PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM

Water Quality Monitoring Protocol

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I. INTRODUCTION

The Platte River Recovery Implementation Program (Program) was initiated on January 1, 2007 between Nebraska, Wyoming, Colorado and the Department of the Interior to address endangered species issues in the central and lower Platte River basin. The species considered in the Program, referred to as "target species", are the whooping crane (*Grus americana*), piping plover (*Charadrius melodus*), interior least tern (*Sterna antillarum*), and pallid sturgeon (*Scaphirhynchus albus*).

Monitoring of central Platte River water quality near Program lands will be relevant to the productivity and diversity of native fish and other aquatic species supportive of the interior least tern, piping plover, and whooping crane. Ultimately, the baseline data will be used to assess Priority Hypotheses as described in Table 2 of the Adaptive Management Plan (AMP) (PRRIP 2006).

This project will include monitoring of stage/discharge, water quality parameters (temperature, turbidity, dissolved oxygen, pH, and specific conductance), representative water quality samples for metals (dissolved copper, dissolved lead, dissolved nickel, total selenium, total calcium, and total magnesium), and monitoring of *E.coli*.

II. PURPOSE

The purpose of the Platte River water quality monitoring is to characterize the water quality in the central and lower Platte River during the thirteen-year First Increment (2007-2019) which will form the basis for assessing the influence of the Program and Program-covered activities on Platte River water quality.

The Water Quality Monitoring Protocol (Protocol) defines data collection procedures to obtain scientifically credible data to meet the stated purpose. Data adequacy will be provided through 1) following detailed and scientific protocols, 2) recording and vigorously adhering to the Protocol, and 3) entering data into an electronic format. The Protocol was developed for the collection of data to:

- Determine current baseline water quality condition in the central and lower Platte River.
- Determine temporal variations in water quality.
- Determine variations in water quality in response to changes in discharge.
- Determine variations in water quality spatially along the central and lower Platte River.

Implementation of the Protocol will include:

- Collection and evaluation of data.
- Summarization of results.
- Evaluation of variations due to temporal, spatial, and discharge differences.

- Development of recommendations for subsequent water quality monitoring and/or research.

III. DESIGN CONSIDERATIONS

III.A. Area of Interest

The area of interest includes the central Platte River (Lexington, Nebraska to Chapman, Nebraska) and the lower Platte River (Chapman, Nebraska to confluence with the Missouri River).

III.B. Monitoring Design

Platte River water quality monitoring is designed to document water quality and detect water quality trends in the central and lower Platte River. Water quality will be measured using *in-situ* continuous water quality sondes (sondes), discharge from established gaging stations, and discrete water sample collection at monitoring locations.

III.B.1. Monitoring Locations

Monitoring locations on the Platte River were selected to determine the range and variation of water quality parameters within the lower and central Platte River. The specific focus is on the central Platte River as the habitat-improvement activities of the Program will relate to this river reach. The monitoring locations were also selected because there are existing stream gaging stations maintained by the U.S. Geological Survey (USGS) and the Nebraska Department of Natural Resources (NDNR). The monitoring locations are listed in Table 1 and illustrated on Figure 1. Sondes will be co-located with the existing stream gaging stations.

Table 1. Spatial Monitoring Matrix

Monitoring Location No.	Platte River Locations	Discharge	Water Quality	Analytical
1*	Lexington	NDNR	Contractor	Contractor
2	Overton	USGS	Contractor	Contractor
3	Odessa	NDNR	Contractor	Contractor
4*	Kearney	USGS	Contractor	Contractor
5	Shelton	NDNR	Contractor	Contractor
6*	Grand Island	USGS	Contractor	Contractor
7	Duncan	USGS	Contractor	Contractor
8	Louisville	USGS	Contractor	Contractor

Notes:
NDNR – Nebraska Department of Natural Resources
USGS – United States Geological Survey
Contractor – Firm contracted to implement the Protocol

III.B.2. Parameters of Interest

Water quality data collected for the Protocol can be placed in four groups:

- **Discharge** – Discharge is the measurement of stream flow and is expressed as the amount of water that passes a fixed point over time and typically represented as cubic feet per second. River stage or gage height will also be collected. Existing gaging stations located in the central and lower Platte River and maintained by the USGS and NDNR will be used. No gaging stations will be installed or maintained for Protocol implementation. Discharge was included to link variations in water quality to changes in discharge.

- **Continuous Water Quality Monitoring** – Continuous water quality data will include temperature, turbidity (optical sensor), dissolved oxygen by optical or Luminescent Dissolved Oxygen (LDO) technology, pH, and specific conductance. Data will be logged at set intervals, and downloaded at regular intervals.

  Water temperature and turbidity were included to determine the impacts on water quality due to water and sediment manipulation (USFWS 2006). High water temperatures in combination with low flows have been attributed to fish kills in the central Platte River and high levels of turbidity may impede the foraging success of the least tern (USFWS 2006). Dissolved oxygen, pH, and specific conductance extremes can also impact the biota of the Platte River.

- **Discrete Water Quality Monitoring –** Representative, discrete water samples will be collected and analyzed by a National Environmental Laboratory Accreditation Program (NELAP)-certified laboratory. Analyses include dissolved copper, dissolved lead, dissolved nickel, total selenium, total calcium, and total magnesium.

  Central Platte River sediments (island and bank sand) were found to have concentrations of dissolved copper, dissolved lead, and dissolved nickel exceeding the Upper Effects Threshold (UET) (USFWS 2006). The UET is based on levels above which toxicity is commonly, although not always observed (Buchman 1999). Program activities may include the mechanical disturbance of island and bank sand. Analysis of dissolved copper, dissolved lead, dissolved nickel, and total selenium was selected to provide comparison to data collected by the Nebraska Department of Environmental Quality (NDEQ) at other locations in Nebraska.

  Program activities may also include water augmentation to increase flows. A potential source for water is from a groundwater area which has exhibited high concentrations of total selenium (USFWS 2006). In addition, water development activities in the Platte River drainage basin that are covered by the Program potentially could affect total selenium concentrations in the central Platte River.

  Nebraska surface water quality criteria for dissolved copper, dissolved lead, and dissolved nickel are calculated using hardness measured from total calcium and total magnesium. The analysis of these two metals will permit comparison of dissolved copper, dissolved lead, and dissolved nickel data to established water quality criteria (NDEQ 2006).

- ***E. coli* Monitoring** - Representative, discrete water samples will be collected and analyzed for *E. coli*. Monitoring for *E. coli* will be performed to assess the potential for increased pathogens in the central Platte River resulting from concentrated populations of waterfowl using the central Platte River due to Program activities. Sampling events will be performed during a period of peak waterfowl use (February through March) and a period of minimal waterfowl use (July through September).

III.B.3. Frequency and Duration

The frequency and duration of data collection for the four monitoring groups are listed below. The frequency and duration of monitoring will include the time of year that Program and Program-covered activities could influence Platte River water quality.

- **Discharge**
  - Existing gaging stations on the Platte River are operated continuously by the USGS and NDNR. River stage is measured continuously at these stations and discharge is estimated using rating curves.

- Discharge data will be collected to correspond to the collection of continuous water quality monitoring data described below.

- **Continuous Water Quality Monitoring**
  - The index period for the collection of Continuous Water Quality Monitoring data is from mid-March through November. The contractor will consult with the Program to determine the actual index period and may vary depending on environmental conditions at the start and end of the monitoring period.

  - The Contractor will install sondes for pH, temperature, turbidity, dissolved oxygen, and specific conductance at Lexington, Overton, Odessa, Kearney, Shelton, Grand Island, Duncan, and Louisville and provide operation and maintenance from approximately mid-March through November.

  - After installation, operation and maintenance (including the downloading of data) of the sondes will be conducted every two weeks from March through mid-May, every week mid-May through September, and every two weeks from October through November. If environmental conditions warrant, the time period between visits may be shortened or extended. Supporting evidence for deviation from the schedule above will be documented (e.g. biofouling, parameter drift, extreme or stable river conditions, etc.) and coordinated with the Executive Director's Office (ED Office) for approval.

  - Data will be logged by the sonde at 30-minute intervals.

  - Continuous Water Quality Monitoring data will be collected to correspond with the existing gaging stations. The 30 minute interval will document minor changes in water quality.

- **Discrete Water Quality Monitoring**
  - The index period for the collection of Discrete Water Quality data is from mid-March through November.

  - Representative water samples for analytical analysis will be collected at the eight monitoring locations listed in Table 1. Samples will be collected in April, early June (first two weeks), August, and October during maintenance of sondes. These four sampling periods represent peak usage times of the Platte River by the target species (least tern, piping plover, and whooping crane), times when Program activities are implemented, and are distributed to correspond with the locations of the sondes.

  - The methods and reporting limits (Table 3) selected are current industry standards approved by the EPA.

- ***E. coli* Monitoring**
  - Samples will be collected from the Platte River during periods of concentrated waterfowl populations in February through March (peak period) and during periods with minimal waterfowl populations in July through September (non-peak period). The Contractor will work with the ED office to determine the appropriate sampling times.

  - *E. coli* monitoring will be performed at Lexington, Kearney, and Grand Island. These sites were chosen to be representative of the central Platte River.

  - The Contractor will perform three sampling events for E. coli during the peak period and three sampling events during the non-peak period at Lexington, Kearney, and Grand Island.

  - The method for *E. coli* sample collection and analysis (Table 3) are industry standards and follow NDEQ procedures.

III.C. Statistical Design

The Protocol was designed to produce data that can be used to better assess the range and variation in water quality parameters on the central and lower Platte River and provide a basis for detecting statistically-significant changes and/or trends in those parameters over space and time. The Protocol is observational; there is no control or reference site established for data comparison. The frequency, duration, and method of sampling were chosen to produce scientifically-sound data for statistical analysis and hypothesis testing that will be completed by the ED Office.

IV. METHODS AND PROCEDURES

Prior to the implementation of the Protocol, the Health and Safety Plan, located in Appendix A, will be reviewed by the Contractor and updated if necessary. Also, a list of project contacts, located in Appendix B, will be completed and provided to the ED Office by the Contractor. Four distinct sets of data will be collected as part of the Platte River Water Quality Monitoring: 1) discharge and river stage, 2) continuous water quality monitoring data, 3) discrete water quality monitoring data, and 4) *E. coli* monitoring data. All calibration records, field book(s), datalogger records, and chain-of-custody forms will be kept for inclusion in the Annual Data Summary Report.

IV.A. Discharge and River Stage

Platte River discharge and stage measurements will be obtained from existing gaging stations maintained by the USGS and NDNR (Table 1). River stage is measured continuously at these gaging stations and discharge is estimated using rating curves. The rating curves are maintained by the owning agency through periodic measurements of depth and flow rate followed by

shifting of the rating curves, as needed. The uncorrected 15 minute discharge and stage values, along with corrected daily summaries are stored by the respective agencies. The Contractor will compile, review, and upload the data from these gaging stations into the Program's database.

IV.B. Continuous Water Quality Monitoring

A sonde will be co-located at gaging stations as described in Table 1. The sondes are multi-parameter meters with data logging capabilities. The data and units of measure to be collected are listed in Table 2.

Table 2. Continuous Water Quality Parameters (Typical)

Water Quality Parameter	Unit	Range	Resolution	Accuracy
Temperature	Degrees Celsius	-5 to +50ºC	0.01 ºC	± 0.10 ºC
Turbidity	Nephelometric Turbidity Units	0 to 1,000 NTU	0.1 NTU from 0-400 NTU 1 NTU for >400 NTU	± 5% or 1 NTU
Luminescent Dissolved Oxygen	mg/L	0 to 60 mg/L	± 0.1 mg/L @ ≤ 8 mg/L ± 0.2 mg/L @ > 8 mg/L ± 10% mg/L @ > 20 mg/L	± 0.3 mg/L
pH	Standard Units	0 to 14 units	0.01 units	± 0.2 units
Specific Conductance	mS/cm	0 to 100 mS/cm	0.001 mS/cm	± 0.5% of reading + 0.001 mS/cm

IV.B.1. Continuous Water Quality Sonde Operation

A sonde will be deployed and maintained at each of the identified continuous monitoring locations listed in Table 1. The sonde will log ambient water temperature, dissolved oxygen, pH, specific conductance, and turbidity on pre-selected time intervals and the data will be retrieved and downloaded before data exceeds memory capacity.

The operating manual supplied by the sonde's manufacturer will be incorporated into the Protocol in Appendix C and be available for reference by the field crew at all times. Manufacturer directions for calibration, maintenance, setup, and data transfer will be followed. Data transfer from the sonde will be performed on site and transferred to a field laptop. Files will be named by Platte River Location as listed in Table 1, followed by numerical year, month, and day of data transfer (e.g., Odessa20090528). To ensure file integrity and provide backup, all files will be saved to the laptop hard drive and a portable USB jump drive while in the field. Following the transfer process, files will be opened and reviewed to ensure successful transfer of all data before resetting the sonde. While on site, data will be reviewed for missing data, outlier data, and logging errors so corrections can be made immediately, if needed. A Continuous Water Quality Sonde Record sheet is provided in Appendix D. This sheet will be filled out for each monitoring location visit to document activities related to sonde maintenance, calibration, setup, and data transfer.

IV.B.2. Continuous Water Quality Sonde Installation

Prior to initial installation, each sonde will be calibrated following the manufacturer's specification using calibration standards and barometric pressure. All calibrations will be documented on the Continuous Water Quality Sonde Record (Appendix D). The sondes will be installed by suspending the sondes from each bridge deck on the downstream side of the bridge. The datalogger, battery source, and sonde will be housed in a small section of PVC pipe and tethered to the bridge railing via heavy duty chain. The sonde will be locked to the end of the chain and inserted into the PVC pipe. The cap for the PVC pipe will have a hole big enough for the chain to pass through. The PVC pipe will be attached to the chain by drilling a hole at the top of the PVC and inserting a bolt through one side of the PVC pipe, through the chain and through the other side of the pipe. The bolt will have at least one self locking nut. The submerged section of the PVC pipe containing the sonde will be slotted or perforated with circular holes and the bottom will be open to prevent sediment accumulation. A second bolt will be placed at the very bottom of the PVC to prevent the sonde from falling out the bottom. A float will be attached to the bottom of the PVC pipe to keep the sonde suspended just below the water surface (~6-inches) and minimize the burial of the sonde in sediment during decreasing flows and channel meandering. The sonde will be retrievable for maintenance and data transfer by pulling up the chain to the bridge deck. Ribbon or flagging will be placed every five feet on the chain so it is visible. The heavy duty chain will be attached to the railing by wrapping the chain around the railing and locking the chain to itself.

If the sonde cannot be attached to the bridge railing, a secondary method may be used. The sonde can be deployed by installing two 4 foot screw anchors into the bed of the river and attaching the PVC pipe described above to each anchor. Stainless steel cable will be used to attach and lock the PVC pipe and sonde to the screw anchors. A third screw anchor will be installed on the bank or in the river bed and attached to the sonde for added security. The sonde will be retrievable for maintenance and data transfer by wading in the river.

IV.B.3. Continuous Water Quality Sonde Maintenance

A maintenance schedule will be proposed by the Contractor and submitted to the ED Office for review prior to the installation of the sondes. Each sonde will be visited for maintenance, retrieval of data, and calibration. During these visits, hand-held water quality meter measurements, sonde calibration records, and data transfer notes will be recorded on the Continuous Water Quality Sonde Record (Appendix D). The process for maintenance, data retrieval, and calibration of the sondes are listed below:

- Take Measurement Using Hand-Held Meter – Prior to retrieval of data from the sondes, the field crew will collect and record duplicate water quality parameters using hand-held water quality meters. Barometric pressure will also be recorded in the field book at this time.

- The sondes will be accessed by parking a vehicle or walking on the shoulder of the bridge at the monitoring locations. The sonde will be carefully retrieved by pulling the chain and sonde to the bridge deck. If wading is necessary to retrieve the sonde and the conditions are safe for wading, a member of the field crew will wade to the submerged section of the PVC pipe to retrieve the sonde. If the river conditions are not safe for wading, a boat may be necessary to retrieve the sonde.

- Continuous Water Quality Sonde QA/QC – As part of the routine maintenance process, duplicate and known (spiked) parameter readings will be taken for QC purposes. Duplicate water quality readings will be taken by submerging hand-held meter probes next to the sonde set to display real time readings and these recorded values will be compared to the most recent logged sonde reading. Known (spiked) readings of calibration standards will be taken with the sonde during each maintenance visit to assess drift and/or accuracy of the sonde over the monitoring period. These QC measurements will be recorded on the Continuous Water Quality Sonde Record (Appendix D).

- Download Data From Continuous Sonde – The field crew will download the data from the sonde to a laptop computer and a USB jump drive.

- Review Continuous Water Quality Data – After data transfer, data files will be opened and reviewed for general data quality (i.e., proper logging interval, abnormal or missing data, data outliers, and missing parameters). If data recording issues are present, the deficiency will be documented, the sonde will be adjusted/fixed, and the corrective action will be documented. If issues cannot be resolved by the field crew, the Contractor's project scientist will be contacted and briefed to determine additional needed corrective action.

- Re-deploy the Sonde – As a final step, the field crew will clean and calibrate the sonde following the manufacturer's specification using calibration standards and the calibration documented. The documentation will include the drift of actual reading from the calibrated reading. Once calibrated, the datalogger will be turned on and the sonde re-deployed in the river. The Contractor must re-deploy the sonde by visually inspecting the river and moving the sonde to a river location that has the deepest water with flow.

IV.B.4. Hand-Held Water Quality Instrument Operation

As part of Quality Assurance (QA) and Quality Control (QC), a second set of hand-held water quality instruments (capable of reading temperature, dissolved oxygen, pH, specific conductance, turbidity, and barometric pressure) will be calibrated and maintained to enable the collection of duplicate ambient water quality parameters at the time of site visits. The operating manuals supplied by the instrument manufacturers will be incorporated into the Protocol in Appendix C and be available for reference by the field crew at all times. Manufacturer directions for operation, calibration, and maintenance will be followed and documented on the hand-held

Water Quality Instrument Calibration Record sheet, provided in Appendix D. These instruments will be calibrated at the beginning of each field day and documented.

The hand-held meter that is used for calibrating specific conductance will be designated for calibrating water temperature. The hand-held meter will be checked for accuracy to a mercury in glass calibration thermometer that is traceable to National Institute of Standards and Technology (NIST) certification of its accuracy (Service ID Number 31010C; NIST 1988) and recertified as required by NIST standards. Checking the accuracy of the hand-held meter used for water temperature will be performed prior to any field activities. The hand-held temperature meter and NIST thermometer calibration will be documented.

IV.B.5. Data Compilation and Storage

All data collected will be stored in an electronic format (Microsoft Excel) that can be easily imported into the Program's database.

IV.C. Discrete Water Quality Monitoring

IV.C.1. Discrete Water Sample Collection

Representative samples of water will be collected for analytical analysis of dissolved copper, dissolved lead, dissolved nickel, total calcium, total magnesium, and total selenium. One composite water sample will be collected for metals analysis at each monitoring station. The following procedures will be used to collect representative samples during the discrete sampling events:

- The field crew will assess river conditions to determine the most representative sampling locations for composite sample. The rationale for choosing each composite location will be documented in the field book.

- Five grab samples that represent the bulk of the river flow will be collected and composited at each monitoring location. The collection points shall be distributed evenly among multiple river channels or, when one channel exists, samples may be taken near each bank and at three equidistant points between the banks. If more than five channels exist, samples will be collected from the five channels with the highest flows.

- Before a sample is collected at each site, site water will be used to rinse out the container or Van Dorn bottle and compositing container at least three times.

- The samples will be collected on the upstream side of the bridge.

- The primary sampling method for discrete water sampling is wading. If the river conditions are not safe for wading, the discrete water samples will be collected from the

bridge deck.

- A sub-sample will be collected at the first station at 1/3 of the water depth using a sampling container. If water depth and/or the velocity is not safe for wading, the field crew will lower a Van Dorn water bottle from the bridge deck to obtain sub-samples. Subsequently, if low flow conditions exist, the samples will be collected by carefully submerging a sampling container to avoid re-suspending sediments from the river bed. The sub-sample will be poured into a compositing container. Four additional samples will be taken at equally spaced representative stations and composited in the composite container.

- Once all predetermined stations are sampled and composited, the composite container will be shaken/swirled to mix the composited sample. Two sample containers will be required for each sample. The total metals sample will be poured directly from the composite container into a pre-acidified/pre-labeled sample container. The dissolved metals sample container will be filled from the composite container via a peristaltic or hand vacuum pump using a new in-line 0.45-µm membrane filter capsule and tubing. Filtrate will be discharged directly into the pre-acidified/pre-labeled sample container.

- The sample containers will be placed in individual zip-seal bags and stored in a cooler with ice for shipment or delivery to the lab.

- Once the sample container is stored, the Chain-of-Custody form will be filled out, as detailed in section IV.C.6.

IV.C.2. *E. coli* Sample Collection

Representative samples of water will be collected for analysis of *E. coli*. *E. coli* samples will be collected near the south bank or from the southern-most channel of the river to provide sampling consistency. The southern-most channel is the channel that has flowing water and is at least 6 inches deep. A single grab sample of water will be collected in a sterilized container (obtained from the laboratory) for *E. coli* analysis at each of the identified monitoring locations. The following procedures will be used to collect representative samples for *E. coli* monitoring:

- The primary sampling method for *E. coli* sampling is by wading near the south river bank. If river conditions are not safe for wading, the sample will be collected from the south river bank.

- The sample will be collected by wading into the river with the sampler facing upstream. The sampler will remain stationary to permit disturbed substrates to be washed away to provide "fresh" water to collect the sample. Collect the sample in a sterilized container using the following procedure:
    - Hold the sterilized container close to the water surface and remove the lid.
    - Partially submerge the sterilized sample container in the water column.

- Remove the sample container from the water once it is filled and immediately replace the lid.

- Once the sample is processed, the Chain-of-Custody form will be filled out as described in section IV.C.6.

- Samples will be hand-delivered to Ward Laboratories, Inc. – 4007 Cherry Ave., Kearney, NE, (308) 234-2418 – for analysis **within 6 hours of collection**.

IV.C.3. Analytical Method

The analytical method, required containers, volume, preservative, and holding times are listed in Table 3.

Table 3. Discrete Sampling Handling and Analytical Methods

Analyte	Field Preparation	Method	Container	Holding Time	Method Detection Limit	Reporting Limit	Preservation
Dissolved Metals							
Copper	0.45 µm filtered water	*SW 7211	1000- mL Plastic w/Teflon lined cap	6 months	0.0015 mg/L	0.005 mg/L	Cool, 4ºC HNO_3 to pH <2
Lead	0.45 µm filtered water	*SW 7421	1000- mL Plastic w/Teflon lined cap	6 months	0.001 mg/L	0.004 mg/L	Cool, 4ºC HNO_3 to pH <2
Nickel	0.45 µm filtered water	*SW 7521	1000- mL Plastic w/Teflon lined cap	6 months	0.00435 mg/L	0.01 mg/L	Cool, 4ºC HNO_3 to pH <2
Total Metals							
Selenium	Un-filtered Water	*SW 7740	1000- mL Plastic w/Teflon lined cap	6 months	0.00169 mg/L	0.005 mg/L	Cool, 4ºC HNO_3 to pH <2
Calcium	Un-filtered Water	*SW 6010B	1000- mL Plastic w/Teflon lined cap	6 months	0.0195 mg/L	1.0 mg/L	Cool, 4ºC HNO_3 to pH <2
Magnesium	Un-filtered Water	*SW 6010B	1000- mL Plastic w/Teflon lined cap	6 months	0.0104 mg/L	1.0 mg/L	Cool, 4ºC HNO_3 to pH <2
Bacteria							
E. coli	None	**SM 9223C	100 ml Sterilized Bottle	6 hours	1 colony per 100 ml	1 - 2,419 colonies per 100 ml	Cool, 4ºC

* SW – Solid Waste

**SM – Standard Methods

E. coli samples will be analyzed utilizing IDEXX Quanti-Tray following Standard Methods 9223B: Chromogenic Substrate Coliform Test (APHA, 1995). *E. coli* counts will be determined using Standard Methods 9221C: Estimation of Bacterial Density (APHA 1995).

IV.C.4. Sample Labels

Every sample collected and submitted for analysis will have a sample label uniquely identifying the sample and listing the parameters to be analyzed. Each label will include the following information:

- Project Name – PRRIP WQ Monitoring
- Location Identification – e.g., Lex200904
  - Samples from the different monitoring locations will be identified as follows.
    Lexington – Lex
    Overton – Ovr
    Odessa – Ods
    Kearney – Ker
    Shelton – Shl
    Grand Island – Gri
    Duncan – Dun
    Louisville – Lsv
  - Followed by the year and numerical abbreviation for the month sampled.
    e.g., 200904 – April 2009, 200905 – May 2009, etc.
- Date of sample collection
- Time of sample collection (military format)
- Analyses to be performed
  - Dissolved copper (SW 7211), dissolved lead (SW 7421), and dissolved nickel (SW 7521)
  - Total selenium (SW7740), total calcium (SW 6010B), and total magnesium (SW 6010B)
  - *E. coli* – SM 9223 – a 20:1 dilution of the sterilized water with the sample will be conducted at the laboratory to obtain counts of coliform and *E. coli* colonies in 100 mL of water
- Preservative – Metals – HNO_3 and cool to 4 °C
- Preservative – *E. coli* – cool to 4 °C
- Samplers' initials

IV.C.5. QC Sample Collection and Documentation

Metals

One duplicate water sample will be collected at one randomly selected site during each discrete water quality sampling event. A sufficient volume of water will be composited to fill a sample container for the environmental sample and, concurrently, for the duplicate sample. Duplicate samples will be labeled as "Dup" followed by year and month sampled (e.g., Dup200904). An arbitrary sample time will be placed on the container label and chain of custody. The actual location and sample time will be recorded in the field book at the time of sampling.

One field blank will be collected during each discrete water quality sampling event. Field blanks will be labeled as "FB" followed by year and month sampled (e.g., FB200904). Field blanks will be collected using the following procedures:

- The sampling container or Van Dorn bottle will be rinsed three times with de-ionized water then rinsed one time with lab-grade water.

- The compositing container will be rinsed three times with de-ionized water then rinsed one time with lab-grade water.

- Approximately 1.5 liters of lab-grade water will be poured into the sampling container or Van Dorn bottle and then transferred to the composite container. The pre-acidified/pre-labeled total metals sample containers are then filled. For dissolved metals, the field crew will draw the lab-grade water from the compositing container through a new filter and tubing into the pre-acidified/pre-labeled sample container.

- The containers will be sealed in zip-seal bags and stored in a cooler with ice.

- Field blank samples will be processed in the same manner as the environmental samples.

Trip blanks and matrix spike/matrix spike duplicate samples will not be collected at this time but may be added to the Protocol if indicated by data collected.

E. Coli

One field blank will be collected for each sampling event for Quality Control using sterile water furnished by the lab to fill the sample container. The sampler will fill the field blank container near a point on the river bank where the environmental sample was collected. The sample crew will open both containers simultaneously (sterile water and sample container), fill the sample container with sterile water and immediately replace the lid. Field blank samples will be labeled as "FB" followed by year and month sampled (e.g., FB200904) and handled the same as the environmental samples until delivered to the lab.

IV.C.6. Chain-of-Custody

Every suite of samples collected will be tracked and documented via a chain-of-custody record. A chain-of-custody will be completed as samples are collected and will be submitted with the samples. A chain-of-custody form can be obtained from the laboratory or a carbon copy form can be created from the example provided in Appendix D. Each chain-of-custody record will include the following:

- Project name – PRRIP WQ Monitoring
- Sample identification code – e.g. Lex200904
- Sample date for all samples
- Sample times for all samples (military format)
- Sample type (e.g. composite or grab)
- Required analysis for containers

- Sampler signature for sample collection
- Signature, date, and time relinquished
- Retain a copy of the chain-of-custody upon completion and affix a copy in a zip-seal bag to the inside lid of the sample cooler

IV.C.7. Field Book

The following information should be documented in the field book:

- Date of sampling
- Field crew member names
- Location and sampling beginning and ending time
- Samples collected/work performed in field
- The rationale for choosing each composite location during discrete water sampling
- Duplicates or blanks collected with the location and sampling time
- Weather conditions
- Site Conditions
- Any irregularities encountered and lessons learned during the field effort

IV.C.8. Sample Control and Handling

Sample control and custody is critical to maintain sample integrity for analysis and to track sample from time of collection to time of analysis. The following procedures will be followed to maintain sample integrity:

- The sample containers will be appropriately labeled and filled with a representative composite or grab water samples.

- The containers will be placed in a zip-seal bag in an upright position in a cooler containing ice. The field crew will keep the cooler out of direct sunlight and secured to prevent loss of samples/cooler.

- After all samples are collected, the sample containers will be cross-checked with the chain-of-custody to ensure required sample information matches.

- Aged ice and water will be removed from the cooler and replaced with double-bagged fresh ice along with sample containers and a container labeled temperature blank.

- Completed chain-of-custody in a zip-seal bag will be taped to the inside of the cooler lid.

- The field crew will place signed and dated custody seals over the cooler opening prior to sealing with tape.

- Once the cooler is sealed with tape, it will be delivered to a laboratory for analysis or to an overnight shipping company for delivery to the laboratory.

V. HISTORICAL/CONCURRENT WATER QUALITY DATA

In addition to the data collected through the Protocol, several other entities have collected, or are collecting, related information. The following is a partial list and is provided for reference:

- Nebraska Department of Environmental Quality – Ambient Stream Monitoring
  - Current program initiated in 2001.
  - Monitor seven Platte River sites quarterly for metals.
  - Monitor three tributary sites quarterly for metals.
  - Monitor three sites on the central Platte River (Cozad, Kearney and Grand Island) for *E. coli* on a multi-year rotation.

- United States Geological Survey
  - Stage and discharge data at 13 locations on the Platte River; Overton to Louisville.

- State of Nebraska Department of Natural Resources
  - Stage and discharge data at 4 locations on the Platte River; Brady to Odessa.

- Lower Platte River Corridor Alliance
  - One continuous water quality monitoring station on the lower Platte at Louisville.
  - Four continuous water quality monitoring stations on tributaries to the lower Platte River.

VI. DATA COLLECTED FROM OTHER ENTITIES

Data will be collected from the USGS and NDNR to supplement data collected in the Protocol. The Contractor will be responsible for contacting the agency to access required data. An interview with a representative from the USGS, LPRCA, and NDNR and review of the data collected from the entity will be performed to document collection procedures, calibration procedures, and data gaps. A summary of the interview and review will be included in the Annual Data Summary Report.

VII. QUALITY ASSURANCE/QUALITY CONTROL

It is important that data are of a sufficient quality to meet the monitoring objectives. The quality of the data collected and analyzed is assessed using the elements of precision, accuracy, representativeness, completeness, and comparability.

VII.A. Data Quality Indicators

Precision

The measurement of precision will be accomplished by collecting duplicate water quality readings and duplicate samples. The premise behind the use of duplicate samples is that two samples collected simultaneously from the same location should yield similar results. The variation between duplicate samples that is accepted is a function of the monitoring objectives and the inherent variation around each parameter. Precision will be measured during the Protocol in terms of Relative Percent Difference (RPD) which is calculated using the following formula:

$$\%diff = (X_1-X_2)/[(X_1+X_2)/2]$$

X_1 and X_2 = reported concentrations for each duplicate sample.

Data will be considered acceptable if the RPD is less than or equal to 50% for each parameter. One duplicate water sample will be collected for each discrete water sampling event. Duplicate water quality readings will be collected using hand-held meters for temperature, pH, dissolved oxygen, specific conductance, and turbidity at each location during each discrete water sampling event.

Accuracy

Measures of accuracy will be accomplished using internal laboratory spikes for metal analyses performed by the laboratory and readings of calibration standards taken from the sondes. Accuracy can be quantified as percent recovery from analysis of a known concentration. This will be accomplished using internal lab spikes and calculated on a per batch basis and sonde measurement of calibration standards. The data quality objective for accuracy for all measurements in the Protocol is:

$$\%Recovery = 85\% \text{ to } 115\%$$

Other checks for accuracy will be accomplished through close adherence to instrument calibration procedures.

Representativeness

The issue of representativeness is handled primarily by adhering to the Protocol procedures (e.g., collecting a composite sample), manufacturer calibration procedures, and a sampling plan which describes appropriate location, time, and conditions for data collection. Any condition that may result in a "non-representative sample" should be noted on the field data sheet and will be considered during the data review process.

Comparability

The comparability of the data can be affected by several factors including changes in sample locations, parameters, collection or analytical techniques, etc. Quality assurance procedures are incorporated throughout the Protocol to help assure that comparable data are obtained. These

quality assurance procedures include: written descriptions of all sample locations; assigning sampling responsibilities to the same personnel or the appropriate training for new personnel; establishing a set parameter list; describing data collection, analysis, and assessment procedures. Adherence to these procedures will be closely evaluated during the data quality review process. Corrections will be made when required.

Completeness

Completeness refers to the amount of data necessary to meet the monitoring objectives. To help ensure that all of the designed monitoring data and water samples are collected, a sampling schedule will be prepared and distributed. An inventory and a review process will be implemented to maintain data collected, and routinely check for potential errors, missing data, and missing information on field data sheets. It is the responsibility of the sample collector to make sure field data sheets are completely and accurately filled out and to report missing data from the sondes.

VII.B. Additional Specific QA/QC Activities

Specific QA/QC activities will be the responsibility of the Contractor and will include:

- **Training** – Staff assigned to maintain the sondes and collect representative water quality samples will be adequately trained for their tasks. This includes familiarization with and adherence to the Protocol and any additional aspects that may be required (e.g., equipment operation, calibration, monitoring locations, and safety procedures).

- **Raw Data Audit** – Event specific field data sheets will be reviewed by the project scientist at the conclusion of each sampling event. Field data sheets will be checked for missing or questionable data and legibility. If discrepancies are found, they will be addressed and documented by the project scientist after consulting with the sampling crew.

- **Data Management and Analysis** – Data transfer and processing activities will be recorded on a field data sheet for each data batch. Data downloaded from sondes will be transferred to an office server and backup files will be maintained. Parameter data will be reviewed by the project scientist for data that may be questionable and will require further review. Field data for each sample location will be recorded on field data sheets and manually entered into the database. All (i.e., 100 percent) of the manually entered data will be compared against field data sheets.

VII.C. Assessment and Oversight

Assessment and oversight of project activities will be implemented by the Contractor and the Program ED Office to ensure that activities defined in the Protocol are being followed.

Contractor – Initially, all field procedures will be implemented under the direction of the project scientist. If technical or procedural problems are encountered, corrective action(s) will be taken after consultation with the ED Office. Secondly, all field personnel assigned to the project will be trained and supervised by the project scientist to ensure all procedures are followed.

A senior staff member that is not directly involved in the management of the project will perform an annual technical audit. This audit will assess all field procedures (e.g., composite sample collection, sonde maintenance, and data recording) and QA/QC activities. Results of the audit will be presented to the project scientist and the ED Office. Recommendations generated from the audit will be reviewed and implemented, if feasible.

The project scientist will provide field QA/QC oversight throughout the monitoring period to ensure that the Protocol is being followed.

ED Office – The ED Office will provide oversight and approval of the continuous sonde maintenance schedule and the discrete water sampling schedule. Any deviations from the Protocol will be justified in writing by the Contractor and submitted to the ED Office for approval prior to implementation. The ED Office will be responsible for review and approval of the Annual Data Summary Report and the Annual Update.

VIII. ANNUAL SUMMARY REPORTS

The Contractor will prepare two reports at the conclusion of a water quality monitoring period: 1) Annual Data Summary Report, and 2) Annual Update.

VIII.A. Annual Data Summary Report

An Annual Data Summary Report will be prepared and submitted upon completion of field data collection. The purpose of the report is to present the data collected, provide a summary of the methods and procedures, evaluate the data quality, and summarize observed temporal, spatial, and flow variations.

The annual data summary report will include the following:

- Introduction – Describes the purpose and intent of the project.
- Data Summary – Provides a succinct overview of the data collected during the year and references the attached raw data set.
- Methods and Procedures – Summarizes the methods and procedures used for the project, focusing on adaptations and corrective measures, if any. The Annual Data Summary Report will also include the review of the data collected from other entities.

- Quality Control Summary – Summarizes the QA/QC measures and resulting data quality indicators.

- Summary Statistics – Presents and summarizes results including a tabular presentation of weekly and monthly observations: number (N), mean, maximum, minimum, and standard deviation for each parameter by location.

- Variations – Briefly presents and summarizes observed temporal, spatial, and flow variations;

    - Presents variation in temporal water quality, including a line graph presentation of water quality parameters (i.e., X-axis presents time, Y-axis presents parameter value).

    - Presents water quality variation relative to discharge, including scatter plot presentation (i.e., X-axis presents discharge, Y-axis presents parameter value). Line fit will determine degree of relationship of parameter to change in discharge.

    - Presents water quality variation spatially, including Boxplot presentation of water quality parameter values (i.e., X-Axis presents monitoring location; Y-axis presents parameter value). Graph box plots present minimum; 25^{th}, 50^{th} and 75^{th} percentile; and maximum values of parameter.

- Continuous Water Quality Monitoring Record – Summarizes the adherence to the Protocol and describes any deviations from the methods and procedures listed in the Protocol.

- Appendix A – Tables

- Appendix B – Figures

- Appendix C – QA/QC Data

- Appendix D – Photo Log

- Appendix E – Field data sheets (provided on CD only)

- Appendix F – Raw Water quality parameter data (provided on CD only)

- Appendix G – Flow Data (provided on CD only)

VIII.B. Annual Update

An Annual Update will be prepared and submitted upon completion of field data collection. The purpose of the report is to present observations and recommendations for adjustments to Protocol

implementation. These recommendations will be submitted to the ED Office for review and incorporated into the next year's Protocol implementation. The Annual Update will be incorporated into the Protocol in Appendix E.

IX. REFERENCES

American Public Health Association (APHA). 1995. Standard Methods for the Examination of Water and Wastewater. 9223 Chromogenic Substrate Coliform Test. 9221C Estimation of Bacterial Density.

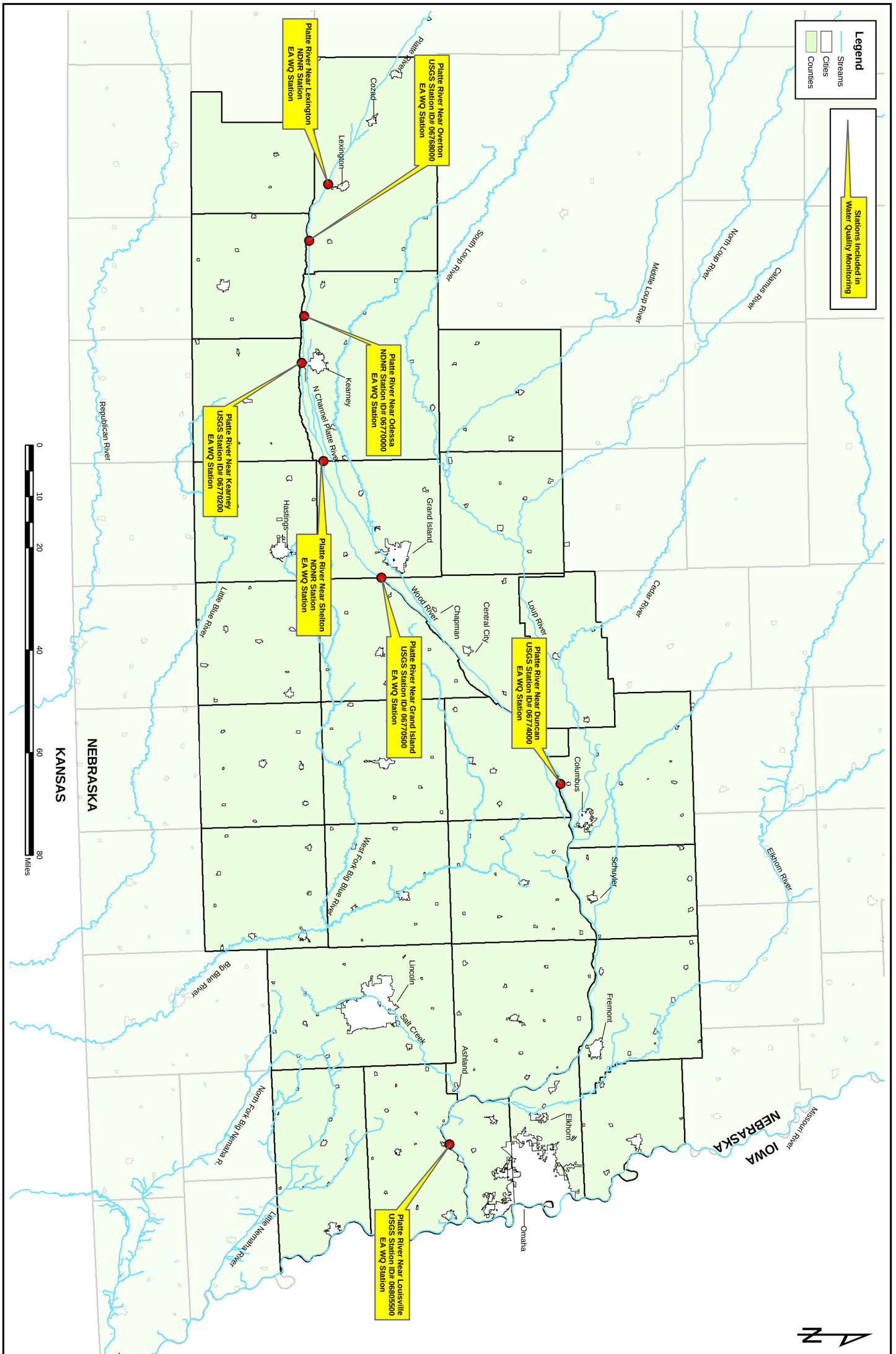
Buchman, M.F. 1999. NOAA Screening Quick Reference Tables, NOAA HAZMAT Report 99-1, Coastal Protection and Restoration Division, National Oceanic and Atmospheric Administration. Seattle, WA.

United States Fish and Wildlife Service (USFWS). 2006. Platte River Recovery Implementation Plan, Final Environmental Impact Statement. Volume 1. United States Department of the Interior, Bureau of Reclamation, U.S. Fish and Wildlife Service. Washington DC.

National Institute of Standards and Technology (NIST). 2008. Thermodynamic Quantities, Laboratory and Industrial-Grade Thermometers, Service ID Number 31010C.

Nebraska Department of Environmental Quality (NDEQ). 2006. Nebraska Administrative Code. Title 117 – Nebraska Surface Water Quality Standards. Lincoln, Nebraska.

Platte River Recovery Implementation Program (PRRIP). 2006. PRRIP Document. Attachment 3: Adaptive Management Plan.



EA ENGINEERING, SCIENCE, AND TECHNOLOGY

FIGURE 1

WATER QUALITY MONITORING LOCATIONS

Date: January, 2011
Prepared by M. Wallman

APPENDIX A

Health and Safety Plan

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM
Water Quality Monitoring
Appendix A
Health and Safety Plan

I. SUMMARY

Following is a summary of potential health and safety issues which may be encountered during performance of the Water Quality Monitoring Protocol. As with any project, unforeseen conditions may be encountered that pose health and safety risks. These new risk(s) must be addressed and documented in a field log book.

II. SITE HEALTH AND SAFETY PLAN

II.A. Key Personnel

The contractor will identify key personnel for the following task and provide contact information. Key personnel for project activities at the site include the following:

Platte River Recovery Implementation Program		
Director of Water Resources Engineering	Beorn Courtney	(303) 918-5096
Executive Director	Jerry Kenny, PhD	(308) 237-5728
Director of Natural Resources	Chad Smith	(402) 261-3185

EA Engineering, Science, Technology, Inc.			
Project Manager	Dan Bigbee	Office	(402) 476-3766
		Mobile	(402) 304-6104
Site Safety and Health Supervisor	Kent Dixon	Office	(402) 476-3766
		Mobile	(402) 525-6759
Field Team Members	Mitch Wallman	Office	(402) 476-3766
		Mobile	(402) 890-1558
	Jon Mohr	Office	(402) 476-3766
		Mobile	(402) 416-4667

II.B. Hazard Analyses

II.B.1. Chemical

There are no known chemicals of concern in the Platte River that may pose a risk. However, field members will be exposed to minimal quantities of nitric acid, used as water sample preservative. Field members will also be working with small quantities of chemical standards for calibration of field instruments; pH, specific conductance, and turbidity standards.

II.B.2. Physical

Sampling activities may take place on an active highway bridge deck or wading in the river. Physical hazards include vehicles traveling at a high rate of speed on the highway. The collection of samples will include working near and looking over the bridge railing so fall hazards exist. Wading the Platte River at higher flows may present deep water, unstable substrate, and high water velocities which all may contribute to fall hazard in the river.

II.B.3. Biological

Biological hazards which maybe encountered include: sunburn, mosquitoes and insects, ticks, severe weather, and wild animals.

II.C. Task Operational Safety

Field personnel will have a daily tailgate safety meeting prior to the performance of field activity. Crew will review safety techniques to be used during the day, weather conditions, and location of nearest emergency response crew and will document the meeting in the field log book.

II.C.1. Chemical

Common practice for the handling of sample preservatives will be followed: store sample bottles in an upright position, do not invert bottles once open, and ensure lids are tightly closed once filled with site water. In general, calibration standards are not immediately hazardous to a person, but common practice will be followed when handling standards. Standards will be handled per directions on supplier-provided Material Safety Data Sheets (MSDS's). All standards used in the field and considered waste will be containerized and retained by the crew until it can be disposed in a sanitary sewer system.

II.C.2. Physical

Safety practices to be followed while working near a highway or on the bridge deck include the following:

- Field crew will wear high visibility vests or shirts while working near the road or on the bridge deck.
- Vehicles will not be parked on bridge decks. Vehicles will be parked off the shoulder of the road as far as possible, based on site conditions.
- Orange traffic cones will be available for use by the sampling crew at all times. Cones will be used at the discretion of the field crew to help make the vehicle or the crew on the bridge deck more visible to motorists.
- Anytime the field crew needs to look over and down from the bridge railing to view the river the potential for falling exists. To prevent accidental fall one must keep both feet on the bridge deck at all times.

Safety practices to follow when wading the river to collect water samples include the following:

- When water temperature is less than 20 ºC (68 ºF) samplers will wear chest waders.
- In general, if the river bottom is not visible from the bridge deck use caution and a wading stick when entering the river.

- In general, when water depth approaches mid-thigh in combination with high velocity wading becomes difficult and additional caution should be used.
- At all times the second sampler will maintain visual contact with the wader to provide assistance if needed.
- Always proceed with caution – if wader is not confident that conditions are safe then samples will be collected from the bridge deck.

II.C.3. Biological

Appropriate safety items will be available for use by the field crew at all times. Items include sunscreen, insect repellent, tick repellent, and a first aid kit. Local radio stations will be monitored when weather becomes threatening and, if warranted, crew will seek shelter in the vehicle or in a local shelter.

II.D. Personnel Training

Potential health and safety issues that may be encountered during performance of this protocol will be reviewed prior to implementation. A tailgate meeting will be done each day prior to field work and documented in the field book. No other specialized training is anticipated.

II.E. Personal Protective Equipment (PPE)

The PPE for this protocol includes: high visibility vests or work shirts, insect repellents, chest waders, and appropriate clothing for weather conditions.

II.F. Emergency Response Plan

A copy of this Health and Safety Plan will be in each project vehicle. This section includes directions and maps to nearby hospitals and emergency phone numbers. A cell phone will be part of the field equipment required for this protocol. This protocol covers a large reach of the Platte River and the nearest emergency response center will depend on the crew's location. When contacting emergency response, the caller will be prepared to give the highway name where the bridge is located so emergency crews can respond efficiently.

II.F.1. Emergency Care Facilities

Figure A-1 shows the locations of hospitals that would respond to an emergency, or if conditions permit, the sampling crew could drive to. Note: when dialing 911 from a cell phone the dispatcher you reach may not be the nearest emergency responder. Always be cognizant of your work location and accurately communicate your position to the dispatcher.

II.F.1.1 Lexington

Tri County Hospital
120 North Erie
Lexington, NE 68850
(308) 324-5651

II.F.1.2 Kearney

Good Samaritan Hospital
10 East 31st Street
Kearney, NE 6884
(308) 865-7100

II.F.1.3 Grand Island

St. Francis Medical Center
2620 West Faidley Ave
Grand Island, NE 68803
(308) 384-4600

II.F.1.4 Columbus

Columbus Community Hospital
4600 38th Street
Columbus, NE 68601
(402) 564-7118

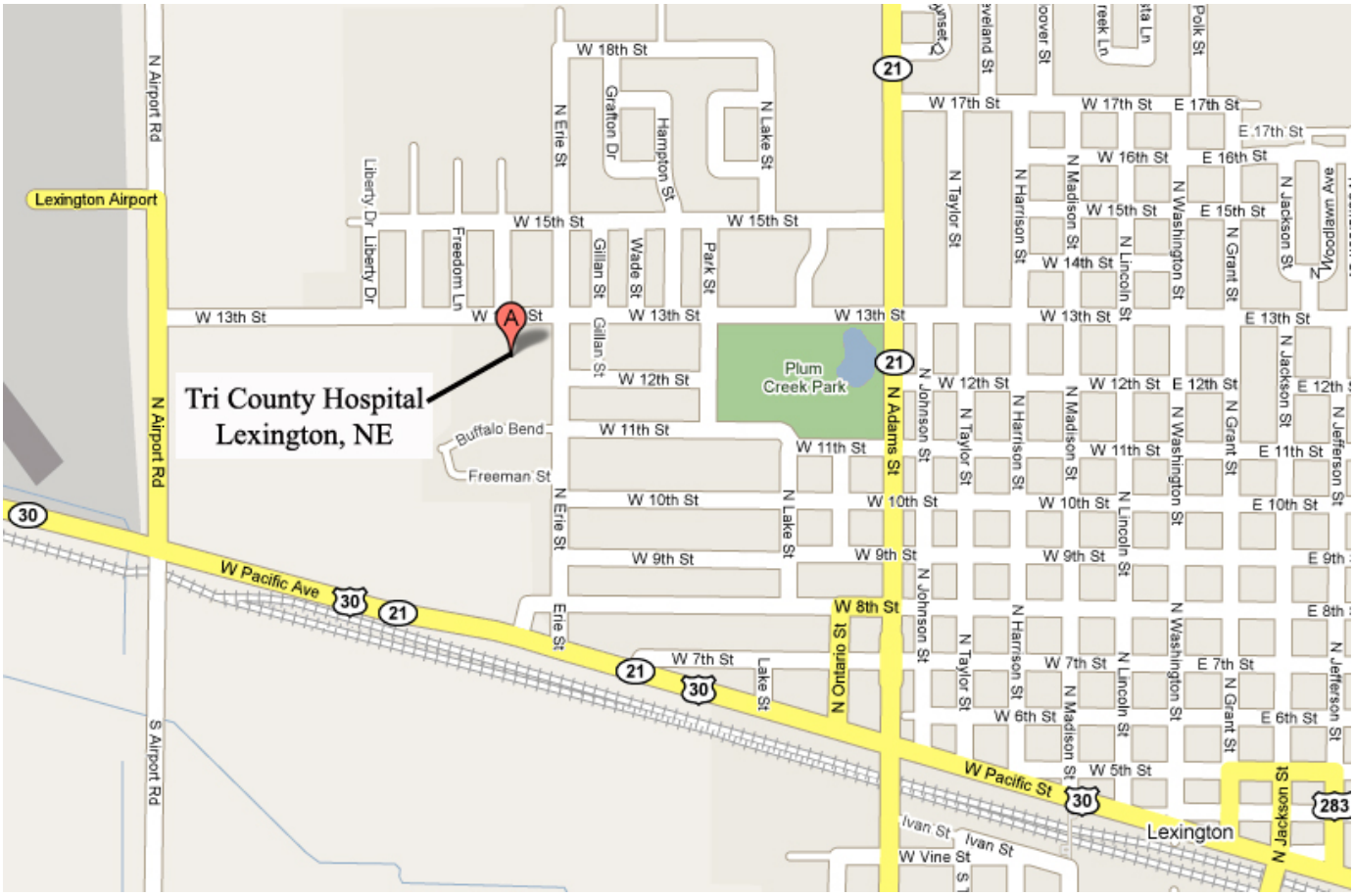
II.F.1.5 Papillion

Midlands Hospital
11111 South 84th Street
Papillion, NE 68046
(402) 593-3000

Tri County Hospital

1201 N Erie
Lexington, NE 68850
Phone: (308) 324-5651

Local Fire/Emergency Number: Call 911 and ask for Tri County Hospital in Lexington, NE

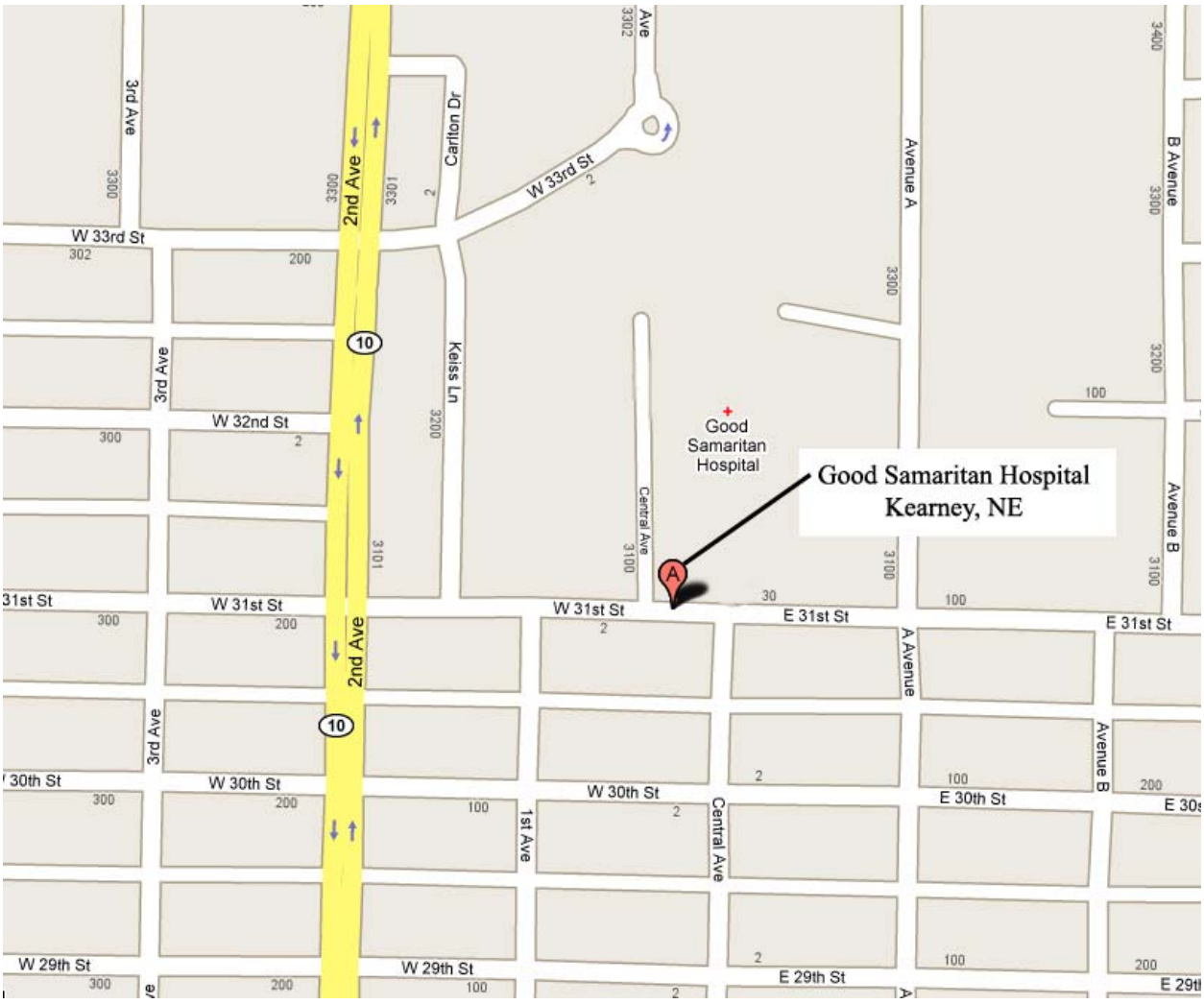


a. Merge onto Plum Creek Pkwy/US-283 from I-80 exit 237, follow toward Lexington – go 2.3 mi
b. Turn right on E. 5th Street/US-283- go 0.2 mi
c. Turn right on E Pacific Street/US-30 – go 1.1 mi
d. Turn right on N Erie Street – go 0.5 mi
e. Turn left on W 13th Street
f. Arrive at Tri County Hospital, Lexington, NE

Good Samaritan Hospital

10 E 31st Street
Kearney, NE 68847
Phone: (308) 865-7100

Local Fire/Emergency Number: Call 911 and ask for Good Samaritan Hospital in Kearney, NE

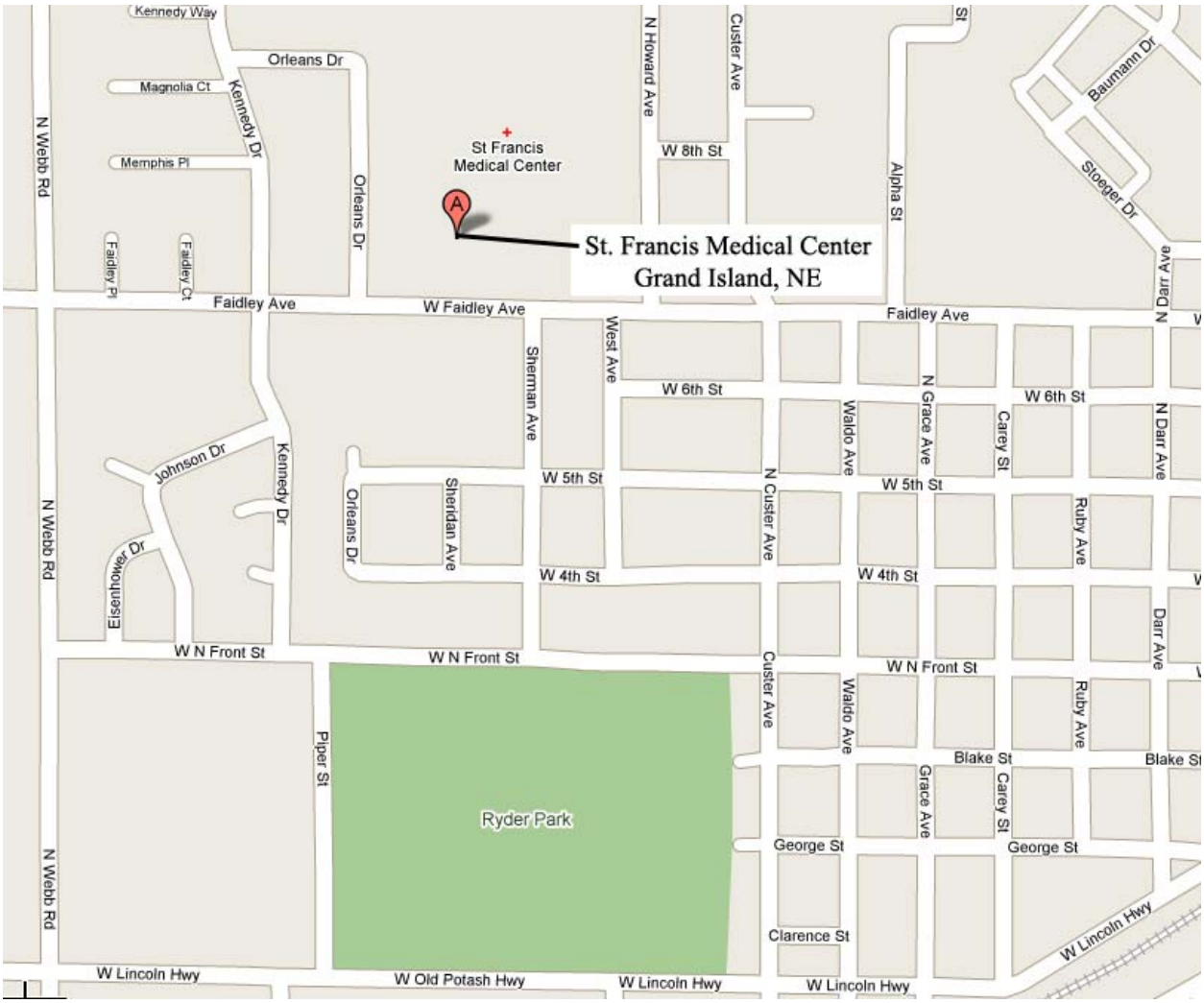


1. Merge onto Kearney exit 272 toward Kearney from I-80 and turn left – 0.3 mi
2. Follow S 2nd Ave/NE-44 – go 2.7 mi
3. Turn Right at W 31st Street – go 0.1 mi
4. Arrive at Good Samaritan Hospital, Kearney, NE

St. Francis Medical Center

2620 West Faidley Ave
Grand Island, NE 68803
Phone: (308) 384-4600

Local Fire/Emergency Number: Call 911 and ask for St. Francis Medical Center in Grand Island, NE

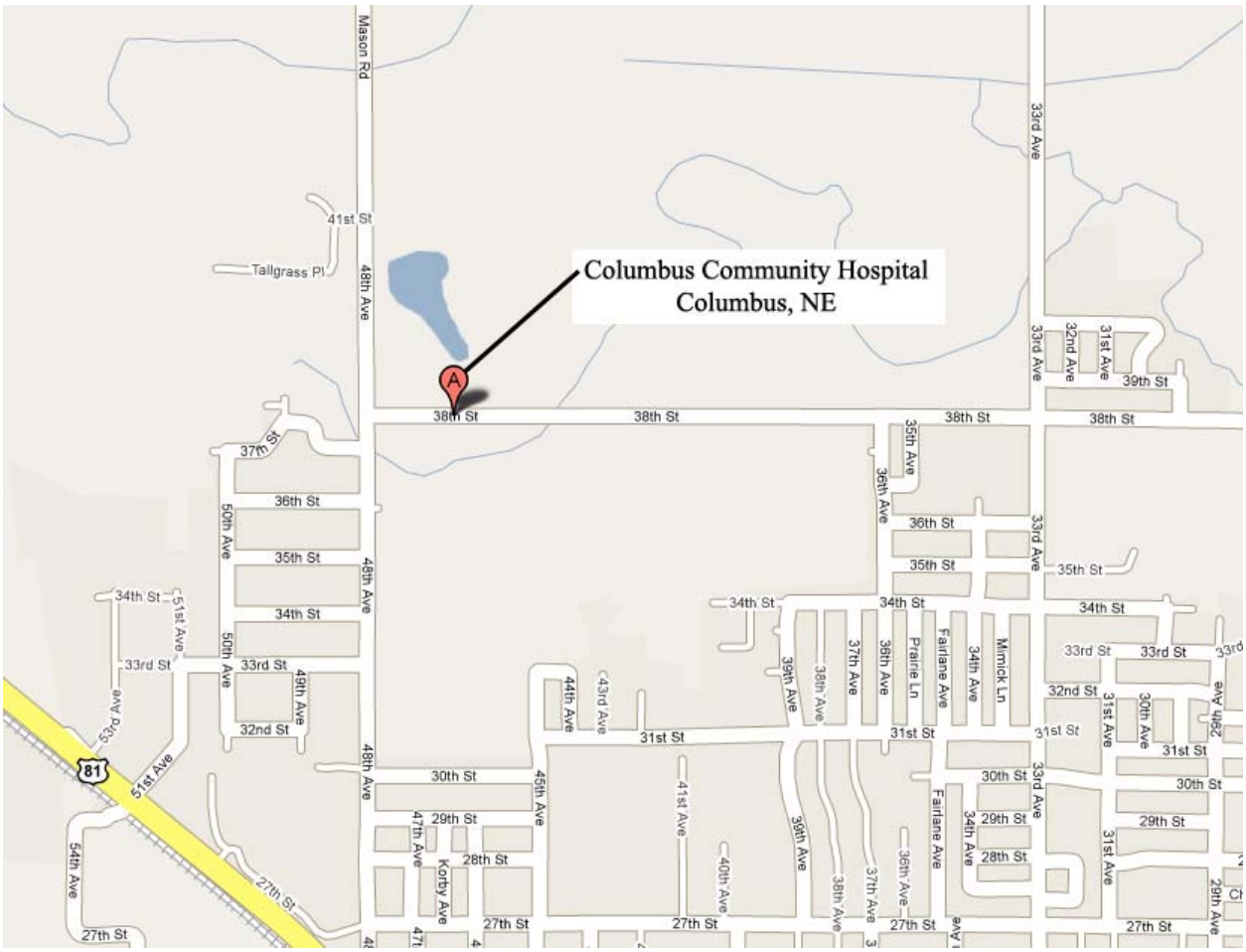


1. Merge onto exit 312 for US-281 N/US-34N toward Grand Island from I-80 – 0.8 mi
2. Continue to follow US-281 – go 7.3 mi
3. Turn right at W Faidley Ave – go 0.6 mi
4. Arrive at St. Francis Medical Center in Grand Island, NE

Columbus Community Hospital

4600 38th Street
Columbus, NE 68601
(402) 564-7118

Local Fire/Emergency Number: Call 911 and ask for Columbus Community Hospital in Columbus, NE

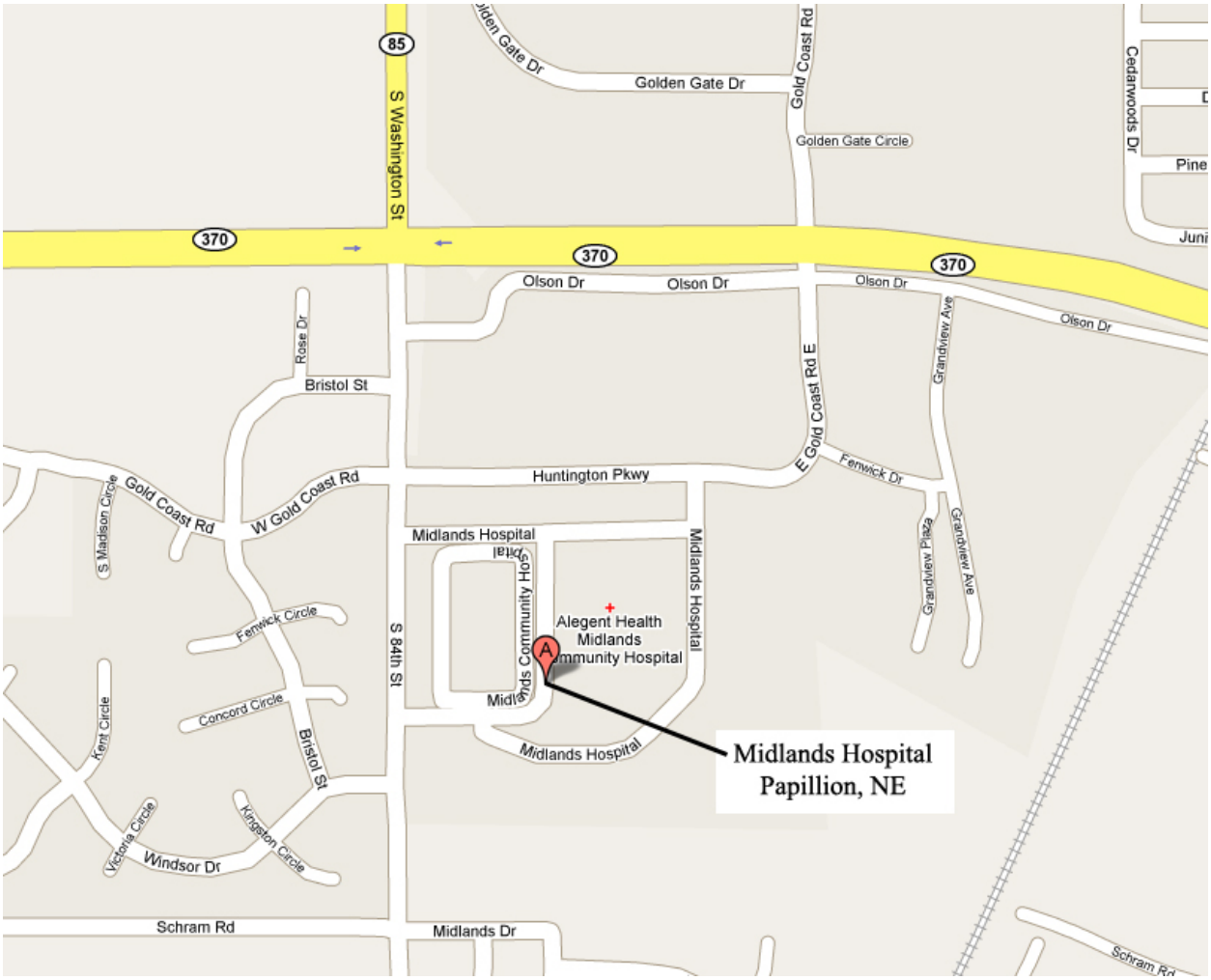


1. Travel South on US-81 towards 2895 Street
2. Turn Left at 29th Street – go 49 feet
3. Continue on 51st Ave – go 0.2 mi
4. Turn Right at 33rd Street – go 0.3 mi
5. Turn Left at 48th Ave – go 0.4 mi
6. Turn Right at 38th Street – go 0.1 mi
7. Arrive at Columbus Community Hospital in Columbus, NE

Midlands Hospital

11111 South 84th Street
Papillion, NE 68046
Phone: (402) 593-3000

Local Fire/Emergency Number: Call 911 and ask for Midlands Hospital in Papillion, NE



1. Follow NE-50 from Louisville, NE – go 9.9 mi
2. Turn Right to merge onto NE-370 – go 5.1 mi
3. Continue straight to stay on NE-370 – go 344 feet
4. Turn Right at S 84th Street/S Washington Street – go 0.2 mi
5. Turn Left at Midlands Hospital in Papillion, NE

APPENDIX B

Project Contacts

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM
Water Quality Monitoring
Appendix B
Project Contacts

I. SUMMARY

Following is the contact information for all key entities. This information will be kept up to date in order to facilitate project communication and quickly resolve issues that are encountered during implementation of the program.

CONTACTS

Platte River Recovery Implementation Program		
Director of Water Resources Engineering	Beorn Courtney	(303) 918-5096
Executive Director	Jerry Kenny, PhD	(308) 237-5728
Director of Natural Resources	Chad Smith	(402) 261-3185

EA Engineering, Science, Technology, Inc.			
Project Manager	Dan Bigbee	Office	(402) 476-3766
		Mobile	(402) 304-6104
Site Safety and Health Supervisor	Kent Dixon	Office	(402) 476-3766
		Mobile	(402) 525-6759
Field Team Members	Mitch Wallman	Office	(402) 476-3766
		Mobile	(402) 890-1558
	Jon Mohr	Office	(402) 476-3766
		Mobile	(402) 416-4667

Continuous Monitor and Hand Held Meter Manufacturers		
Eureka	support@eurekaenvironmental.com http://www.eurekaenvironmental.com/Support.html	(512) 302-4333
Hydrolab	techsupport@hachenvironmental.com http://www.hydrolab.com/	(970) 669-3050

YSI Inc.	environmental@ysi.com https://www.ysi.com/ysi/support	(937) 767-7241
Oakton	info@4oakton.com http://www.4oakton.com/Tech.asp	(888) 462-5866
LaMotte	tech@lamotte.com http://www.lamotte.com/support/technical_support.html	(410) 778-3100

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APPENDIX C

Water Quality Instrument(s)
Manufacturer's Manual

(Contractor Supplied)

APPENDIX D

Field Data Sheets

Platte River Recovery Implementation Program
Water Quality Monitoring
Hand Held Water Quality Instruments
Calibration Record

Personnel: _____ Date: _____

Start Time: _____ Finish Time: _____

Dissolved Oxygen

Instrument Model: _____ SN: _____

Stable Temperature	Calibration Ratio	Final Temp:
Stable DO:		Final DO:

Specific Conductance

Instrument Model: _____ SN: _____

Standard Value:	Observed Value	Acceptable Range (1385 - 1441)

Temperature

Instrument Model: _____ SN: _____

Meter calibrated to National Institute of Standards and Technology (NIST) traceable thermometer. Calibration record on file and amended to Protocol.

pH Meter

Instrument Model: _____ SN: _____

Standard Value	Pre-Calibration Value	Post-Calibration Value
4		
7		
10		

Turbidity Meter

Instrument Model: _____ SN: _____

NTU Value	Pre-Calibration Value	Post-Calibration Value
0		
100		

Platte River Recovery Implementation Program
Water Quality Monitoring
Continuous Water Quality Sonde Record

ıter Quality Sonde Record

Personnel: _____ Date: _____ Retrieved Date/Time: _____

Location: _____ Meter SN: _____ Deployed Date/Time: _____

Hand-Held *In-Situ* Water Quality - taken adjacent to or grab prior to retrieval				
Temperature	pH	Dissolved Oxygen	Specific Conductance	Turbidity
Continuous Monitor *In-Situ* Water Quality - via laptop				
Temperature	pH	Dissolved Oxygen	Specific Conductance	Turbidity

Continuous Monitor Calibration Standard Readings				
Temperature	pH	Dissolved Oxygen	Specific Conductance	Turbidity
NIST Reading =	7	H_2O Saturation	1,413	0 and 100
Multi-Paremeter Meter Value				

Continuous Monitor Data Transfer		
Meter Connected	Yes	No
Data Transferred	Yes	No
Data File		
File Checked	Yes	No
Memory cleared	Yes	No
Meter Recording	Yes	No

Meter Cleaning, Operational and Calibration Notes

Continuous Monitor Calibration		
pH		
Standard Value	Pre-Calibration Value	Post Value
7		
10		
Specfic Conductance		
1,413		
Turbidity		
0		
100		
Dissolved Oxygen		
Stable Temperature	Barometric Pressure	Stable Temperature
Stable DO		Stable DO

New Data File _____

CHAIN - OF - CUSTODY RECORD

Laboratory Address:

PROJECT #:

PROJECT NAME:

SAMPLED BY: (SIGNATURE)

SAMPLED BY: (PRINTED)

PARAMETERS/CONTAINERS/PRESERVATIVE

SAMPLE INFORMATION

DATE	TIME	C-COMP G-GRAB	SAMPLE IDENTIFICATION								**REMARKS** (REQUESTED TURNAROUND, PRESERVATIVE, ETC.)

RELINQUISHED BY: (SIGNATURE/PRINTED)

DATE:
TIME:

RECEIVED BY: (SIGNATURE/PRINTED)

DATE:
TIME:

RELINQUISHED BY: (SIGNATURE/PRINTED)

DATE:
TIME:

RECEIVED BY: (SIGNATURE/PRINTED)

DATE:
TIME:

RECEIVED AT LAB BY: (SIGNATURE/PRINTED)

DATE:

TIME:

SHIPPED VIA:

SEAL #:

COOLER #:

SEAL DATE:

REPORT TO:

ATTENTION:

ADDRESS:

INVOICE TO:

ATTENTION:

ADDRESS:

APPENDIX E

Annual Update

PLATTE RIVER RECOVERY IMPLEMENTATION PROGRAM
Water Quality Monitoring
Appendix E
Annual Update

A. SUMMARY

This document covers procedural revisions to the Water Quality Monitoring Protocol (Protocol) based on field observations during a monitoring season and discussions with the Platte River Recovery Implementation Program (Program). All revisions listed below have been incorporated into the Protocol.

B. 2011 MONITORING SEASON

The following information and section headings have been organized for consistency with the Protocol and focuses on recommendations for adjustments to Protocol implementation based on the 2009 and 2010 season observations and anticipated 2011 Program activities.

III. DESIGN CONSIDERATIONS

III. B. 3. Frequency and Duration

Operation and Maintenance of the Sondes

The quality of the data collected by the continuous water quality sondes (sondes) was impacted by heavy colonization from aquatic insects on the sonde probes. The Protocol was revised to perform operation and maintenance (including the downloading of data) of the sondes every two weeks from March through mid-May, every week mid-May through September, and every two weeks from October through November. This revision will improve the quality of the data collected while minimizing the required field effort.

EA will collect all bacteria samples in 2011. NDEQ has modified the basin rotation and will not be collecting bacteria samples in the central Platte region in 2011.

IV. METHODS AND PROCEDURES

IV.C.4.Sample Labels

A requirement for a 20:1 dilution of sterilized water with the sample will be conducted at the laboratory to obtain counts of coliform and *E. coli* colonies in 100 mL of water was added to the Protocol.

V. HISTORICAL/CONCURRENT WATER QUALITY DATA

There are no revisions to this section of the Protocol.

VI. DATA COLLECTED FROM OTHER ENTITIES

There are no revisions to this section of the Protocol.

VII. QUALITY ASSURANCE/QUALITY CONTROL

There are no revisions to this section of the Protocol.

VIII. ANNUAL SUMMARY REPORTS

VIII.A. Annual Data Summary Report

Appendix C – Field Data Sheets was changed to Appendix E – Field Data Sheets.

Appendix D – QA/QC Data was changed to Appendix C – QA/QC Data.

Appendix D – Photo Log was added.

Appendix E – Raw Water Quality Parameter Data was changed to Appendix F – Raw Water Quality Parameter Data

Appendix F – Flow Data was changed to Appendix G – Flow Data

IX. REFERENCES

There are no revisions to this section of the Protocol.