Tierra Solutions, Inc.

Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey

November 2014

Revision 1

Prepared By:

Tierra Solutions, Inc.
East Brunswick, NJ

Table of Contents

Figures

Appendices

Acronyms and Abbreviations

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CPG	Cooperating Parties Group
DQO	data quality objectives
FRS	Field Research Specialist
FSP	Field Sampling Plan
ft	feet/foot
GPS	Global Positioning System
GPR	Ground Penetrating RADAR
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
in	inch
LPRSA	Lower Passaic River Study Area
m	meter
mm	millimeter
N/A	not applicable
NGVD29	National Geodetic Vertical Datum of 1929
PES	Parametric Echosounder
PM	Project Manager
PQO	project quality objectives
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RIWP	Remedial Investigation Work Plan
RPM	Remedial Project Manager
RTK	Real Time Kinematic
SE	southeastern
SOP	Standard Operating Procedure
SSO	Site Safety Officer
TBD	to be determined
Tierra	Tierra Solutions, Inc.
UAO	Unilateral Administrative Order
UFP	Uniform Federal Policy
UoI	University of Illinois – Department of Geology

USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency

1. Introduction

This Quality Assurance Project Plan (QAPP) has been prepared at the request of the U.S. Environmental Protection Agency (USEPA) to identify the horizontal and vertical location of two 72-inch diameter water pipelines crossing the Passaic River near River Mile 10.9 (RM 10.9) of the Passaic River. The objective of locating these two pipelines will be accomplished by probing below the sediment surface from a shallow draft pontoon barge situated within the Passaic River. The work completed as part of this QAPP will be performed under the requirements of the Unilateral Administrative Order (Comprehensive Environmental Response Compensation and Liability Act [CERCLA] -02-2012-2020 (United States Environmental Protection Agency [USEPA] 2012) for RM 10.9 of the Lower Passaic River Study Area (LPRSA), with oversight conducted by the USEPA.

This plan describes the implementation of the field data collection, data analysis, and associated quality assurance (QA) and quality control (QC) activities developed for this program.

This document uses applicable worksheets from the Uniform Federal Policy (UFP) on QAPPs [Publication Numbers: EPA: EPA-505-B-04-900A Department of Defense: DTIC ADA 427785] (USEPA 2005) and activity-specific Standard Operating Procedures (SOPs) for the field activities.

1.1 Background Information

The RM 10.9 Study Area is an area that was subject to a focused characterization and removal action (sediment removal and capping) by the LPRSA Cooperating Parties Group (CPG) in response to the finding of elevated concentrations of chemicals of potential concern (COPCs) in the surface sediments. Outside of the No Dredge Zone (see below), sediment removal work was initiated in 2013 and cap placement was completed in 2014; the cap monitoring plan still needs to be finalized and implemented. The RM 10.9 Study Area extends bank-to-bank between RM 10 and RM 12 of the LPRSA (Figure 1). The RM 10.9 Removal Area (the area subject to CPG's removal action) is an approximately 5.6-acre area located along an inside bend on the southern and eastern shore of the Passaic River upstream of the DeJessa Park Avenue Bridge. The area includes the mudflat and point bar in the southern/eastern half of the river channel. It is bounded to the west by the navigation channel of the Passaic River and to the east by the Riverside Park complex, which is owned and operated by Bergen County and the Town of Lyndhurst.

The two 72-inch diameter water pipelines bifurcate the RM 10.9 Removal Area. Because the exact horizontal and vertical locations of these pipes were not identified by the CPG prior to their commencing work, a No Dredge Zone in the area of the pipelines was established so as to not potentially damage the pipes during the CPG's removal activities (refer to Figure 1.)

Figure 1

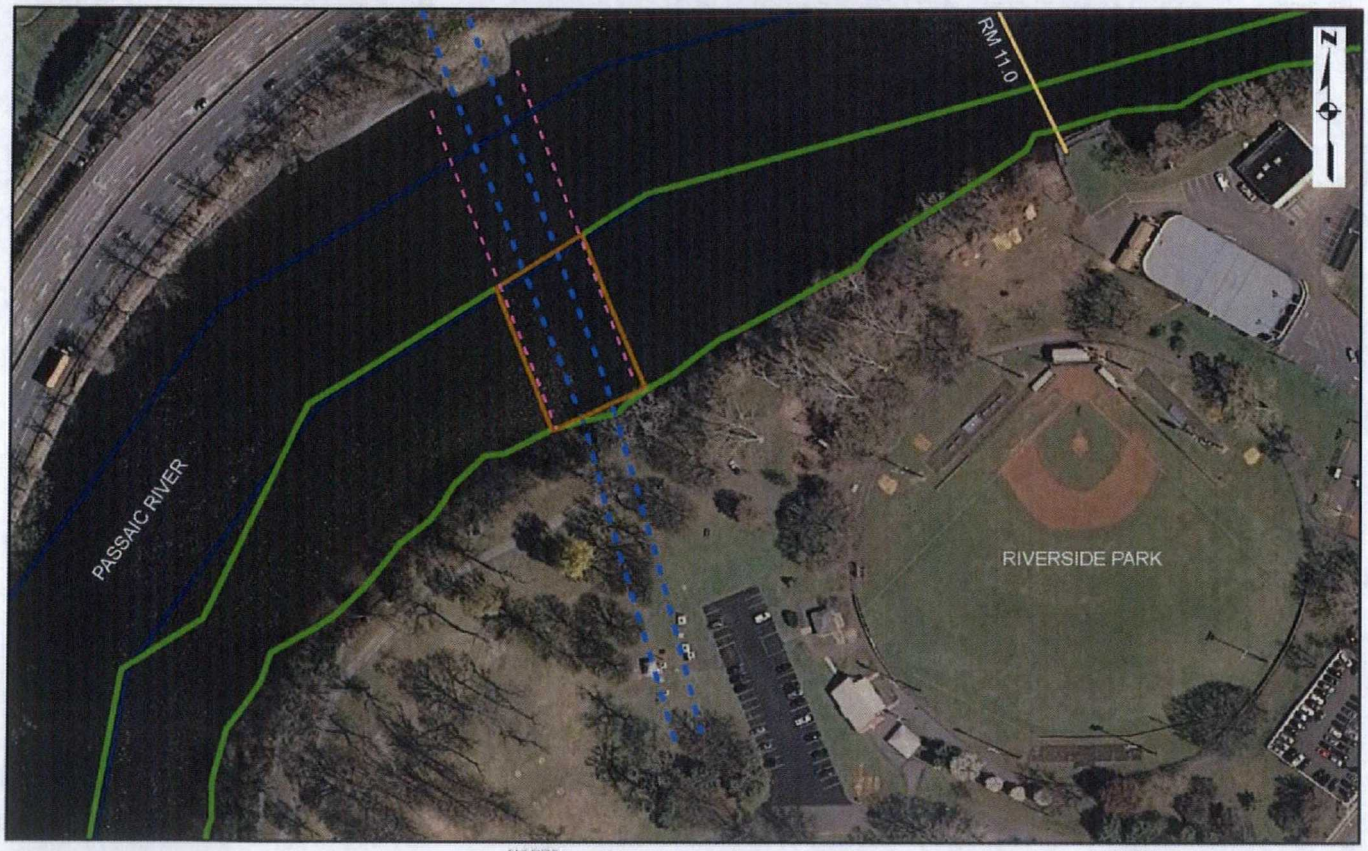


FIGURE 1. LOCATION OF THE NO DREDGE ZONE AT RM 10.9.

0 150 300 Feet

GRAPHIC SCALE

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY FROM THE NJ OFFICE OF INFORMATION TECHNOLOGY (NJOIT), OFFICE OF GEOGRAPHIC INFORMATION SYSTEMS (OGIS), 2007.
3. THE COORDINATE SYSTEM REFERENCED IN THE MAP IS STATE PLANE, NEW JERSEY ZONE, NORTH AMERICAN DATUM 1983, U.S. SURVEY FEET.
4. 72" UNITED WATER PIPELINE AS BUILT LOCATIONS DIGITIZED FROM THE UWJC 72 INCH WATERMAINS ACROSS LOWER PASSAIC RIVER DRAWING, UWJC_NUTLEY_PASSAIC_WMAIN.PDF.

LEGEND:

- RIVER MILE
- 72" UNITED WATER LINES (APPROXIMATE LOCATIONS)
- 30' PIPE OFFSET
- NAVIGATION CHANNEL
- CPG RM 10.9 REMOVAL AREA
- CPG RM 10.9 REMOVAL AREA NO DREDGE ZONE

Section 2
QAPP Worksheets

QAPP Worksheet #1 (UFP-QAPP Manual Section 2.1) Title and Approval Page
Document Title: Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey

Lead Organization:
Tierra Solutions, Inc.
2 Tower Center Boulevard, 10th Floor
East Brunswick, New Jersey 08816
Phone: 732.246.5851
E-mail: paul.brzozowski@tierra-inc.com

Preparer's Name and Organizational Affiliation:
Mr. Clifford Firstenberg and Mr. Paul Brzozowski, Tierra Solutions, Inc.

Preparer's Address, Telephone Number, and E-mail Address:
Two Tower Center Boulevard, Tenth Floor
East Brunswick, NJ 08816

Cliff Firstenberg
Phone: 757-258-7720
E-mail: Clifford.Firstenberg@tierra-inc.com

Paul Brzozowski
Phone: 732.246.5851
E-mail: paul.brzozowski@tierra-inc.com

Preparation Date (Month/Day/Year): November 11, 2014

Lead Organization's Project QA Manager

Cliff Firstenberg (Tierra)

Lead Organization's Project Coordinator

Paul S. Brzozowski (Tierra)

QAPP Worksheet #2 (UFP-QAPP Manual Section 2.2.4) QAPP Identifying Information

Site Name/Project Name:	Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey
Site Location:	Passaic River, New Jersey
Site Number/Code:	CERCLA Document No. 02-2012-2020
Operable Unit:	00
Contractor Name:	Ocean Surveys, Inc. (OSI)
Contractor Number:	Not Applicable (N/A)
Contract Title:	N/A
Work Assignment Number:	N/A

1. Identify guidance used to prepare QAPP:

   - USEPA. 2005. U.S. Department of Defense, and U.S. Department of Energy. Intergovernmental Data Quality Task Force. Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. USEPA 505-B-04-900A.Final Version 1. March.

2. Identify regulatory program: CERCLA.

3. Identify approval entity: USEPA Region 2

4. Indicate whether the QAPP is a generic or a project-specific QAPP. (circle one)

5. List dates of scoping sessions that were held:

   - September 3, 2014 scoping session with OSI (George Reynolds) and Tierra (Paul Brzozowski, Cliff Firstenberg)

6. List dates and titles of QAPP and Field Sampling Plan (FSP) documents written for previous site work, if applicable:

   Quality Assurance Project Plan for River Mile 10.9 Pipeline Surveys: Geophysical Surveys: Parametric Echosounder and Ground Penetrating Radar – June 2014

7. List organizational partners (stakeholders) and connection with lead organization:

   This work will be performed under the requirements of the Unilateral June 2014 Administrative Order (CERCLA-02-2012-2020) (USEPA 2012) for RM 10.9 of the LPRSA, with oversight conducted by USEPA. Tierra has engaged OSI to conduct the field work on its behalf.

8. List data users: USEPA

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:

   The planned probing activities involve the collection of field-measured data only (vessel position, sub-surface depths, and x, y and z co-ordinates of the pipelines). As such, a number of worksheets are not considered applicable to this investigation and are not included in this document.

   No laboratory analyses are required as part of this investigation, and therefore, the following worksheets are not applicable to this effort:

   - #15 Data Quality Levels and Analytical Method Evaluation
   - #19 Analytical SOP Requirements Table
   - #23 Analytical SOP References Table
   - #24 Analytical Instrument Calibration Table
   - #25 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table
   - #30 Analytical Services Table
   - #36 Validation (Steps IIa and IIb) Summary Table

   No physical samples will be collected as part of this investigation, and therefore, the following worksheets are not applicable to this effort:

   - #18 (UFP-QAPP Manual Section 3.1.1) Sampling Locations and Methods/SOP Requirements Table
   - #20 Field Quality Control Sample Summary Table
   - #26 Sample Handling System
   - #28 QC Samples Tables

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information Relevant to Collection of Probing Data	Crosswalk to QAPP Worksheet No. or Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	1
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	 2
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	5 6 7 8
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps	9 9 10/ Pages 5 & 6/Figure 1 Figure 1
2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria 2.6.1 Development of PQOs Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	11 12
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13/Appendix A
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Project Schedule/Timeline Table	14 14 16

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information Relevant to Collection of Probing Data	Crosswalk to QAPP Worksheet No. or Related Documents
Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/SOP Requirements Table - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	14 & 17 14 14/Figures 2& 3/ Appendix B 21 22
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures		N/A
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures	- Sample Custody Requirements	27
3.4 QC Samples 3.4.1 Sampling QC Samples 3.4.2 Analytical QC Samples		N/A
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	-	29/Appendix B
Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Planned Project Assessments Table - Assessment Findings and Corrective Action Responses	31 32
4.2 QA Management Reports	- QA Management Reports Table	33
4.3 Final Project Report	- To be completed following data collection	Not available

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information Relevant to Collection of Probing Data	Crosswalk to QAPP Worksheet No. or Related Documents
Data Review		
5.1 Overview 5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.3 Step III: Usability Assessment	 - Verification (Step I) Process Table - Verification (Steps IIa and IIb) Process Table - Usability Assessment	 34 35 37
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	- To be completed following data evaluation	Not available

QAPP Worksheet #3 (UFP-QAPP Manual Section 2.3.1) Distribution List

QAPP Recipients	Title	Organization	Telephone Number	E-mail Address	Document Control Number
Jennifer LaPoma	Remedial Project Manager (RPM)	USEPA Region 2	212.637.4328	LaPoma.Jennifer@epamail.epa.gov	N/A
Stephanie Vaughn	RPM	USEPA Region 2	212.637.3914	Vaughn.Stephanie@epa.gov	N/A
Ray Basso	Strategic Integration Manager	USEPA Region 2	212.637.4417	basso.ray@epamail.epa.gov	N/A
Sarah Flanagan	Attorney	USEPA Region 2	212.637.3136	Flanagan.Sarah@epamail.epa.gov	N/A
Derrick Vallance	Assistant General Counsel	Maxus Energy	281.681.7255	dvallance@maxuscorp.com	N/A
Carol Dinkins	Attorney	Vinson & Elkins	713.758.2528	cdinkins@velaw.com	N/A
Paul S Brzozowski	Project Coordinator	Tierra	732.246.5851	paul.brzozowski@tierra-inc.com	N/A
Clifford Firstenberg	Environmental Sciences Manager	Tierra	757.258.7720	Clifford.Firstenberg@tierra-inc.com	N/A
George Reynolds	Vice President	OSI	860.388.4631	ggr@oceansurveys.com	N/A

QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet

Organization: A completed sign-off sheet will be maintained in the files for each organization shown below. A blank form is provided on the following page.

Project Personnel	Title	Telephone Number	Signature*	Date QAPP Read
Paul Brzozowski	Project Coordinator (Tierra)	732.246.5851		
Clifford Firstenberg	Environmental Sciences Manager (Tierra)	757.258.7720		
George Reynolds	Vice President	860.388.4631		

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

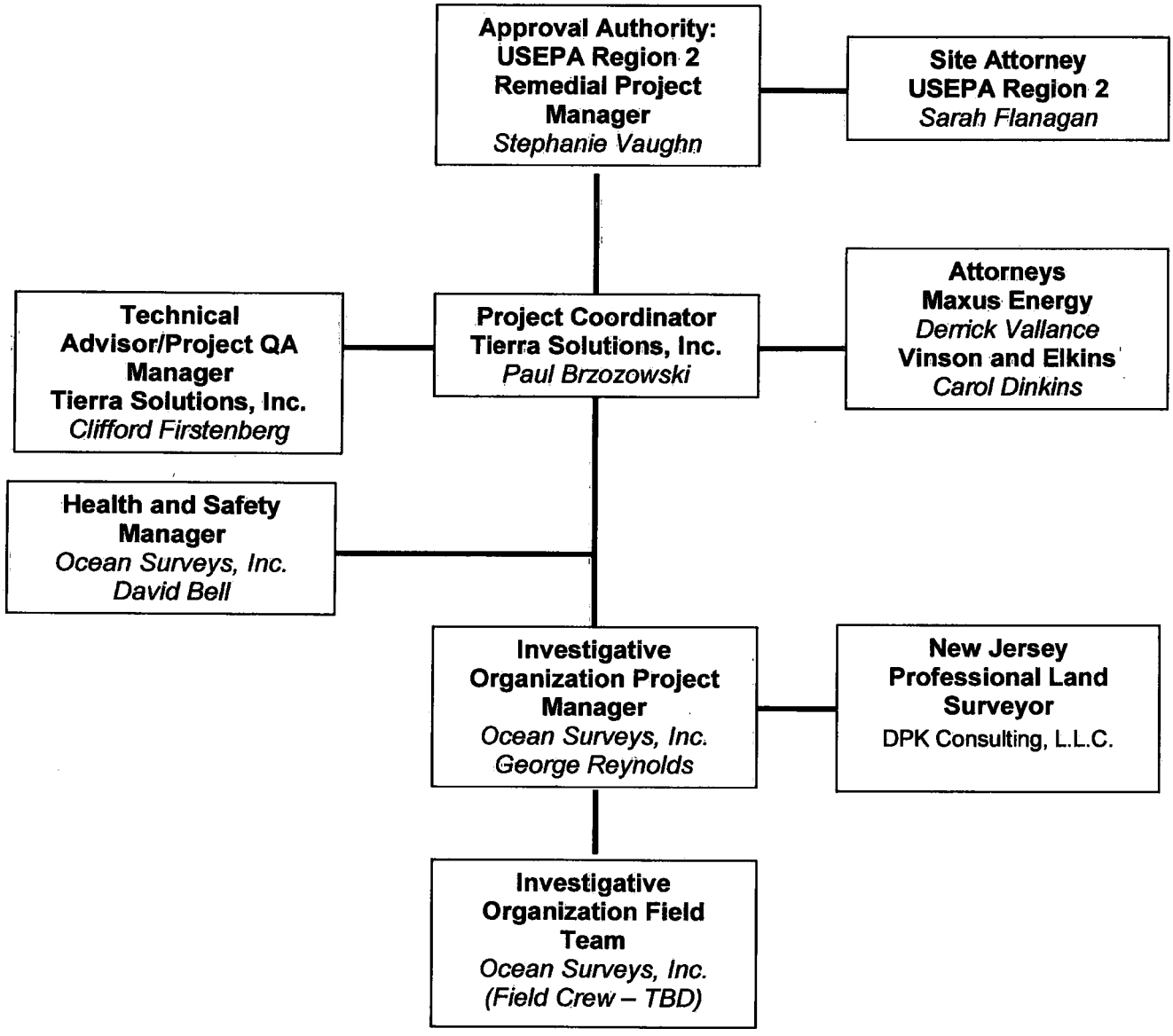
QAPP Worksheet #4 (UFP-QAPP Manual Section 2.3.2) Project Personnel Sign-Off Sheet

Organization:

Project Personnel	Title	Telephone Number	Signature*	Date QAPP Read

*Signature indicates that personnel have read the applicable QAPP sections and will perform the tasks as described.

QAPP Worksheet #5 (UFP-QAPP Manual Section 2.4.1) Project Organizational Chart



QAPP Worksheet #6 (UFP-QAPP Manual Section 2.42) Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number (mobile)	Procedure (timing, pathways, etc.)
Field activities status and issues	Tierra Project Coordinator	Paul Brzozowski	732.246.5851	Communicate daily, or as needed, with USEPA regarding status updates and deviations and/or proposed revisions received from UoI Survey Field Task Lead. Any revisions to procedures will be discussed with USEPA and oral approval received prior to implementation; written revisions will also be submitted to USEPA.
Field and data processing analysis	OSI Survey Field Task Lead	OSI Survey Field Task Lead (TBD)	TBD	Communicate daily with Project Coordinator via e-mail or phone.
Health and safety briefings and updates	Site Safety Officer (SSO)	OSI SSO (TBD)	TBD	Communicate daily, or as needed, with field personnel and boat operators directly, or via e-mail or phone.
Significant health and safety concerns or incidents	SSO	OSI SSO (TBD)	TBD	Communicate immediately with Project Team and Project Health and Safety Manager in accordance with the Health and Safety Plan (HASP).
Vessel operations	OSI Survey Field Task Lead	OSI Survey Field Task Lead (TBD)	TBD	Communicate daily, or as needed, with Project Coordinator.
Issues potentially affecting data quality objectives (DQOs)	OSI Survey Field Task Lead	OSI Survey Field Task Lead (TBD)	TBD	Communicate with Project Coordinator, via e-mail or phone. Significant work plan modifications will be proposed to the Project Coordinator.
Project status and issues (external)	Tierra Project Coordinator	Paul Brzozowski	908.328.8395	Communicate with USEPA and OSI as needed via e-mail or phone.
Data management	OSI QA Manager	OSI QA Manager (TBD)	TBD	Communicate with the Project Coordinator via email; transmit final processed and supporting data files.
Stop Work (technical non-compliance)	Project Team	N/A	N/A	Any person believing that stopping work is necessary shall first verbally notify their respective PM, who will, in turn, verbally notify the Project Coordinator, if necessary. Given the potential significance of such communications, this should occur as quickly as possible.

Personnel identified as TBD will be defined 2-weeks prior to field work based on personnel availability.

QAPP Worksheet #7 (UFP-QAPP Manual Section 2.4.3) Personnel Responsibilities and Qualifications Table

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications[1]
Paul Brzozowski	Tierra Project Coordinator	Tierra	Overall responsibility for the safe and proper execution of task. Be available to discuss and review technical and other issues that may arise during work. Periodically review and audit work to ensure that work plan, project QA/QC, health and safety including both boating and hazardous materials worker safety procedures are being followed. All deviations from approved project plans will be discussed with and approved by the Project Coordinator. Primary point of contact with the USEPA and its oversight contractor.	B.S. Civil Engineering; 32 years' experience
Clifford Firstenberg	Technical Advisor / Project QA Manager	Tierra	Provide technical advice on the environmental conditions of the Passaic River and the application of the planned probing technique.	B.A. Earth and Planetary Sciences M.S. Marine Environmental Sciences/Physical Oceanography; 32 years' experience
George Reynolds	Technical Advisor	OSI	Probing technical approach, equipment selection and probing operations oversight.	E.E. A.S. Electrical Engineering Certified Hydrographer 35 years' experience
David Bell	Health and Safety Manager	OSI	Oversee Health and Safety plans and implementation.	MS Geophysics 35 years' experience

[1] Resumes of all individuals are available upon request.

QAPP Worksheet #8 (UFP-QAPP Manual Section 2.4.4) Special Personnel Training Requirements Table

Workers on the boat will be HAZWOPER certified, either 40-hour or 24-hour, depending upon their potential annual exposure. All personnel on the boat will have 40-hour training.

Additional health and safety information will be detailed in the site-specific Health and Safety Plan to be prepared and submitted separately.

QAPP Worksheet #9 (UFP-QAPP Manual Section 2.5.1) Project Scoping Session Participants Sheet

Project Name: River Mile 10.9 Pipeline Probing Survey **Projected Date(s) of Sampling:** Fall 2014 **Project Coordinator:** Paul Brzozowski	**Site Name :** RM 10.9 **Site Location :** Passaic River, New Jersey
Date of Session: September 3, 2014 **Scoping Session Purpose:** Development of scope for pipeline survey.	

Name	Affiliation	E-mail Address	Project Role
Paul Brzozowski	Tierra	Paul.brzozowski@tierra-inc.com	Project Coordinator - Tierra
Cliff Firstenberg	Tierra	Clifford.firstenberg@tierra-inc.com	Technical Advisor/Project QA Manager - Tierra
George Reynolds	OSI	ggr@oceansurveys.com	Investigative Organization Project Manager

Comments/Decisions:
Respondents submitted a QAPP to USEPA in June 2014 to perform a study to investigate the location of the water mains at the River Mile 10.9 Removal Action Area utilizing parametric echosounder and ground penetrating radar techniques. Although the USEPA did not review such QAPP, the USEPA permitted the Respondents to conduct the work on the condition that a supplemental QAPP for physical probing be submitted for approval and implemented. The respondents conducted the parametric echosounder and ground penetrating radar investigations; as of this QAPP preparation, Tierra is awaiting the final results.

QAPP Worksheet #10 (UFP-QAPP Manual Section 2.5.2) Problem Definition

The problem to be addressed by the project:

During the design of CPG's removal action at RM10.9, insufficient information was collected in a timely fashion to define the exact horizontal and vertical positioning of the two 72-inch water pipelines crossing the proposed dredge area. As such, the Jersey City Municipal Utilities Authority (JCMUA) requested that a 30 foot buffer zone for dredging during the CPG's removal action be established upriver and downriver of the expected location of the pipes. Based on this request, USEPA allowed CPG to at least temporarily exclude dredging within the area of the buffer zone. USEPA is now requiring that this area (the No Dredge Zone) be addressed and has ordered Tierra to collect information on the pipeline location to inform USEPA as to the viability of dredging. If dredging can be accomplished, such information would be used to inform the dredging design.

QAPP Worksheet #11 (UFP-QAPP Manual Section 2.6.1) Project Quality Objectives/Systematic Planning Process Statements

PROGRAM GOAL

The overall goal of the work is to collect information on the pipeline location to inform USEPA as to the viability of dredging the No Dredge Zone area of the RM10.9 removal program. If dredging is determined viable, such information will be used to inform the dredging design.

PRIMARY STUDY QUESTIONS/NEEDS

To accomplish the goal above, the primary study need is a quantitative delineation of the locations of two 72-inch pipelines within the No Dredge Zone of the Passaic River at RM 10.9 of the LPRSA.

Previous work has been conducted by both the CPG and Tierra to locate the pipes utilizing geophysical/non-intrusive techniques including:

- A sonar and magnetometer survey by OSI in 2013 on behalf of the CPG.
- A Ground Penetrating Radar (GPR) and parametric echosounder (PE) survey by UoI in August 2014 on behalf of Tierra.

In general, the results of these previous studies have confirmed the presence of the pipes and their approximate horizontal locations. Neither of the studies have provided beneficial/reliable depth information that can be used for the evaluation and design of potential dredging activities.

Recent drawings provided by JCMUA (Appendix A) include information on pipe depth, foundation support, and pipe cover. The usefulness of these drawings for the evaluation and design of potential dredging activities is limited for the following reasons:

- It is not known if these drawings represent design or as-built drawings.
- The accuracy of these drawings, whether design or as-built, is unknown.
- The referenced vertical datum cannot be quantitatively related to currently used datums.

In light of the above, Tierra proposes for this field investigation QAPP to employ a physical probing technique in the River to accomplish the following:

- To determine if the pipe is outside a reasonable threshold for safely performing dredging activities above the pipes. For the purpose of this investigation, a reasonable threshold is defined as 4.0 feet below sediment surface [2.0 feet (required dredge depth) plus 0.5 feet (dredging precision as defined by the document Technical Guidelines for Environmental Dredging of Contaminated Sediments – US Army Corps Sept. 2008) plus 1.0 feet for pipe protection (potential JCMUA requirement) plus 0.5 feet (factor of safety)]. While JCMUA has not specified a 1.5 foot clearance above the pipe, they have indicated via telephone conversation with Tierra that some level of safety clearance is needed (but they were not inclined to define such at the time).
- To gather geospatial data (horizontal coordinates and elevation referenced to a known datum) of the "subsurface infrastructure" and relate such data to the information on the JCMUA drawings. [The term subsurface infrastructure relates to the pipe and pipe backfill (gravel bedding and pipe cover material) which likely will not be distinguishable from the actual pipe by probing.] The cross-referencing of field data to the JCMUA drawings may allow Tierra to better understand the drawings (particularly as it relates to pipe depth information) and therefore enable the drawings to be of better use for future dredging actions.

ALTERNATIVE ACTIONS

N/A

WHO WILL USE THE DATA?

USEPA

WHAT WILL THE DATA BE USED FOR?

The data will be used to inform USEPA as to the viability of dredging the No Dredge Zone area of the RM10.9 removal program. If dredging is determined viable, such information will be used to inform the dredging design.

WHAT TYPE OF DATA IS NEEDED?

- At a minimum, confirmation from physical probing that the pipe/subsurface infrastructure is either within or not within the allowable threshold (4.0 feet below sediment surface) for safely performing dredging activities above the pipes.
- To the extent possible, determine the elevation of the top of the water pipelines (referenced to NGVD29) and associated New Jersey State Plane coordinates (NAD83) within the No Dredge Zone. Obtaining such data may not be possible, or may be impaired, because of the depth of the pipes and how they were constructed (backfilled on top and sides with gravel). Probing may not be able to distinguish between debris in the area, top of gravel backfill and the pipe itself.

HOW MUCH DATA ARE NEEDED?

The location, depth and orientation of the pipe in the River is not known with specificity. However, existing information provides a starting point to locate the pipe and begin collecting horizontal and vertical coordinates. Because the pipes are "engineered" structures that were installed with engineering precision at the time, it can be expected that there will be consistency in the horizontal orientation and vertical slope of the pipes across the River. As such, a spacing for the probe locations was defined as noted below:

- The first five transects off the southern embankment will be at a 10 foot spacing to characterize the anticipated greater elevation change (downward slope) in that area. Thereafter, the transects will be spaced at 20 feet along the orientation of pipe up to the navigational channel.
- Each transect will consist of a minimum of nine (9) probes (along the transect) across the expected location of the pipe. Additional probes along each transect may be completed based on real-time probing results, as collected in the field.

HOW GOOD DO THE DATA NEED TO BE?

The data quality should be reliable to address the primary study needs previously discussed in this Worksheet 11.

<u>Physical Measurements of Vertical Depth</u>

Considering the primary study needs and limitations of in-field measurements by the human eye, the vertical depth readings of top of pipe, gravel backfill and/or obstructions will be measured with an accuracy 0.25 feet (3 inches) or less.

RTK GPS

The horizontal and vertical accuracy of the Trimble MS 750 is 1cm + 2ppm (part per million) and 2cm + 2ppm, respectively, for all kinematic observations (where the ppm value is derived from the distance between the base station and the rover – the baseline). To optimize the positional accuracy, the baseline distance will be minimized to the extent practicable.

WHEN WILL THE DATA BE COLLECTED?

The data are planned to be collected December 2014.

A data report will be prepared within eight weeks of completion of the field data collection. This report will include a discussion of all field and quality control activities, the data collected, a description of all deviations from this QAPP and an explanation for each, and tables of coordinates and plots of same.

QAPP Worksheet #12 (UFP-QAPP Manual Section 2.6.2) Measurement Performance Criteria Table

Matrix	Not applicable				
Analysis	Not applicable				
Concentration Level	Not applicable				
Sampling Procedure	**Analytical Method/SOP**	**Data Quality Indicators**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
Position accuracy	GPS SOP	Accuracy/Bias, Precision	1cm + 2ppm (horizontal) and 2cmm + 2ppm, (vertical)	GPS QA/QC	S
Measurement of subsurface elevation	Probing	Accuracy, Precision	0.25 feet (3 inches)	None	S

QAPP Worksheet #13 (UFP-QAPP Manual Section 2.7) Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Construction Drawings				
Old Pipeline Profile drawing	United Water, not cited, unknown	Unknown, vertical section, unknown	Inform survey	No limitations on intended use.
New Pipeline Profile drawing	Department of Streets and Public Improvements, Bureau of Water; not cited; April 16, 1930.	Unknown, vertical section, unknown	Inform survey	No limitations on intended use.
Plan of Crossing under Passaic River	Jersey City Water Supply Co./JCMUA, Plan of Crossing under Passaic River (27-C12 and 32-C-14), est. 1900	Jersey City Water Supply Co., vertical section, unknown	Inform Survey	No limitations on intended use. Unclear if the drawings represent design or as-built information.
Geophysical Surveys of LPRSA Recently Performed by Others[1]				
Magnetometer and Sub-bottom Profiler survey	Ocean Surveys, Inc. (OSI) Marine Geophysical Surveys Submarine Utility Crossings Passaic River, 2013	Magnetometer and Sub-bottom profiler survey (Edgetech Geostar "Chirp" and Geometrics G882) performed by OSI at RM 10.9 in the LPRSA in 2013.	Identify the locations of existing utilities in the river that potentially could be affected during planned sediment removal operations in the area.	Sub-bottom data were not included in the final report because they were unable to locate the pipeline; specifics unclear.
Lower Passaic River Bathymetry Survey	AECOM, Periodic Bathymetry Survey, Fall 2011 Post Hurricane Irene Survey Report, 2013	Multibeam bathymetry survey performed by Gahagan & Bryant Associates, Inc. (GBA) on behalf of the Cooperating Parties Group (CPG) as part of the Lower Passaic River Remedial Investigation (RI) and Feasibility Study (FS).	To assist in understanding the sediment surface elevation for planning and implementing the pipeline survey.	No limitations on intended use.
Parametric Echosounder and Ground Penetrating Radar Surveys	UoI/Tierra, River Mile 10.9 Pipeline Surveys: Geophysical Surveys: Parametric Echosounder and Ground Penetrating Radar, DRAFT data provided September 2014	UoI, Ground Penetrating Radar (GPR) and parametric echosounder (PE) survey, August 2014	To assist in understanding the approximate pipe location and depth.	Data and information at time of review is draft. Should be used for guidance only.

QAPP Worksheet #14 (UFP-QAPP Manual Section 2.8.1) Summary of Project Tasks

Field Orientation:

During field set-up of equipment, the estimated location of the pipes will be physically marked in the field to provide a visual field reference during probing. To the extent possible, this will be done by placing stakes on the southern shore of the River. These markers will be placed based on:

- Survey coordinates from the OSI magnetometer and sub-bottom profiler survey completed in 2013 (refer to Figure 2 and Attachment 3 of OSI's June 13, 2013 Geophysical Survey Report)
- UoI Draft GPR information

Probing Sequence:

- Probing will be initiated at each pipe closest to the southern shore and move in a northerly direction towards the navigational channel.
- Probing will be completed along transects perpendicular to each pipe in a sequence as shown on Figure 2. Each transect will consist of a minimum of nine (9) probes (one foot on center) across the expected area of the pipe as shown on Figure 3. Additional probes along each transect may be completed based on real-time probing results, as collected in the field.
- The first five transects off the southern embankment will be at a 10 foot spacing to characterize the anticipated greater elevation change (downward slope) in that area. Thereafter, the transects will be spaced at 20 feet along the orientation of pipe up to the navigational channel.

Figure 2

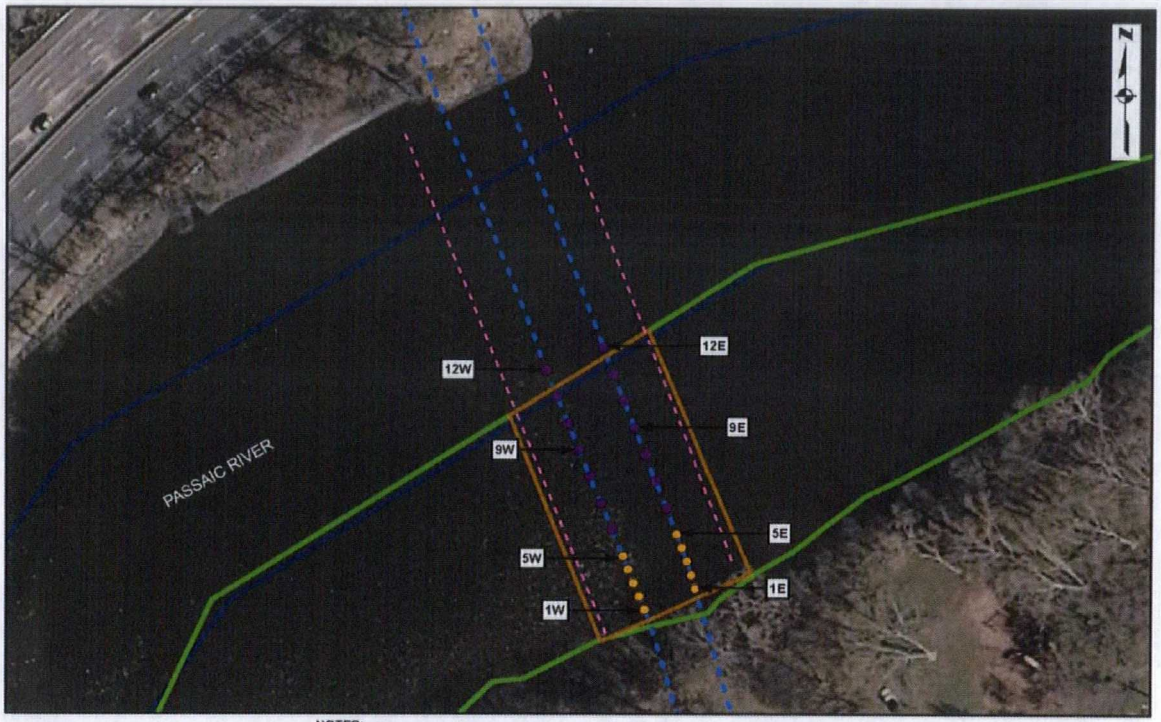


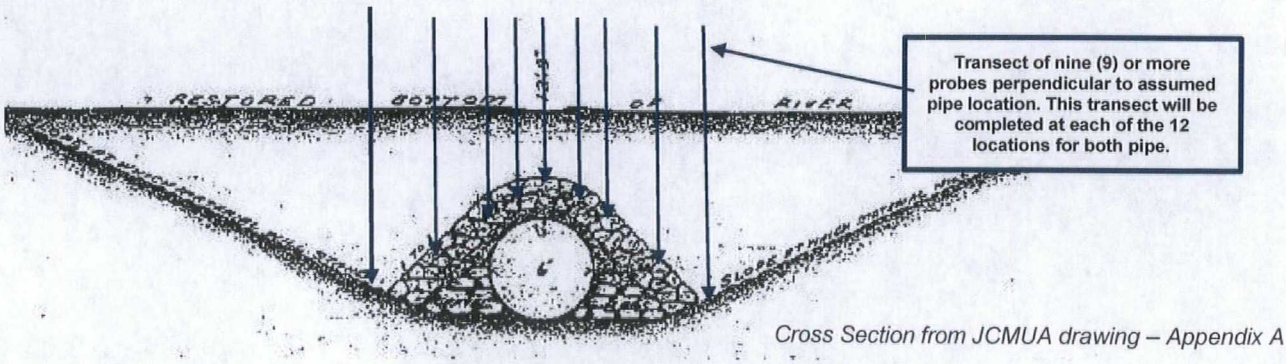
FIGURE 2. PIPE PROBING LOCATIONS AT RM 10.9.

0 80 160 Feet
GRAPHIC SCALE

NOTES:
1. ALL LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY FROM THE NJ OFFICE OF INFORMATION TECHNOLOGY (NJOIT), OFFICE OF GEOGRAPHIC INFORMATION SYSTEMS (OGIS), 2007.
3. THE COORDINATE SYSTEM REFERENCED IN THE MAP IS STATE PLANE, NEW JERSEY ZONE, NORTH AMERICAN DATUM 1983, U.S. SURVEY FEET.
4. 72" UNITED WATER PIPELINE AS BUILT LOCATIONS DIGITIZED FROM THE UWJC 72 INCH WATERMAINS ACROSS LOWER PASSAIC RIVER DRAWING, UWJC NUTLEY PASSAIC WMAIN.PDF.

LEGEND:
- PROBING TRANSECT LOCATION (10' SPACING)
- PROBING TRANSECT LOCATION (20' SPACING)
- 1E PROBE TRANSECT REFERENCE NUMBER
- 72" UNITED WATER LINES (APPROXIMATE LOCATIONS)
- 30' PIPE OFFSET
- NAVIGATION CHANNEL
- CPG RM 10.9 REMOVAL AREA
- CPG RM 10.9 REMOVAL AREA NO DREDGE ZONE

Figure 3



Cross Section from JCMUA drawing – Appendix A

Probing Operations:

The following equipment and supplies will be used to conduct sediment probing:

- Steel pipe (minimum ¾ " pipe) to probe thickness of overlaying sediment and identify the burial depth of the utility in question (or engineered protection, i.e. gravel). Pipe will be pre-marked with foot and quarter foot intervals. The pipe will be configured with a pressured jet (adjustable up to approximately 150 psi) which can allow pressurized water to pass through the ¾" steel probe pipe to displace and loosen sediment as the probe advances. The pressurized water will only be used if required to help advance the probe pipe and only when the pipe is at least two (2) feet below the surface (so as to minimize suspension of sediment).
- Personnel Protective Equipment (PPE) – including but not limited to: hard hat, steel toed boots, nitrile gloves, life vest.
- Probe log to record acquired data.
- RTK GPS receiver with Hypack survey data collection software.
- Vessel configured with a three to four point mooring system.

Probing will commence as follows:

- Referencing GPS coordinates, maneuver the vessel into position over the expected area of the pipeline. Observe drift and deploy anchors (minimum of three) with sufficient scope to work a full transect of the utility.
- Using the probe pipe, or a lead line, determine depth of water and record this data in the log.
- Advance the probe pipe by hand into sediment, manually moving pipe up and down to increase penetration of pipe, adding sections of pipe as necessary. The pressurized water jet will be applied only if and when deemed appropriate based on field observations (i.e. a solid point of refusal is not encountered but rather the pipe is encountering stiff penetration at two (2) feet or more below sediment surface).
- Upon refusal, note reason for refusal (when possible) and final depth.
- Retrieve probe pipe and offset vessel to next location along the alignment and begin probing again.

When conducting the probing, utmost caution will be taken so as not to jeopardize the integrity of the existing water pipes. This will include:

- Not employing any type of hammering technique to advance the pipe into the sediment.
- Not releasing the pipe entirely which might otherwise cause free fall through the sediment.
- Advancing the pipe slowly through the sediment and using both vertical and horizontal movements (versus abrupt up and down movement) of the pipe to assist in pushing the pipe deeper.
- Using the assistance of the jet probe (when necessary) to advance the pipe (only once the pipe is deeper than two (2) feet below the sediment surface).
- Using existing drawings and other information to understand the estimated pipe depth.

As noted above, when refusal is encountered, the reason for such refusal will be noted if possible based on the feel of the probe and the experience of OSI. It is important to note that probing will be an iterative process; should refusal be encountered at a depth/location that is not consistent with other refusal points or existing information (JCMUA drawings), then additional probes in the area may be completed to help ascertain the anomaly.

Location Survey:

- Three temporary benchmarks have been established and certified by DPK Consulting, LLC., a New Jersey licensed Professional Land Surveyor (PLS). These temporary benchmarks were established in New Jersey State Plane Coordinate System (2900), NAD 83 and National Geodetic Vertical Datum 1929. These benchmarks were established as part of the parametric echosounder and ground penetrating radar surveys completed in August 2014.

- During the probing, a real time kinematic (RTK) Global Positioning System (GPS) will record position and antenna height information at a minimum rate of 5 Hz. RTK GPS positions, based on data from the locally-established base station, will be used in conjunction with the probing to record the locations (x, y) of sub-bottom points of resistance that are determined to be the two 72-inch water pipelines and/or the surrounding gravel backfill (as shown on the JCMUA drawings (Figure 3 and Appendix A)).

- The RTK GPS will be checked against the known survey benchmark (established by a DPK Consulting LLC) at the beginning and end of each survey day.

Quality Control Tasks:

QC tasks will be completed before survey operations; this includes GPS QA/QC.

Secondary Data:

All relevant secondary/historical data are summarized on Worksheet #13.

Data Management Tasks:

Positioning data will be backed-up to an independent data storage device at the conclusion of each survey day (e.g., flash drive, second computer, client server, etc.). The backed-up data, if on a physical storage device, will be transported separately from the data in the data logging system. During data processing, no raw data will be deleted and interim data products will be retained.

Documentation and Records:

Project-related records (e.g., field, raw data, and processed data) are summarized on Worksheet #29.

Assessment/Audit Tasks:

Conducted in accordance with Worksheet #31.

Data Review Tasks:

Field data will be reviewed as described in Worksheet #34.

Reporting Tasks:

Deliverables are summarized in Worksheet #16 and include a summary report and submittal of raw and processed data files.

QAPP Worksheet #16 (UFP-QAPP Manual Section 2.8.2) Project Schedule/Timeline Table

Activities	Organization	Dates		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Project Status	Tierra	First month following QAPP approval	Monthly until project completion.	Progress report	20th of each month
Planning and Development of Study Objectives	Tierra	Completed	Completed	QAPP	QAPP submitted September 30, 2014. Revise as needed.
Performance of physical probing	OSI/Tierra	Within 30 days of USEPA approval of QAPP	Within 7 days of initiating field work	Raw and processed data files	Delivered along with the processed data
Processing of Survey Data	OSI	Upon completion of probing	Within 2 weeks of completing probing	none	Not applicable
Quality Review and Evaluation of Collected Data	OSI	Upon completion of probing	Within 2 weeks of completing probing	Included in Survey Summary Report	Not applicable
Preparation and Delivery of Draft Survey Summary Report to Tierra	OSI	Upon completion of processing survey data	Within 4 weeks of completing processing of survey data	Draft Survey Summary Report to Tierra	Dependent on QAPP approval and weather conditions
Preparation and Delivery of Final Survey Summary Report to USEPA	Tierra	Upon receipt of draft report from OSI	Within 2 weeks of receiving draft report	Survey Summary Report to USEPA	Dependent on QAPP approval and weather conditions

QAPP Worksheet #17 (UFP-QAPP Manual Section 3.1.1) Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):

The probing program is designed as an "adaptive biased sampling" approach, meaning that the initial probe locations are biased based on existing information as to where the pipes are most likely located. However, as data are collected in the field, the planned number of probes and planned locations of the probes at each transect may be modified based on the data collected.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations):

As no physical samples will be collected or analyzed, none of the items noted in this entry are applicable.

QAPP Worksheet #21 (UFP-QAPP Manual Section 3.1.2) Project Sampling SOP References Table

The following is a list of SOPs associated with project activities.

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
N/A	Field Documentation SOP No. 1;	Tierra	N/A	Yes	Appendix B
N/A	Data Management SOP No. 2;	Tierra	N/A	Yes	Appendix B
N/A	Positioning SOP No. 3;	Tierra	GPS	Yes	Appendix B

Procedural modifications to these documents may be warranted depending upon field conditions. Substantive modification will be approved in advance by the Project QA Manager and PM and communicated to the Project Coordinator and to the USEPA RPM and documented. Deviations will be documented in the field records.

QAPP Worksheet #22 (UFP-QAPP Manual Section 3.1.2.4) Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Real Time Kinematic Global Positioning System	Verify and check all horizontal and vertical control and datum before beginning any survey	Per manufacturer's instructions	Accuracy of position	Alignment with known benchmark	Beginning and end of each day	Manufacturer's published accuracy	Resurvey for positional accuracy; replace unit if necessary.	Survey Field Task Lead or designee	GPS SOP

QAPP Worksheet #27 (UFP-QAPP Manual Section 3.3.3) Sample Custody Requirements

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): N/A

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): N/A

Sample Identification Procedures: N/A

Chain-of-Custody Procedures: N/A

Chain of Custody Procedure: N/A

Transfer of Custody and Shipment: N/A

Sample Packaging and Shipping Requirements: N/A

Laboratory Custody Procedures: N/A

Final Evidence Files
All field data including raw data files and navigation files will be provided to Tierra and will be retained by Tierra along with associated field records and other related correspondence.

Final evidence files as retained by Tierra will include, but not be limited to, correspondence (paper and email), plans, contractual documents, maps and drawings, field data, calculations, assessment reports, and progress and data reports. This information will be maintained in a secure area according to the procedures outlined in the Data Management SOP (Appendix B).

QAPP Worksheet #29 (UFP-QAPP Manual Section 3.5.1) Project Documents and Records Table

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
N/A	Field notes, field data sheets, field logbooks	Data processing notes	Reports of field audits	Progress reports
	Field instrument calibration records	Communication records	Data evaluation reports	Final report - Prepared and submitted to clients and USEPA
	Field measurement data		QA reports to management	
	QAPP and HASP		Corrective action reports and results	
	Corrective action reports and results			
	Documentation of field modifications and non-conformances			

This section describes the project data management process for tracking the data from their generation through final use and/or storage. All project data, communications, and other information must be documented in a format useable to project personnel.

Project Document Control System

Project documents are controlled according to the Data Management SOP (Appendix B) which addresses maintaining and managing hardcopies and electronic copies of all project-related documents. Electronic copies of all information relating to this project are maintained on the project network files; access to these files is limited to authorized project personnel. All project data and information must be documented in a standard format which is usable by all project personnel.

Data Recording

Almost all of the data generated during this investigation (position, RTK antenna height elevations) will be captured electronically. Any manually-recorded data (depth) will be entered by hand into bound field logbooks and later transferred to an electronic record. Refer to Appendix B for the SOP on Field Documentation.

Data Quality Assurance Procedures

OSI will monitor the survey progress to verify that data are collected and recorded as planned. A policy of continuous improvement will allow all data generation processes to be reviewed and modified, as needed, to meet project objectives. Oversight of field operations by Tierra will ensure that data collection, documentation, and QC procedures are being followed.

Laboratory Data Transmittal

N/A

Data Storage and Retrieval

Completed forms, logbooks, photographs, data packages, and electronic files will be transmitted to the OSI Project Document Control Manager at the completion of the work. Raw data and electronic files of all field data and QC analyses must be maintained by the survey contractor in accordance with the terms of their contract with Tierra. Project closeout will be conducted in accordance with contractual obligations. As required by the UAO (USEPA 2012) for the LPRSA, all data and other project records will be made available to USEPA. Records will be retained in accordance with the UAO requirements. Refer to Appendix B- Data Management SOP for additional data handling and management.

The data transfer to USEPA will include the raw data files, processed data files, and supporting data files (depth, position).

QAPP Worksheet #31 (UFP-QAPP Manual Section 4.1.1) Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment	Person(s) Responsible for Responding to Assessment Findings	Person(s) Responsible for Identifying and Implementing Corrective Actions	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions
Technical Oversight of Field Activities	Once during the first day of field operations; follow-up as necessary	Internal	Tierra	Tierra QA Manager or designee	OSI Survey Field Task Lead / Tierra Project Coordinator	OSI Survey Field Task Lead	Tierra Project Coordinator

QAPP Worksheet #32 (UFP-QAPP Manual Section 4.1.2) Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response	Timeframe for Response
Note 1	*Note 1*	*Note 1*	*Note 1*	*Note 1*	*Note 1*	*Note 1*

Note 1: Due to the short duration of this effort (anticipated to take less than five days), oversight of field activities and reporting of non-compliance will be conducted "in real time" in the field and documented in field logbooks or similar field documentation (e.g., electronically, forms).

Non-Conformance/QC Reporting

Refer to Note 1 above.

Assessment

Refer to Note 1 above.

QAPP Worksheet #33 (UFP-QAPP Manual Section 4.2) QA Management Reports Table

Type of Report	Frequency (e.g., daily, weekly, monthly, quarterly, annually)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Progress Reports	Monthly	Due the 20th of each	Project Coordinator	USEPA RPM
Nonconformance Report	As needed	When nonconformance identified	Project QA Manager or designee	USEPA RPM; Tierra Project Coordinator
Corrective Action Reports	When corrective action is required	When corrective action is implemented	Project QA Manager or designee	USEPA RPM; Tierra Project Coordinator

QAPP Worksheet #34 (UFP-QAPP Manual Section 5.2.1) Verification (Step I) Process Table

Verification Input	Description	Internal/ External	Responsible for Verification
Field data	Field data will be reviewed for completeness to ensure that data for positioning and depths were collected at the desired frequency and locations/transects.	External	OSI QA Manager (TBD)
Processed data	Processed data will be reviewed prior to release to ensure completeness of reported results.	External	OSI QA Manager (TBD)
Assessment actions and reports	QA/QC process will be reviewed for agreement with QAPP to ensure that all necessary assessments have been performed.	Internal	Tierra Project Coordinator

QAPP Worksheet #35 (UFP-QAPP Manual Section 5.2.2) Validation (Steps IIa and IIb) Process Table

Step IIa/IIb	Validation Input	Description	Responsible for Validation
IIa	GPS SOP's	Verify conformance to approved procedures and verify that deviations from procedures or criteria were documented	OSI QA Manager
IIa	Field records, database output	Verify that transcription of field data from field forms to electronic files (if applicable) and processing of data was accurate and complete	OSI QA Manager
IIa	Field records, deliverables	Verify conformance to contractual specifications	Tierra Project Coordinator or designee on the project team
IIa/b	Field observations, field records	Verify conformance to procedures and criteria specified in QAPP and assess impact of deviations	Tierra Project Coordinator or designee on the project team
IIb	Field records, processed data	Review data and processing procedures to ensure conformance with the project quality requirements. This will include review of positioning controls, survey quality controls (bar check), and data files	Tierra QA Manager or designee.
IIb	Assessments	Verify that data evaluations were performed per the QAPP	Tierra Project Coordinator

QAPP Worksheet #37 (UFP-QAPP Manual Section 5.2.3) Usability Assessment

Identify the personnel responsible for performing the usability assessment:
The usability assessment will be performed by the OSI QA Manager in cooperation with Tierra.

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:
The data to be collected will consist of GPS location coordinates and manual depth measurements. The use of statistics, equations, and computer algorithms is not applicable. As part of the usability evaluation, OSI will review the data collected, and data plots, for interference issues, consistency and continuity after probing operations are complete. Problems experienced during data collection and processing will be addressed along with how such problems may have potentially affected data usability.

Describe the evaluative procedures used to assess overall measurement error associated with the project:
The GPS data will be examined to determine if any field interferences may have occurred resulting in unusable data. Vertical and horizontal data will be plotted to generate plan and profile drawings; the review of such drawings will allow OSI/Tierra to identify where anomalies appear to be present and to potentially determine if such anomalies are as a result of measurement error.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:
Any issues identified as part of the usability assessment that may have an impact on the usefulness of such data to address the primary study questions/needs (Worksheet #11) will be summarized in the final report to be submitted to USEPA.

Section 3
References

AECOM. 2010. Quality Assurance Plan for the Lower Passaic River Restoration Project: Periodic Bathymetric Surveys. Revision 2. May.

AECOM. 2011. Field Modification Form FM-120830-1. Revision 2. June.

Ocean Surveys, Inc. 2013 Marine Geophysical Surveys Submarine Utility Crossings Passaic River, OSI Report No. 13ES028

USACE. 2008. Technical Guidelines for Environmental Dredging of Contaminated Sediments – ERDC/EL TR-08-29

USEPA. 2004. Administrative Order on Consent for Remedial Investigation and Feasibility Study, Newark Bay Study Area, USEPA Index No. CERCLA-02-2004-2010. Including all attachments, amendments, and updates.

USEPA. 2005. U.S. Department of Defense, and U.S. Department of Energy. Intergovernmental Data Quality Task Force. Uniform Federal Policy for Quality Assurance Project Plans. Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs. Part 1: UFP-QAPP Manual. USEPA 505-B-04-900A. Final Version 1. March.

USEPA. 2007. Administrative Settlement Agreement and Order on Consent for Remedial Investigation/Feasibility Study, Lower Passaic River Study Area, USEPA Index No. CERCLA-02-2007-2009.

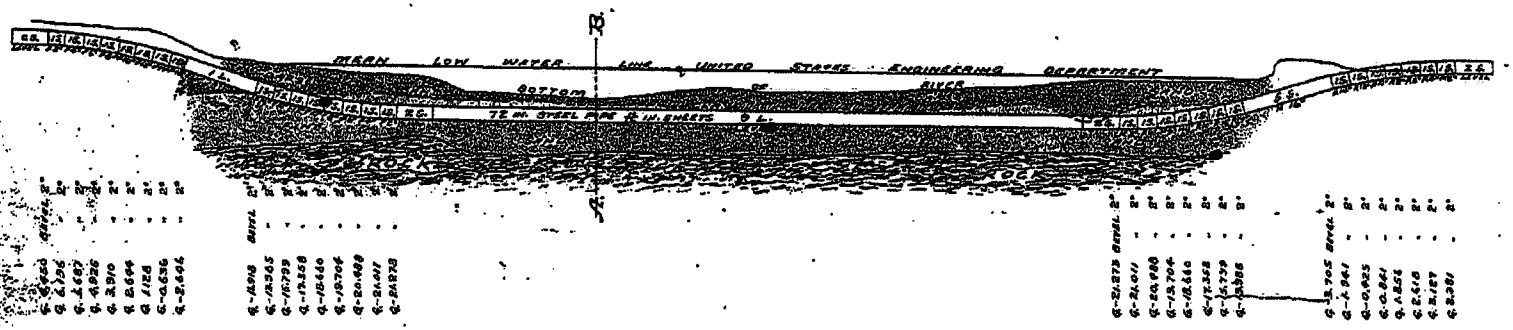
APPENDIX A
Pipeline Drawings from
Jersey City Municipal
Utilities Authority

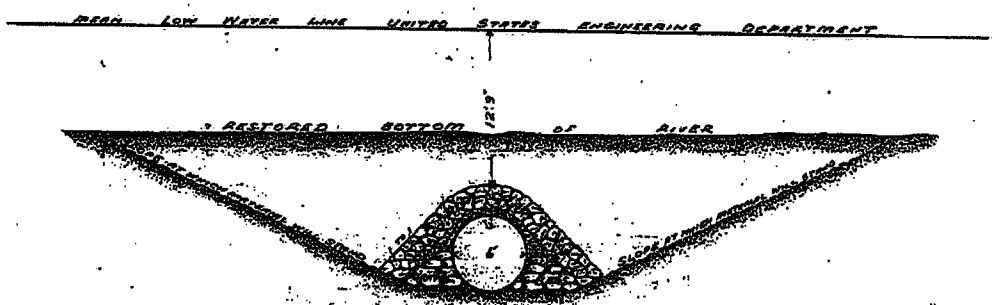
27-C-12

JERSEY CITY WATER SUPPLY CO.

PLAN OF CROSSING UNDER PASSAIC RIVER

SCALE: 1 INCH = 40 FEET.





SECTION 1-2 THROUGH A.B.

SCALE: 1/8 INCH = 1 FOOT.

NOTE:
* GRADES REFER TO MEAN LOW WATER UNITED STATES ENGINEERING DEPARTMENT.

Approved Dec 1910
E. W. Harrison
Chief Engr.

HARRISON, ENGINEERS, N.Y.

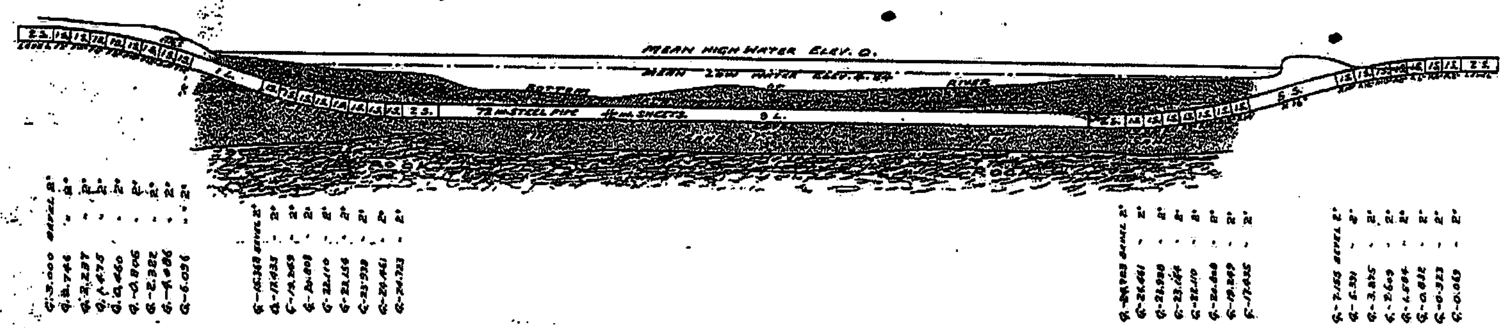
JCWW0083

27-C-12

JERSEY CITY WATER SUPPLY CO.

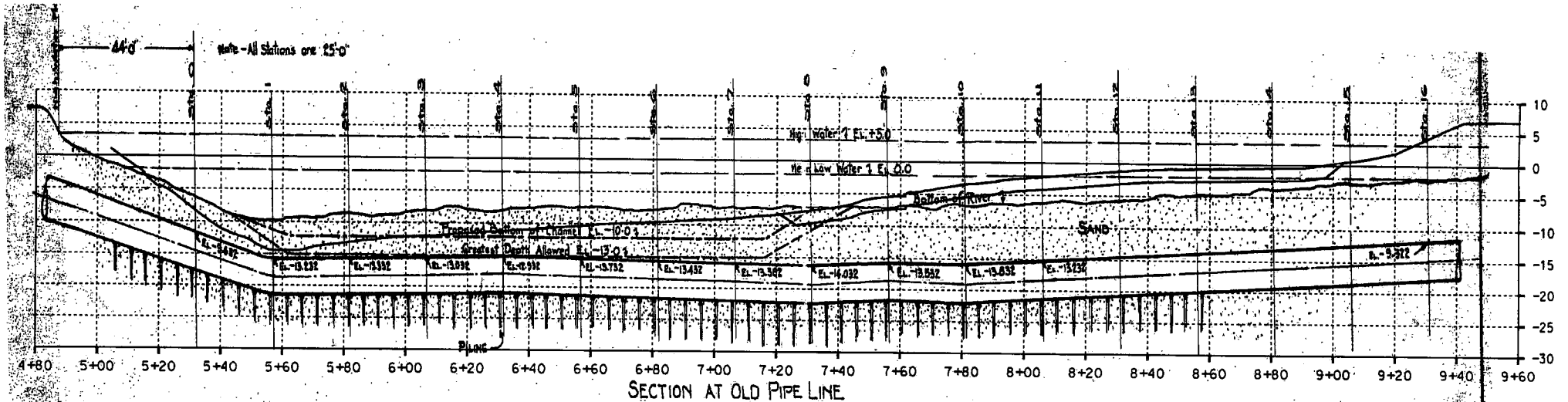
PLAN OF CROSSING UNDER PASSAIC RIVER

SCALE: 1 INCH = 40 FEET.



Approved Dec 190_
E W Harrison
County Engr

32-C-14



SECTION AT OLD PIPE LINE

NOTES

1. 72" United Water pipeline location digitized from the UWJC 72in Watermains across Lower Passaic River drawing, UWJC_Nutley_Passaic_Wmain.pdf
2. Historic pipeline sheet, 4-B-25.TIF, is raster referenced and is approximate in both horizontal and vertical
3. MLW at elevation 0.0 feet is the same as NGVD29 at elevation -2.06 feet

—— EXISTING SEDIMENT SURFACE
—— POST DREDGING ELEVATION

15 0 15 30
SCALE 1" = 30'

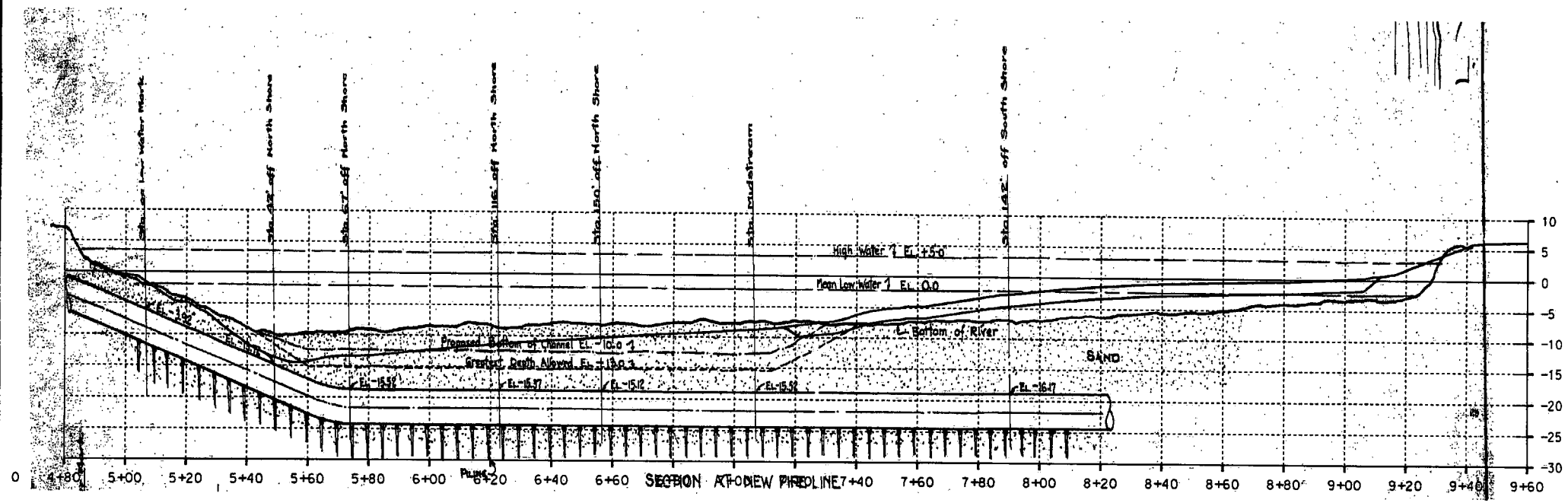
DEPARTMENT OF STREETS AND PUBLIC IMPROVEMENTS, J.C.

BUREAU OF WATER

PLAN AND PROFILE OF PIPE LINE CROSSING IN PASSAIC RIVER

FROM LYNDHURST TO NUTLEY

SCALE 20' = 1"	DRAWN BY A.P.McC.
PREPARED BY A.P.McConville	APR. 16, 1930
CHECKED BY	
APPROVED	
Andrew B. Murphy	WATER CONSERVATOR
APPROVED	
Michael J. Fagen	DIRECTOR
SHEET NO. OF SHEETS	FILING NO. 4-B-25
REVISED	



NOTES

1. 72" United Water pipeline location digitized from the UWJC 72in Watermains across Lower Passaic River drawing, UWJC_Nutley_Passaic_Wmain.pdf
2. Historic pipeline sheet, 4-B-25.TIF, is raster referenced and is approximate in both horizontal and vertical
3. MLW at elevation 0.0 feet is the same as NGVD29 at elevation -2.08 feet

—— EXISTING SEDIMENT SURFACE
—— POST DREDGING ELEVATION

15 0 15 30
SCALE 1" = 30'

APPENDIX B
Standard Operating
Procedures

Standard Operating Procedure
No. 1

Field Documentation

September 2014

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for documentation of field activities associated with the Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey (Tierra Solutions, Inc. 2014). Appropriate documentation of field activities provides an accurate and comprehensive record of the work performed, sufficient for a technical peer to reconstruct the day's activities and determine that necessary requirements were met, without relying on the collector's memory.

This SOP may change depending upon field conditions or limitations imposed by the procedure. Substantive modification to this SOP shall be approved in advance by the Project Coordinator and the U.S. Environmental Protection Agency Remedial Project Manager. The ultimate procedure employed will be documented in the Final Work Plan prior to the start of work.

Other SOPs will be utilized in conjunction with this procedure:

- SOP No. 2 – Data Management
- SOP No. 3 – Positioning

2. Procedures

In all instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

2.1 General Procedures

Pertinent field information will be recorded in a logbook and/or appropriate forms (as included herein or additional forms developed by the project team) in black, ballpoint pen. If weather conditions do not allow for a ballpoint pen to be used, a thin-tipped Sharpie®, or equivalent, may be used. Alternatively, electronic methods of recording field information may be utilized. All content and guidance for the logbook/form documentation can apply, as appropriate, to electronic logs at the discresion of the field staff. If field records are being kept electronically, an appropriate backup procedure will be implemented. At a minimum, the procedure will include saving data to a removable storage device (i.e., flash drive, external hard drive, etc.) at the end of each day. The backup device(s) will be stored in a location separate from the laptop or primary recording device.

A key that describes each entry will be provided for the forms. Logbook entries will be factual and observational (i.e., no speculation or opinion), and will not contain any personal information or non-project-related entries. Separate and dedicated logbooks will be kept for different operations running concurrently; individual tasks making up each operation will be maintained in the same logbook, if possible. The cover and binding of each logbook will be labeled to identify the operation and dates included within the logbook; each page in the logbook will be consecutively numbered.

A page header will appear on the first page of each day's notes in the logbook, and activities for each day will be recorded on a new page. The page header will include:

- name of author and other personnel on site (and affiliated organization if applicable)
- date

- time of arrival
- current weather and tidal conditions, and weather forecast for the day

An abbreviated header, limited to the date, will appear at the top of each additional page for the active date. The Daily Activity Log (see attachment), to be completed each day, will require similar header information.

Field activities and other events pertinent to the field activities will be documented in chronological order at the time of occurrence, to the extent possible. Any entries recorded significantly after the fact will be dated as such. Times will be recorded using 24-hour notation for each entry. At a minimum, documentation in a logbook will include the following:

- names of visitor(s) to the work location being documented in the logbook, including time of arrival and departure, the visitor's affiliation, and reason for visit
- summary of project-related communications, including names of people involved and time
- time daily work commences and ceases
- start and stop times of new tasks
- start and stop times of breaks
- safety or other monitoring data, including units with each measurement
- deviations from scope of work
- progress updates
- problems/delays encountered
- unusual events
- signature or initials of author on every page

A single line will be drawn through incorrect entries and the corrected entry written next to the original strikeout. Strikeouts are to be initialed and dated by the originator.

If there are additional lines on the page at the end of the day's activities, a line will be drawn through the empty space, initialed, and dated, leaving no room for additional entries.

The logbook will cross-reference information documented in the field forms.

Photographs will be identified in the logbook by a unique numbering system. If photographs are collected by a digital camera, the file number as well as the photograph number will accompany the description of the photograph in the logbook, if practicable. At a minimum, the time the photograph was taken, the general location, a brief description, and

the photographer's name will be recorded. Additional information may include: Differential Global Positioning System coordinates, direction the photographer was facing, and/or weather conditions. If necessary, an object will be included to indicate the scale of the object in the photograph.

Any electronic files used for recording the field observations will have a file saved each day (not including the backup file procedure) with an identifier that includes the date and a description of the file contents. For example: "YYYYMMDD_FieldNotes". The file will be saved in Portable Document Format for the official project file.

2.2 Additional Requirements for Field Activities

This section presents specific documentation requirements for activities to be performed. It is meant to provide guidance to project staff responsible for field documentation during these activities, and is not intended to be a comprehensive list of activities performed. These documentation procedures are meant to supplement, not replace, the required documentation presented in Section 2.1.

As noted in Section 2.1, a Daily Activity Log was developed to ensure proper documentation of field information is obtained in a consistent manner. Once completed, this log provides a summary of daily vessel logistics during survey activities, including personnel present, equipment used, and weather conditions. This log is provided as an Attachment to this SOP.

2.2.1 Equipment Calibration and Maintenance

Equipment calibration will be recorded in the equipment calibration logbook. Instrument information, including the instrument manufacturer, model number, and serial number, will be recorded. Instrument calibration will be performed in accordance with manufacturer's specifications, and at the frequency specified by the manufacturer's specifications. Values measured during calibration will be recorded in the equipment calibration logbook. In addition, maintenance, problems, and repairs to the equipment will be recorded in the equipment calibration logbook.

2.3 Distribution and Maintenance of Field Documentation

Logbooks and field forms will be filed according to the QAPP and SOP No. 2 – Data Management.

Logbooks that are taken off site from the field offices will be photocopied and filed at the end of each day to mitigate against the loss of historical entries should the logbook be lost in the field.

Field data forms will be filed once they have been completed and distributed (if necessary), or at the end of each field day.

Electronically recorded field information will be backed-up or e-mailed to an offsite location at the end of each day for official project filing and backup.

Distribution of daily forms will be performed according to the needs of the project team and at the direction of the Project Coordinator or designee.

3. Quality Assurance

The personnel that are recording the field notes are to have reviewed the QAPP and supporting documentation and are to be familiar with the goals and procedures for task completion.

Entries in the field forms will be double-checked by the field crew to verify the information is correct. Completed field forms will be reviewed periodically by the Project Coordinator and/or Project Quality Assurance Manager or their designee(s) to verify that the requirements are being met.

4. Reference

Tierra Solutions, Inc. 2014. Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey Revision 0.

DAILY ACTIVITY LOG
Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey
(Sheet 1 of 2)

Date of Field Work[1]: _____

Person Responsible for Log[2]: _____

Vessel Name/Owner of Vessel Performing Work[3] (if applicable): _____

List personnel on board vessel or in field team, affiliation, and role (if more room is needed, continue in the field logbook):

_____

_____

_____

_____

_____

_____

Time of Daily Health and Safety Tailgate Meeting and Form Completion[4]: _____

Weather Conditions and Forecast[5]: _____

Time of High Tide/Low Tide[6]: _____

EQUIPMENT SUMMARY[7]:

Equipment Name	Serial Number or Unique Identifier	Daily Calibrations Performed By	Other Calibrations

Time of Departure from Marina at Beginning of Day or time of arrival onsite: _____

Time of Return to Marina at End of Day or time survey-day concludes: _____

** If more room is needed, record information in field logbook and provide a copy of any notes in field logbook with this form**

DAILY ACTIVITY LOG KEY
Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey
(Sheet 2 of 2)

Description of Items:

(1) Date of activity (e.g., 12/1/2014).

(2) Name of person entering information into this form.

(3) Name of vessel performing activity.

(4) Enter time (24-hour format) that Health and Safety Tailgate Meeting was held in the morning. Tailgate form from the Health and Safety Plan should be filled out and archived with this Daily Activity Log each day.

(5) Weather forecast checked via marine radio, Newark Liberty International Airport, etc.

(6) Time of High and Low Tide for the day checked via the National Oceanic and Atmospheric Administration's website.

(7) Calibration details/schedules.

(8) Time of departure from the marina or arrival at site at the beginning of the day (24-hour format).

(9) Time of return to the marina at the end of the day or conclusion of field activities (24-hour format).

(10) Name of person entering information into this form.

Standard Operating Procedure No. 2

Data Management

September 2014

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for documentation of field activities associated with the Quality Assurance Project Plan (QAPP) for River Mile 10.9 Pipeline Probing Survey (Tierra Solutions, Inc. 2014). This SOP describes the procedures necessary to manage the survey data.

Substantive modification to this SOP will be approved in advance by the Project Coordinator and the U.S. Environmental Protection Agency (USEPA) Remedial Project Manager.

Other SOPs will be utilized in conjunction with this procedure:

- SOP No. 1 – Field Documentation
- SOP No. 3 – Positioning

2. Procedures

In all instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

2.1 Data Handling and Management

The following sections trace the paths of data from generation to final use and storage, as well as the associated quality checks for error detection that are performed to promote data integrity. Note that no samples will be collected as part of this survey; all data will be recorded electronically and field notations/observations will be associated with quality control and safety procedures.

2.1.1 Data Recording

2.1.1.1 Field

Data and information collected in the field through visual observation or measurement may be recorded using electronic methods such as a Personal Digital Assistant, laptop, or equivalent, or associated logbooks and forms, and will be recorded in accordance with requirements as described in SOP No. 1 – Field Documentation.

2.1.1.2 Field Data Checking

Completeness will be determined by verifying that there are no missing data or information. The field crew will verify that the data and information that are collected electronically are being recorded accurately during collection and then perform a review of the data and information at the end of each day. Accuracy will be based upon review of the recorded information and upon resolving any questions that arise during this review.

Note that if there are any deviations from the QAPP guidelines, these must be immediately communicated with the project team, including the Task Manager and the Project Quality Assurance Manager. In addition, the deviations, reasons for the deviations, and corrections/final decisions from the project team will be noted in the field logs.

All completed activity logs and Health and Safety Tailgate forms will be completed in accordance with the site-specific Health and Safety Plan and will be kept by the field representative in a binder until the fieldwork is completed. The completed binder will be handled in accordance with hard copy management, described in Section 2.2.1.

2.2 Data Tracking and Control

The following sections discuss the procedures for data tracking, storage, archiving, retrieval, and security for both hard copy and electronic data and information.

2.2.1 Data Storage, Archiving, and Retrieval

2.2.1.1 Hard-Copy Files

Hard copies of project documentation and data will be placed in the project file, parts of which will exist in several locations, including:

- OSI, Old Saybrook, Connecticut
- Tierra, East Brunswick, New Jersey

Such files will be maintained in secure locations within each facility. Hard copies of project documentation and data will be provided to USEPA upon request.

Duplicate copies of pertinent field-related correspondence/documentation will be maintained at the field office during field operations. Once such field operations have been completed, this documentation will be transferred to the project file.

At such time that it is deemed appropriate to archive the project file, either in parts or in its entirety, files will be placed into boxes and shipped off site to a secure document storage facility. The assigned barcode identifier for each box being archived will be logged into a tracking spreadsheet along with a brief description of the contents of the box. Archived boxes will be retrieved from the document storage facility if/when necessary using the logged barcode identifier.

2.2.1.2 Electronic Files

Electronic data and information will be maintained and managed by the entities listed above using password-protected computers and on secure network drives with access limited to project personnel. Files will generally consist of the same components as the hard-copy files. Reports and field data will be in Portable Document Format (or equivalent).

2.2.2 Data Security

Hard-copy information/data will be stored in secure areas within the two project file locations. Electronic data and information will be maintained and managed using password-protected computers and on secure network drives with access limited to project personnel.

3. Quality Assurance

Appropriate quality assurance/quality control procedures will be followed during data management in accordance with the QAPP (Tierra 2012), SOP No. 1 – Field Documentation, and this SOP.

4. Documentation

Field documentation will be maintained in accordance with the QAPP (Tierra 2014), SOP No. 1 – Field Documentation, and this SOP.

5. Reference

Tierra. 2014. Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey. Revision 0.

Standard Operating Procedure No. 3

Positioning

September 2014

Revision 0

1. Purpose and Scope

The purpose of this document is to define the standard operating procedure (SOP) for continuous positioning of survey equipment and/or vessels associated with the Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey (Tierra Solutions, Inc. 2014). Positioning will be conducted to locate equipment and/or vessel(s) with sufficient accuracy and precision to meet project objectives during surveying activities. This SOP provides descriptions of equipment, field procedures, and documentation necessary to conduct the probing; the objectives and locations of the survey are discussed in the QAPP.

This SOP may change depending upon field conditions, equipment limitations, or limitations imposed by the procedure. Substantive modification to this SOP shall be approved in advance by the Project Coordinator and U.S. Environmental Protection Agency Remedial Project Manager. The ultimate procedure employed will be documented in the project Report.

Other SOPs will be utilized in conjunction with this procedure:

- SOP No. 1 – Field Documentation
- SOP No. 2 – Data Management

2. Procedures

In all instances where this SOP will be utilized, a hard copy or electronic version will be available at the point of use.

2.1 Equipment List

The following equipment list contains materials which may be needed in carrying out the procedures contained in this SOP. Not all equipment listed below may be necessary for a specific activity. Additional equipment may be required, pending field conditions.

- personal protective equipment and other applicable safety equipment
- survey vessel or cart adequate to support the survey equipment
- real time kinematic Global Positioning System (RTK GPS) including a base station and a rover receiver and external antenna
- manual(s) for RTK GPS
- navigation, plotting, and computer equipment

- logbook and location map

2.2 Procedure

While this SOP provides general guidance and procedural steps, personnel performing positioning activities also should follow the appropriate sections of equipment user's manuals and have the manuals available for reference at all times.

Establish the DGPS base station over a known and accurate survey monument or a temporary benchmark established by a Professional Land Surveyor (PLS) licensed in the State of New Jersey. The operation and horizontal/vertical accuracy of the rover DGPS antennae will be verified at different monument or temporary benchmark. The x, y, z reading will be compared to the known, certified (by the licensed PLS) coordinates and recorded in the field log.

Affix the receiving antennae above the survey sensors to be used.

Ensure that coordinates are being properly recorded and logged into the respective data logging systems.

Elevation data (z) will be reported relative to the National Geodetic Vertical Datum of 1929. Position data (x, y) will be referenced to New Jersey State Plane Coordinates (NAD83)

2.4 Decontamination

Survey and sounding equipment that has been immersed in Passaic River waters will be cleaned/decontaminated in accordance with manufacturer requirements.

3. Quality Assurance

The RTK GPS system performance will be verified daily prior to, and after, survey activities using one or more temporary survey points.

4. Documentation

Complete field documentation procedures are presented in SOP No. 1 – Field Documentation. The following activities should be documented in the field logbook or forms, including the associated date and time:

- set-up and dismantling of base station;

- confirmation of the performance of all RTK GPS antennae, including quantitative comparison to known benchmark;
- set-up and dismantling of rover GPS antennae (i.e., affixing antennae to survey equipment), including necessary measurements; and
- confirmation that position data is being correctly logged in the instruments' data loggers.

5. References

Tierra Solutions, Inc. 2014. Quality Assurance Project Plan for River Mile 10.9 Pipeline Probing Survey Revision 0