision error due to uncertainty in the data.

A7.2.1 Problem Statement

The problem is the City of Coralville must determine if properties identified as having ASTM recognized environmental conditions in Phase I assessment study are not impacted for consideration as part of redevelopment without remedy of environmental impairment.

The measurement and method of the determination is for redevelopment planning. The method must be must be cost-effective yet produce defensible data. The determination must be relevant to issues of redevelopment beyond the life of the Brownfields Grant.

Unlike many Brownfields involving a single property or land use, this Pilot study allows for properties of diverse size, use and physical conditions to be enrolled. The final types and numbers of properties to be enrolled are as yet unknown. The Brownfields Pilot process is ongoing and Phase I and Phase II work may overlap. To be comprehensive and useful to the City of Coralville in making decisions, Part 2 of the Project Plan must to a degree predict and anticipate what might be needed on any or all of multiple properties of varied land use located within the Pilot study area.

Key elements to be continually considered are;

- The Brownfields Pilot study is only a screening level decision to consider a property further for redevelopment. This is a feasibility study for use in City of Coralville planning as part of comprehensive municipal redevelopment.
- A Brownfields study decision to accept a property as feasible for consideration does not mean the property will be redeveloped.
- A Brownfields study decision to reject a property as not feasible for consideration under IAC137 has two (2) elements; rejection based on generic statewide standards or based on site-specific standards. Rejection on either basis does not mean the property will not be redeveloped. Rejection does not represent a final decision that a property cannot be environmentally restored and redeveloped.
- If a property proceeds in future transactions to restore a property under IAC137, the state of Iowa will require additional assessment and evaluation for affected areas prior to closure. IAC137 will allow site-specific considerations of remedy through site management that do not require physical cleanup.
- Enrolled properties with ASTM recognized environmental conditions from potential or known point-source releases to soils or groundwater require a focused Phase II “yes – no” determination of impact relative to Iowa code.
- Enrolled properties with ASTM recognized environmental conditions from potential non-point source releases to soils or groundwater require a statistical Phase II “yes – no” determination of impact relative to Iowa code.

A7.2.2 Decision Statement

The decision is to determine whether or not a property with an ASTM recognized environmental condition identified in Phase I assessment is or is not impacted relative to Iowa environmental standards. Based on the outcome of the data collection, there are two (2) actions:

- The property is “clean” and poses, due to measured conditions of IAC137 environmental impairment, no reasonable impediment to consideration for redevelopment than would normally be exercised by the City of Coralville.

or,

- The property is impacted and poses, based on measured conditions of environmental impairment, a need for additional evaluation above that normally exercised by the City of Coralville in considering a property as feasible for redevelopment.

Part 2 of the Project Plan does not attempt to derive the site-specific process of each possible property which might enroll with a recognized environmental condition. Instead, it provides a detailed decision framework to apply to any property within the study area and produce useful data of a quality to the decision the City of Coralville must make. Part 3 of the Project Plan produces a detailed Site-Specific Sampling and Analysis Checklist to implement Phase II assessment on actual properties.

EPA Region 7 recognizes this and has waived the typical Brownfields Data Quality Objectives segment regarding development of a conceptual site model.

A7.2.3 Identification Of Inputs To The Decision

In making the decision for any specific enrolled property with a Phase I ASTM recognized environmental condition, the project process must define what constitutes environmental impairment appropriate to the decision.

ASTM E1527: Standard practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process defines recognized environmental condition as *“the presence or likely presence of any hazardous substances or petroleum products on a property under conditions that indicate an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into structures on the property or into the ground, groundwater, or surface water of the property.”* Iowa Administrative Code Chapter 131: *Reporting Of Hazardous Conditions* deals with the identification and reporting of conditions of material threat. Phase I work did not identify hazardous conditions on enrolled properties.

Iowa Administrative Code Chapter 137: *Iowa Land Recycling Program and Response Action Standards* is specific to environmental impairment with regard to redevelopment and mitigation. Administrative rule has identified two (2) primary criteria for study and mitigation of impairment; chemical impacts to soil and chemical impacts to groundwater.

The methods of analysis must be quantitative for Iowa comparisons. Different land uses, current or historical, have the potential to render releases of a variety of chemicals to soil or groundwater. Every chemical cannot be measured and quantified. The selection of chemical analytes to measure impairment must be focused to chemicals associated with land use.

A joint session in late December 1999 of the City, Pilot consultants, EPA Region 7 project representatives and the laboratory identified by professional consensus groupings of associated

chemical classes which might be observed on land uses identified in Phase I and depicted below in Table 4. These were included as inputs to the decision process. Specific to this Brownfields pilot the following are identified:

- The characterization will perform within limits allowing for an α (probability of a false positive error rate) of ten percent (10%). This provides a confidence level of ninety percent (90%).
- The characterization will perform within limits allowing for a β (probability of a false negative error rate) of twenty percent (20%). This provides a power of eighty percent (80%).
- The soil/characterization must take place on a minimum of two (2) intervals of depth, surface to two feet below (0-2) and greater than two (>2) feet below surface. Each interval will be subject to the generic design limits unless property-specific information becomes available (i.e., previous exploration for calculating a CV, previous exploration indicates a single contaminant of concern) to adjust a parameter.
- If the coefficient of variation for all soil samples from a particular property varies more than ten percent upward (+10%) of the design or more than twenty percent downward (-20%), the Phase II report will specifically observe the effects of the change on the data and discuss in the report.
- Soil/fills sampling will require a minimum of ninety five percent (95%) completeness for the combined number of soil samples of both depth intervals.

Table 4. Land Use And Associated Target Chemical Inputs

Land Use	VOC	SVOC	Total Metals	Iowa OA-2	Iowa OA-1 Vapor	Iowa MTBE	PCBc	pH	Land Fill Gas
Railroad Properties	X	X	X						
Former Landfills	X	X	X						X
Mixed Commercial	X	X	X						
Painting Operations	X		X						
Salvage or Junk Storage	X	X	X	X					
Automotive Fuels/Lubricants	X		Lead	X	X	X			
Coal Storage		X	X					X	
Power Generation	X	X	X				X		
Power Distribution	X			X			X		
Bulk Petroleum Fuels	X			X	X	X			

The Pilot project will use USEPA standard methods for items to analyze soil and groundwater as set forth in Table 5 to meet the objectives of the Brownfields Phase II assessment. For properties identified with unregulated petroleum issues that would be deferred laterally to

IAC135 for regulation, the Pilot will use Iowa methods to analyze soil, groundwater and soil vapor.

A7.2.4 Study Boundaries

The decision by the City must be bounded as to spatial and temporal issues to be effective. The scales of physical and time must be appropriate to the limits of the Pilot Grant and the nature of preliminary characterization to determine City feasibility to consider redevelopment. Properties undergoing Phase II assessment must address the practicalities of dimension set forth in IAC137 Iowa Land Recycling Program, the program of future use.

A7.2.4.1 Spatial Boundaries

The project and context of the study is bounded in three (3) primary lateral spatial boundaries; regional, those of the Brownfields Pilot study and property-specific. In addition, Iowa programs of regulation pertinent to the study introduce elements of vertical boundaries which must be considered.

Pilot Study Area – Regional Boundaries

The Pilot study area is composed of approximately 200 acres of mixed land use property in Coralville, Iowa. The study area is generally defined as south of Interstate I-80 to Clear Creek and East of 1st Avenue to the Iowa River. A smaller portion west of 1st Avenue is also included north of Clear Creek, east of 3rd Avenue and south of 4th Street. Reference Figure 1 Appendix B.

Pilot Study Area – Brownfields Pilot Boundaries

During Phase I assessment and evaluation enrolled properties within the area of the Brownfields Assessment Demonstration Pilot study area were grouped into four (4) conceptual zones for handling and organizing information. These boundaries will similarly be maintained throughout Phase II data collection, evaluation and reporting.

Groupings were generally based on similar land use for the purpose of reference, data collection assignments, organized data management and to make final data presentation in the Brownfields Assessment Demonstration Pilot electronic planning portfolio more manageable. The project zones are conceptual and are not related to any city, county or state designations. The discrete boundaries are not significant in their detailed location; properties on either side of a zone boundary are not necessarily of differing environmental significance. Please reference Figure 1, Appendix B.

The project zones are identified by number as;

1. Central Area Of The Pilot – Zone 1 is an area bounded east by the Iowa River, west by 1st Avenue, north by East 7th Street and south by 5th Street Place East. The area is generally characterized by abandoned and vacant property of former industrial and rail-related use with light commercial and retail use along 1st Avenue.
2. Northern Area Of The Pilot – Zone 2 is an area bounded on the west by 1st Avenue, the south by East 7th Street, the east by Quarry Road and north by the Interstate I-80 Corridor. The area is completely in use by mixed and diverse commercial, light-to-moderate industrial and retail operations. Zone 2 contains the Coral Industrial Park.
3. Eastern Area Of The Pilot – Zone 3 is an area bounded along the south/east by the Iowa River and the west by Quarry Road. Edgewater Park, owned and operated by the City, comprise more than seventy percent (>70%) of the area in greenspace use with the balance in residential and recreational use.
4. Southern Area Of The Pilot – Zone 4 is an area mostly bounded to the west by 1st Avenue and the extension of 3rd Avenue, to the south by Clear Creek, the east by the Iowa River and the north by 5th Street Place East. The area is generally characterized by former heavy industrial and power-related use, current commercial occupancy and a segment west of 1st Avenue that includes inactive commercial property.

Program-specific Boundaries

If feasible for further consideration for redevelopment and barring any as yet undiscovered conditions which would prompt other regulatory action, an enrolled property undergoing Phase II

would be redeveloped pursuant to remedy under IAC 137 Iowa's Land Recycling Program. The program allows for site-specific standards of comparison.

IAC137 sets forth criteria of evaluation for two (2) media; soils/fills and groundwater. IAC137 does not address air as a media. The decision must address soil/fills and groundwater as physical delineators.

In considering acceptable chemical- and site-specific thresholds of comparison to determine public and environmental health effects beyond the generic Iowa statewide standards, IAC137 differentiates between exposures to chemicals of concern relative to depth from surface. IAC137 differentiates between specific exposures for impacts to soils in the upper two (<2) feet, the interval between two and ten (2-10) feet and greater than ten (>10) feet from ground surface. The decision must consider these spatial parameters.

Property-specific Boundaries

The generic QAPP will consider the enrolled parcel(s) or property of assessment with an ASTM recognized environmental condition to constitute the physical property boundary identified and described in the ASTM Phase I environmental site assessment and set forth in Sections 1.0 (Introduction) and 3.0 (Location) of those property-specific reports.

Secondary comparisons to IAC137 will consider the vertical spatial effects of chemicals of concern in soil. Phase I assessment, existing and historical topographic maps and historical foundation drilling for the study area indicate fills greater than ten (>10) feet are likely to occur only Zone in Zone 2 along 1st Avenue. Redevelopment and construction will typically involve soils in the approximate zone from surface to approximately fifteen (~15) feet below ground surface, except in instances of unusual design or deep foundations involving construction worker exposures.

A7.2.4.2 Temporal Boundaries

Phase II assessment for the decision of feasibility as governed by the Grant is anticipated to be a single phase assessment. Secondary phases of investigation and data collection to improve data levels in support of refined decision-making would be conducted external to the primary Grant funding. Primary Phase II evaluation for feasibility of ranked sites within available funding will be completed in September 2000.

Property-specific Phase II assessment will occur after City negotiation of property access (Form C.1 Appendix C) with owners. The schedule to complete will be set forth in a Property-specific Sampling and Analysis Checklist which will activate specific elements of Part 2, the generic QAPP. The anticipated schedule elements are described above in Section A6.2.5.

Iowa has set forth in environmental programs that data more than a year old may be suspect for the purpose of decision-making. IDNR preferences are for data no greater than 6-months old. IDNR considers data relative to age as more of an issue in groundwater than in soil. IDNR considers the issue to be more sensitive for volatile than semi-volatile compounds or metals. This is reflected in post-monitoring program schedules for closure approved by the agency under IAC133 and IAC135.

The study will make use of any historical groundwater data greater than one (>1) year old only for qualitative evaluation. Quantitative comparisons to IAC137 for decision-making will only make use of analytical groundwater chemistry less than or twelve (≤ 12) months old.

With the exception of volatile organic chemistry, the study will make use of all historical soil/fill data for quantitative evaluation regardless of age. Quantitative comparisons to IAC137 for decision-making will only make use of analytical volatile soil/fill chemistry less than or twelve (≤ 12) months old.

A7.2.5 Decision Rule

The purpose of developing the decision rule for the 1st Avenue Revitalization Pilot is to bring together the previous data quality objectives into a clear statement the project will use to determine feasibility of redevelopment on a specific property. The statement must estimate parameters of usefulness, a scale for application, specific action levels and describe the logical basis for choosing among alternative options. The decision rule is a series of logical tests expressed as “if ... then” statements that define the direction the City can proceed to in considering a property to have environmental impairment relative to future planning and redevelopment.

A decision rule in Brownfields is usually a comparison of a statistical parameter of interest to a specific quantitative action level. The action levels at the 1st Avenue Brownfields are the comparison of concentrations of chemicals of concern that acts as the pivotal decision to move in one direction or another by the City of Coralville to consider a property for redevelopment.

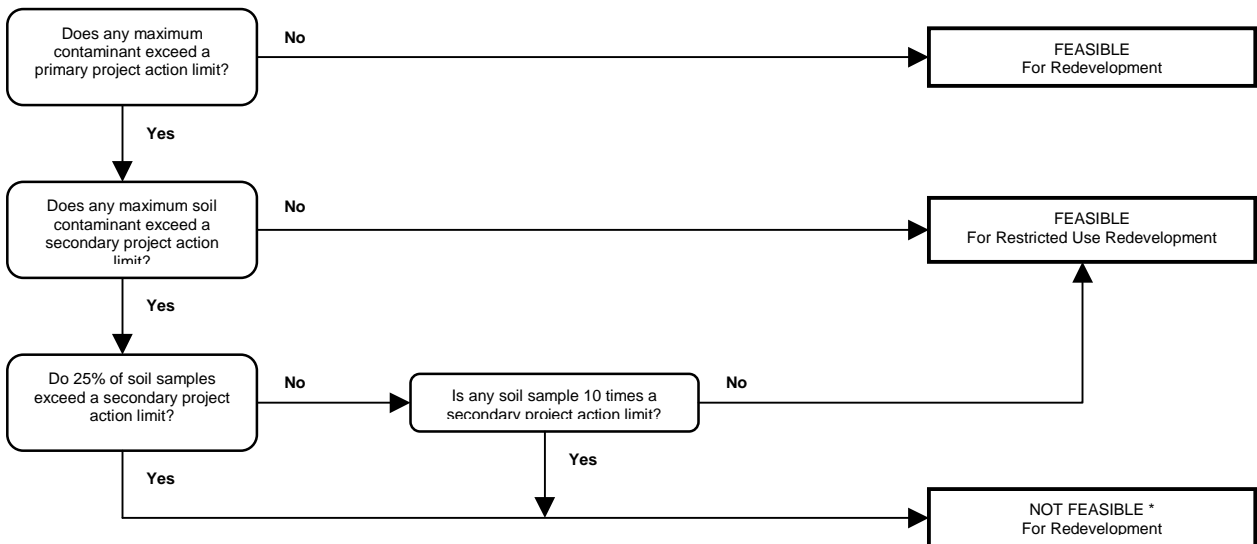
A decision will be made relative to a comparison of property concentrations of chemicals of concern in soil and groundwater to IAC137 Iowa Statewide Standards as the primary action limit.

A decision will be made relative to a comparison of property concentrations of chemicals of concern in soil to IAC137 Iowa Site-Specific Standards as a secondary action limit.

The City will decide the following for enrolled properties of the 1st Avenue Revitalization Brownfields Assessment Demonstration Pilot having undergone Phase II assessment. The elements of the decision rule are diagrammed in Inset 2.

- If the maximum concentrations of target analytes in soil/fills or groundwater associated with a property do not exceed any of the primary project action limits, then the City will consider the property not to be impacted and the property is feasible for redevelopment without regard to land use or having to consider remedy of environmental impairment under normal municipal process.
- If the maximum concentrations of target analytes in soil/fills or groundwater associated with a property do not exceed any of the secondary project action limits, then the City will consider the property to be impacted but feasible for redevelopment with special consideration of remedy of environmental impairment or restricted land use and disclosure of conditions of environmental impairment to other future parties as part of the municipal redevelopment process.
- If twenty five percent or more ($\geq 25\%$) of the maximum concentrations of target analytes in soil/fills or groundwater associated with a property exceed any of the secondary project action limits or any single concentration is more than ten times (10x) the limit, then the City will consider the property to not be feasible for redevelopment without further assessment and evaluation beyond the scope of the 1st Avenue Revitalization Pilot.

Inset 2. Elements of the Decision Rule



* Without Special Assessment Beyond Scope Of This Pilot Project

A7.2.6 Limits To The Decision

The 1st Avenue Revitalization EPA Brownfields Assessment Demonstration Pilot study encounters an unusual circumstance in the development of a generic QAPP. The earlier versions 2.1 and 2.2 trial optimizations identified the need for the generic QAPP to set limits for both statistical and non-statistical approaches.

IAC137 also mixes the use of statistical and judgmental comparisons for soils and groundwater. IAC137.10(5) allows comparison of a percentage of maximum values with an upper limit factor or the use of a weighted statistical approach. The weighted approach allows use of the calculation of a 95 percent confidence level of the arithmetic mean using EPA guidance⁴. Terracon experience shows that the latter approach does not work well with small data sets and lognormal distributions typical of “plume chasing” for conditions of point source release (i.e., a minimum data set with very high concentrations at center of release and remaining samples near the edge of plume as low-concentration and/or ‘clean’). The EPA procedure states this to be true, as well.

The procedure recommends alternatively for areas with limited data or data with extreme variability when additional data cannot be collected, to use the highest measured or modeled value as the concentration term. This leaves the project team with the need to develop statistically defensible data, that may or may not figure into the decision, depending on site circumstances. Limited funding curtails the probability that data sets will be “too large” rather than limited. Point source conditions set the stage for extreme variability within limited data sets. This leads the team to necessarily;

- Develop data quality for use with a judgmental approach for point source conditions and a direct, non-statistical comparison under IAC137.10(5)a & b(1).
- Develop data quality for use with a statistical approach for non-point source conditions and either a weighted mean statistical comparison or direct non-statistical comparison under IAC137.10(5)a & b(1).

The measuring of chemicals to levels of parts-per-billion and parts-per-trillion can lead the public to a misconception that environmental methods are exact measurements of property conditions. Although very controlled, environmental sampling and laboratory analysis are not perfect. Both are performed within ranges of acceptable performance to estimate, as best the method can, the amount of chemical present. The project team must develop means to limit or control cumulative negative impact of performance within these ranges and where they might overlap.

⁴ *Supplemental Guidance to RAGS: Calculating the Concentration Term*, U.S. Environmental Protection Agency, Office of Solid waste and Emergency Response, Washington, D.C., Publication 9285.7-081, May 1992.

The cumulative effect is known as the total study “error”. The following can potentially add to the total 1st Avenue Revitalization study “error”;

- Variability of chemical conditions between sampling points measured on a property. The City can not physically or financially sample everything, everywhere.
- Variations in the measurements made during sampling, handling and analysis of samples if standard procedures are not used.
- Preparation of reports in rounding or adding values or the variability of methods available to evaluate the data.

It is not financially or physically feasible within the scope of the Pilot study to produce an evaluation that is one hundred percent (100%) free of decision error. The setting of limits for data collection and analysis is a practical acknowledgment that few things or methods are truly perfect and that performance within predetermined and accepted limits therefore makes decisions on the data reasonable.

A7.2.6.1 Project-Specific Hypothesis

As part of the redevelopment process, the City needs to determine if the project decision hypothesis is true. For the 1st Avenue Revitalization process the hypothesis is;

“A property is not impacted (environmentally impaired) and the City can consider it feasible for redevelopment under IAC137 without considering remedy of soils or groundwater.”

A7.2.6.2 Project-Specific Null Hypothesis

Using the EPA data quality process necessary for data collection using federal funding, the City and Brownfields project team address the issues of the margin of study error through a process called testing the null hypothesis. This is where the team designs the sampling and analysis program to prove the contrary or “opposite” Brownfields hypothesis. This is the hypothesis upon which the total study “error” has the least negative effect after the decision is made, thereby reciprocally providing the most positive effect to result from the decision. For the 1st Avenue Revitalization process the null hypothesis is;

“A property is impacted (environmentally impaired) and the City cannot consider it feasible for redevelopment under IAC137 without considering remedy of soils or groundwater.”

In developing the 1st Avenue Revitalization data collection program to limit cumulative study errors so that they do not become significant to the quality of the decision, the City and team

considered the types of error significant to the project. The team set acceptable limits within which the errors are considered to have the least effect to the quality of the decision.

In the case of this Pilot, erroneously accepting that the null hypothesis is true (false positive decision error) could result in the City including an enrolled Property for consideration that is not reasonably feasible for redevelopment without remedy.

Erroneously accepting that the null hypothesis is false (false negative decision error) could result in the City including an enrolled Property for consideration that is feasible for redevelopment without remedy.

A7.2.6.3 Project-Specific Factors

The sampling and analysis approach must set limits appropriate to the Pilot project. In setting these limits the definitive use of the results must be considered. In establishing limits, the issues set forth as inputs to the decision are again re-visited. Relative to the 1st Avenue Revitalization Brownfields project, the following are significant limits of this project;

- The Brownfields Pilot study is only a screening level decision to consider a property further for redevelopment.
- A Brownfields study decision to accept a property as feasible for consideration without need for remedy does not mean the property will be redeveloped.
- A Brownfields study decision to reject a property as not feasible for consideration under IAC137 has two (2) elements; rejection based on generic statewide standards or based on site-specific standards.
- If a property proceeds in future transactions to restore a property under IAC137, the state of Iowa will require additional assessment and evaluation for affected areas. IAC137 will allow site-specific considerations of remedy through site management that do not require physical cleanup.
- Enrolled properties with ASTM recognized environmental conditions stem from known or potential point and non-point source releases. The approach to these types of contaminant distributions must vary.

Other issues considered significant and specific to setting limits on this Pilot study included;

- Point source distributions of chemicals identified in the Phase I assessment in soil or groundwater will require judgmental sampling within limited areas, or “hot spots” to identify a reasonable probability of identification.
- “Hot spots” in soil are directly related in physical dimension to the dimensions of the operation or historical activity which triggered the Phase I identification of a recognized environmental concern, limited by the enrolled property boundary unless otherwise noted.
- Non-point source, potentially homogeneous distributions of chemicals identified in the Phase I assessment in soil or groundwater will require statistical sampling to define a reasonable probability of identification.
- Chemicals of concern will be considered those in groups shown in Table 4 and specific analytes under IAC137 for which the Iowa DNR has published data as of the most recent revision, October 1999.
- Phase I information indicates organic compounds as chemicals of concern or contaminants will be derived from human, or anthropogenic, sources and should be readily differentiated as contaminants within the Pilot study.
- Consistent with Eastern Iowa assessment experience, anthropogenic values of metals may not be readily distinguishable from natural background conditions in soil/fills (i.e., arsenic). All areas of the Pilot study fall within municipal boundaries and have been influenced by association with human activity.
- Measured values for “hot spot” chemicals of concern in soils/fills and groundwater may be highly variable with distance from the point source and previous sampling and analysis data may not be available.
- Measured values for non-point source chemicals of concern may be moderately variable due to random distribution within soil/fills media. Previous sampling and analysis data may not be available.
- Phase I conditions of on-going release or imminent threat were not identified for enrolled properties within the study area. Measured values for chemicals of concern within groundwater are likely associated with historical activity. Variability of groundwater will likely be less than that associated with soils.

A7.2.6.4 General Project-Specific Limits On Decision Error

The primary comparison to determine “impacted” or “not impacted” will be made relative to generic “one size fits all” IAC137 statewide standards for soils and groundwater.

Cumulative study error that might allow the City to erroneously consider a property as “not-impacted” presents the potential for greater negative effect. This would position the property for no further consideration of environmental impairment than might be performed by future owners or developers as part of due diligence. Although this future assessment has a high probability of occurrence due to current industry practice, there is no guarantee the property will be further evaluated. Greater emphasis should be placed on designing the study to minimize false positive decision error.

The erroneous inclusion of a property as “impacted” and the resultant negative effect, not considering it feasible for consideration of redevelopment without remedy, is mitigated by the use of a secondary decision process under IAC137 to consider site-specific standards. Decision of an enrolled property as feasible for redevelopment but requiring further consideration of remedy as part of that redevelopment does not remove that property from potential reuse, but does force further consideration of environmental issues influencing redevelopment. For this screening process of feasibility, a lesser emphasis can be placed on effect of the false negative decision error since it does not completely remove a property from final consideration or reuse.

A7.2.6.5 Point Source Project-Specific Limits

The project considered the following on decision error for Phase II data collection and evaluation on Pilot study properties for which the recognized environmental condition was identified in the Phase I assessment as potentially producing a point-source condition.

The point-source condition will be measured using judgmental sampling. IAC137.10 has set limits for direct comparisons within the Iowa Land Recycling Program which consider data variability and quality. These limits are expressed as percentage and factored comparisons relative to action limits. This requires the Brownfields team to proceed with the following;

- Point source judgmental sampling and analysis will attempt to prove the null hypothesis, that a property is contaminated beyond inclusion for feasibility without considering corrective action.
- Superfund guidance suggests⁵ that the best strategy for identifying hot spots is a combination of systematic sampling supplemented by judgmental sampling, with a minimum

⁵ *Guidance for Data Useability in Risk Assessment (Parts A and B) – Final - Superfund*, United States Environmental Protection Agency, Office of Emergency and Remedial Response, Publication 9285.7-09A, April 1992.

of three to five (3-5) samples if just judgmental or purposive sampling is done. If the operational area related to the potential hotspot (i.e., drums stored on a pallet within a small compound) exceeds two thousand square feet (>2000SF), a statistical approach for the area (e.g., the compound) combined with a purposive sample at source (i.e., the drum pallet) estimated by the Phase I findings will be used.

- The limits for laboratory measurements will be within those limits of precision, accuracy and repeatability as set forth in the published regulatory method specific to the analysis and as controlled by the laboratory in procedures set forth in Appendix E.
- Point-source judgmental sampling and analysis for soil and groundwater will design the strategy to remove the vagueness of number of samples and location when applied to any property enrolled and ranked for Phase II assessment.
- No less than five (≥ 5) soil sampling locations will be used for point source identification, with one at the estimated center of potential source based on Phase I assessment of the recognized environmental condition.
- No less than one (≥ 1) groundwater sampling location will be used for point source identification, with one at the estimated center of potential source based on Phase I assessment of the recognized environmental condition.
- Judgmental sampling will require one hundred percent (100%) completeness of soil and groundwater sample locations.

A7.2.6.6 Non-Point Source Project-Specific Limits

The project considered the following limits affecting decision error for Phase II data collection on Pilot study properties for which the recognized environmental condition was identified in the Phase I assessment as potentially producing a non-point source condition or distribution of chemicals of concern.

Soils

Phase I findings indicate ranked properties include potential non-point source distributions of chemical impact requiring a determination of statistical probability to identify randomly distributed materials. The project approach acknowledges that the IAC137 approach of calculating a 95UCL as the comparison may not bear out and maximum concentrations could be used as set forth in the Iowa rule, regardless.

For purposes of non-point source design strategy to investigate soils/fills on enrolled properties the following limits are considered for the project;

- Regardless of IAC137 to potentially allow an average concentration⁶ or a maximum concentration comparison to the action level, the non-point source sampling designs will use a mean vs. action level approach (one-sample t test).
- The non-point source condition in soils will be studied using a systematic random sampling approach for general consistency with IAC137, although the Land Recycling Program sets no specific statistical limits.
- Phase I assessment identified that for most properties insufficient or no pre-existing data sets will be available to calculate meaningful factors of variability. Therefore the Brownfields project sets for use in the generic QAPP the following limits using proxy chemicals, professional judgment and suggested guidance from EPA literature as shown in Tables 6 and 7.

Table 6. Parameters For Generic Sampling Designs For Organic Non-Point Sources

Land Use Potentially Associated With A Non-Point Distribution Of Chemicals Of Concern	VOC (1)	SVOC (2)	CV (3)	MDRD or Gray Area (4)	Type I Error (5)	Type II Error (6)
Railroad Properties	X	X	40%	25%	90%	80%
Former Landfills	X	X	45%	25%	90%	80%
Mixed Commercial	X	X	45%	25%	90%	80%
Painting Operations	X		25%	25%	90%	80%
Salvage or Junk Storage	X	X	40%	25%	90%	80%
Coal Storage		X	30%	25%	90%	80%
Power Generation	X	X	30%	25%	90%	80%
Power Distribution	X		30%	25%	90%	80%
Bulk Petroleum Fuels	X	X	30%	25%	90%	80%

(1) Volatile Organic Compounds, see Table 4, Section A6.2.1 herein.
 (2) Semi-Volatile Organic Compounds, see Table 4, Section A6.2.1 herein.
 (3) Coefficient of Variation selected by professional judgment as default and observing the average CVs of volatile or semi-volatile chemical group from EPA Guidance for Data Usability in Risk Assessment, Part A, April 1992 - Exhibit 23: Median Coefficient Of Variation For Chemicals Of Potential Concern In soil. Varied nature of media as anthropogenic fills considered for land use.
 (4) Minimum Detectable Relative Difference, suggested default if no other information exists from (3) reference, Exhibit 45. Part III:: Exposure Area Summary Sampling Design Selection Worksheet.
 (5) Probability of the false positive error rate expressing the confidence level as a percentage.
 (6) Probability of the false negative error rate expressing the power as a percentage.

⁶ IAC137.10(5)a & b(2), *Chapter 137: Iowa Land Recycling Program and Response Action Standards*, October 1999.

Table 7. Parameters For Generic Sampling Designs For Inorganic Non-Point Sources

Land Use Potentially Associated With A Non-Point Distribution Of Chemicals Of Concern	Metals (1)	CV (2)	MDRD or Gray Area (4)	Type I Error (5)	Type II Error (6)
Railroad Properties	X	40%	25%	90%	80%
Former Landfills	X	40%	25%	90%	80%
Mixed Commercial	X	40%	25%	90%	80%
Painting Operations	X	40%	25%	90%	80%
Salvage or Junk Storage	X	40%	25%	90%	80%
Coal Storage	X	40%	25%	90%	80%
Power Generation	X	40%	25%	90%	80%
Power Distribution	X	40%	25%	90%	80%
Bulk Petroleum Fuels	Lead	15%	25%	90%	80%

(1) Total Metals, see Table 4, Section A6.2.1 herein.
 (3) Coefficient of Variation selected by professional judgment as default and observing the average CVs of volatile or semi-volatile chemical group from EPA Guidance for Data Usability in Risk Assessment, Part A, April 1992 - Exhibit 23: Median Coefficient Of Variation For Chemicals Of Potential Concern In soil. Lead was considered specific from Exhibit 23 and rounded upward.
 (4) Minimum Detectable Relative Difference, suggested default if no other information exists from (3) reference, Exhibit 45. Part III:: Exposure Area Summary Sampling Design Selection Worksheet.
 (5) Probability of the false positive error rate expressing the confidence level as a percentage.
 (6) Probability of the false negative error rate expressing the power as a percentage.

Groundwater

Potential groundwater impacts beneath non-point source conditions have a high probability of resulting from leaching from random distributions of chemicals of concern in overlying soils/fills. The Pilot study cannot afford to generate a statistical sampling of the groundwater condition. The groundwater condition in conjunction with non-point source exploration of soils will be evaluated using judgmental sampling and analysis as limited in A7.2.5.5. The design strategy will remove the vagueness of number of samples and location when applied to any property enrolled and ranked for Phase II assessment.

- Point-source judgmental sampling and analysis will attempt to prove the null hypothesis, that a property is contaminated beyond inclusion for feasibility without considering corrective action.
- Point-source judgmental sampling and analysis cannot set statistical limits on the design to accomplish this and relies on the control of laboratory data quality to support the IAC137 decision.
- The limits for laboratory measurements will be within those limits of precision, accuracy and repeatability as set forth in the published regulatory method specific to the analysis and as controlled by the laboratory in procedures set forth in Appendix E.

- Groundwater sampling conducted in conjunction with soils/fills exploration will occur at the minimum rate of twenty percent ($\geq 20\%$) of the sampling locations at surface determined by the statistical soil strategy, rounded to the next whole number.
- Groundwater sampling locations will be selected by systematic random distribution using the predetermined number of samples and converting the nearest soil boring for groundwater collection. Locations may be adjusted in the field on the basis of qualitative field screening.
- Groundwater samples will require one hundred percent (100%) completeness of the design set forth in the Property-specific Sampling and Analysis Checklist.

A7.2.7 Project Action Limits

The action limits for the project will be;

- The property is not impacted and feasible for the City to consider redevelopment without remedy if a judgmental sample of groundwater does not exceed the IAC137 statewide standard set forth in Appendix A, IDNR Table 1 or a corollary action level set forth under IAC135⁷.
- The property is not impacted and feasible for the City to consider redevelopment without remedy if the judgmental or statistical sample of soil does not exceed the IAC137 statewide standard set forth in Appendix A, IDNR Table 2 or a corollary action limit set forth under IAC135.
- The property is impacted but feasible for the City to consider redevelopment with consideration of remedy if seventy five percent (75%) of all property-specific judgmental samples of soil do not exceed the IAC137 statewide standard and no single sample is greater than ten times (10x) the standard set forth in Appendix A, IDNR Table 2.
- The property is impacted but feasible for the City to consider redevelopment with consideration of remedy if the property-specific 95UCL of statistical samples of soil do not exceed the IAC137 statewide standard set forth in Appendix A, IDNR Table 2.
- The City will further consider preliminary determinations of feasibility for redevelopment with a need for corrective action of impacted soils through comparison of the Site-Specific Standards set forth in Appendix A, IDNR Table 2. This comparison moves beyond the data quality process and into the planning and sustainability portions of the Grant.

⁷ IAC Chapter 135, Appendix A – Tier 1 Look-Up Table for actual receptors for soil or groundwater tested using VOC and Iowa OA-2 methodology on sites in Table 5, A7.2.3 above.

A7.2.8 Optimizing The Design

This project is a feasibility study of multiple properties for the 1st Avenue Revitalization Brownfields Pilot study, many of the final enrolled properties are as yet unknown since the project intends to sustain itself beyond the grant. The generic QAPP cannot optimize the design relative to data quality and available Brownfields funding on a specific site. This is unlike many other Pilots which have a single property and a specific end use in mind.

It is anticipated that all sites with some type of recognized environmental condition identified by the Phase I ESAs cannot be assessed. To focus too much budget/chemistry on too few sites will not meet the needs of producing a meaningful inventory of multiple properties under the Brownfields grant. To focus too little budget/chemistry on too many sites will not produce sufficient quality data to support meaningful estimates of the relative degree of impairment as it relates to potential cleanup and/or redevelopment.

Unable to assess all sites, a balance must be established. This was accomplished through a relative scoring and ranking of sites in the Phase I assessment process (Part 1 of the Project Plan) having recognized environmental concerns.

A7.2.8.1 Testing The Design

Terracon previously considered the results of preliminary estimated project costs in developing v2.1 and v2.2 of the generic QAPP. Terracon again considered the results of the v2.3 design strategy and the ability to fund work as proposed. DEFT software was limited in addressing the use of hybrid sampling designs, particularly judgmental approaches.

Terracon made use of a Department of Energy (DOE) tool to assist in evaluation of the hybrid designs as they might affect properties within the Pilot study area. Although the DOE software is a beta version it has been used successfully on recent DOE projects and is suggested by EPAG-5 guidance. The program allows multiple consideration of key designs referred to in EPA's *Guidance for Data Quality Assessment" Practical Methods for Data Analysis*, EPA QA/G-9, 1998. The DOE tool allows visual, map-related evaluation of random and systematic G-9 designs as well as other industry hot spot and proportional comparisons to action limits, allowing simultaneous preliminary cost estimations and effects on statistical limits. It allows evaluation of judgmental sampling.

A7.2.8.2 Adjustments To Generic Designs

The project sets the following revised project-specific limits on decision error and factors to optimize the generic sampling and designs to be used by Property-Specific Sampling and Analysis Checklists (reference Appendix F and Example Attachments) as follows;

- The project will design sampling and analysis to prove the null hypothesis, that a property is contaminated beyond inclusion for feasibility without considering corrective action.
- Four (4) samples will be proposed as “rule of thumb” for evaluating point source conditions in soil rather than a systematic “hot spot” grid and probability approach. Judgmental is more in keeping with the Brownfields decision.
- Point source judgmental sampling and analysis cannot set statistical limits on the sampling design strategy and will rely on the control of laboratory data quality and margins built into the IAC137 thresholds to support the decision.
- The likelihood is that that previous data will not be available to estimate variability of chemicals of concern specific to an enrolled property. This requires the evaluation to rely on proxy chemicals and their associated published EPA data for estimates of variability, specifically minimum detectable relative differences (MDRDs) and coefficients of variability (CV).
- Terracon reconsidered the relative limits of confidence and power appropriate for non-point source statistical evaluation of soils. This screening characterization for potential non-point source impacts to soils identified by the Phase I findings will result in a statistical approach to sampling design for data collection in soils allowing for an α (probability of a false positive error rate) of ten percent (10%) and a β (probability of a false negative error rate) of twenty percent (20%). Reference Tables 6 and 7.
- Impacts to groundwater will be assessed for preliminary screening characterization through judgmental sampling rather than statistical methods. This is more appropriate to a balance of the City feasibility decision as a preliminary characterization to IAC137 statewide standards and cost effectiveness. This also considers that chemicals of concern in the groundwater media will be anthropogenic and show a marked and easily distinguishable measurable difference from background. Iowa experience shows the groundwater analyses will not be subject to the matrix interference issues encountered in analyzing soils. Phase I assessments indicate potential groundwater impacts have the highest likelihood to result from vertical leaching from either type of impacts in soil/fills. Groundwater for both point and non-point source evaluation will use judgmental sampling to bias the measurements to areas of existing soil data points.
- Groundwater will be sampled at a rate of no less than twenty percent (>20%) of the sampling locations at surface determined by the statistical soil strategy, rounded to the next whole number. A minimum of one sampling point per half-acre (.5A).

A8 SPECIAL TRAINING REQUIREMENTS AND CERTIFICATIONS

The Brownfields project must consider special training and requirements necessary to the Phase II assessment portion of the Grant. The 1st Avenue Revitalization Brownfields Assessment Demonstration Pilot has considered these needs.

A8.1 Purpose and Background

The purpose of this element is to provide specialized training necessary to complete the projects. The training skills must be verified, documented and updated as necessary.

A8.2 Training

The project has identified special needs as part of the DQO process in section A6.2.3. In addition, the project considered the following necessary to quality completion of the project.

A8.2.1 Certified Iowa Groundwater Professional

Professional judgment may be required in the positioning of judgmental samples and in relation to cross-program analyses to Iowa Administrative Code Chapter 135 regarding sampling, analysis and limits of comparison to petroleum compounds of a similar nature to those not regulated by IAC135 (e.g., heating oil releases, "housekeeping" oils and lubricants).

A8.2.2 Registered Professional Engineer

Issues relative to Iowa Code and corrective action or integration with the 1st Avenue transportation corridor could involve a need for professional judgment or resolution. Public design issues may need to be addressed as unknown properties enroll.

A8.2.3 Iowa Registered Well Driller

Iowa has a program of registration for companies who drill water supply wells and monitoring wells into groundwater of the state of Iowa. The company and staff must demonstrate proficiency and experience in the drilling and sampling of wells and the methods necessary under Iowa code for abandonment of wells. This project requires drilling and sampling of groundwater through monitoring wells.

A8.2.4 Registered Professional Geologist

The evaluation of soil types and subsurface lithology is necessary to the determination of groundwater classifications under IAC137 and may require professional judgment in the description and final classification of soil types and deposition.

A8.2.5 Health and Safety

Properties within the study area are not anticipated, on the basis of current Phase I assessment findings, to be hazardous waste sites listed on Iowa's Uncontrolled Sites list. However, the conditions of investigating properties identified with the potential for a recognized environmental condition pose the potential exposure equivalent.

All field staff involved in sampling and analysis activities will have been trained in OSHA 1910.120 requirements for hazardous waste site workers, including use of respirators. This will include a minimum of 40-Hour base training and appropriate 8-Hour Annual refresher training. Field captains will have 16-Hour Supervisory training or documented equivalents. Personnel will be enrolled in Terracon's annual medical monitoring program. Activities will be conducted and monitored by Terracon-Corporate *through Terracon Safety Policy Procedures for Environmental/Hazardous Waste Projects*, Terracon, Inc., revised January 1999.

Drilling personnel will have included in their annual 8-Hour refresher training emphasis on utility hazard identification/location and drilling industry-specific activities of safety and health.

Property-specific safety plans will be generated and supervised through a professional trained and experienced in the field of health and safety.

A8.2.6 Data Quality Process

The successful implementation of the plan and data quality process requires an understanding of the underlying procedures, limits and criteria of decision-making. 8-Hours of EPA training in the process is considered supportive to the successful in-progress identification and corrective action of data quality issues in the property-specific applications within the 1st Avenue Revitalization Brownfield Pilot Grant.

A8.3 Certification

Documentation and certification as to the requisite skills and training necessary in A8.2 will be required and documented as follows. Copies of certificates for project documentation will be kept in the project files of record at Terracon's Rock Island, Illinois office. Copies of staff resumes

demonstrating practical project experience will also be filed with training certifications for each position below and shown in section A4.

Iowa Certified Groundwater Professional
Project Manager
Phase II Coordinator

Iowa Registered Professional Engineer
Phase II Coordinator
Engineering Manager

Iowa Registered Water Well Driller
Drilling Resources Coordinator and Terracon

Registered Professional Geologist
Phase I Coordinator

Health and Safety Training
Project Manager
Field Coordinators
All Field Staff

Data Quality Process
Project Manager
Phase II Coordinator
Field Captains
Quality Assurance Reviewer
Laboratory Quality Assurance Officer

A9 DOCUMENTATION AND RECORDS

This element sets forth the types of data which will be retained in project files, the proper retention and disposition of project documents.

A9.1 Purpose and Background

The 1st Avenue Revitalization project is an EPA Brownfields Assessment Demonstration Pilot conducted under federal grant. Document control is crucial for quality assurance within this process. The project team has identified the following documents to be critical to the control and review process.

A9.1.1 Field Records

Daily Field Reports as discussed in section A6.2.6.2 and field forms, examples attached in Appendix C.

Field Logbook as discussed in section A6.2.6.3.

Field Standard Operating Procedures as discussed in section A6.2.6.5 and Appendix D.

Sample Custody Records as discussed in section A6.2.6.8.

A9.1.2 Laboratory Records

Prairie Analytical Systems, Inc. (PAS) participated in the December 1999 Project planning session in Coralville, Iowa and has prepared the related laboratory quality assurance portion of the generic QAPP.

Sample data for the laboratory as discussed in *Appendix E: Prairie Analytical Systems, Inc. Quality Assurance Plan (21-March-00)*, Attachment 5.0

Sample management records and documentation for the laboratory as discussed in *Appendix E: Prairie Analytical Systems, Inc. Quality Assurance Plan (21-March-00)*, Attachment 6.0.

Test Methods for the laboratory as discussed in *Appendix E: Prairie Analytical Systems, Inc. Quality Assurance Plan (21-March-00)*, Attachment 9.0 and associated PAS appendices.

Quality assurance and control reports for the laboratory as discussed in *Appendix E: Prairie Analytical Systems, Inc. Quality Assurance Plan (21-March-00)*, Attachment 7.0 and 8.0.

Data handling records for the laboratory as discussed in *Appendix E: Prairie Analytical Systems, Inc. Quality Assurance Plan (21-March-00)*, Attachment 10.0.

A9.2 Data Reporting Package Format and Control

Field documents will be recorded on standard paper formats of Terracon using pre-printed forms, examples in Appendix C, bound logbooks and indelible pen. Lined-through corrections with initials and date will be made in lieu of erasures. The Field Captain will retain all project documents within his physical control at the end of any project field day. Pre-, interim or post-field periods will see the project field documents delivered to the Phase II Coordinator and retained in project files each specific to an enrolled property.

Property-specific files of record will be will retained in subdivided documentation and data folders using Terracon-Rock Island standard office procedure, to include;

Administration – Manila Coded
Background Information (Property-Specific References) – Yellow Coded
Memorandums, Notations & Correspondence – Gray Coded
Field Exploration [Mobilization] – Green Coded
Field Exploration [Results] – Blue Coded
Sampling/Chemistry & Monitoring Data (Raw Data) – Orange Coded
Computation & Analysis (Data Reduction/Verification) – Purple Coded
Reports (Draft & Final Hardcopy) – Pink Coded
Financial – Red Coded

Electronic filing of data transferred to electronic platforms will be stored on the Terracon-Rock Island Network, resident at the server with nightly backup by separate means. The electronic file protocol for the 1st Avenue Revitalization Project will continue to follow the Phase I documentation and recordkeeping, mirroring with electronic folders the hard file names and identifiers. Electronic platforms and formats for the project will consist of the following standards;

Word Processing	-	Microsoft	Word 97
Spreadsheets	-	Microsoft	Excel 97
Database	-	Microsoft	Access 97
Drafting	-	AUTOCAD	v.14

Data transcription to Excel spreadsheets from PAS electronic transfers will receive one hundred per cent verification by each of two (2) technical staff. The first will occur at electronic transfer, the second upon written reports.

Electronic review and editing by report writers and reviewers will be online and make use of Word 97 features of “Track Changes” and “Highlight Changes”. “Accept Changes” will be made only by qualified reviewers upon completion and release of the document pursuant to Terracon management plans discussed in Appendix D, *Project Plan - Part 1: General Project Management and Phase I Environmental Site Assessment*. Levels and qualifications of review are similarly set forth in Part 1.

Public outreach and delivery of the project findings are a critical element of the Brownfields Pilot. The City of Coralville will maintain the project Electronic Planning Portfolio (EPP) as described in the Consultant Services Agreement. This will reside on a personal computer in the lobby of City Hall and available to the general public at large. Files will be available for print, but as “read only” files in .pdf format. A copy of the EPP (version 1.3) on compact disk was previously forwarded to the EPA Brownfields Manager.

A9.3 Document Retention And Retrieval

Document distribution will be as indicated for the QAPP, with the exception of PAS and filed copies, and described in section A3. Document retention will be as follows,

- Final reports as hardcopy files at City of Coralville offices by the Brownfields Coordinator or successor for a minimum of ten (10) years.
- “FILE” copies of final reports will be maintained at Terracon-Rock Island offices for a minimum of ten (10) years, after a period of two (2) years from reporting documents will be transferred to inactive status and archived.
- Electronic copies of report text, drawings, and spreadsheets will be maintained electronically for a period of at least one (1) year from final reporting and close of project prior to transfer to compact disk for a minimum of an additional five (5) years storage.

Retrieval of hard copy records by authorized parties can be accomplished from City of Coralville files through the Brownfields Coordinator or City Manager.

Retrieval of hard copy records by authorized parties can be accomplished from Terracon records through the Terracon-Rock Island Project Manager or Office Manager.

SECTION B – MEASUREMENT AND DATA ACQUISITION

B1 SAMPLING PROCESS DESIGN

This element of the generic QAPP describes the technical and practical implementation of the experimental designs developed and discussed in section A7 through the data quality objectives process for this Brownfields Pilot study.

B1.1 Purpose and Background

The 1st Avenue Revitalization Assessment Demonstration Pilot requires both judgmental and statistical designs for properties of as yet unknown land use and unknown size. The generic design must be flexible and adaptable to explore either point or non-point source conditions of environmental impact of a Brownfields' Phase I recognized environmental condition. The generic design must produce quality, defensible data sufficient to a balance of needs for City decision-making and the strictures of federal Brownfields funding.

B1.2 Scheduled Project Activities

The generic nature of a Brownfields QAPP designed for a changing Pilot study of redevelopment feasibility cannot set specific dates of completion, participants enroll and drop from elements of the process on a flexible basis.

The following will be initiated after submittal of the final version of the generic QAPP.

- City will seek and obtain written access agreement from property owners of enrolled and ranked sites.
- A signed access agreement will trigger the development and submittal to EPA of a Property-specific Sampling and Analysis Checklist (Checklist) within five (5) days that will activate specific elements of the generic QAPP upon the agency's approval.

Thereafter the Checklist will implement the periods of activity set forth in section A6.2.5 . The estimated periods of activity are shown graphically in Inset 3.

B1.3 Rationale For The Generic Designs

The development and discussion of data quality objectives in section A7 identified the need for two (2) types of assessment to make a primary decision determine soil and groundwater impact and a secondary decision relative to soil impact. From the DQO development in section A7, the following hold true;

- The primary decision relative to impact in soil/fills and groundwater will relate to IAC137 statewide response action standards. The secondary decision for soil/fill impact will relate to IAC137 site-specific standards. The Iowa code allows a standards comparison based on a calculated average contamination of the site *or* a direct maximum comparison qualified by a proportional rule.
- The Brownfields Pilot study area has both point and non-point types of potential release properties enrolled and which might be enrolled and ranked in the future under the life of the Pilot Grant process.
- Exploration of potential contaminant distribution in soils from a point source Phase I recognized environmental condition intends to measure as the parameter of interest the maximum chemical concentration for comparison to standards. The point of potential release represents the highest likelihood of estimating the highest contamination concentration and is best addressed by a judgmental sampling approach.
- Exploration of potential contaminant distribution in soil/fills from a non-point source Phase I recognized environmental condition intends to measure as the parameter of interest an average chemical concentration term for comparison to standards. With random non-point distribution of chemical impacts in soil, a random statistical approach has the highest likelihood of estimating a defensible value for comparison.
- Optimization of the design in section A7.2.7 produced a judgmental approach to sampling and analysis of groundwater for making the Iowa IAC137 using direct comparison modified by fixed association with soil sampling locations.

B1.4 Assumptions Of The Generic Designs

Without knowing the specific conditions of a property enrolled and assessed in the future, few specific assumptions can be made herein. However, a number of baseline common assumptions were considered in the DQO process and are set forth here in summary;

- The media of soil will not likely be affected by local changes in weather or seasons within the period of the Phase II Pilot study. Methods provide for effects on sampling.

- The media of groundwater may be influenced by vertical elevation but these are not considered to affect significant chemical changes within the period of the Phase II Pilot study.
- Heterogeneity of soil materials is anticipated, both natural and manmade, and is considered to have no significant effect on the limits of the decision. The artificial separation of the soil media into separate horizons, reflected in sampling plans, under the secondary IAC137 comparison helps offset the potential variability in the vertical plane.

At this time no contingency plan to account for conditions and exceptions as yet unknown can be formulated. If such conditions are identified as part of developing the Property-specific Sampling and Analysis Checklist, the Project Manager will write a Property-specific procedure for attachment to the Checklist.

B1.5 Generic Procedures For Locating and Selecting Samples

The most appropriate plan for selecting samples for any particular property and potential condition of environmental impairment considers the following under this Brownfields Pilot study;

- The exploration is of a single phase without the probability of existing sampling and analysis.
- The method of selection must be consistent between all properties enrolled and evaluated under the Brownfields Pilot study.
- Structures may obstruct access for a random sampling design approach.
- IAC137 sets forth the intent of systematic random (or quasi random) sampling using a statistical mean-to-action level comparison.
- The key characteristic to be measured varies between judgmental and statistical designs, but either can be used within the IAC137 options.
- Economic resources are limited, insufficient to evaluate all properties in the study area, optimization and ongoing prioritization by the City may have to occur as the redevelopment process continues.

The number and specific sampling locations will be determined on the basis of the QAPP prior to the field mobilization as part of the Property-specific Sampling and Analysis Checklist. The Checklist will have a property-specific map showing locations.

B1.5.1 Lateral (Surface) Sample Locations

Sample locations and frequency must be determined in a consistent manner for continuity between types of properties and conditions within the Brownfields Pilot study area to provide a meaningful consideration of feasibility for redevelopment by the City of Coralville. The methods vary depending on the type of potential source of chemicals of concern identified in Phase I assessment.

For continuity, Terracon will use the DOE software for every property enrolled, ranked and funded by the Brownfields Pilot process.

B1.5.1.1 Point Source Conditions – Soil/Fill

Phase I assessment indicates the size of a potential point source release will vary depending on the physical size of current or historical operations which generated the source for impairment (e.g., drum pallet, aboveground tank, dump or burn pile). The size of the operational area bears directly on the likelihood of biasing the sampling to obtain a maximum-to-standard comparison. Two (2) assumptions are made in the generic judgmental design based on industry observation;

1. The probability of encountering a reasonable estimate of the maximum concentration is immediately at the center of the point source and decreases with distance from the center.
2. The probability of encountering a reasonable estimate of the maximum concentration is at the near surface, not the immediate surface due to biological and ultraviolet ionization effects in the top few inches of soil, beneath the point source and decreases with depth.

The generic criteria for judgmental sampling follows EPA default guidance to produce a minimum of three to five (3-5) samples³. The Phase II Coordinator and Project Manager will estimate the dimensions of the operational area representing the point source from Phase I data and determine the maximum dimension or “width” of the potential point source or “hot spot”. A point source value of one-half the distance will be determined as “*w*”.

One (1) primary sample is needed at the center of the point source identified by the Phase I assessment process as the physical limits of the operational area producing the source. This sample must be placed at the center of the potential source area as estimated from historical Phase I data. This will be designated on the Checklist map using the symbol “■”. This sample location will sample soil/fill in the upper two (<2) feet of soil. Thereafter, a soil sample will be selected from the next shallowest IAC137 soil horizons, each based on qualitative adaptive field screening described in TSOPs of Appendix D to bias results to the maximum concentration.

Four (4) secondary samples will be collected to account for potential source variability and accuracy of available Phase I assessment information. These will be located on four (4) vectors from the estimated point source separated by ninety (90) degrees of arc. The direction of vectors may vary to accommodate the property-specific physical setting but will maintain the 90-degree separation. The Checklist will identify preliminary vector locations and the Field Captain will document the final vector locations at field service. One (1) soil sample will be collected on the line of each vector and will be identified by the symbol “●” on the Checklist map. These will be located on the vectors as property-specific distances from the center point of the operational area estimated from Phase I data, preferably at a distance equal to “ w ”. Structures or issues of safety due to public utilities are likely to require field offsets on some properties. If locations greater than $1.25w$ from the centerpoint are needed, the Phase II Coordinator will select these, with Project Manager approval, alternate locations to meet the minimum sample number. The rationale will be identified on the Checklist.

Some offsets may not be identified until field mobilization. Offsets from the Checklist may be made along the vectors as less than w by the Field Captain. Offsets along the vectors not exceeding $1.25w$ can be made by the Field Captain (see theoretical example, Inset 4).

Inset 4. Theoretical Example



The locations will be depicted on a figure titled *Attachment 1: Point Source, Judgmental Sampling Locations* and attached to the Checklist.

B1.5.1.2 Non-Point Source Conditions – Soil/Fill

Statistical systematic random sampling will be conducted on soil/fills of enrolled and ranked Brownfields properties for the 1st Avenue Revitalization Assessment Demonstration Pilot. Sampling will occur in two (2) horizons. Different statistical parameters apply in addressing organic or inorganic chemicals of concern as discussed in section A7.2.5. The Checklist will integrate the two components for property-specific parameters. Sample locations will be generated to produce the following data for attachment to the Checklist for a specific property;

- Systematic random sample soil locations will be displayed graphically. These will be depicted on a property-specific scaled map adapted from Phase I of the assessment report for soil samples for organic and inorganic chemicals (Appendix F, Attachments 2 and 3). The figure will be titled *Non-point Source Statistical Sampling Locations* and be attached to the Checklist.
- Systematic random distribution of a predetermined number of groundwater sample locations equal to at least twenty percent (>20%) of the soil sample locations will be displayed. These will be depicted graphically on a property-specific scaled map adapted from Phase I of the assessment report for soil samples for organic and inorganic chemicals (Appendix F, titled *Distribution of Well Samples*).
- A Decision Performance Goal Diagrams (DPGD) will be attached representing the statistical performance of the property-specific design for organic and inorganic chemicals (Appendix F) and will be so titled.
- A printout of x-y sample coordinates for all sample locations (Appendix F) will be attached for optimized designs.

General

The Department of Energy (DOE) software VSP-Visual Sampling Plan will be used to select boring locations.

Organic Chemicals Of Concern

The following procedures will be conducted to select statistical locations for sampling and analysis of organic chemicals of concern in soil/fills on a property within the Brownfields study.

Inorganic Chemicals Of Concern

If the statistical parameters for inorganic chemicals of potential concern are the same in Tables 6 and 7 (section A7.2.5.6) for the primary property land use producing the Phase I recognized

environmental condition, the resultant map will make use of the same random coordinates for inorganic sample locations.

If the parameters differ between Table 6 and Table 7 (section A7.2.5.6). The parameters will be adjusted to select statistical locations for sampling and analysis of inorganic chemicals of concern in soil/fills on a property within the Brownfields study.

B1.5.2 Vertical (Subsurface) Sample Locations

The intended use of IAC137 standards as part of the decision exerts a direct bias on the vertical location of samples on properties within the Brownfields Pilot Study area.

B1.5.2.1 Soil/Fills

IAC137 site-specific standards for soils consider specific ranges of depth in evaluating potential public exposures and chemicals of potential concern. IAC137 differentiates a surface zone of less than two feet (Range 1, <2), a second zone of exposure from soils at a depth of two to ten feet (Range 2, 2-10) and a third zone of exposure from soils below ten feet of the surface (Range 3, >10). These zones will determine primary sample intervals, modified within the second zone by adaptive field screening methods described later.

Point source and non-point source soil/fill sampling will be positioned to accumulate data for the secondary decision, a comparison to IAC137 site-specific standards. The Checklist will identify the anticipated depths of fill placed on a property from Phase I assessment. The Checklist will identify if the Phase I recognized environmental condition produces possible release to soil/fills at surface or at depth. Depth and locations of either judgmental or statistically located samples will be as follows;

A Range 1 sample collected from surface to a depth of two (2) feet at any soil sampling location, excluding any part of the sample identified as paving or granular crushed rock or gravel surfaces.

A Range 2 sample collected between two and ten (2-10) feet below the surface at any soil sampling location if Phase I assessment indicates a probability of fills placed in excess of two (>2) feet in depth or if the property has existing structures. The structure contingency addresses possible foundation backfill using on-site materials. The specific 2-foot sampling interval will be selected on the basis of non-critical field measurements. If field measurements do not indicate biased selection of a sample interval for laboratory testing, the sample will be obtained from a depth of four to six (4-6) feet below ground surface.

A Range 3 sample will be collected if Phase I assessment indicates a probability of fills placed on an enrolled and ranked property in excess of ten (>10) feet in depth. The specific 2-foot sampling interval will be selected on the basis of non-critical field measurements. If field measurements do not indicate biased selection of a sample interval for laboratory testing, the sample will be obtained from a depth of twelve to fourteen (12-14) feet below ground surface.

B1.5.2.2 Groundwater

Groundwater will be sampled through construction of temporary monitoring wells. Consistent with IDNR programs under IAC135, the well screens will intersect the groundwater surface as estimated at the time of drilling.

B1.5.3 Groundwater Sample Locations

Groundwater sampling for organic or inorganic chemicals of potential concern on all properties will be conducted using a judgmental design consistent with the optimization discussions of section A7.2.7. In summary and further clarification;

- The groundwater condition is considered in association with the recognized environmental condition as it relates to either a point or non-point source in soils acting as the recognized environmental condition from Phase I assessment data.
- Statistical sampling proved not to be the optimal approach for cost effectiveness to allow the IAC137 comparison and meet financial strictures of the Brownfields Grant program.
- Groundwater sampling conducted in conjunction with soils/fills exploration will occur at the rate of twenty percent ($\geq 20\%$) of the sampling locations of surface determined by the statistical soil strategy, rounded to the next whole number.
- This number of wells will be distributed using systematic random distribution within the area of soil assessment. The locations will be shown on a figure titled Groundwater Sampling Locations attached to the Checklist.

B1.5.4 Combination Of Sample Locations For Cost Effectiveness

The random selection of sample locations for organic and inorganic compounds can produce, in effect, approximately twice the number of locations necessary for either parameter individually. This loss of cost-effectiveness is not acceptable under the funding strictures of the Brownfields Grant. An adjustment of sample locations into appropriate combined locations for drilling and sampling must be made.

The organic and inorganic soil and groundwater sample locations will be compared. At locations where the lesser number of sample locations most closely corresponds to locations of the greater, the location will be moved to the closest latter location. These combined locations will be identified on a figure titled *Optimized Sampling Locations* and attached to the Checklist map (Appendix F, Attachment 8).

B1.6 Critical and Noncritical Measurements

The Brownfields Pilot study will make use of two (2) types of measurement; critical and non-critical. The non-critical measurements will consist of two (2) subtypes; qualitative and quantitative. Chemical and physical measurements will be made as follows for the media identified in Table 8.

Table 8. Types Of Measurements For The Pilot Study

Measurements						
Parameter	Media	Critical	Qualitative	Quantitative	Laboratory	Method
Soil Classification	Soil	No	X		No	ASTM D2487
Moisture Content	Soil	No		X		ASTM D2216/D4643
Density	Soil	No		X		ASTM D4292/D2937
Organic Carbon Content	Soil	No		X	Yes	ASTM D2974
pH	Soil	No	X			Terracon E.500
pH	Soil	No		X	Yes	
Volatile Organic Compounds (VOCs)	Soil	Yes		X	Yes	EPA SW-846 5035/8260B
Semi-volatile Organic Compounds (SVOCs)	Soil	Yes		X	Yes	EPA SW-846 8270C
RCRA Metals, Total	Soil	Yes		X	Yes	EPA SW-846 6010A/6020
IAC135 Volatile Petroleum Compounds	Soil	Yes		X		Iowa OA-1
IAC135 Low-Volatile Petroleum Compounds	Soil	Yes		X		Iowa OA-2
IAC135 Petroleum MTBE	Soil	Yes		X		IAC135
Ionizable VOCs	Soil Vapor	No	X			Terracon E.550
Ionizable Petroleum	Soil Vapor	No	X			Terracon E.550
Landfill Gas ^A Screening	Soil Vapor	No	X			Terracon E.600/605
Total Dissolved Solids	Water	Yes		X	Yes	
Hydraulic Conductivity	Water	Yes		X		Terracon E.1840
pH	Water		X			Terracon E.530
Volatile Organic Compounds (VOCs)	Water	Yes		X	Yes	SW-846 8260B
Semi-volatile Organic Compounds (SVOCs)	Water	Yes		X	Yes	SW-846 8032*/8081*/8270C
RCRA Metals, Total	Water	Yes		X	Yes	SW-846 6010A
IAC135 Volatile Petroleum Compounds	Water	Yes		X	Yes	Iowa OA-1
IAC135 Low-Volatile Petroleum Compounds	Water	Yes		X	Yes	Iowa OA-2
IAC135 Petroleum MTBE	Water	Yes		X	Yes	

A: Landfill gas field screening as ionizable VOCs, hydrogen sulfide and methane using methods described.
 B: ACM, potential Asbestos-containing materials.

B1.7 Validation Of Non-Standard Methods

The project will make use of field screening methods for ionizable volatile compounds and ionizable petroleum for which no formal validation studies have been performed. However, the state of Iowa allows the use of this method for selection of samples for chemical analysis under IAC135 environmental regulations. The procedures of IAC135 will be used and the mechanical specifics have been documented in Terracon SOP #E.550 (Appendix D). The procedure is purely qualitative for use in the Brownfields Pilot project decision process.

The project will make use of field screening methods for low- or non-volatile petroleum chemical impacts using ultraviolet fluorescence for which no formal validation studies have been performed relative to adaptive field sampling. However, the general technique has been in widespread use as a means of identifying petroleum in subsurface oil production field studies for many years. The procedures modified for use in environmental assessment have been documented in Terracon SOP #E.560 (Appendix D). The procedure is purely qualitative for use in the Brownfields Pilot project decision process.

The project will not make use of any non-standard laboratory test methods requiring validation.

B2 SAMPLING METHODS

This element of the QAPP sets forth directly or by reference the procedures for collecting samples and identifies the sampling methods. It includes protocols for sample collection, handling, documentation, transport, testing and disposition within the Pilot project.

B2.1 Purpose

The QAPP for the Brownfields Pilot project intends to set forth in generic terms the methods and procedures for potentially sampling any of the land use properties identified in the Phase I assessments or which might be enrolled in the future. These were categorized in section A6, Table 1. Properties may be added or dropped from the Pilot. Financial considerations may remove “clean” or “impacted properties from actual Phase II assessment.

A property-specific Sampling and Analysis Checklist, example Appendix F, will be developed for each property which actually requires the City of Coralville to address the decisions discussed in section A7.

Each property-specific Checklist will be completed pursuant to this document and will be reviewed by EPA prior to actual implementation.

B2.2 Sample Collection, Preparation and Decontamination

The following common elements are identified as generic issues to maintain and direct the quality of samples collected for the Brownfields Pilot study decision process.

B2.2.1 Appropriate Sampling Methods

The end use of data within the IAC137 Land Recycling Program requires the use of traditional sampling methods to acquire representative samples of solid materials. Methods proposed for general use and selected for Checklists will be equivalent or exceed the Iowa industry standard of professional care currently in practice.

Terracon will make use of a number of internally standardized procedures for collecting data that have been formulated as Terracon Standard Operating Procedures (TSOP). These incorporate both industry protocols and internal procedures. These TSOPs are enumerated in Appendix E. Copies of the appropriate TSOPs will be attached to property-specific Checklists for field use.

B2.2.1.1 Soil/Fill Sampling Methods

Sampling within the Pilot study area were generally considered as to the following for consideration in selecting generic QAPP methods. Development of the property-specific Checklists will make use of Phase I reports and site reconnaissance to refine specific methods to site conditions.

- Both cohesive and granular soils are likely to be present
- Fills may contain debris inhibiting push-probe technology
- Saturated and unsaturated soils will be present
- Consolidated (bedrock) sampling will not be conducted
- Methods should be familiar and constant with state-led programs for consistency under the IAC137 use
- The IAC137 end use of data dictates a discrete sampling approach for sampling of soils and fills without construction of composite samples

Appendix D identifies the possible standard field methods and procedures to be used in collecting samples of fill and soil. Checklists will identify a table of specific TSOPs for implementation. Field sample handling, preservation and transport will be as specified in Table 5 and Appendix D.

Laboratory handling, preservation and storage will be as stated in Appendix E, specifically Attachments 5 and 6 and any parts cross-referenced.

B2.2.1.2 Groundwater Sampling Methods

Sampling within the Pilot study area were generally considered as to the following for consideration in selecting generic QAPP methods. Development of the property-specific Checklists will make use of Phase I reports and site reconnaissance to refine specific methods to site conditions.

- Preliminary redevelopment feasibility determination in the decision require assessing quality only of first encountered groundwater, multi-aquifer study is not needed
- Groundwater will be readily accessible within 30 feet of ground surface
- Soil/fill competence will require maintaining borehole integrity through use of casing or other support to access groundwater
- IAC137 end use requires definitive quantitation, borehole water sampling is inappropriate, although used in other Iowa programs

Appendix D identifies the possible standard field methods and procedures to be used in collecting samples of groundwater. Checklists will identify a table of specific TSOPs for implementation. Field sample handling, preservation and transport will be as specified in Table 5 and Appendix D.

B2.2.2 Base Requirement of Methods

Essential to the quality of the samples in the Pilot area is to use field methods and procedures which will;

- Retain sufficient volume as to provide at least 200% of the minimum amount of sample necessary for transport to the laboratory
- Provide sufficient shape and volume for soil samples to represent the vertical cross-section of the sampled interval

In general, methods acceptable for sampling and testing must meet the criteria of IAC137 for end use. Methods and procedures have been proposed which meet these criteria.

Analytical procedures have defaulted to the limits of standard methods proscribed as adequate to the preliminary characterization for feasibility in this Brownfields Pilot study.

B2.2.3 Cleaning and Decontamination

Field cleaning procedures for each method are described in Appendix D, in general as TSOPs E.2410 and E.2420 and in particular will be specified for the selected method marked in the Checklist.

Analytical cleaning and decontamination are provided by the limits of laboratory procedure and standard methods proscribed in Appendix E as adequate to the preliminary characterization for feasibility in this Brownfields Pilot study.

B2.3 Adequacy Of Support Facilities

The laboratory support facility has a current Illinois Environmental Protection Agency state Contract Laboratory Program (ICLP) certification under 35IACPart 186: Environmental Protection. The laboratory is certified for testing in Iowa by the IDNR and is designated by IDNR identification number 130.

The Project Manager has last visited and toured the facilities described in Appendix E on March 21, 2000. It was observed to be physically as described and to hold certifications as presented. The facilities are adequate to the tasks required under the Brownfields Pilot study.

B2.4 System Failure Response and Corrective Action Process

In general, the Project Manager is responsible for the quality of the field data and exercises final corrective action responsibility in producing resolution and determinations of suitability of data regarding failures. The City requires a feasibility-level decision and a minimal or individual failure of any one sample is not critical to the quality of the process as long as the overall systems and approach are maintained to remain suitable.

The process whereby sufficient experience and technical ability occurs within Terracon is a managed professional one. The process for technical and project management responsibility for decision-making is achieved through Terracon's Management Plan set forth in Part 1 of the Project Plan, Appendix D. This process was in force throughout the Phase I assessments and continues on in this portion of the project.

B2.4.1 Field Sampling Failures

The Project Manager is responsible for auditing and controlling the overall quality and implementation of field sampling to produce acceptable data. Failures identified by either will be documented using Form C.11, Appendix C. During field audits by the Project Manager, failures noted and corrected will be documented on Form C.12, Appendix C.

The Phase II Coordinator is responsible for similar management control or while on the site. The Coordinator will make similar use of the referenced forms.

Checklists will state the precise sampling strategy. With the unknown nature of sites as yet not enrolled and the variability of soils and terrain within the Pilot study area, it is likely field adjustments may be required to sampling designs. Terracon has anticipated some preliminary default corrective action responses to maintain quality of the field data collection program. Default corrective action responses do not need to be approved by the Project Manager or Phase II Coordinator, but must be logged in the field book or annotated on data forms to clearly reflect the change. The following are default responses;

- A sample location may be offset by a radial distance of up to fifteen (15) feet for non-point source conditions of potential release due to obstruction or to redrill for lost samples
- A sample location may be offset to the first safe location, irrespective of distance, if the requirement is driven by a formerly unidentified issue of project safety (i.e., illegal utility hookup identified by property owner after mobilization)
- TSOP methods E.460 and E.465 may be substituted for each other to accommodate localized changes in soil/fill lithology to best promote recovery
- A soil sample with a measured recovery of 80% of the design interval will be considered adequate for representation of the interval, providing adequate volume for the analytical method is procured and preserved
- Well screen lengths and elevations may be field adjusted from design to accommodate a localized interception of the well screen by apparent groundwater at approximately mid-third of the screen
- In the event of a post-field sample failure (e.g., express carrier loses or damages a sample in shipment, laboratory breaks or compromises a sample), the Project Coordinator can immediately reschedule a re-sampling activity if the measurements are identified as critical, providing contingent budget is available and the Project Manager is notified immediately in writing with appended budget

B2.4.2 Laboratory System Failures

Laboratory failures will be dealt with within the procedures of Appendix E, specifically Attachments 10, 11 and 12 and associated cross-references to other parts. Method-specific corrective action and evaluation are set forth in Appendix E respective to the standard method.

B2.5 Sampling Equipment, Preservation and Holding Times

The design for field sampling has been made with a bias to single use, disposable equipment and materials whenever possible. The specific types are described and specified in the TSOPs in Appendix D which will be selected for use on the Checklists. Where disposable equipment is not practical, cleaning procedures have been stipulated for field equipment.

Laboratory prevention and monitoring to provide against sample interference by cross- or extraneous contamination will be addressed within the criteria of the standard methods and as set forth in procedures in Appendix E, Attachment 8 and other cross-references.

Proper sample size, preservation and control are essential. TSOPs in Appendix D describe specific parameters of control for specific field activities. Laboratory controls will be within the criteria of the standard methods and as set forth in procedures in Appendix E, particularly Attachments 6, 8, and 11. Table 5 is a general summary of these criteria.

B2.6 References

Terracon made primary use of the following references in preparation of Part 2 of the Project Plan. Terracon also made use of secondary references within the primary documents during development.

The Project Plan has been prepared considering the following guidance relative to sampling designs and procedures to deliver a quality of data with sufficient confidence for the purposes of estimating feasibility and conducting preliminary planning for future development.

- *Guidance for the Data Quality Objectives Process – EPA QA/G-4*, OSWER, USEPA, February 1998, EPA/600-R-96/055, September 1994.
- *EPA Requirements for Quality Assurance Project Plans For Environmental Data Operations - EPA QA/R-5*, External Review Draft Final, October 1998.
- *Guidance for Quality Assurance Project Plans – EPA QA/G-5*, OSWER, USEPA, February 1998, EPA/600-R-98/018.
- *Quality Assurance Guidance for Conducting Brownfields Site Assessments*, OSWER, USEPA, September 1998, EPA/540-R-98-038.
- *Guidance for Data Usability in Risk Assessment (Part A) – Final*, OSWER, Superfund, USEPA, April 1992, EPA9285.7-09A.

- *Decision Error Feasibility Trials (DEFT) Software for the Data Quality Objectives Process – Final*, USEPA, December 1997, EPA/600/R-96/056.
- *Information Sources for Innovative Remediation and Site Characterization Technologies*, OSWER, USEPA, 1998, EPA542-C-98-003.
- *Iowa Administrative Code (455H) Chapter 137: Iowa Land Recycling Program And Response Action Standards*, Iowa Environmental Protection Commission, 1998.
- Various practice and guidance standards of the American Society of Testing and Materials (ASTM), current versions specific to methods proposed or referenced, ASTM, West Conshohocken, PA, February – April 2000.

The laboratory methods reference and bibliography used in preparation is given in Appendix E, Attachment 15.

B3 SAMPLE HANDLING AND CUSTODY REQUIREMENTS

This section sets forth the requirements and provisions for sample control and proper custody in the field, during transport and in the laboratory.

Examples of the handling and chain-of-custody documents discussed below are included as C-7, C-8 and C9, Appendix C.

B3.1 Purpose

The feasibility study of the 1st Avenue Revitalization Pilot does not involve enforcement action or other civil penalties which might result from data use and does not necessitate an upper level stringency of the custody procedure. Reports will carry a written notice regarding limitations of reuse or reliance by others on the data provided to the City for the feasibility decision.

The transfer of sample custody will be limited between Terracon personnel, the express carrier and laboratory personnel. The primary objective of custody requirements for this project is simply to track that samples are handled by authorized personnel, document that handling occurred within the parameters of the Plan. Individual custody seals will not be necessary unless the samples are held overnight by the Field Captain.

In general, the outline for sample handling and custody will be as follows;

- The Phase II Coordinator will brief sampling personnel on custody procedures.

- Samples will be in the custody of the field team at all times.
- Samples will be removed from the project site to the laboratory on a daily basis.
- Laboratory will implement tracking and custody documentation.
- Post-analysis samples will be disposed of properly.
- Chain-of-custody documentation will be maintained by Terracon after reporting.

B3.2 Sample Custody Procedures

Chain-of-custody (COC) protocol will be adhered to during all phases of the sample collection, storage, shipment, and analysis procedures.

B3.2.1 Mobilization

The Phase II Coordinator will assemble and designate a Field Captain and Field Sampling Team of qualified staff. COC documents, forms and labels will be assembled in advance of sitework. The Phase II Coordinator will review for appropriateness to Part 2 of the Project Plan. The process and procedure for sample handling and custody will be stressed in the pre-field briefing prior to field mobilization.

Original laboratory analytical reports and COC forms will be maintained with the project files.

B3.2.2 Field Procedures

Maintaining the COC in the field will be the responsibility of the Field Captain. The Field Captain will perform and/or direct the collection, handling, field analysis, and/or shipment of all samples collected from the site through the sampling personnel assigned. Samples taken and properly preserved will be prepared immediately for shipment, remaining in the immediate custody of the Sampling Team until received same day by the Field Captain. Until receipt, samples will reside in a locked van with temperature control to maintain preservation.

All samples collected in the field will be placed in proper sample containers, labeled, and stored in an iced cooler from the time of collection through sample shipment or field screening. Terracon will place soil and fluid samples selected for off-site laboratory analysis into laboratory prepared containers. The container labels will indicate:

- Time and date of collection.
- Name of person collecting the sample.
- Type of sample.
- Sample designation and depth.
- Name of site.
- Project Number.
- Requested Analysis.

The laboratory prepared containers will have labels affixed indicating the date, time, collector's name, sample location, type of matrix, preservatives and analysis to be performed (reference example C7, Appendix C). Terracon will place the samples into an insulated cooler cooled by ice or into a portable refrigeration unit while at the physical location of the sampling area.

A COC record will accompany all samples during collection and shipment. Each COC record will be filled out and signed in permanent ink by a Terracon field team member and the Field Captain. The COC records will include the following information:

- Sample identification
- Signature of field site manager or designated individuals(s) responsible for sample custody
- Date and time of collection
- Sample type
- Number of sample containers
- Laboratory analysis to be performed
- Signature of laboratory person(s) receiving samples
- Inclusive dates and times of possession

Whenever possible for any sample, but required for time-critical samples as identified in Table 5, samples will be removed from the project site on a daily basis under the supervision of the Field Captain and signed over to United Parcel Service (UPS) as the designated carrier for Overnight Express Delivery to the laboratory by 10 AM the following morning. This allows an electronic tracking of sample location and handling between field and laboratory. The laboratory will provide for Saturday receipt of samples from the carrier.

Should non-time critical samples be taken which need not be shipped same day, samples will be held in a locked refrigerated compartment under the supervision of the Field Captain to maintain preservation until next shipping day. COC documentation will reflect this retention.

Original COC documents placed in laboratory shipping containers will be double-bagged in Ziplock plastic bags for protection against moisture and damage. Before sealing and placing in the shipping container, a carbon copy or photocopy will be made of the COC record.

B3.2.3 Laboratory Procedures and Disposal

Upon receipt, the laboratory will implement tracking and custody documentation as set forth in Appendix E, Attachment 6. Original copies of documentation signed by laboratory QA staff will be returned with test reports to the Phase II Coordinator.

Samples identified not to have impacts above IAC137 values will be disposed of by the laboratory under Appendix E, Attachment 6, subpart 6.7. Samples identified with impact above

IAC137, will be returned to the project site or alternatively disposed of by the laboratory consistent with test method's disposal practices consistent with Appendix E, Attachment 6.

B3.2.4 Post-Reporting Retention

Original chain-of-custody documentation will be maintained in Active Project File 42997048-E, subfile "Orange", by the Phase II Coordinator until reports are complete. Thereafter, documents will be maintained for a period of seven (7) years in archives by Terracon as set forth earlier in document.

B4 ANALYTICAL METHODS REQUIREMENTS

This section identifies the detailed and specific criteria for conducting, maintaining and checking the analytical process in the laboratory to provide useful, quality data.

B4.1 Purpose and Background

The data must be sufficient to the City of Coralville's need to screen properties for preliminary feasibility of redevelopment under the Brownfields Pilot study. Data will not be used for enforcement action, civil litigation nor final determinations of properties as "clean".

The laboratory has provided previously the Quality Assurance Plan attached in Appendix E for the Brownfields Pilot study, Revision No. 7, dated July 1998. Updates within attachments are identified by footer annotation "Revision 1, July 1999". Due to the period of revisions from initial drafting of Part 2, Terracon Project Manager revisited laboratory quality management with the Prairie Analytical Systems, Quality Assurance Officer in March 2000. This document includes a current form PAS-QMR186.185(f) updating revisions to methods and process as QAP Revision No. 8 as of March 21, 2000.

B4.2 Subsampling

The process and need for subsampling are described in general in Appendix E, Attachment 16 specific to the protocols and will be within recommended procedures of standard methods.

B4.3 Preparation of Samples

Preparation of laboratory samples is described in general in Appendix E, Attachments 5 and 6 and specific to the protocols and will be within recommended procedures of standard methods in Attachment 16.

B4.4 Analytical Methods

Analysis of laboratory samples is described in general in Appendix E, Attachments 9 and specific to the protocols and will be within recommended procedures of standard methods in Attachment 16.

B4.5 References

Laboratory document and manual references are presented in Appendix E, Attachment 15.

B5 QUALITY CONTROL REQUIREMENTS

This section implements the quality control necessary to monitor the proper working of the data quality program in process, both as affected in the field and the laboratory environment.

B5.1 Purpose

The purpose is to set up a series of checks that identifies if the data quality process is being implemented within bounds supportive of the decision process. The procedures should be in-process and deliver information in a timely fashion appropriate to enact corrective action.

The Brownfields Pilot study finds itself with numerous sites to assess and limited resources to conduct the screening feasibility relative to the IAC137 Iowa Land Recycling Program. Iowa programs routinely rely on limits of standard methods to limit the instrumental and laboratory bias⁸. This process will similarly rely heavily on that level of field quality control checks and those of standard methods to mitigate instrumental and analytical bias. Brownfields Pilot funds will be focused on a monitoring and correcting human or operational errors in process.

The City of Coralville decision regarding redevelopment feasibility is a preliminary one of characterization and screening to select properties of opportunity. The data quality need only be sufficient to these ends. The degree of field quality control should be of a low to moderate

⁸ IAC135 assessment requires a proscribed minimum of field and trip blanks. Although monitoring method and schedule are prescribed and monitored by internal laboratory checks as well, IAC135 allows by guidance rule for precision or other error in analytical process. At closure of monitoring conditions are considered stable and unchanged if no more than a 20% fluctuation range occurs in concentration at a well point.

level. The laboratory checks should be as extensive as recommended by published standard methods.

B5.2 Other QC Check Systems

Table 9 sets forth the field checks and frequencies which they will be performed.

Table 9. Quality Control Checks and Schedules

ASSESSMENT ACTIVITY	AGENCY	FREQUENCY OF ACTIVITY
Field Split	EPA 7	Discretionary
Field Split	IDNR	Discretionary
Field Blank	Terracon	1 per Pilot Study week of on-site activity, minimum
Blind Replicate Sample	Terracon	1 per property-specific mobilization
Field Replicate Sample	Terracon	1 per property-specific mobilization
Soil Gas Duplicate (IAC135)	Terracon	Minimum 1 per sampling event
Trip Blank	Laboratory	As specified in Appendix E, Attachment 5
Lab Reagent Blank	Laboratory	As specified in Appendix E, Attachment 8
Method Blank	Laboratory	As specified in standard method SOP, Appendix E, Attachment 16
Matrix Spike/Matrix Spike Duplicate	Laboratory	As specified in standard method SOP, Appendix E, Attachment 16
Laboratory Control Sample	Laboratory	As specified in Appendix E, Attachment 8
General Bottle Control	Laboratory	1 per each Lot 50, Appendix E, Attachment 8
VOA Bottle Control	Laboratory	1 per each Lot 25, Appendix E, Attachment 8

B6 INSTRUMENT TESTING INSPECTION AND MAINTENANCE REQUIREMENTS

The equipment used to make measurements must be reliable and not present a potential source for data failure for the Brownfields pilot study. Equipment and instrumentation involved operated in the laboratory and field.

B6.1 Purpose

The QAPP must directly include or indirectly reference the procedures which will be used to verify that all instruments and equipment are maintained in sound operating condition and are capable of operating at acceptable performance levels.

B6.2 Testing, Inspection and Maintenance

The following describes the process to implement the stated purpose.

B6.2.1 Field Equipment

No field instruments will be used to make critical measurements relative to the decision process. Field instruments referenced in the project workplan and TSOPs of Appendix D will be supplied and maintained “in house” by Terracon-Rock Island. No rental equipment will be used.

Terracon-Rock Island maintains and repairs field screening equipment through the position of Environmental Equipment Manager (EEM) held by a Senior Environmental Technician. Repairs and certifications beyond the limits of the EEM are performed by the original manufacturer or designated repair facility as authorized by the EEM. All Terracon instruments have an affixed inventory tracking number and tag unique to the equipment. Repair and test records for the assigned unit number are kept by the EEM. This allows the EEM to monitor elements which both degrade over time regardless of use (i.e., oxygen sensors) and those related to use (i.e., UV long-wave cabinet lamps). This tracking of field screening equipment allows the EEM to affect timely preventive maintenance for proper operation.

Equipment is bench-tested for performance by the EEM at the office prior to mobilization.

Terracon personnel are not authorized to perform field repairs or replacements on testing units. Terracon maintains for the Brownfields project at least one duplicate operating unit used in field screening or has made arrangements for availability with one of Terracon’s other 52 offices in the United States. This, combined with our close office proximity to the Brownfields Pilot study area, allows the same-day or overnight replacement of a damaged test unit.

B6.2.2 Laboratory Equipment

Appendix E, Attachment 3 presents the laboratory instrumentation and equipment specific to laboratory analysis and the schedules of maintenance and testing.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

This section identifies instruments used to make measurements, critical and non-critical to the decision, that must be controlled to maintain quality of the data.

B7.1 Purpose

This section presents the identification and documentation for the checking of physical measurements against accepted standards.

B7.2 Instrument Identification

Instruments participating in the making of field environmental measurements for which response must be checked against standards for acceptable performance are as follows;

- Portable pH meter for making non-critical field measurements of soil and groundwater.
- Portable conductivity meter for making non-critical field measurements of water.
- Portable turbidity meter for making non-critical field measurements of water.
- Photoionization detector for making non-critical field screening measurements of ionizable volatile compounds in soil vapor.
- Portable hydrogen sulfide, methane and oxygen detectors for making non-critical measurements of possible landfill gas in soil vapor.
- Portable ultraviolet chamber for making non-critical qualitative measurements for screening low-volatile hydrocarbons in soil/fill matrices.

Instruments participating in the making of laboratory environmental measurements for which response must be checked against standards for acceptable performance are identified in Appendix E, specifically Attachment 3 and Attachment 16 (Subsection 6.0).

B7.3 Calibration Methods

Measuring equipment will be routinely calibrated and the calibration documented. Check standards will be relied upon as certified and presented by the industry and as recommended by the manufacturer of the instrument.

B7.3.1 Field Equipment: Bench Calibration

All field instruments will receive scheduled bench calibration to check measurement response to accepted check standards. Calibration methods and results will be documented on calibration logs and placed in the project file 42997048, subfolder "Green/Field Mobilization".

The calibration methods and materials for field equipment are included in their respective TSOPs referenced in Appendix D; specifically Terracon E.500, E.530, E.540, E.545, E.550 and E.560, E.600 and E.605 respective to listing in B7.2. TSOPs have attached the current

manufacturer's manual and written procedures specific to the unit named in the TSOP. A second copy of manuals are maintained in maintenance files for each unit by the EEM.

B7.3.2 Field Equipment: On-site Calibration

All field instruments will receive regular and scheduled calibrations in the field to check measurement response to accepted check standards. TSOPs will be identified on the specific property-specific Checklist and copies will accompany the sampling Team to the field in the care of the Field Captain. Calibrations will be recorded in the project fieldbook.

B7.3.3 Laboratory Equipment Calibration

Instruments making of laboratory environmental measurements for which response must be checked against standards for acceptable performance are identified in Appendix E, specifically Attachment 3 and Attachment 16 within specific requirements of the standard methods.

In general, all field instruments will receive one bench calibration by the EEM prior to each field mobilization. The bench calibration for any unit will be to test materials specified in the manufacturer's manuals and supporting documentation.

B7.4 Calibration Apparatus

No special calibration apparatus is necessary for field or laboratory equipment.

B7.5 Calibration Standards

Calibration standards for field equipment will be as referenced in the manufacturer's manual appended to the respective TSOP identified in Appendix D.

Calibration standards for laboratory instrumentation will be as referenced in the Appendix E and specified within the parameters of the standard method used from Attachment 16, respective methods Subsections 7 - *Reagents And Standards*.

B7.6 Calibration Frequency

Field equipment will be calibrated on the schedule summarized in Table 10. Frequency meets minimum requirements specified in conjunction with Iowa IAC135 field screening protocols related to OA-1 and OA-2 analyses.

Table 10. Calibration Checks Frequency Summary For Field Equipment

TYPE OF FIELD MEASURING INSTRUMENT	TSOP REFERENCE (Appendix D)	CALIBRATION CHECKS			
		Per Unit Manufacturer's Specifications			
		1 Pre-Field Bench Check At Mobilization	On-Property, 1 Per Each Portion Of 4 Hours Use	On-Property 1 Per Each Portion Of 1 Weeks Use	On-Property "Zero" To Ambient Prior To Each Use
pH Meter (Portable)	E.500/530	X	X		
Specific Conductance Meter	E.540	X	X		
Turbidity Meter	E.545	X		X	
Photoionization Detector	E.550	X	X		X
Ultraviolet Fluorometer	E.560	X		X	
Hydrogen Sulfide Monitor	E.600	X		X	
Methane Detector	E.605	X	X		
Oxygen Meter	E.610	X		X	

Calibration frequency for laboratory instrumentation will be as referenced in Appendix E, specifically Attachments 8 and the parameters of standard methods of Attachment 16, respective methods Subsections 9 – *Calibration and Standardization*.

B7.7 References

Laboratory references are presented in Appendix E, Attachment 15.

B8 INSPECTION AND ACCEPTANCE REQUIREMENTS FOR CONSUMABLES

Terracon-Rock Island maintains centralized control of field sampling expendables, supplies and materials for conducting environmental assessments through the position of Environmental Equipment Manager (EEM). Only the Division Manager, Office Manager and EEM are authorized to make purchases of approved supplies from listed vendors selected by Terracon. Materials are purchased and stored in the Terracon facility under the supervision of the EEM. The EEM approves all materials logged into the facility, to-and-from the project Field Captain and Sampling Team on a project-specific basis.

Laboratory responsibilities and procedures to control and monitor supplies and expendables is as referenced in Appendix E, specifically Attachments 3 and 4. Laboratory water quality can be of particular concern and is specifically addressed in Appendix E, Attachment 8, subsection 8.3 *Laboratory Water Control*.

B9 NON-DIRECT MEASUREMENTS AS DATA ACQUISITION

The use of data from non-measurement sources is essential in implementing the Phase II activity for the 1st Avenue Revitalization Brownfields Pilot study. This information was derived under Part 1 of the Project Plan approved by USEPA Region 7 previously.

The format, rationale and methodology to collect information under Part 1 was specifically designed toward the decision to be made by the City of Coralville on feasibility of redevelopment of properties within the study area. The primary basis of the Part 1 effort defaulted to the standards set forth in the industry as current practice, specifically;

- *ASTM E1527-97: Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process.*
- *ASTM E1528-96: Standard Practice for Environmental Site Assessments: Transaction Screen Process.*

This is considered representative and supportive of the decision process. Issues of bias and precision do not enter into consideration.

B10 DATA MANAGEMENT

This section describes the scheme of data management and path of data for field, laboratory and reporting activity. Data management will be in keeping with end-use by the City of Coralville for feasibility comparison to IAC137. Terracon data management will be consistent with Iowa industry practice for professionals.

Terracon's approach to this is laid out in Part 1 of the Project Plan, Appendix D, Terracon Corporate Quality Program Manual (CQPM, Revised 1998). Pursuant to compliance and demonstration to the CQPM, Terracon- Rock Island underwent its most recent Internal Peer Review in November 1999.

Laboratory data management will focus on a level requisite of EPA protocols and the standard methods. These procedures are set forth in Appendix E, specifically Attachments 10 and 13.

SECTION C - ASSESSMENT AND OVERSIGHT

C1 ASSESSMENT AND RESPONSE ACTIONS

This section lists and describes the oversight assessment activities to be conducted for the 1st Avenue Brownfields Revitalization Project to meet the City of Coralville's data needs in rendering a preliminary screening-level decision on feasibility for redevelopment.

C1.1 Purpose

This element describes the internal and external checks to provide that;

- All elements of the QAPP are correctly implemented
- The quality of the data produced by the QAPP is sufficient to the DQO screening decision
- That corrective actions, if needed, are done and effectiveness confirmed to the DQO

The end use of the data is commensurate with a screening level process by the City of Coralville. The end use of the data will be for IAC137 comparison and needs be consistent not only in technical effort to the Iowa industry standard of care, but also consistent with the degree of supporting efforts to that standard of care. Consistent with this purpose, this project will not enact extensive assessments or audits relative to supporting management systems of subsidiary organizations or internal management programs. Project assessment will be limited to monitoring the completion of technical and evaluation assignments.

Terracon will also apply the EPA Data Quality Assessment Statistical Toolbox (DataQUEST EPA600/R97/085-12/97) software to data sets. This will be used as a check, stringent application of the results to measure compliance will not be considered critical in view of the decision error criteria discussed previously and margins of conservatism inherent in the IAC137 comparison method.

C1.2 Assessment Activities

To accomplish the objectives of C1.1 the following will be conducted;

Table 11. Assessment Assignments and Schedules

ASSESSMENT ACTIVITY	AGENCY NAME	PROJECT POSITION	FREQUENCY OF ACTIVITY
Project Field Check	EPA Region 7	Brownfields Project Coordinator	2 Per Calendar Year Of Pilot; 1 to coincide with Planning Phase 1 to coincide with Phase II Field Work
Field Check	City of Coralville	City Manager or City Engineer	Minimum 2 per Project at time of Phase II activity
Technical Methods Audit	Terracon	QA Reviewer	Minimum 2 per project at Phase II, from daily records
Technical Methods Audit	Terracon	Project Manager	Minimum 1 per project from daily records
Project Files/Media Check	Terracon	Administrative Support Unit	Minimum 1 per calendar year
Field Methods Check	Terracon	Phase II Coordinator	Minimum 20% of properties, from daily records during Phase II work
Field Methods Audit	Terracon	Phase II Coordinator	Minimum 10% of properties, on-site observation during Phase II work
Field Methods Audit	Terracon	Project Manager	Minimum 1 per project, on-site during Phase II work
Technical Design Check	Terracon	Phase II Coordinator	Minimum 30% of properties, from daily records during Phase II work
Laboratory System Audit	Prairie Analytical Systems	QA Officer	Appendix E
Laboratory Certification	Illinois EPA	Illinois EPA Contract Laboratory Program (CLP)	NELAP Proficiency Testing, Biennial On-site Inspection
Laboratory Performance Audit	USEPA-EMSL Cincinnati, OH	Illinois EPA Contract Laboratory Program (CLP)	NELAP Proficiency Testing, Biennial On-site Inspection
Laboratory Certification	Iowa DNR	University (State) Hygienic Laboratory	Annual Proficiency Testing Series, Inspection every 2 years

C1.3 Assessment Criteria and Documentation

The following criteria will be used for evaluation as part of the assessments listed in C1.2.

C1.3.1 Project Field Check

This will be a site visit to meet with City, consultants and interested public parties to observe the project in progress. The resulting delivery will be a trip report to Agency supervisors with Copy to the City Project Manager or City Brownfields Coordinator. One trip report will be generated during the planning and design stages of the Phase II activity and one during the on-property assessment phases.

C1.3.2 Field Check

These will consist of an unannounced in-progress visit to the sites during on-property assessment to observe the activities and management of the project. No formal written

deliveries will be made by the City, but findings and observations will be conveyed verbally to the Terracon Project Manager.

C1.3.3 Technical Methods Audit

These will be conducted at random and unannounced as in-progress checks from requested copies of daily records from the Phase II Coordinator relative to the performance of the specific activity to sections A6, A7, B2 and B3. These will result in a completed Form C.11 (Appendix C) delivered within one week of audit to the Phase II Coordinator with copies to the QA Reviewer and Project Manager. The Phase II Coordinator copy will remain resident in project file 42997048, subfolder "Manila/Admin".

C1.3.4 Project Files/Media Check

This will be conducted at random and unannounced as an in-progress check of resident hardcopy and electronic project files relative to section A9. This will result in a completed Form C.11 (Appendix C) delivered within one week of check to the QA Reviewer and Project Manager. The auditor copy will remain resident in project file 42997048, subfolder "Manila/Admin".

C1.3.5 Field Methods Check

These will be conducted at random and unannounced as in-progress checks from requested copies of daily records provided by the Field Captain relative to the performance of the specific activity to sections A6, A7, B2 and B3. These will result in a completed Form C.11 (Appendix C) delivered to the Field Captain. A copy will be delivered within one week of audit to QA Reviewer and Project Manager. The Phase II Coordinator copy will remain resident in project file 42997048, subfolder "Manila/Admin".

C1.3.6 Field Methods Audit

These will be conducted at random and unannounced as in-progress checks on-site by the Phase II Coordinator relative to the performance of the specific activity to sections A9, B1, B7 and Appendix D TSOPs (Terracon Standard Operating Procedures). The Coordinator will immediately deliver a completed Form C.12 (Appendix C) to the Field Captain and discuss and resolve any necessary corrective action. A copy of the Form C.12 will be delivered within one week of check to the QA Reviewer and Project Manager. The auditor copy will remain resident in project file 42997048, subfolder "Manila/Admin".

C1.3.7 Technical Design Check

These will be conducted at random and unannounced as in-progress checks from requested copies of daily records directly from the Field Captain relative to the performance of the specific activity to sections A7 and B1. Non-compliance will be verbally communicated immediately to the Phase II Coordinator. This will also result in a completed Form C.11 (Appendix C) delivered within one week of check to the Phase II Coordinator with copies to the QA Reviewer. The auditor copy will remain resident in project file 42997048, subfolder "Manila/Admin".

C1.3.8 Laboratory System Audit

These will be conducted as necessary consistent with Appendix E, particularly Attachments 11 and 12.

C1.3.9 Laboratory Certifications and Performance Audits

These assessments will occur on the schedules, of the content and at the discretion allowed by programs of the regulating and certifying agency as set forth in public programs. Reporting will be consistent with those programs. Any non-compliance or serious failure of the program which revokes or impugns the accreditation necessary to this Project will be immediately reported in writing to the Terracon Project Manager.

C2 REPORTS AND MANAGEMENT

Communication is essential in the Brownfields Pilot study assessing feasibility. Properties can enroll on a daily basis, altering the ranking and allocation of available resources. Quality is enhanced when this communication is regular and routine. Terracon management will act promptly to understand the impact and assist in resolution of corrective action on a continuous basis.

C2.1 Project Reports

The reports described and submitted to parties and on schedules described in C1.3 will be made part of the permanent data quality record. In addition, routine reports describing project activity, needs for resolution amongst participating parties and to distribute schedule changes will be made both electronically and in writing. These are summarized in Table 12.

Terracon's assigned Project Manager is a Principal of the company and has direct resource allocation authority of equipment, funds and personnel at his immediate disposal to implement

corrective action. The Principal has direct reporting authority and responsibility for project quality to the NE Division Manager, a Vice-President of the Company.

Table 12. Routine Reports

Document	Party	Preparer	Distribute	Frequency
Pilot Grant Reports	City of Coralville	Brownfields Coordinator	Section A3.1-3, 8, 9	Quarterly Throughout Pilot And As Determined by City
Daily Job Reports	Terracon	Phase II Coordinator/ Field Captain	Project Manager	Daily when Phase II field work in progress with logbook copies
E-Status Reports	Terracon	Project Manager/ Phase II Coordinator	Section A3.1-9	Weekly at onset of field work Monthly during field activity Every other month during interim periods of review or funding
Project Status Reports	Terracon	Project Manager	Section A3.1-7	Monthly during field activity 6-Month Period Reports
Electronic Planning Portfolio (EPP) for Community Outreach	Terracon	Project Manager	Section A3.1-3 Public PC	Updated at final report for project activities or as request by City for public education or outreach

C2.2 Laboratory Reports

Laboratory quality is enhanced through a formalized process and management system of reporting relative to communicating issues on data quality, identification/resolution of problems and corrective action. These will be accomplished to maintain project laboratory data quality within the limits of the standard methods. Reporting occurs consistent with Appendix E, particularly Attachments 8 and 12 and referenced subparts.

The laboratory will deliver to Terracon with analytical test reports a Level IIIb data quality package for all analyses.

C2.3 Public Reports

In addition to data quality reports, the Brownfields Pilot study has an obligation to report both technical data for decision-making by the City of Coralville and public information through community outreach portions of the project. The content of reports will be sufficient to the planning and feasibility needs of the City of Coralville and for future use relative to IAC137. These needs and deliverables are set forth in the *Consultant Scope of Services* between Terracon and the City of Coralville.

SECTION D - DATA VALIDATION AND USEABILITY

D1 DATA REVIEW, VALIDATION AND VERIFICATION

The 1st Avenue Revitalization Brownfields Pilot study conducted with end comparison under the Iowa IAC137 rules does not require the detailed statistical and numerical comparison of traditional CERCLA or other enforcement activities.

On December 17, 1999 EPA Region 7 conducted on-site training at the City of Coralville as part of an EPA Project Check visit. Training was to enhance project planning and QAPP development through presentation and an interactive workshop for “*Systematic Planning Process and Quality Assurance Project Plans (8 Hours)*” as part of the 1st Avenue Brownfields Pilot. In participatory attendance were multiple representatives of EPA7-Brownfields, EPA7-Quality Assurance, Iowa DNR Uncontrolled Sites, the City of Coralville, the U.S. Army Corps of Engineers, the laboratory and consultants. Terracon was represented by our Project Manager, Phase II Coordinator, QA Reviewer, and Phase II Field Captain.

The intent was to enhance the quality of the final DQO/QAPP and to best integrate the document into Brownfields-specific issues for the 1st Avenue Revitalization Project, a Region 7 EPA Brownfields Assessment Demonstration Pilot. Key to discussions were the transition of the use of data from the federal process into state-level use beyond the Brownfields Pilot Grant stage. The working group was of a consensus that the federal criteria for validation of assessment data was an elevated effort relative to that required of most Iowa environmental regulatory programs outside of CERCLA.

Traditionally, Terracon engages a third-party Data Quality Assurance review firm specializing in independent full-package review. This Brownfields project does not require extensive validation procedures traditionally required of enforcement action or in support of civil litigation when considering the DQOs of Section A7, the end user of the data under the Brownfields process and the preliminary screening level of the decision-making effort by the City. This is consistent with the discussions of the Brownfields EPA planning/training session conducted on-site in December 1999.

D1.1 Purpose

The focus will be on the completeness and accuracy of field methods, proper sample handling and a reliance on the validation and verification of the laboratory operating within its Illinois CLP program certification and Level IIIb protocols. This approach supported by the other elements

of the DQO/QAPP discussed previously is consistent with or exceeds current levels of industry practice for work within the IAC137 Land Recycling Program.

The Project Manager will be responsible to conduct a full-package review of the field process and data produced for a property enrolled and ranked in the Brownfields. The laboratory QA Officer will conduct validation and reporting consistent with Appendix E, particularly Attachments 7 and 10 and referenced subparts of standard methods criteria. The laboratory will deliver to the Project Manager a Level IIIb data package for testing to be entered into the project record.

The project must review designs for conformance to determine that procedures, measurements and data produced are requisite of and proper to the screening level decision of the Brownfields decision that being;

“Is the property impacted relative to Iowa Response Action Standards ?”

D1.2 General

The resultant data and information produced through implementation of Part 2 of the Project Plan will be reviewed on a specific basis to the objectives set forth in A7. The review and verification will check that methods as stipulated were implemented, and where failures occurred, assess the relative impact to the DQO and primary decision of A7.2.

Qualified or corrected procedures and data for the comparison to IAC137 standards will likely be acceptable if consistent with and sufficient to the Decision Statement.

D1.3 Field Methods and Measurements

Each property will receive review of the implementation of methods and measurement criteria of section B of the QAPP in general and specific to the sampling design strategy of the Property-Specific Sampling Analysis and Checklist.

D1.4 Laboratory Methods and Measurements

Data validation will include a review of the following items: chain-of-custody, analysis completeness, holding times, duplicate sample results, field duplicates, and detection limits.

After validation of each laboratory package is completed, the laboratory results will be summarized in tabular form. The data summary report will include tabular summaries of analytical testing results, laboratory reports, and a summary of data validation conclusions. In addition to the data summary report, data collected during the project will be summarized in the final report.

Measurements and procedures compliance will be compared to the QAPP, with specific emphasis on performance within parameters of standard methods. The quality of the laboratory test results will be assessed through evaluation of the results of the submitted QA/QC samples and laboratory internal QA/QC results. The laboratory data assessment procedures will consider the following items as set forth through Appendix E, but in general will include:

- Analytical Precision
- Analytical
- Positive detections in laboratory blank samples
- Positive chemical detections in field blank samples
- Representativeness
- Completeness
- Instrument calibrations
- Data reduction and processing

D2 VALIDATION AND VERIFICATION METHODS

The Brownfields feasibility decision by the City of Coralville is a preliminary screening-level activity for use in redevelopment planning. The data will engage in an IAC137 comparison having wide margins of latitude incorporated into a conservative first order comparison – the Iowa statewide standards derived protective of unrestricted land use. This is generally evidenced by the “75% passing” compliance criteria of IAC137 sufficient to meet compliance to a standard. The level of supporting effort expended in validation procedures should be of a similar latitude and magnitude. The validation procedures of the Brownfields Pilot will be general and will focus on determining proper collection, preservation and delivery of proper amounts of material under proper conditions to the laboratory for measurement and use in the final decision.

The Project Manager will be responsible for validation of project implementation, conducting a direct comparison of the project records to the QAPP for each Property assessment prior to writing of the Phase II evaluation report required by the Consultant Scope of Services. This will be initiated immediately upon completion of the field sampling activity on an enrolled and ranked Property within the Brownfields Pilot study area. Due to limited nature of the validation.

The QA review will conduct a minimum of one review per year, up to 10% of total sites.

The Project Manager will rely on standard methods conformance and the laboratory data packages to support valid analytical data.

D2.1 Field and Management

The review will specifically evaluate the implementation of the following relative to field and management procedures as they apply to the Brownfields study. They will be DQO and Property-specific regarding the quality of resultant data and will include;

- Generic conformance to design parameters of the QAPP and DQOs of A7.2 for selection and implementation as point source or non-point source condition
- Sampling Design as detailed in the Checklist
- Sample collection procedures as prescribed in TSOPs of Appendix D and compared to field documentation and corrective audits of Section C1.2, also;
 - Sampling will be considered complete if 90% of all soil samples are obtained pursuant to the Checklist design
 - Sampling will be considered complete if 100% of all groundwater samples are obtained pursuant to the Checklist design
 - Sampling will be considered accurate if the 100% of the TSOP procedures stipulated were used and documentation supports proper use
 - Sampling will be considered representative if 80% of the sample interval for soil and 100% of the laboratory volume for groundwater was recovered and submitted
- Sample handling protocols and chain of custody will be reviewed and holding and transport times must be met for the sample to be considered valid
- Quality control checks conducted from Table 9 as they relate to field influences on data quality
- Calibration of instruments at bench mobilization and in the field from instrument records and field logbooks specific to the property enrolled and assessed

D2.2 Laboratory Data

The Laboratory QA Officer will be responsible for validation of laboratory project implementation measures of success. The QA Officer will be responsible for submittal of Level IIIb data

packages to the Project Manager to support the validation and sufficient to the planned efforts of Appendix E.

D3 RECONCILIATION WITH USER REQUIREMENTS

The decision process by the City of Coralville is a planning evaluation to assess the feasibility of a property to be available for redevelopment. The decision, and data to support the decision, are considered quantitative for technical implementation, but are preliminary relative to the end decision to actually do so. The Brownfields Pilot assessment is the first step in moving properties with actual or perceived environmental impairment toward constructive reuse beneficial to the public. The assessment and data are not the sole determinant in deciding a property is feasible for redevelopment.

Beyond the Brownfields process, the IAC137 has incorporated levels of contingent public protection into the development of the Land Recycling Program and statewide response standards for soil and groundwater. The IAC137 process has incorporated acceptance of variability through the allowable methods of demonstrating compliance (e.g., statistical averaging of site concentrations to consider risk, less than 100% compliance to threshold to be acceptable). This infers to the Brownfields Pilot assessment that some variability and a “less than perfect” data set will still be useful to the City decision of section A7.

The Brownfields Pilot study has limited resources for assessment and must maximize use of all resultant data, even if qualified, in making the feasibility decision.

A failure to validate full compliance of a field procedure will not likely remove the resultant data from use by the City, it may merely qualify it for recognition and use by others beyond the primary decision.

With the IAC137 increased reliance on laboratory systems to produce quality data, a significant failure to validate project chemistry will be less likely to be used in the process. Laboratory data failures will be given more extensive consideration and result in a written opinion by the Project Manager as to useability relative to the DQO, by the City and for the IAC137 comparison. Key to the reconciliation will be the following considerations;

- Is the invalid or qualified data point the sole determinant ?
- Does inclusion of the flawed method or qualified data point/set skew the resultant IAC137 comparison ?

The resultant opinion of the Project Manager will be incorporated as an element of uncertainty in Phase II reports to be delivered to the City and made available to the public as part of the Brownfields process.