ADDENDUM NO. 2

TO

PROCUREMENT AND CONTRACTING REQUIREMENTS

FOR

NineStar CR200 Sewer – Division I

FOR

NINESTAR CONNECT

Issue Date: November 7th, 2023

BIDS ARE DUE BY

Thursday November 9th, 2023

10:00 AM (Local Time)

Attn. Alan Martin, Manager of Water and Wastewater Utilities, NineStar Connect – 2243 E Main Street; Greenfield, IN 46140

This addendum consists of five (5) pages and the following attachments:

Attachment No. 1 – NineStar SCADA Master Plan

The following, as additions to and modifications in the Bidding Requirements and Contract Documents, will be included in, and become a part of the **NineStar CR200 Sewer – Division I**. This Addendum forms a part of the Contract Documents. Bidders are, therefore, instructed to take the following into account in rendering any Bid for this work. Acknowledge receipt of this Addendum in the space provided on the Bid Form.

CHANGES TO PRIOR ADDENDA:

Clarification:

1. The question was asked if contractors would have to be preapproved by INDOT in order to do this project. Contractors will need to be permitted to work in INDOT right of way; however, they will not need to complete this permit or be on any INDOT-specific lists prior to bidding.

CHANGES TO PROCUREMENT REQUIREMENTS: (N/A)

CHANGES TO CONTRACTING REQUIREMENTS: (N/A)

CHANGES TO SPECIFICATIONS:

a. Specification 00 41 13 Article 5 – Basis of Bid Item 6 was updated to show $20,000 Unit Price and $20,000 Total for Maintenance of Traffic.
b. Attachment No. 1 to this addendum is provided to clarify Ninestar instrumentation and controls requirements.

CHANGES TO DRAWINGS: (N/A)

c. On all sheets, the make and model of the PLC requested from Compact Logix L24ER series should be Allen Bradley 5380 Series of PLCs and IO modules. These changes impact the following sheets:
    i. E206, notes 13, 14, 15, 16, 17
    ii. E306, notes 13, 14, 15, 16, 17
    iii. E403, notes 20, 37, 38, 39, 40
    iv. NOT the L24ER-QBFC1B called out on E141, note 16
d. On all sheets where a FIBER TO ETHERNET CONVERTER/SWITCH is specified:
    i. Instead should read -- "Ethernet switch to be provided by NineStar Connect".
e. On sheets E206, E306, and E403 – Delete the HMI from these panels.
f. On sheet E202, note 36 (and specifications) – instead of the specified MUT2200US Magnetic Flow Meter owner requests an equivalent Magnetic Flow Meter from either Rosemont or Siemens manufacturers as an alternative.
g. On sheet E202, note 35 – instead of the specified PDA2300-Series enclosure, substitute the Flow Meter manufacturer's equivalent FIT as an alternative.
h. Sheet E206, note 29 – Instead of one (1) Analog ISB there should be 3. The ISB's should also be used for the flow meter signals as well.
i. Sheet E304, note 25 – This 4-channel digital ISB does not require a box. The box may be deleted.

CHANGES TO MISCELLANEOUS DOCUMENTS: (N/A)

SUBMITTED QUESTIONS/REQUESTS & RESPONSES:

2. <u>Emailed Questions</u>
    a. Q: I couldn't find the auger channel depth or the top of vault elevation on the drawings. Can you please let me know?
        i. A: The top of concrete at the headworks is designed at 859.00. The channel bottom is located on C708, which shows channel at a 1% slope discharging at 855.00. This means channel depth is approximately 4 feet.
    b. Q: Please confirm whether the auger discharge is to be off to the side or straight down?
        i. A: The discharge of the Auger screenings should drop straight down into a dumpster.
    c. Q: Is the intent for Wessler to take care of the programming for this project or can our I&C sub include this in their scope?
        i. A: Wessler will handle all SCADA programming as an on-call directly for NineStar and will work with the I&C but if the integrator is working off our SCADA Master Plan then all the equipment should be correct.
    d. Q: At what point does the Division I contractor pick up the 8" Dual Force Mains that discharge at the new Headworks?
        i. A: The Division II contractor will need to bring force main all the way to the headworks site, and bring the pipe above ground and cap. The Division I contractor will then hook on and finish the remaining above-grade portion of the work.
    e. Q: Bid form states an MOT allowance but no allowance is specified. Can an allowance amount be provided?
        i. The allowance is up to a maximum of $20,000.
    f. Q: Specification 33 32 19 2.3\J-Is a coating required on any of the precast structures? If so, can a product be specified?
        i. A: In specification 33 05 13 – Part 1.M.2, it calls for two coats of a bituminous coating when precast structures are below the groundwater table at the owner's discretion. On wet wells, according to 33 32 19 – Part 2.3.J states that an impregnated coating be used to prevent buildup. NineStar Connect does not have any specific standards for coating requirements. Please bid based on a coating that meets AWWA/ASTM standards.
    g. Q: The MBE and WBE goals: Are we to use INDOT certified MBE and WBE's or can they be certified on any local or national list?
        i. A: Any MBE/WBE business is acceptable. These goals and the good faith efforts worksheet are simply to show that you have made an attempt to work with such

companies. There are no minimum percentage requirements to bid the project, only goals.

h. Q: Please confirm a generator is not required in Division 1. No specifications are given.
    i. A: Generator(s) are required according to Addendum Number 1. Please refer to the addendum adjusted drawings as well as additional specifications for more information.
i. Q: Page C701 drawings- what size area velocity flow meter is required? No size given.
    i. A: 8" flow meter is required.
j. Q: Page C701 drawings- A note reads "Proposed stairs. See details on page C902." No details were given on sheet C902. Can a detail be added for the stairs?
    i. A: Apologies. The stair detail can actually be found along the top of page C901 under "Steel Stair Detail."
k. Q: Can the limits of clearing & grubbing at the boulders location be given? Currently no limits and a very vague note.
    i. A: All tree clearing work will be done by others for both divisions where indicated on the drawings (Addendum No. 1). As far as general grubbing, the contractor should clear an area large enough to do site work as drawn.
l. Q: C704-Note A- states "Contractor to grout existing 8-inch core." Can this be clarified or defined? What core are we grouting?
    i. A: There is an 8"-diameter hole that connects the existing headworks to the existing Aeromod facility. This hole will need to be grouted when the existing headworks is removed to ensure that wall of the WWTP remains water-tight.
m. Q: At the Philadelphia site- will the Aeromod tank be drained by others to allow connection of the 12 inch pipe?
    i. A: Ninestar is currently operating the Aeromod facility and will drain the tankage as appropriate to complete work.
n. Q: Page C900 drawings detail HDPE pipe transition-Will the division 2 contractor be required to provide this detail or will the Division 1 contractor? I think we just stub out 2-5' from the structures and cap for future connections by Division 2 contractor.
    i. A: The Division I contractor will be responsible for the stub as you describe. Coordination should be done with the Division II contractor to connect linear work to proposed facilities; which will likely include the transition detail.
o. Q: Please confirm all stairs are to be both galvanized and painted.
    i. A: See sheet S100 for information regarding the stairs. More specifically. The Note states "ALL STRUCTURAL STEEL GRATING AND HARDWARE SHALL BE

HOT-DIP GALVANIZED. ALL FIELD WELD SHALL BE TOUCHED UP WITH TWO COAT OF GALVANIC PAINT."

p. Q: Is Wessler only providing integration services and the software for the SCADA system?
    i. A: This is correct. Wessler will not be providing the hardware. Wessler would have a separate contract with NineStar and not through the bidding process of this project.
q. Q: Is the Sugar Creek Lift Station hatch to be reused or replaced? The note on C702 'Existing 36"X54" Access Hatch. Contractor to field verify hatch size prior to placing order' is unclear.
    i. A: The necessary hatch size will need to be verified in field. The contractor should determine whether this could be replaced in kind or upsized.
r. Q: Will equal screens be allowed to bid?
    i. A: We prefer the in-line grinder but are open to reviewing any or-equal products during the submittal process.
s. Q: Is there a plan for dealing with the dewatering discharge from wet wells? The FM Combo Vault, and the CR 300 North Lift Stations location do not have a stream close by to run discharge to.
    i. A: The discharge from the wet wells shall be discharged into the nearest stormwater inlet or ditch.
t. Q: Is the auger in the screen stainless or carbon steel?
    i. A: SECTION 46 24 36 - MODULAR GRINDING-SCREENING-COMPACTING EQUIPMENT – This specification references stainless steel.

+ + END OF ADDENDUM + +

PLEASE ACKNOWLEDGE THIS ADDENDUM IN THE BID FORM YOU SUBMIT.

Aaron Crow

Certified:_____
Engineer

Date: 11/07/2023

BID FORM

NINESTAR CONNECT

CR 200 W Sewer – Division I

TABLE OF CONTENTS

Page

ARTICLE 1 – BID RECIPIENT

1.01 This Bid is submitted to:

NineStar Connect

2243 East Main Street

Greenfield, IN 46140

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 – BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for 60 days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 – BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, and any data and reference items identified in the Bidding Documents, and hereby acknowledges receipt of the following Addenda:

Addendum No.	**Addendum, Date**
_____	_____
_____	_____
_____	_____
_____	_____

B. Bidder has visited the Site, conducted a thorough, alert visual examination of the Site and adjacent areas, and become familiar with and satisfied itself as to the general, local, and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and has satisfied itself as to all Laws and Regulations that may affect cost, progress, and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or adjacent to the Site and all drawings of physical conditions relating to existing surface or subsurface structures at the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings, and (2) reports and drawings relating to Hazardous Environmental Conditions, if any, at or adjacent to the Site that have been identified in the Supplementary Conditions, especially with respect to Technical Data in such reports and drawings.

E. Bidder has considered the information known to Bidder itself; information commonly known to contractors doing business in the locality of the Site; information and observations obtained from visits to the Site; the Bidding Documents; and any Site-related reports and drawings identified in the Bidding Documents, with respect to the effect of such information, observations, and documents on (1) the cost, progress, and performance of the Work; (2) the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder; and (3) Bidder's safety precautions and programs.

F. Bidder agrees, based on the information and observations referred to in the preceding paragraph, that no further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price bid and within the times required, and in accordance with the other terms and conditions of the Bidding Documents.

G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.

H. Bidder has given Engineer written notice of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and confirms that the written resolution thereof by Engineer is acceptable to Bidder.

I. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance and furnishing of the Work.

J. The submission of this Bid constitutes an incontrovertible representation by Bidder that Bidder has complied with every requirement of this Article, and that without exception the Bid and all prices in the Bid are premised upon performing and furnishing the Work required by the Bidding Documents.

ARTICLE 4 – BIDDER'S CERTIFICATION

4.01 Bidder certifies that:

A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any collusive agreement or rules of any group, association, organization, or corporation;

B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid;

C. Bidder has not solicited or induced any individual or entity to refrain from bidding; and

D. Bidder has not engaged in corrupt, fraudulent, collusive, or coercive practices in competing for the Contract. For the purposes of this Paragraph 4.01.D:

1. "corrupt practice" means the offering, giving, receiving, or soliciting of any thing of value likely to influence the action of a public official in the bidding process;

2. "fraudulent practice" means an intentional misrepresentation of facts made (a) to influence the bidding process to the detriment of Owner, (b) to establish bid prices at artificial non-competitive levels, or (c) to deprive Owner of the benefits of free and open competition;

3. "collusive practice" means a scheme or arrangement between two or more Bidders, with or without the knowledge of Owner, a purpose of which is to establish bid prices at artificial, non-competitive levels; and

4. "coercive practice" means harming or threatening to harm, directly or indirectly, persons or their property to influence their participation in the bidding process or affect the execution of the Contract.

ARTICLE 5 – BASIS OF BID

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following price(s):

ITEM	Description	Unit	Estimated Quantity	Unit Price	Total Price
1	Sugar Creek WWTP and Lift Station, Complete	LS	1		
2	CR300 Lift Station, Complete	LS	1		
3	Combination Valve Vault, Complete	LS	1		
4	Boulders Lift Station, Complete	LS	1		
5	Philadelphia WWTP Work, Complete	LS	1		
6	Maintenance of Traffic	ALLOW	1	$20,000	$20,000

Total Base Bid Price $ _____

ARTICLE 6 – TIME OF COMPLETION

6.01 Bidder agrees that the Work will be substantially complete and will be completed and ready for final payment in accordance with Paragraph 15.06 of the General Conditions on or before the dates or within the number of calendar days indicated in the Agreement.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages.

ARTICLE 7 – ATTACHMENTS TO THIS BID

7.01 The following documents are submitted with and made a condition of this Bid:

A. Required Bid security;

B. List of Proposed Subcontractors;

C. List of Proposed Suppliers;

D. List of Project References;

E. Bidder's License No.: _____ demonstrating evidence of authority to do business in the state of Indiana.

F. Required Bidder Qualification Statement (Form 96) with supporting data;

G. American Iron and Steel Certification;

H. Good Faith Efforts Worksheet ;

I. E-Verify Affidavit

ARTICLE 8 – DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders, the General Conditions, and the Supplementary Conditions.

ARTICLE 9 – BID SUBMITTAL

BIDDER: *[Indicate correct name of bidding entity]*

_____

By:
[Signature] _____

[Printed name] _____
(If Bidder is a corporation, a limited liability company, a partnership, or a joint venture, attach evidence of authority to sign.)

Attest:
[Signature] _____

[Printed name] _____

Title: _____

Submittal Date: _____

Address for giving notices:

_____

_____

_____

Telephone Number: _____

Fax Number: _____

Contact Name and e-mail address: _____

_____

Bidder's License No.: _____
(where applicable)

(NO TEXT FOR THIS PAGE)

WESSLER ENGINEERING

NineStar CONNECT

SCADA MASTER PLAN

WESSLER ENGINEERING
integrations@wesslerengineering.com

Contents

1. Introduction

1.1. Objectives of the SCADA Master Plan

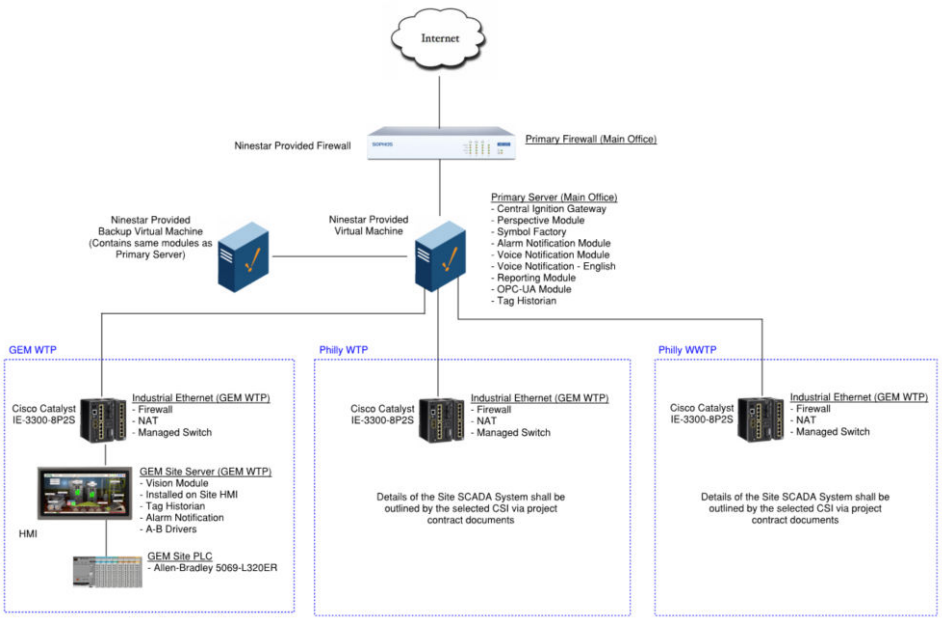
The development of a SCADA Master Plan is critical in establishing equipment standardization and the comprehensive plan for all upcoming SCADA improvements for Ninestar Connect. It serves as the roadmap for all future upgrades to existing and future sites to provide several benefits to Ninestar Connect, including:

1) Equipment Commonality for all Ninestar sites
2) Reducing Automation Complexity by streamlining upgrades with common equipment
3) Reduced Operator Training from site-to-site because of common equipment
4) High Equipment Accessibility
5) Wide Support Network
6) Overall Reduced Project Cost

This document addresses the major elements of the control system of operator interfaces and programmable logic controllers (PLCs), and provides the recommended hardware and software associated with this equipment. Recommendations will also be made for best practice installation guidelines, as well as configuration guidelines. This document should be used as a reference for all upcoming capital improvement projects by the Control System Integrator (CSI) bidding the project.

This plan is intended to serve as the foundation for the SCADA system design and all future capital improvement projects for Ninestar Connect. This plan shall be a living document and shall be upgraded as needed to keep the plan contents as a current representation of the SCADA System equipment and architecture. Ninestar Connect shall own the rights and privileges of this document and be the sole requestor for all changes made within.

2. SCADA System Overview



2.1. General System Overview

In General, a SCADA System is a collection of all of the components that allow an operator to access data and operate a facility's control system from a common location. These components include field devices, Programmable Logic Controllers (PLCs), Operator Workstations (OWS), Human-Machine Interfaces (HMIs), Servers, Clients, and the remaining equipment and software packages that are required to gather information from field conditions and display them to an operator. SCADA Systems and SCADA programming also offer the ability to automate certain control processes, making plants more self-sufficient, and less dependent on operators.

Adding a SCADA System to the existing Ninestar Connect treatment facilities will take advantage of these benefits and allow Ninestar operators and staff to more effectively run their processes, and alert them when critical faults or conditions happen at their facilities. Furthermore, the Ninestar staff skillset, networking understanding, and communication infrastructure exists to modernize and consolidate all current treatment facilities into a single, remote accessible, graphical user interface. This allows the Ninestar staff the ability to access plant data for any of Ninestar's connected water or wastewater treatment facilities from one central HMI client. This is achieved using specialized software running on a Primary Server located at Ninestar's main office that is networked to each of the treatment facilities.

In addition to the main site server, each treatment site shall contain one server and one or more clients that allow an operator located at that site to access the data and control the treatment facility in which the client is located. This is achieved by specialized software running on Workstation or Industrial Touchscreen PCs located at each treatment facility. Details of the Primary and Site Servers, clients, and software are located throughout this report, and a detailed system overview diagram is located in Appendix B for further reference.

2.2. Ninestar Primary Server

Ninestar Connect's primary server is a Win Server 2019 virtual machine installed on a server located at the main office. This server will be specified and maintained by Ninestar Connect IT staff. The main functions of this server are to handle the alarm notification communications for all Ninestar plant facilities, provide remote accessibility to plant data, and to consolidate and store the plant data for historical records and weekly/monthly reporting. It is recommended that this Virtual Machine be redundant and supported by Ninestar's IT department. Details of the Primary Server functions are as follows:

2.2.1. Alarm Notification Functions

Under normal operation, the Primary Server monitors the alarm tags communicated from each site's server. For example, the GEM WTP alarm tags are communicated from the GEM WTP Site Server via gateway-to-gateway communications to the Primary Server. The Alarm Notification Module located on the Primary Server will then monitor these conditions and send the appropriate alarms to Ninestar's operational staff when the pre-defined alarm conditions are met. For Ninestar Connect, the notifications will be sent as Voice Notifications and emails. Details of the schedule, on-call roster, and call numbers will be configurable by Ninestar Connect staff via the Perspective Module client.

When the connection between the Primary and the Site Server is lost, the Site Servers will notify Ninestar Connect staff that a loss of communication event has occurred via a connected Omni-site alarm notification system. The site servers will continue to track and display alarms on the site clients located at each treatment facility. Once connection to the Primary Server is re-established, normal operation outlined above will resume.

2.2.2. Reporting Functions

The Reporting Module installed on the Primary Server will send customized reports to Ninestar Connect on a frequency defined through the client. These reports are specific to the site in which the reports are generated and shall be detailed for each site by the CSI via contract documents.

Each site shall communicate the proper data to the Primary Server for the reports to be printed in the main office at the selected frequency.

2.2.3. Remote Accessibility

The Perspective Module installed on the Primary Server will allow the CSI to develop specialized SCADA screens for Ninestar Connect that are accessible outside of the connected network. Since the development of these screens shall be located on the Primary Server, the information at all connected plants can be displayed through a Perspective Client to be accessed by remote staff with the appropriate credentials. The CSI shall establish a layered approach to security of remote accessibility by implementing the use of the following hardware and software practices:

2.2.3.1. Ninestar Connect Firewall Appliance

Ninestar Connect's IT department shall install and maintain a firewall appliance that will safeguard the Primary Server from unauthorized access. This appliance shall be specified by Ninestar Connect staff, and the CSI shall work directly with Ninestar's IT staff to ensure proper remote accessibility to the Primary Server.

2.2.3.2. Multi-Factor Authentication

Ninestar Connect utilizes multi-factor authentication services provided by Duo. The Perspective Module located on the Primary server shall be set up to require MFA of any remote access to a Perspective Client.

2.2.3.3. Security Levels and User Roles (Ignition Software)

The use of security levels is required for all Ninestar projects and shall be installed on both the Primary Server Perspective Modules and each Site server Vision Module. Security Levels will allow Ninestar to configure security permissions to different groups of personnel, such as operators, supervisors, and Engineers.

2.2.3.4. Security Zones (Ignition Software)

The CSI shall set up the appropriate security rules based on the location of the operator trying to obtain access to the system. Details of this authentication shall be discussed with Ninestar Connect staff for each remote site project, and shall be detailed in each project documentation.

2.3. Site Servers

Each site shall contain at least one Site Server that contains the Ignition Gateway needed to communicate the plant information to the Primary Server. This server shall also contain, at minimum, the Vision Module, Tag Historian Module, Alarm Notification Module, and all appropriate drivers to communicate to the site PLCs. The site server can be in the form of any Windows based computer or Industrial Touch panel that meets the criteria outlined in Section 3.2.2 of this plan. Communication to this server shall be over Ethernet to an on-board RJ45 jack. Use of third-party devices, such as Ethernet to serial converters, shall not be used on new equipment.

The function of these servers is to provide the operator the ability to control the facility locally, to provide the tag communications to the Primary Server, and provide the appropriate databases needed for historical datalogging when the connection to the Primary Server has been lost. Details of these functions are outlined below:

2.3.1. Local Facility Control

Each site server shall utilize Inductive Automation's Vision module to provide the operator the appropriate graphics to control the site locally from the HMI or OWS. In addition, the proper Allen Bradley drivers must be utilized for communication to the plant PLCs.

During Site design, all details for each site control scheme shall be clearly communicated to Ninestar Connect through detailed specifications submitted to Ninestar Connect for review. As part of these specifications, the responsible CSI must submit a detailed control narrative to indicate the operation of site controls for each treatment facility. Among these details, the following controls hierarchy must be observed:

1st Priority: Manual Control using H-O-A switches, hardwire interlocks and Manual Operations

2nd Priority: Control commands issued from local HMIs

3rd Priority: Control commands issued from the Primary Server

2.3.2. Tag Communications

Ninestar's SCADA platform utilizes multiple servers set up on an Ignition Gateway Network to pass tag information from each site server to the primary server. During the design of each site server HMI, the CSI shall work with Ninestar Connect staff to establish the tags that will be broadcast to the Primary Server for each site for remote viewing. These tags shall be passed continuously from the site server to the Primary server any time that communication is established between the site server and the Primary Server.

2.3.3. Local Datalogging

If the site servers cannot communicate to the Primary Server, the site server must contain the appropriate databases to preserve critical historical data. The data that shall be preserved in this scenario shall be identified during the site project design between the CSI and Ninestar staff. The database on the site server must be large enough to contain the data for a minimum of 5 days.

3. Human Machine Interface (HMI) Details

3.1. HMI Software Platform Overview

The Human Machine Interface (HMI) software is the software that allows the operator to monitor, control, and access the data for each facility via a computer application. The HMI Software Platform for Ninestar Connect shall be developed, launched and maintained using Inductive Automation's Ignition platform. This platform consists of several modules that make up the SCADA System, and are outlined in the following pages.

3.1.1. Ignition Vision Module

The vision module is the hub of each site's internal SCADA System Gateway and is used to develop the graphics for each site. This module allows the developer to construct the various screens needed for the HMI, integrate the necessary databases, and launch runtime clients on the site's local network. For Ninestar Connect, the vision module will be used at each facility for the HMI screen development, connection to the field PLCs, and the host for all graphics libraries specific to Ninestar Connect.

3.1.2. Ignition Perspective Module

The Ignition Perspective Module is the module used to bring remotely accessible screens to remote devices. This module allows the developer to design SCADA system graphics for any size screen and run in any browser and on mobile devices. This module also allows the developer to integrate modern cybersecurity protocols, such as multi-factor authentication, for access to the SCADA screens. For Ninestar Connect, this module shall be used on the main server, and shall utilize Duo as the MFA host for all multi-factor authentication functions.

3.1.3. Ignition Alarm Notification Module

The Alarm Notification Module is used to configure alarm notifications to go to whoever, whenever, and for whatever reason. This module allows Ninestar Connect to configure alarm groups, schedules and escalations for its staff and is to be configurable within the client for each site. The Control System Integrator is responsible for ensuring access to the configuration of the alarm scheduler from the client. Ninestar Connect shall not be required to log into the Gateway for any alarm notification changes. The Alarm Notification Module allows users to receive and acknowledge alarms via 2-way email.

Ninestar Connect has standardized on both email and voice communications for alarm notifications. Email notifications are included in the Alarm Notification Module, as outlined above. The Voice Notification Module (detailed below) shall be utilized for each Ninestar Connect project to allow for the use of alarm notification and acknowledgement via phone call. The specific setup of each module shall be outlined in the contract documents for each project.

3.1.4. Ignition Voice Notification Module

In conjunction with the Alarm Notification Module, the Voice Notification Module uses text to speech technology to notify users of an alarm via a phone call. Users can acknowledge these alarms with a simple code input during the phone call. This module allows for multiple languages to be used. Ninestar Connect has standardized on the English language to be used for this service. Additional language modules can be purchased at the direction of Ninestar Connect if necessary. This module requires a SIP-compatible VoIP service or the use of an ATCOM IP02 bridge for use with a standard phone line.

3.1.5. Ignition OPC-UA Module

The Ignition OPC-UA Module implements both OPC-UA Server and Client functionality. As an OPC-UA Server, it comes with the necessary drivers to connect to popular industrial devices, such as Allen-Bradley PLCs and Modbus devices. As a client, the OPC-UA Module allows for connection to third-party OPC UA servers. Another added benefit to Ignition using this module is the benefit of being able to deploy clients on virtually any Operating System. For Ninestar Connect, all projects will be deployed on the Windows Operating System, with the specifics of each project to be contained in each project's contract documentation.

3.1.6. Ignition Allen Bradley Driver Suite

The Allen-Bradley Ethernet driver is used to communicate with most Allen-Bradley Ethernet Programmable Logic Controllers (PLCs), and is part of the OPC-UA module. For Ninestar Connect, the Allen-Bradley driver suite must include, at minimum, the ControlLogix and CompactLogix

firmware v21 and newer driver. This ensures proper connection to the Ninestar Connect standardized PLCs outlined in Section 4.

3.1.7. Ignition Reporting Module

The Ignition Reporting Module allows for the Control System Integrator (CSI) to generate custom reports for Ninestar Connect. These reports shall be used to convey plant Key Process Indicators (KPIs) and identify both immediate and progressive process issues within the Ninestar Connect facilities. The reporting module shall be utilized for each project to produce reports specific to that project's facility. These reports shall be set up on schedules and delivered to Ninestar Connect as specified in the project contract documents. At a minimum, these reports shall be emailed to the project Owner and saved on Ninestar Connect servers at a specified timeframe per Ninestar Connect direction.

3.1.8. Ignition Tag Historian

The Tag Historian Module allows the CSI to set up tags to be loaded to a database to allow the Owner to view historical tag values in SCADA or in SCADA generated reports. This module largely runs in the background and stores critical tag information into a database that works seamlessly with the Vision Module to present historical data. Tags that will utilize the Tag Historian Module shall be outlined in each project's contract documents.

3.2. HMI Hardware and System Requirements

The SCADA HMI software modules outlined in Section 3.1 shall be selected, configured and installed on the appropriate hardware for each location by the Controls System Integrator. The CSI shall work with Ninestar Connect directly to identify the required functions and detail the installation of the software modules in the project documentation for each capital improvement project. The following sections outline the system requirements for the Primary Server location and the GEM WTP location as a reference for each site location.

3.2.1. Main Site (Primary Server) System Requirements

Ninestar Connect's main site will contain the Central Ignition Gateway located on the Primary Server. This server must have the following minimum requirements:

Description	**Minimum Requirement**
HMI Software Version:	Ignition 8.0.6
Processor:	Dual Core Processor
RAM:	32GB
Hard Drive Space:	1TB
Operating System(s):	Windows Server 2019
Supported Databases:	Microsoft SQL Server
	Oracle
	MySQL
Supported Browsers:	Google Chrome
	Microsoft Edge
	Apple Safari

3.2.2. Site Server System Requirements

Ninestar Connect's GEM Water Treatment Facility will operate as an independent site running, at minimum, a vision module, tag historian, and the appropriate drivers for Allen-Bradley PLCs. The GEM Server must have the following requirements:

Description	**Minimum Requirement**
HMI Software Version:	Ignition 8.0.6
Processor:	Dual Core Processor
RAM:	32GB
Hard Drive Space:	512GB SSD
Operating System:	Windows 10 Pro

Supported Database:	MySQL
Supported Browsers:	Google Chrome

4. Programmable Logic Controllers

4.1. Overview

The Programmable Logic Controllers (PLCs) are the computers that link the field equipment and instrumentation to the HMI System and allow the operator to read, analyze and control the system based on the Inputs and Outputs (I/O) from the field devices. Often, a PLC is made up of a central processing unit (CPU) as well as hardware modules that serve specific functions that the CPU acts upon. These modules may include input modules that supply instrumentation status to the CPU, output modules that help control field equipment, and communication modules that help in network connectivity from PLC to other PLCs or field devices. PLCs are specifically manufactured to be mounted in strategic locations near field devices and handle harsh industrial environments much better than standard computers. PLCs are set up and programmed by Control System Integrators, using proprietary software specifically developed for the control of that particular PLC. Ninestar Connect has specified the use of Rockwell Automation PLCs for commonality among all Ninestar sites. The following sections outline the standard PLC hardware and software to be used at all Ninestar Connect sites.

4.2. Rockwell Automation Programmable Logic Controller (PLC)

For general use in the Water and Wastewater Industries, Rockwell Automation offers two different Programmable Logic Controller families; ControlLogix and CompactLogix PLCs. ControlLogix PLCs are classified as “Large Control Systems” PLCs and are typically used in large, multi-site locations that contain large amounts of I/O or demand a higher CPU usage for processing. For medium to smaller scale facilities, Rockwell’s CompactLogix PLCs provide a more cost-effective solution without sacrificing performance. Both families can exist simultaneously within a single facility and can communicate to each other seamlessly. The CompactLogix and the ControlLogix families share a common development software platform, making it extremely easy to switch between the two PLC families.

Although either platform can be used, Ninestar Connect utilizes Rockwell Automation’s CompactLogix family of PLCs for all Water and Wastewater facilities. Within the CompactLogix family, there are several models of PLCs with different feature sets and functions that can be used based on different

applications. For simplicity and commonality, Ninestar Connect has standardized PLCs from the CompactLogix 5380 Controller models. Based on demand of each site, a selection from within this family/model is recommended. The following PLCs have been standardized for Ninestar Connect:

Part Number	Description	Application
5069-L306ER	600KB Ethernet Controller	Remote Tanks, Lift Stations, Small Applications
5069-L310ER	1MB Ethernet Controller	Small Building Controls Applications
5069-L320ER	2MB Ethernet Controller	Plant PLCs, Medium Applications
5069-L330ER	3MB Ethernet Controller	Larger I/O Applications

A selection of a PLC within this family ensures the software that the System Integrator uses for programming to be common across all facilities, as well as to provide for common replacement parts for all locations. For Ninestar Connect, the PLC development software is to be Rockwell Software Studio 5000, version 30 or later.

4.3. Rockwell Automation Remote Ethernet Adapters

Some applications may require the use of Remote I/O Ethernet adapters. These adapters are used in locations that require the consolidation of I/O, but utilize the CPU of a nearby PLC. These adapters connect to the nearest PLC via Ethernet/IP (Rockwell's primary communication protocol) via CAT6 Ethernet cables or Fiber optic connections. For Ninestar Connect, these adapters shall be of the following family:

Part Number	Description	Application
5069-AENTR	Compact I/O Slim EtherNet/IP Adapter	Remote I/O Communications
5069-AEN2TR	Compact I/O Ethernet/IP Adapter	Remote I/O Communications

While there are several benefits of using these adapters, the System Integrator shall be aware that these devices rely on the network connection to the PLC to operate and shall use these adapters appropriately.

4.4. Rockwell Automation CompactLogix I/O Modules

The CompactLogix I/O modules are the hardware devices specifically designed for CompactLogix PLCs to connect the outside world to the CPU. There are five basic types of modules available for the CompactLogix hardware platforms. These types can be classified as:

Module Type	Short Description
Digital IO	All On/Off Status and Control
Analog IO	Instruments with variable inputs/outputs (i.e. 4-20mA signals)
Communications	Communication to field devices
Address Reserve	Reserves software addresses within the PLC
Potential Distributors	Allows for multiple voltages to be used on a single backplane

The following sections will outline each module type, and further expand on the application and operation of each.

4.4.1. CompactLogix Digital Input Modules

The CompactLogix Digital Input Modules are used to notify the PLC CPU when a connected field device signal is in the ON or OFF state. Ninestar Connect has standardized on two digital input modules, based on the voltage of the connected field device used. These part numbers are as follows:

Part Number	Description
5069-IA16	16-point 120/240V AC Input Module
5069-IB16	16-point 10-32V DC Input Module

4.4.2. CompactLogix Digital Output Modules

The CompactLogix Digital Output Modules are used to allow the PLC CPU to turn ON and OFF various field devices. Ninestar Connect has standardized on three different types of digital output modules: AC digital outputs, DC digital outputs, and relay output modules. The part number for these modules are as follows:

Part Number	Type	Description
5069-OA16	AC Digital Output	16-point 120/240V AC Output Module
5069-OB8	DC Digital Output	8-point 24V DC Output Module
5069-OB16	DC Digital Output	16-point 24V DC Output Module
5069-OW4I	Relay Output	4-point Isolate Relay Output Module
5069-OW16	Relay Output	16-point Relay Output Module

4.4.3. CompactLogix Analog Input Modules

The CompactLogix Analog Input Modules are used by the PLC to read inputs from field devices that measure conditions that are varying. In most cases, these signals are represented by a 4-20mA signal being sent from the field device to the PLC. Other field devices may send these varying signals as a 0-10V DC signal. In either case, the following CompactLogix Analog Inputs are able to interpret these signals, and have been standardized to all Ninestar Connect facilities:

Part Number	**Description**
5069-IF8	8-channel current/voltage input module
5069-IY4	4-channel current/voltage/RTD/Thermocouple input module

4.4.4. CompactLogix Analog Output Modules

The CompactLogix Analog Output Modules are used by the PLC to output varying signals to field devices. Some examples of this type of signal may be valve position or motor speed commands to a VFD. Like the Analog Input Module, in most cases, these signals are either 4-20mA or 0-10V DC signals, depending on the field device connected. Ninestar Connect has standardized on the following Analog Output Modules:

Part Number	**Description**
5069-OF4	4-channel current/voltage output module
5069-OF8	8-channel current/voltage output module

4.4.5. CompactLogix Communications Modules

The CompactLogix Communications Modules give the ability to the PLC to communicate to other common industrial protocols. Ninestar Connect has standardized on the use of a serial communication module to interface to RS-232 and RS-485 devices:

Part Number	**Description**
5069-SERIAL	2-channel serial communication module

4.4.6. CompactLogix Address Reserve Modules

The CompactLogix PLC indexes the internal IO addresses by the physical location of each module placed in the PLC rack. When programming, the System Integrator uses these addresses to program the PLC CPU to act upon the appropriate IO that is connected to that specific card. When planning for future upgrades, an Address Reserve Module (ARM) may be used to allocate IO for future projects. Ninestar Connect has standardized on the use of Address Reserve Modules when appropriate, and is listed as follows:

Part Number	**Description**
5069-ARM	Address Reserve Module

4.4.7. CompactLogix Field Potential Distributors

The CompactLogix PLC platform architecture utilizes a backplane that contains two power busses for the IO modules. These are identified as MOD power and SA power. The MOD power bus provides the 24VDC power required for the connected IO modules to simply turn on and communicate to the PLC CPU. The SA power bus provides the power required for the connected field devices to that specific IO module. By default, the SA power is distributed to the voltage source that is connected to the PLC. If this source is 24VDC, and the system requires 120VAC signals to be brought to the PLC as well, a field potential distributor must be used. For Ninestar Connect, the following FPD modules have been standardized:

Part Number	**Description**
5069-FPD	Field Potential Distributor Module

4.5. Programming Software and Practices

4.5.1. Programming Software Details

The Programming platform that is used to develop software for the specified Allen Bradley PLCs is Rockwell Software Studio 5000. For all Ninestar Connect projects, version 30.0 or newer must be used for the development of PLC software. It is the CSI's responsibility to ensure that the version that is being used for the plant PLCs is compatible with the overall SCADA System, and that tags can be read on both the Site Servers and the Primary Server.

4.5.2. PLC Programming Practices

Common programming practices shall be utilized for the programming of all Ninestar Connect PLCs. The CSI is responsible for the overall architecture of the PLC software design, however, a few common practices shall be observed. These practices are as follows:

4.5.2.1. Tagging

PLC tags must be Controller Scope tags and descriptive in nature. For all tags, the use of operand descriptions is encouraged. The use of memory addresses from prior PLC programming platforms shall not be used (i.e. N7:10 to describe an integer address). Tag names and descriptions shall be active high, and descriptive to the connected equipment (i.e. a contact on a valve indicating an opened condition shall not be tagged "Valve1_Not_Closed". In this example, the tag shall read "Valve1_Opened").

4.5.2.2. I/O Tag Mapping Routine

Dedicated routines shall be used specifically for the mapping of hardwire I/O to internal PLC tags. This allows the CSI to quickly change the source and destination of internally programmed tags to other I/O points in the event a change in wiring is needed. The use of alias tags shall not be used for Ninestar Connect projects.

4.5.2.3. Fault Routines

Routines shall be designed within the PLC software to specifically handle the conditions that will call for faults. These routines shall be written in Ladder Diagram, and executed on every scan of the task. All critical process faults shall be latched, with human intervention required for reset.

5. Networking and Miscellaneous Equipment

5.1. Control Panel Ethernet Switches

The Ethernet Switches to be used at each field location shall be a Cisco IE-3300-8P2S and provided by NineStar Connect. These switches will be installed and configured by NineStar IT personnel, however, the CSI shall anticipate enclosure backplane space for these switches.

5.2. Uninterruptible Power Supplies (UPS)

The Control Panel Uninterruptible Power Supplies to be used at each field location shall be an APC Back-UPS Pro 1000 and provided by NineStar Connect.

Appendix A: Abbreviations and Acronyms

AI: Analog Input

AO: Analog Output

CPU: Central Processing Unit

CSI: Control System Integrator

DI: Digital Input

DO: Digital Output

HMI: Human Machine Interface

I/O: Inputs and Outputs

KPI: Key Process Indicators

MFA: Multi-Factor Authentication

OPC-UA: A Machine to Machine communication protocol for industrial automation

OIT: Operator Interface Terminal

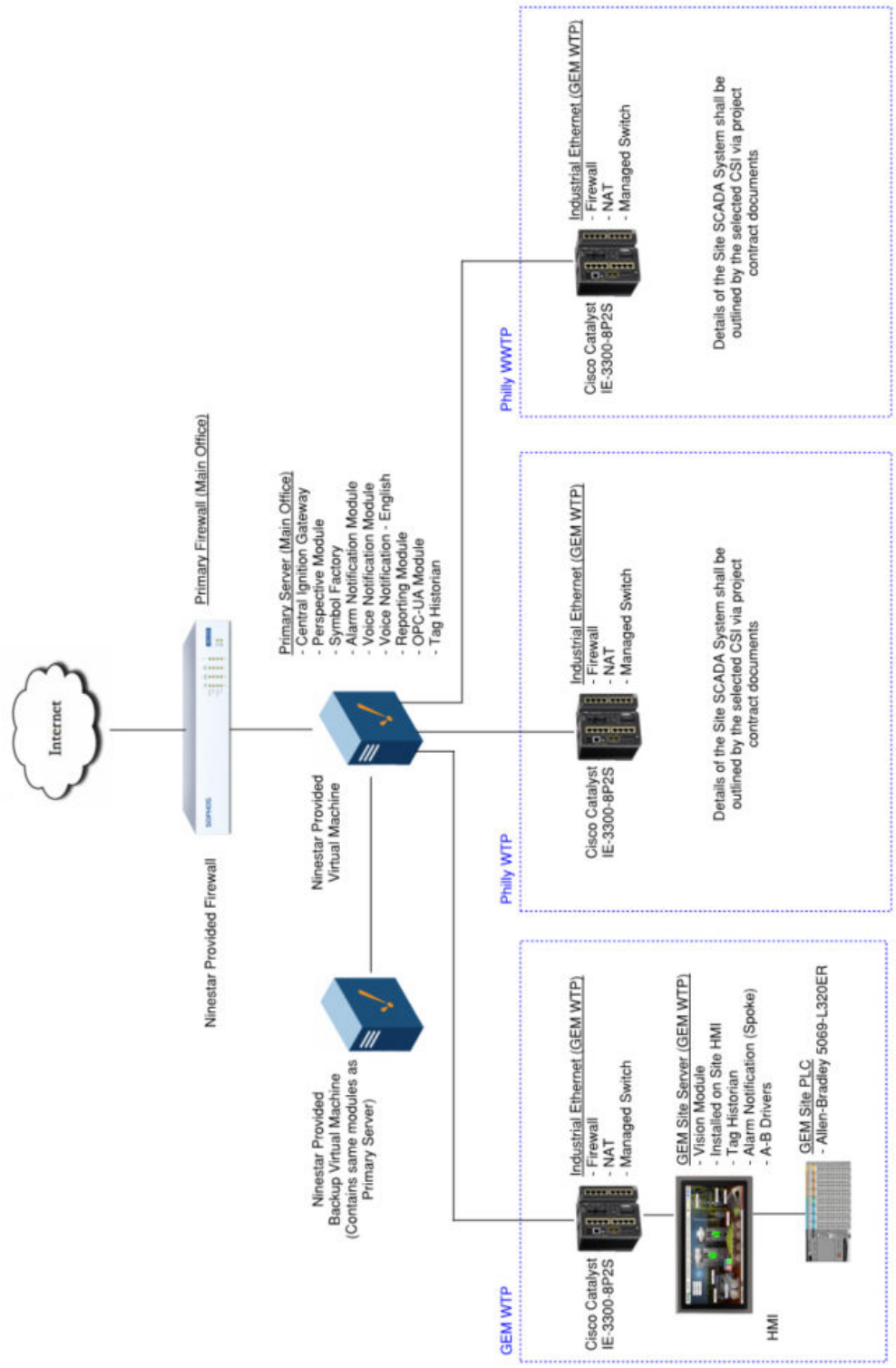
OWS: Operator Workstation

PLC: Programmable Logic Controller

SCADA: Supervisory Control and Data Acquisition

SSD: Solid State (Hard) Drive

Appendix B: Network Overview



Appendix C: Inductive Automation Module Datasheets

The following pages contain the Inductive Automation Module Datasheets that correspond to the modules to be installed on the Ninestar SCADA system. These datasheets are for reference use only, and the details of each installation shall be designed and confirmed by the Controls System Integrator working on the project.