

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Task 1: WEST FORK SAN JACINTO RIVER, TX
CONTINUOUS WATER QUALITY MONITORING
PROJECT PLAN

USGS Project No. 8653-9XI05

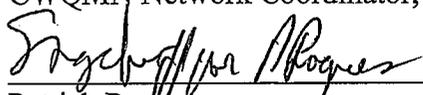
Effective Date: July 1, 2008

A1 APPROVAL PAGE



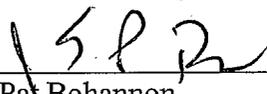
Charles Dvorsky
CWQMN Network Coordinator, TCEQ

6/27/2008
Date



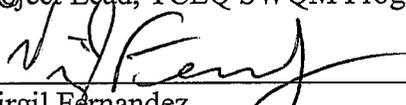
Patrick Rogues
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6/30/08
Date



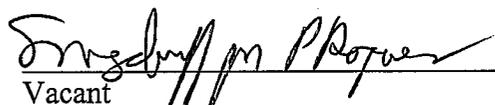
Pat Bohannon
Project Lead, TCEQ SWQM Program

6/27/08
Date



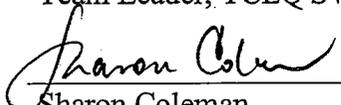
Virgil Fernandez
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6/30/08
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Vacant
Team Leader, TCEQ SWQM Program

6/30/08
Date



Sharon Coleman
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1 juillet 2008
Date



David Manis
Manager, TCEQ Data Management and
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6/30/08
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Edward Ragsdale
CWQMN Quality Control Officer
TCEQ SWQM Program

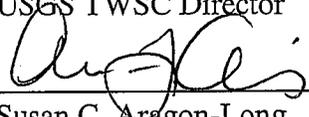
6/30/08
Date

Texas Commission on Environmental Quality
West Fork San Jacinto River Continuous Water Quality Monitoring Network Quality Assurance Project Plan



Robert L. Joseph
USGS TWSC Director

Date



Susan C. Aragon-Long
USGS TWSC Quality Assurance Officer

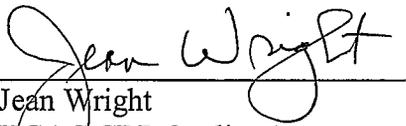
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Jeff W. East
USGS TWSC QW Project Technical Lead

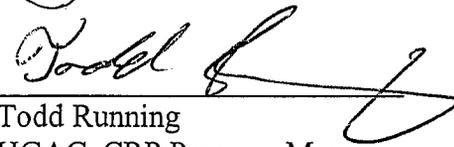
Date

6/27/2008



Jean Wright
HGAC CRP Quality Assurance Officer and Project Manager

6/26/08
Date



Todd Running
HGAC CRP Program Manager

6/26/08
Date

A2 TABLE OF CONTENTS

A1	Approval Page
A2	Table of Contents
A3	Distribution List
A3	List of Acronyms
A4	Project/Task Organization
A5	Problem Definition/Background
A6	Project/Task Description
A7	Quality Objectives and Criteria
A8	Special Training/Certification
A9	Documents and Records
B1	Sampling Process Design
B2	Sampling Methods
B3	Sample Handling and Custody
B4	Analytical Methods
B5	Quality Control
B6	Instrument/Equipment Testing, Inspection, and Maintenance
B7	Instrument Calibration and Frequency
B8	Inspection/Acceptance of Supplies and Consumables
B9	Non-Direct Measurements
B10	Data Management
C1	Assessment and Response Actions
C2	Reports to Management
D1	Data Review, Verification and Validation
D2	Verification and Validation Methods
D3	Reconciliation with User Requirements

Tables:

Table A4.1 – Operator and Site Information

Table A7.1 – YSI 6600 Extended Deployment System (EDS) Performance Specifications.

Table B2.1 – CWQMN - Monitoring Methods and Equipment

A2 LIST OF ACRONYMS

°C	Degrees Celsius
AQI	Ambient Quality Invalid
ASTM	American Society for Testing and Materials
CAMS	Continuous Ambient Monitoring Station
CRP	Clean Rivers Program
CVS	Calibration Verification Sample
CWA	Clean Water Act
CWQMN	Continuous Water Quality Monitoring Network
DO	Dissolved Oxygen
DM&QA	Data Management and Quality Assurance
EC	Electrical Conductance (Reported as Specific Conductance)
FTU	Formazine Turbidity Units
GOES	Geostationary Operational Environmental Satellite
HGAC	Houston-Galveston Area Council of Governments
LEADS	Leading Environmental Analysis and Display System
MOPs	TCEQ Monitoring Operation Division
MQQs	Measurement Quality Objectives
NA	Not Applicable
NTU	Nephelometric Turbidity Units
NIST	National Institute of Standards and Technology
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SC	Specific Conductance
SOP	Standard Operating Procedure
SWQM	Surface Water Quality Monitoring Team
SWQMIS	Surface Water Quality Monitoring System
TBD	To Be Determined
TCEQ	Texas Commission on Environmental Quality
TDS	Total Dissolved Solids
TRACS	TCEQ Regulatory Activities and Compliance System
RPE	Relative Percent Error
µS/cm	micro Siemens per centimeter
USGS	U. S. Geological Survey
WQM&A	Water Quality Monitoring & Assessment Section
YSI	Yellow Springs Instrument

A3 DISTRIBUTION LIST

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY (TCEQ)

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Houston-Galveston Area Council Of Governments

Ms. Jean Wright, CRP Quality Assurance Officer and Project Manager
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Ms. Susan C. Aragon-Long, Quality Assurance Office, USGS Texas Water Science Center

Ms. Stephanie L. Marr, South Texas Program Office, USGS Texas Water Science Center

Mr. Michael Turco, Gulf Coast Program Office, USGS Texas Water Science Center

Mr. Jeff East, Gulf Coast Program Office, USGS Texas Water Science Center

Mr. Lee Bodkin, Gulf Coast Program Office, USGS Texas Water Science Center

A4 PROJECT/TASK ORGANIZATION

This Project Plan describes or references policies, procedures, and protocols for the measurement of water quality by USGS at the sites listed in Table-A.4.1. Please see the CWQMN QAPP for other network details.

Table A4.1 Operator and Site Information

TCEQ Region	Basin	CAMS Number	TCEQ Station ID	USGS Station ID	Operator	Site Location
12	San Jacinto Basin	771	11246	08068000	USGS	W Fk San Jacinto Rv at IH 45, nr Conroe, TX
12	San Jacinto Basin	772	11251	08067650	USGS	W Fk San Jacinto Rv at SH105, nr Conroe, TX

A4.1 TCEQ CWQMN Network Coordinator: (Charles Dvorsky)

- Overall coordination of the Continuous Water Quality Monitoring Network (CWQMN) and primary contact.
- Describes the objectives for the CWQMN.
- Provides overall support for coordination, development, and installation of new Continuous Ambient Monitoring Stations (CAMS).
- Responsible for establishing new monitoring stations and integrating stations into the existing monitoring network.
- Coordinates all document reviews.
- Provides overall support for the ingestion of USGS data into LEADS.

A4.2 TCEQ Project Lead: (Pat Bohannon)

- Complete Site Initiation Form (SIF)
- Participate in development of Project Plan

A4.3 TCEQ Contract Manager: (Virgil Fernandez)

- Manage TCEQ/HGAC contract and amendment(s)

A4.4 HGAC Intergovernmental Agreement Manager: (Jean Wright)

- Manage HGAC/USGS intergovernmental agreement and QAPP amendments.

A4.5 CWQM Site Operator USGS Houston Program Office – Jeff East (713) 560-9618

- Responsible for operation and maintenance of West Fork San Jacinto River CWQMN stations as described below.

All calibration activities will be conducted in a controlled environment (laboratory). USGS will conduct operation of the instruments and site consistent with Standard Operating Procedure (SOP) AMPM-011, Rev 1, Analysis of Dissolved Oxygen (DO), Electrical Conductivity (EC), pH, Temperature, Sample Depth, and *in vivo* Chlorophyll Fluorescence Detection in Ambient Surface Water Using Yellow Springs Instrument (YSI) 6-Series Sondes. CWQMN SOPs for this project can be found on the internet at www.texaswaterdata.org except for turbidity. The USGS will use the YSI 6600 EDS multi-parameter instrument with the YSI 6136 probe for in-situ turbidity measurements. The protocols for operating and maintaining the probe will be consistent with TM1-D3 and USGS National Field Manual Chapter 6.7. Standards used for the calibration of the 6136 turbidity probe will be prepared in house as outlined in USGS NFM 6.8 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 1998. This calibration consists of the use of turbidity free water, deionized water passed through 0.2 micron filter, and 4000 NTU stock formazin solution. Units for the sensor will be reported in Formazin Nephelometric Units (FNU).

Reference documents for USGS protocols may be found at the following locations:

USGS Techniques and Methods 1-D3 (TMI-D3)

<http://pubs.usgs.gov/tm/2006/tm1D3/>

USGS National Field Manual, Chapters 6.7 and 6.8

http://water.usgs.gov/owq/FieldManual/Chapter6/6.7_contents.html

http://water.usgs.gov/owq/FieldManual/Chapter6/6.8_contents.html

Method Summary 3.2

- The DO sensor is a Reliable optical dissolved Oxygen sensor (ROXTM) using luminescence technology. Manufacture calibration and maintenance requirements will be followed.

Method Summary 3.3

- The specific conductance sensor is a flow cell with four pure nickel electrodes for the measurement of solution conductance. Two of the electrodes are current driven and two are used to measure the voltage drop. The measured voltage drop is then converted into a conductance value. Specific conductance uses the temperature and raw conductivity values associated with each determination to generate a specific conductance value compensated to 25°C.

Method Summary 3.6

- The selected YSI sondes include a built in depth sensor... Range: 0-30 feet, resolution: 0.001 feet. Accuracy: at 0-10 feet ±0.01 feet, at 10-30 feet ±0.016 feet.

Method Summary 3.7

- The turbidity sensor measures the presence of suspended and dissolved matter. The sensors direct a light beam from a light-emitting diode into the water sample and measure the light that scatters or is absorbed by the suspended particles in the water. The sensor response is related to the wavelength of the incident light and the size, shape, and composition of the particulate matter in the water. This Project Plan describes sampling, calibration, and CVS procedures.

Procedure 7.4.3 addresses DO membrane calibration.
Procedure 7.4.4 addresses depth sensor calibration.
Procedure 7.4.5 addresses turbidity sensor calibration.

A4.6 Data Validation: USGS Houston Office (713) 560-9618

- Daily examination of CAMS data record to ensure completeness and accuracy of reporting.
- Maintenance of a hard copy validator log with notes sufficient to reconstruct a validation event at a later time and online completion of LEADS Calibration Verifications behind the TCEQ firewall.
- Explanation of lost data.
- Review of operator logs for post-calibration records and general site information.
- Communication with TCEQ Network Coordinator.
- Weekly validation of data record using Manual Validation.
- Monthly validation of hourly data.
- Data will be validated to be consistent with TCEQ Data Validation SOP (CWQM SOP – DQRP-015).

A4.7 Project Participant

Project Technical Lead
Jeff East - USGS Houston Program Office (713) 560-9618

Project Technical Personnel
Lee Bodkin – USGS Houston Program Office (713) 594-7704
Michael Lee – USGS Houston Program Office (713) 560-9614
Michael Burnich – USGS Houston Program Office (713) 560-9899

A5 PROBLEM DEFINITION/BACKGROUND

The West Fork of the San Jacinto River is a freshwater stream located north of the Houston metropolitan area. The river is one of the main tributaries to Lake Houston which serves as the primary source water (surface) for the City of Houston and surrounding region.

The goal of this project is to provide information to support the continued use of Lake Houston as viable source water and to support the development of any future watershed plans.

The Houston-Galveston Area Council of Governments (HGAC) project objective is to collect specific conductance (SC), dissolved oxygen (DO), pH, turbidity and temperature data to support development of a watershed protection plan for Lake Houston and to provide continuous water quality filed data to be used with laboratory data collected under a separate QAPP to develop correlations among the field and laboratory data.

TCEQ anticipates using specific conductance (SC), dissolved oxygen (DO), pH and temperature data for the Clean Water Act (CWA) Section 305 (b) assessment but has no intended use for turbidity data collected under this project plan.

A6 PROJECT/TASK DESCRIPTION

Continuous monitoring of water temperature, SC, DO, pH, and turbidity at the sites listed in Table A4.3 beginning July 8, 2008 through August 31, 2010. USGS will host monitoring data from Table A4.3 locations on their continuous surface water monitoring web pages. TCEQ will decode the data from the NOAAPort and will ingest the data to LEADS. The USGS already operates streamflow gaging stations at these locations (USGS site 08067650, West Fork San Jacinto River Below Lake Conroe near Lake Conroe, TX and USGS site 086800, West Fork San Jacinto River near Conroe, TX). These streamflow sites are operated and maintained consistent with the United States Geological Survey Water-Supply Paper 2175, Measurement and Computation of Streamflow: Volume 1. Measurement of Stage and Discharge; Volume 2. Computation of Discharge (<http://pubs.usgs.gov/wsp/wsp2175/>); and United States Geological Survey Water-Resources Investigations Report 01-4044, Standards for the Analysis and Processing of Surface-Water Data and Information Using Electronic Methods (http://wwwnwis.er.usgs.gov/nwisdocs4_3/WRIR01-4044.pdf). TCEQ will download the daily discharge look-up table for USGS and report the associated discharge for the site in LEADS.

A7 QUALITY OBJECTIVES AND CRITERIA

The measurement performance specifications to support the project objectives are specified in Table A7.1. Methods used are based on *Standard Methods for the Examination of Water and Wastewater*, 20th Edition, 1998 unless otherwise noted.

Table A7.1 – YSI 6600 EDS Performance Specifications

Parameter	LEADS Parameter Code	Units	Method	Calibration Verification Sample Acceptance Limit (CVS) *
SC	10094	µmhos/cm	Standard Method 2510	±5.0% RPE
TDS	10294	mg/l	Calculated by LEADS. Sonde SC measurements are multiplied by 0.65.	≤ 5.0% RPE (SC CVS)
Temperature	10010	°C	Standard Method 2550 B	±0.5° C
pH	10400	pH / units	Glass electrode, Standard Method 4500-H+B	± 0.50 pH unit
DO	10300	mg/L	ASTM D888-05 [^]	% Saturation ≤ 6.0% ± 0.50 mg/L
Turbidity	63680	FNU	Method number ISO7027., method code TS087 using YSI sensor 6136	± 3.0 FNU or ± 5% **
Sample Depth	10078	meters	Pressure Transducer	NA

* CVS criteria for use in the SWQM DQOs

** USGS DQO

[^] Method not based on *Methods for the Examination of Water and Wastewater*, 20th Edition, 1998. EPA Region 6 has approved this method for use in TCEQ's CWQMN.

Ambient Water Reporting Limits (AWRLs)

Ambient Water Reporting Limits do not apply to this project.

Precision

Currently, sonde measurement precision is not being determined.

Bias

As described in section B5 of the CWQMN QAPP.

Representativeness

As described in section B5 of the CWQMN QAPP.

CWQM Comparability

As described in section B5 of the CWQMN QAPP.

CWQM Completeness

The minimum data completeness requirement for water quality is 75 percent valid data for each parameter (DO, SC, pH, Temperature and Turbidity). USGS validation requirements are outlined in Section D2 of this project plan. Periods of no flow or dry conditions necessitate shutdown of some instrumentation and these times are not considered in the goal for data completeness.

A8 SPECIAL TRAINING/CERTIFICATION

According to the TCEQ *Quality Management Plan*, training requirements for contract staff shall be stated in contract specifications if contracted work is part of the project. In accordance with TCEQ agreement number 582-5-72628:

- Manual data validation training will be provided by designated TCEQ personnel to USGS personnel. Manual data validation training has been completed by the following USGS personnel:
 - Michael Lee - USGS Houston Office (713) 560-9614
 - Milton Sunvison - USGS Austin Field Office (512) 940-9393
 - Michael Canova - USGS Austin Field Office (512) 413-5537
 - Jon Snatic - USGS Austin Field Office (512) 423-2517
 - Cary Carman - USGS San Angelo Field Office (325) 280-1352
 - Amy Clark - USGS San Antonio Office (210) 827-0585
 - Chiquita Lopez - USGS San Antonio Office (210) 827-7122
 - Brian Petri - USGS San Antonio Office (210) 414-1285
 - Mick Baldys - USGS Fort Worth Office (817) 253-3470
 - Susan C. Aragon-Long - USGS Austin Office (512) 927-3537
 - Stephanie L. Marr - USGS San Antonio Office (210) 691-9200

A9 DOCUMENTS AND RECORDS

As described in section A9 of the CWQMN QAPP.

B1 SAMPLING PROCESS DESIGN

Site Selection Criteria

The USGS project lead chose monitoring locations that will provide the needed information for the project objectives in section A5 of this project plan.

The USGS has published a method for site selection, design, and operation of continuous water quality stations (USGS Techniques and Methods 1-D3, 2006). (<http://pubs.usgs.gov/tm/2006/tm1D3>).

Monitoring Station Design

Monitoring and/or support equipment are installed in weather-tight aluminum enclosures containing a data logger, modem, telemetry equipment, and various other support equipment.

Monitoring and support equipment:

YSI 6600 EDS

Sutron Satlink with display, 300 baud (HDR) radio.

Yagi antenna

30 watt arrays with charging regulator solar panel.

Site operation and maintenance will be provided by USGS.

B2 SAMPLING METHODS

In-situ water quality, sample depth, and gage height (collected as part of a separate project as discussed in Section A6) measurements are logged once every 15 minutes by the data logger.

Table B2.1 – CWQMN - Monitoring Methods and Equipment

River Basin	Station Location	MetroStar/ LEADS Data Averaging Time	Sampling Method	Measurement Equipment	Telemetry	Station Parameters
San Jacinto Basin	W Fk San Jacinto Rv at IH 45, nr Conroe, TX (CAMS 0771)	Measurement every 15 minutes	YSI 6600 EDS	YSI 6600 EDS	GOES	Surface Temperature Surface SC Surface pH Surface DO Surface Turbidity
San Jacinto Basin	W Fk San Jacinto Rv at SH 105, nr Conroe, TX (CAMS 0772)	Measurement every 15 minutes	YSI 6600 EDS	YSI 6600 EDS	GOES	Surface Temperature Surface SC Surface pH Surface DO Surface Turbidity

Sampling/Measurement System Corrective Action

USGS is responsible for Sampling/Measurement system corrective action. Corrective action measures in the CWQMN QAPP will be taken to ensure the DQOs are attained. The site operator is responsible for monitoring the performance of the measurement and support equipment and identifying problems or potential problems. The site operator is responsible for documenting problems and corrective actions in the appropriate instrument logbook(s).

Operator logbook(s) will be kept throughout the duration of this project, and these will be input to the TCEQ system and CVS pages behind the TCEQ firewall by sufficiently trained USGS personnel.

B3 SAMPLE HANDLING AND CUSTODY

See Section B10 of this project plan for electronic data management.

B4 ANALYTICAL METHODS

Analytical methods are listed in Table A.7.1 of this project plan.

B5 QUALITY CONTROL

As described in Section B5 of the CWQMN QAPP. Please see Table A7.1 for QC criteria. USGS will follow procedures and criteria in TCEQ SOP AMPM-011 Rev 1, Analysis of Dissolved Oxygen (DO), Electrical Conductivity (EC), pH, Temperature, Sample Depth, and *in vivo* Chlorophyll Fluorescence Detection in Ambient Surface Water Using Yellow Springs Instrument (YSI) 6-Series Sondes. CWQMN SOPs are available via the internet at www.texaswaterdata.org. Protocols for operating and maintaining the turbidity record will be consistent with TM1-D3 and the USGS National Field Manual Chapter 6.7.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION AND MAINTENANCE

USGS maintenance documents are based on manufacturers' recommendations. Instrument maintenance activities are documented in equipment dedicated logbooks. Preventative maintenance records contain information on periodic routine maintenance, symptoms, troubleshooting effort descriptions, results and follow-up observations. Records should include the date, time, and the name or initials of the site operator performing the maintenance.

YSI 6-Series operational, maintenance and inspection manuals are being used as guidance for maintenance activities.

TCEQ AMPM-011 Rev 1 is the SOP being used for instrument DO SC, pH, and temperature testing by CVS requirements.

B7 INSTRUMENT CALIBRATION AND FREQUENCY

As described in TCEQ YSI SOP AMPM-01 Rev 1 for DO SC, pH, and temperature. See USGS exceptions listed in A.4.4

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Standards, reagents and parts are purchased using USGS procurement guidelines. Standards and reagents are traceable to NIST standards. Certification of traceability is available upon request.

Site operators are required to keep replacement probes and instrument parts on hand at all times for field equipment.

Standards used for the calibration of the 6136 turbidity probe will be prepared in house as outlined in USGS NFM 6.8 and Standard Methods for the Examination of Water and Wastewater, 20th edition, 1998. This consists of the use of turbidity free water, deionized water passed through 0.2 micron filter, and 4000 NTU stock formazin solution. Units for the sensor will be reported in Formazin Nephelometric Units (FNU).

B9 NON-DIRECT MEASUREMENTS

There are no non-direct measurements used for continuous water quality monitors.

B10 DATA MANAGEMENT

Monitoring site data are stored in a Sutron Satlink data logger and transmitted via GOES satellite to USGS (Austin, Texas) NWIS database once every hour.

TCEQ will decode and ingest data from the NOAAPort and ingest the data to LEADS. TCEQ will download the daily discharge look-up table from USGS and display discharge based on the table.

The USGS will be responsible for water quality through the point of data validation.

USGS will be responsible for detecting and resolving any communications issues with the monitoring sites up to and including the GOES transmission.

The site operator should check the operational status of the station every business day via the USGS website. If communication problems are detected, the site operator needs to initiate corrective action in a timely manner.

C1 ASSESSMENTS AND RESPONSE

As described in CWQMN QAPP.

Corrective Action

As described in the United States Geological Survey Techniques and Methods 1-D3, Guidelines and Standard Procedures for Continuous Water-Quality Monitors.

C2 REPORTS TO MANAGEMENT

The TCEQ CWQMN Network Coordinator and the HGAC Project Manager must be notified in writing of any USGS collected data (only USGS validated data that has been provided to TCEQ) that has been identified by USGS and/or TCEQ as not meeting USGS/TCEQ quality objectives or criteria.

Reports to TCEQ and HGAC Project Management

USGS will provide TCEQ with a report providing the following information when any USGS validated data does not meet quality objectives or criteria:

- Specific data not meeting quality objectives or criteria.
- The quality objective or criteria not met.
- An explanation of impact to data.
- Corrective action.

D1 DATA REVIEW, VERIFICATION, AND VALIDATION

As described in section D1 of the CWQMN QAPP.

D2 VERIFICATION AND VALIDATION METHODS

USGS is responsible for the validation of water quality and discharge data.

As described in section D1 of the CWQMN QAPP. USGS will validate (behind TCEQ's firewall) water quality data using LEADS manual validation tool. USGS will follow: TCEQ SOP DQRP-015 Validation of Continuous Water Quality Monitoring Data Collected by Multiparameter Sonde (Attachment A). This SOP is available at www.texaswaterdata.org

D3 RECONCILIATION WITH USER REQUIREMENTS

USGS Project Lead will make the determination if the data in question are usable. The TCEQ CWQMN Network Coordinator and the HGAC Project Manager will be notified in writing of any USGS collected data that fails to meet user requirements.