

**IT Professional Technical Services
Master Contract Program
T#:902TS**

**Statement of Work (SOW)
For Technology Services
Issued By**

Minnesota Department of Transportation

Project Title
Intelligent Fiber and Asset Management System

Service Category
Geographic Information Systems (GIS)

Appendices

The following appendices are attached as part of this SOW:

- Appendix A: MnDOT Shelter Schematic Diagram
- Appendix B: MnDOT Fiber Construction Plan
- Appendix C: OET Visio Schematic As-Builts
- Appendix D: RTMC Device List
- Appendix E: Technical Development Architecture Guide

Business Need

This project will develop a comprehensive intelligent inventory of all fiber optic strands and cable connected devices for MnDOT's Regional Transportation Management Center (RTMC) operations. This inventory includes the data handling processes, methods, rules of connectivity, cooperative agreements on use, capacities, locations, and other detailed attributes of the RTMC fiber operations system. Location information will strive to be as close to as-built as possible, with schematic connectivity as a minimum for trace and routing functions. This project deliverables are to be extensible for use within the State of Minnesota (Office of Enterprise Technology) and other MnDOT districts.

There is not a current system that accurately represents the Traffic Management System and the Office of Enterprise Technology (OET) connections. Assets above ground and especially underground, need to be managed and communicated to others to help avoid costly fiber cuts and network outages. This can be accomplished through the usage of GIS software and creating web maps, web services and Microstation design files from the same managed source. The RTMC as well as other functional groups, need to use this information for design, scoping, and locating purposes. The Traffic Management System and OET include but are not limited to:

- Fiber Optic Cable (single mode & multimode)
- Copper Cable
- Conduits
- Structures (Buildings, Shelters, Cabinets, Vaults, Junction Boxes, Handholes)
- Detectors (Loops, MnPass Readers, Non-Intrusive)
- Electronic Signs (DMS, ILCS, LCS, MnPass)
- Other Network Devices (switches and routers)
- Signals (Ramp Meters, Flashers)
- Splice Enclosures
- Power Sources & Transformers
- Power Company Connections
- See Appendix D

There is need for fiber optic strand data management from source to destination with intelligent tracking and connectivity schematics. Fiber cables contain tubes and strands by color and may contain up to 432 strands of fiber that get split, spliced and routing to various locations and devices. With the complexity of the cables and their individual strands, it is vital to be able to quickly identify what is affected during construction projects, outages, and fiber cuts. Management will also aid in helping to reroute network traffic, notifications, and limiting downtime of the system.

There is need to automate the creation of network schematic drawings currently being manually created using Microstation and/or Visio (See Appendix A and C). One change in a network cabinet could result in updating many schematic drawings downstream and upstream which could introduce the opportunity for errors to occur and delay repairs. Automating schematic drawings will also reduce the staff time needed to update and maintain those drawings.

There is a need to manage non-MnDOT owned assets or leased assets to another agency that connect or utilize connections to the MnDOT fiber optic network. There is also a need to manage connections made through non MnDOT owned assets.

There is need to manage documents related to cables and devices. Types of documents could be, but not limited to: warranties, memorandums of understanding (MOU), agreements, leases, specifications, and plan sheets. This documentation resides in a variety of formats and several locations. The ability to link them together is crucial.

Project Deliverables

A. Business Requirements

1. Conduct detailed user requirements sessions documenting a complete set of specific system requirements.
2. Submit a best practice work plan/schedule, and estimated durations to complete each deliverable. In-depth discussion of work plans may occur at contract negotiations.

B. Technical Architecture

MnDOT currently is researching and evaluating an Enterprise level Asset Management Foundation and AFMS Replacement Project (P1352), this project will implement an Enterprise Asset Management (EAM) system.

The timeline for procurement and implementation of P1352 may overlap the timeline of this project. This Intelligent Fiber Asset Management System will design a technical architecture to assist in collaboration of integration of these two projects

- The technical architecture should accommodate the functional and data needs of both the Intelligent Fiber and Asset Management System Project and the Asset Management Foundation and AFMS Replacement Project.
- The technical architecture should reduce – as much as possible - functional and data redundancy between the two systems.
- The technical architecture activity should identify the requirements of the Intelligent Fiber and Asset Management System Project that can share data with the EAM system.

The Intelligent Fiber and Asset Management System Project will then proceed to implement a solution that satisfies those requirements of the Intelligent Fiber and Asset Management System Project that allow for coordination with the proposed EAM system.

C. Automated Schematic Diagrams

Create and implement dynamic schematic template with ArcSchematics product, from ESRI, that can be used in place of the Microstation schematic files. Include user definable test fields per Appendix A.

Create user tools for quick and easy connectivity and attribute assignments. Visual templates for common equipment used. Not spreadsheet based.

Deliverables, schematic diagrams

1. Six Schematic templates created for dynamic schematic drawing that maintain readability and are similar to examples in Appendix A
2. User interface for easy connection manipulation using visual templates for equipment
3. Manual or cheat sheet for creating new schematic templates

D. Design and Implement a Networked Model

1. User tracing tool to create fiber cable and strand traces using ArcMap
2. Trace results in map and text formats using ArcMap
3. SQL spatial tracing queries to utilized in web reports and other interfaces

E. Data Model Structure

This project will create the new structure for storing MnDOT's RTMC assets using the ESRI Telecom Data model as a basis for a starting point. The new data model should adjust to match MnDOT's commonly used terms and names for devices. The new data model will comply with MnDOT's database standards and be expected to utilize MnDOT's current enterprise software.

The new data model will be developed using ArcGIS version 10. The database can be developed using a Microsoft SQL Server Express database or file geodatabase but will have to be ported over to an Oracle database and be stored in native Oracle geometry format (SDO). The end data model will need to support a multi-editor environment and will have to address edits coming from both internal and external sources to support our designers, field workers, external partners, and contractors in a connected and disconnected environment.

The data model will have placeholders for all the devices in the RTMC. The data model will also have a place to hold asset owner and lease information.

Included in the new data model will be customized domains and subtypes to create as much standardization as possible and eliminate free text entry where feasible.

Deliverables, data model structure

1. ESRI telecom based data model modified to fit MnDOT's common ITS equipment names and terminology
2. Oracle used as database with SDO geometry
3. Multi-Editor environment supporting inputs from ESRI and non-ESRI products
 - a. Possible inputs
 - i. ArcMap
 - ii. Webmap
 - iii. Field Mobile Data Collector
 - iv. CSV file
 - v. Microstation file
4. Placeholders for all devices including attributes using subtypes and domains to maximize standardization
5. Place to hold asset owner and lease information

F. Data Management Process & Tools

Create a process to receive new or updated information about the Traffic Management System and review and update master repository.

New or updated information could come through ArcGIS, web interface, mobile field collection, comma separated values, or Microstation.

The new data model will need a mechanism to accept redlines from a non-ESRI environment.

Permission based validation will be created for after updates to the master have been complete to verify integrity of system so network traces can be performed.

There will be the ability to change attributes on multiple devices with a click and drag fence tool or by dialog box.

There will be the ability manage and identify connectivity through the “cloud”. Example is connecting the MnDOT’s Metro District fiber optic network to MnDOT’s Duluth’s fiber optic network to show network connectivity.

Deliverables, data management process & tools

1. Map with scale dependent symbology down to the fiber strand level, definable by MnDOT
2. Demonstrated process to create new features in the database using ArcMap, Bentley Microstation, webmap, comma separated file and mobile
3. Demonstrated process to manage the multi-editor environment with edits coming in from different sources
4. Demonstrated process to manage internal and external document links relating to fiber strand, fiber cable, copper cable and devices
5. Permission based process to validate new features and edits coming into the system
6. Demonstrated process to create new features and or attributes in the data model
7. Demonstrated process to manage connectivity through the “cloud”
8. Data input and configuration tools for ArcMap
9. Geometric Network validation tools for ArcMap
10. Tools for changing attributes of multiple devices simultaneously using ArcMap

G. Complete Asset Inventory for Fiber & Device Connectivity:

Create fiber cable strands and updating fields as needed and identified by MnDOT. Create connections from cable to device and from device to device for the whole metro fiber system. If a fiber cable is missing then one will have to be added to the system.

Deliverables, fiber & device connectivity

1. Fiber optic cables and strands inputted, configured and connected out to the cabinets
2. Fiber connectivity validated
3. Wave division multiplexing functionality
4. Course wave division multiplexing functionality

H. Documentation, Manuals & Training:

Deliverables, documentation, manuals & training

1. Document the data structure (1- electronic copy, 2- hard copies)
 - a. Entity Relationship Diagram (ERD)
 - b. Data definitions and metadata
 - c. Geometric Network
 - d. Multi-Editor Environment
2. Manual for adding or updating features in a multi-editor environment, including reconciling with the master repository (1- electronic copy, 2- hard copies)
3. Manual for using, editing & creating schematic diagrams (1- electronic copy, 2- hard copies)
4. Training & knowledge transfer for 2 persons to use and manage the new environment
5. Training hosted at MnDOT Roseville office
6. Custom software source code and scripts related to the project

I. Optional tasks

These are tasks to be completed if time and money permits and should be identified separately in your work plan and cost proposal.

Deliverables, optional tasks

1. Input and configure copper cable connections out to termination devices (loop detectors, cameras, electronic signs, etc.)
2. Configure and create process utilizing Bentley’s ProjectWise connector for ArcGIS to facilitate design and edits directly from Microstation
3. Mobile device module for field review and edits
4. Mapbook creation using ArcGIS to create a hardcopy of the Traffic Management System

Project Milestones and Schedule

Tentative schedule – schedule is subject to change

- Project Start Date: February 2012
 - Data structure completed March 21, 2012
 - Fiber Cables created and devices connected May 15, 2012
 - Schematic diagrams completed June 15, 2012
 - Migrated to production environment July 20, 2012
 - Manuals and training completed August 15, 2012
- End Date: September 1, 2012 – Final Test

Project Environment (Mn/DOT Resources)

- Mn/DOT will provide technical and business resources to assist with the project as follows:
 - a) Terry Haukom – ITS System Architect
 - b) Adam Julson - GIS / Project Manager
 - c) Charlie McCarty – GIS Architect
- See Appendix E for MnDOT development architecture and guidelines.
- The project is to leverage MnDOT's existing ERSI enterprise software agreement with the fiber schematic add-in; it also is to be engineered in such a manner as to have the data incorporated into MnDOT's Oracle based geodata base system. No additional hardware is planned.
- ESRI Telecomm model to be used as a starting point
- For all inquiries regarding this SOW, contact the Mn/DOT Contract Administrator Melissa McGinnis at 651-366-4644. Contact with any other Mn/DOT personnel regarding this SOW may result in disqualification

Agency Project Requirements

- This system is being designed to manage the RTMC network and facilities, but it will be offered to D1, D3, D4 and D6 to manage their ITS networks as well.
- Training on the final product will be included as part of the Consultant contract.
- The only anticipated ongoing need will be the yearly \$500 fiber schematic add-in model
- This project will leverage and comply with Statewide Enterprise Architecture.
- This project in a sense will be creating an ITS industry standard
- Provide workspace, computer, network access and badge access

Responsibilities Expected of the Selected Responder

- Must work a negotiated number of hours at the RTMC site in Roseville, MN
- Submit a best practice work plan/schedule, and estimated durations to complete each deliverable. In-depth discussion of work plans may occur at contract negotiations.
- Provide sufficient staffing to complete the project in the desired timeframe.
- Provide a Project Manager for this effort. The Selected Responder's Project Manager is expected to provide bi-weekly status reports which are sent to the MnDOT Project Manager.
- Report all work plans and completed requirements to the MnDOT Project Manager.
- Perform unit and integration testing.
- Thoroughly test and track all defects
- Provide knowledge transfer training to key MnDOT staff.
- All Selected Responder provided code will compile/build on MnDOT systems and will work on the MnDOT enterprise system servers provided for this project.
- Provide a comprehensive plan and scripts for deployment and configuration of project data and application code developed for MnDOT.
- Coordinate as necessary with MnDOT or its vendors regarding current and proposed systems within all phases of this project.

Required Skills

Required minimum qualifications are identified in this section. The proposal must specifically indicate how members of the Responder's team meet these minimum qualifications. This portion of the proposal review will be conducted on a pass/fail basis. If Mn/DOT determines, in its sole discretion, that the Responder fails

to meet one or more of these requirements (or that the Responder has not submitted sufficient information to make the pass/fail determination), then the proposal will be eliminated from further review.

- Required Skill Type
 - ERSI Products including ArcMap & ArcGIS Server (Minimum: 2 years)
 - Oracle Spatial Database Design & Administration (Minimum: 2 years)
 - Experts in the Intelligent Transportation System field (Minimum: 2 years)

Desired Skills

Mn/DOT desires Key Personnel with the skills identified in this section. The extent to which the Responder meets or exceeds the desired skills will be included as part of the qualitative evaluation of the proposal.

- Web mapping technologies (Javascript & HTML5)
- Mobile field editing technologies (TerraSync/Pathfinder & ArcGIS Server Mobile)
- Intelligent Transportation System design experience
- Experience configuring and using Bentley’s ProjectWise connector for ArcGIS or ProjectWise connector for Oracle

Process Schedule

- Deadline for Questions 02/01/2012, 2:00pm
- Anticipated Posted Response to Questions 02/03/2012, 2:00pm
- Proposals due 02/08/2012, 2:00pm
- Anticipated proposal evaluation begins 02/08/2012
- Anticipated proposal evaluation & decision 02/17/2012

Questions

All questions regarding this SOW must be addressed to the Mn/DOT Contract Administrator listed below. Proposers may not discuss the content of this SOW with other Mn/DOT staff. Any questions regarding this SOW must be received via e-mail by:

Melissa McGinnis
melissa.mcginnis@state.mn.us

Questions and answers will be posted on the Office of Enterprise Technology website by approximately 02/03/2012, 2:00pm Central Time at (questions may be posted verbatim as submitted):
www.oet.state.mn.us/mastercontract/statements/mcp902ts_active.html

SOW Evaluation Process

Mn/DOT and OET representatives will evaluate proposals received by the deadline. Proposals will be evaluated on a “Best Value” basis of 60% qualifications and 40% cost considerations. The review committee will not open the cost proposals until after the qualifications points have been awarded.

The selection process being used for this project involves a three step process. Step one will include the pass/fail assessment and a qualitative evaluation of Contractors’ technical proposal. Step Two will be an interview of two or more Responders who received the top scores in step one. Step Two may be eliminated at Mn/DOT’s discretion based on the results of the step one’s evaluations. Step three will be an analysis of the cost proposal.

Mn/DOT will review proposals according to the following criteria:

- Proposed work plan for required and optional deliverables, including the apparent ability to complete project on time and on budget (20%)
- Experience of personnel assigned to this project (20%)
- Interview (20%)
- Cost (40%)

Statement of Work does not obligate the state to award a work order or complete the assignment, and the state reserves the right to cancel the solicitation if it is considered to be in its best interest. Mn/DOT reserves the right to reject any and all proposals.

Mn/DOT reserves the right to check references and to review previous performance reviews for work performed for Mn/DOT or other state agencies, and to take such references and reviews into account for consultant selection purposes.

The following contains additional information describing the proposal evaluation process:

Step One

In step one the proposals will first be reviewed to verify whether the proposer meets the “Required Skills” (see Required Skills Section). Proposals receiving a “fail” on one or more of the required skills will not be reviewed further. Proposals which pass the Required Skills review will then be scored on the non-cost and non-interview factors listed above.

Step Two

The two (or more, at Mn/DOT’s discretion) proposers receiving the highest score in step one may be required to participate in a structured interview. The interview will be approximately one hour in length and consist of structured interview questions prepared by Mn/DOT. Mn/DOT will designate the number and type of Proposer team members to attend the interview. The interview will be 20 points of the total evaluation.

It is anticipated that interviews will be conducted during the week of **02/13/2012** so please plan accordingly. Interview questions will be available to the Proposers 15 minutes prior to the interview. The proposer will be responsible for its’ own interview costs.

Step Three

Cost proposal will be evaluated and scored in accordance with the percentage listed above. Cost will not be revealed to selection committee members until after the technical scoring (and interviews, if any) has been completed.

Response Requirements

- Introduction
- Project Overview
- Detailed response to Project Requirements
 - a) Description of the responder’s understanding of the need and explanation of their proposed solution.
 - b) Explain how the project will meet the requirements of each deliverable. Each deliverable should be addressed in the response.
 - c) Include description of software configuration
- Detailed response to Project Approach

Explain how the responder will approach their participation in the project. This must include:

 - a) Organization and staffing. Include staff qualifications in a chart (see below) **and** resumes that will allow Mn/DOT to easily determine if assigned key staff meets the required skills and the extent to which assigned staff meet or exceed the desired skills. Chart and resumes must match up (i.e. the skills identified in the chart must also be identified in the resumes). Resumes must include start and end dates of project experience.

Required / Desired Skill type	Personnel/ Years of Experience	Project(s) worked on demonstrating these skills	Reference (name, company, phone number)

- b) Work-plan, including a realistic plan to meet the projects target completion date.
- c) Contract/change management procedures.
- d) Project management (e.g. quality management, risk assessment/management, etc.).

- e) Documentation of progress such as status reports.
- Submit a cost proposal in a separate sealed envelope. All rates provided must not exceed the rates identified under the Master Contract Program. Provide one copy of the cost proposal, clearly marked on the outside "Cost Proposal", along with the responder's official business name and address. For purposes of completing the cost proposal, MnDOT does not make regular payments based upon the passage of time; it only pays for services performed or work delivered after it is accomplished. Terms of the proposal as stated must be valid for the length of the project. If proposing an hourly rate, unit rate or lump sum, include a breakdown (labor, overhead, profit & expenses) showing how the rate was derived. If proposing a cost plus fixed fee (profit) budget, the responder's Overhead Rate must not exceed 160%. The responder must utilize their current MnDOT approved Overhead rate, not to exceed 160%. For the purposes of this Cost Proposal, responders should utilize a fixed fee (profit) of 10%. Actual fixed fee (profit) will be determined/calculated by MnDOT upon selection. The responder must include a total project cost along with the following:
 - A breakout of the hours by task for each employee.
 - Identification of anticipated direct expenses.
 - Identification of any assumption made while developing this cost proposal.
 - Identification of any cost information related to additional services or tasks, include this in the cost proposal but identify it as additional costs and do not make it part of the total project cost.
 - Responder must have the cost proposal signed in ink by authorized member of the firm. The responder must not include any cost information within the body of the RFP technical proposal response.
 - **Include the costs for the optional tasks identified in Section I. separately from the required tasks.**
- Required forms to be returned or additional provisions that must be included in proposal
 - a) Conflict of interest statement as it relates to this project
 - b) Affirmative Action Certificate of Compliance (if over \$100,000)
<http://www.mmd.admin.state.mn.us/doc/affaction.doc>
 - c) Affidavit of non-collusion
<http://www.mmd.admin.state.mn.us/doc/noncollusion.doc>
 - d) Certification Regarding Lobbying
<http://www.mmd.admin.state.mn.us/doc/lobbying.doc>
 - e) Veteran-Owned/Service Disabled Veteran-Owned Preference Form
<http://www.mmd.admin.state.mn.us/doc/vetpref.doc>

MnDOT anticipates that the cost for this contract will not exceed \$225,000.00.

Proposal Submission Instructions

- Submit 7 copies of the response. Responses are to be submitted in a mailing envelope or package, clearly marked "Proposal" along with the project title on the outside.
- Submit 1 copy of the Cost Proposal. This information should be placed in a separate envelope clearly marked on the outside "Cost Proposal" with the responder's name. For purposes of completing the cost proposal, Mn/DOT does not make regular payments based upon the passage of time, it only pays for services performed or work delivered after it is accomplished. Terms of the cost proposal as stated must be valid for the length of the project. If proposing an hourly rate, unit rate or lump sum, include a breakdown (labor, overhead, profit & expenses) showing how the rate was derived. An authorized representative must sign the copy of the cost proposal, in ink.
- All responses must be mailed (U.S. Postal Service), expressed (UPS, FedEx or other similar express carrier) or dropped off to the attention of:
Melissa McGinnis, Contract Administrator
Minnesota Department of Transportation
395 John Ireland Boulevard
Consultant Services Section, Mail Stop 680
St. Paul, Minnesota 55155
- Late responses will not be considered. Fax and e-mail responses will not be considered. All costs incurred in responding to this solicitation will be borne by the responder.
- All responses must be received not later than 2:00 p.m. Central Daylight Time on **02/08/2012**, as indicated by the time stamp made by the Contract Administrator. Please note that Mn/DOT Offices have

implemented new security measures. These new procedures do not allow non-Mn/DOT employees to have access to the elevators or the stairs. You should plan enough time and follow these instructions for drop-off:

- a) Enter through the Rice Street side of the Central Office building (1st Floor).
- b) Once you enter through the doors, you should walk straight ahead to the Information Desk.
- c) **Proposals are accepted at the Information Desk only.** The receptionist will call the Contract Administrator to come down and to time stamp the proposal. Please keep in mind Mn/DOT is very strict on the proposal deadline. Proposals will not be accepted after 2:00pm.

General Requirements

Proposal Contents

By submission of a proposal, Responder warrants that the information provided is true, correct and reliable for purposes of evaluation for potential award of a work order. The submission of inaccurate or misleading information may be grounds for disqualification from the award as well as subject the responder to suspension or debarment proceedings as well as other remedies available by law.

Indemnification

In the performance of this contract by Contractor, or Contractor's agents or employees, the Contractor must indemnify, save, and hold harmless the State, its agents, and employees, from any claims or causes of action, including attorney's fees incurred by the state, to the extent caused by Contractor's:

- 1) Intentional, willful, or negligent acts or omissions; or
- 2) Actions that give rise to strict liability; or
- 3) Breach of contract or warranty.

The indemnification obligations of this section do not apply in the event the claim or cause of action is the result of the State's sole negligence. This clause will not be construed to bar any legal remedies the Contractor may have for the State's failure to fulfill its obligation under this contract.

Disposition of Responses

All materials submitted in response to this SOW will become property of the State and will become public record in accordance with Minnesota Statutes, section 13.591, after the evaluation process is completed. Pursuant to the statute, completion of the evaluation process occurs when the government entity has completed negotiating the contract with the selected vendor. If the Responder submits information in response to this SOW that it believes to be trade secret materials, as defined by the Minnesota Government Data Practices Act, Minn. Stat. § 13.37, the Responder must: clearly mark all trade secret materials in its response at the time the response is submitted, include a statement with its response justifying the trade secret designation for each item, and defend any action seeking release of the materials it believes to be trade secret, and indemnify and hold harmless the State, its agents and employees, from any judgments or damages awarded against the State in favor of the party requesting the materials, and any and all costs connected with that defense. This indemnification survives the State's award of a contract. In submitting a response to this RFP, the Responder agrees that this indemnification survives as long as the trade secret materials are in possession of the State.

The State will not consider the prices submitted by the Responder to be proprietary or trade secret materials.

Conflicts of Interest

Responder must provide a list of all entities with which it has relationships that create, or appear to create, a conflict of interest with the work that is contemplated in this request for proposals. The list should indicate the name of the entity, the relationship, and a discussion of the conflict.

The responder warrants that, to the best of its knowledge and belief, and except as otherwise disclosed, there are no relevant facts or circumstances which could give rise to organizational conflicts of interest. An organizational conflict of interest exists when, because of existing or planned activities or because of relationships with other persons, a vendor is unable or potentially unable to render impartial assistance or advice to the State, or the vendor's objectivity in performing the contract work is or might be otherwise

impaired, or the vendor has an unfair competitive advantage. The responder agrees that, if after award, an organizational conflict of interest is discovered, an immediate and full disclosure in writing must be made to the Assistant Director of the Department of Administration's Materials Management Division ("MMD") which must include a description of the action which the contractor has taken or proposes to take to avoid or mitigate such conflicts. If an organization conflict of interest is determined to exist, the State may, at its discretion, cancel the contract. In the event the responder was aware of an organizational conflict of interest prior to the award of the contract and did not disclose the conflict to MMD, the State may terminate the contract for default. The provisions of this clause must be included in all subcontracts for work to be performed similar to the service provided by the prime contractor, and the terms "contract," "contractor," and "contracting officer" modified appropriately to preserve the State's rights.

IT Accessibility Standards

Responses to this solicitation must comply with the Minnesota IT Accessibility Standards effective September 1, 2010, which entails, in part, the Web Content Accessibility Guidelines (WCAG) 2.0 (Level AA) and Section 508 Subparts A-D which can be viewed at:

http://www.mmd.admin.state.mn.us/pdf/accessibility_standard.pdf

Nonvisual Access Standards

Nonvisual access standards require:

- 1) The effective interactive control and use of the technology, including the operating system, applications programs, prompts, and format of the data presented, are readily achievable by nonvisual means;
- 2) That the nonvisual access technology must be compatible with information technology used by other individuals with whom the blind or visually impaired individual must interact;
- 3) That nonvisual access technology must be integrated into networks used to share communications among employees, program participants, and the public; and
- 4) That the nonvisual access technology must have the capability of providing equivalent access by nonvisual means to telecommunications or other interconnected network services used by persons who are not blind or visually impaired.

Veteran-owned/Service Disabled Veteran-Owned Preference

In accordance with Minnesota Statute §16C.16, subd. 6a, veteran-owned businesses with their principal place of business in Minnesota and verified as eligible by the United States Department of Veterans Affairs' Center for Veteran Enterprises (CVE Verified) will receive up to a 6 percent preference in the evaluation of its proposal.

Eligible veteran-owned small businesses include CVE verified small businesses that are majority-owned and operated by either recently separated veterans, veterans with service-connected disabilities, and any other veteran-owned small businesses (pursuant to Minnesota Statute §16C.16, subd. 6a).

Information regarding CVE verification may be found at <http://www.vetbiz.gov>.

Eligible veteran-owned small businesses should complete and **sign** the **Veteran-Owned Preference Form** in this solicitation. Only eligible, CVE verified, veteran-owned small businesses that provide the required documentation, per the form, will be given the preference.

Early Retirement Incentive Reemployment Prohibition

Laws of Minnesota 2010, Chapter 337, Subdivision 5, provided an early retirement incentive to some State of Minnesota employees. The law provides that an individual who received an early retirement incentive payment may not be hired as a consultant by any agency or entity that participates in the State Employee Group Insurance Program for a period of three years after termination of service. By submitting a proposal under this RFP, the responder certifies that it will not utilize any former state employee in the performance of a contract who received an retirement incentive payment under Laws of Minnesota 2010, Chapter 337, unless three years have passed from the date of the employee's separation from state service.

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Conflict of Interest Checklist and Disclosure Form

Purpose of this Checklist. This checklist is provided to assist proposers in screening for potential organizational conflicts of interest. The checklist is for the internal use of proposers and does not need to be submitted to Mn/DOT, however, the Disclosure of Potential Conflict of Interest form should be submitted in a separate envelope along with your proposal.

Definition of “Proposer”. As used herein, the word “Proposer” includes both the prime contractor and all proposed subcontractors.

Checklist is Not Exclusive. Please note that this checklist serves as a guide only, and that there may be additional potential conflict situations not covered by this checklist. If a proposer determines a potential conflict of interest exists that is not covered by this checklist, that potential conflict must still be disclosed.

Use of the Disclosure Form. A proposer must complete the attached disclosure form and submit it with their Proposal (or separately as directed by Mn/DOT for projects not awarded through a competitive solicitation). If a proposer determines a potential conflict of interest exists, it must disclose the potential conflict to Mn/DOT; however, such a disclosure will not necessarily disqualify a proposer from being awarded a Contract. To avoid any unfair “taint” of the selection process, the disclosure form should be provided separate from the bound proposal, and it will not be provided to selection committee members. Mn/DOT’s Contract Management personnel will review the disclosure and the appropriateness of the proposed mitigation measures to determine if the proposer may be awarded the Contract notwithstanding the potential conflict. Mn/DOT’s Contract Management personnel may consult with Mn/DOT’s Project Manager and Department of Administration personnel. By statute, resolution of conflict of interest issues is ultimately at the sole discretion of the Commissioner of Administration.

Material Representation. The proposer is required to submit the attached disclosure form either declaring, to the best of its knowledge and belief, either that no potential conflict exists, or identifying potential conflicts and proposing remedial measures to ameliorate such conflict. The proposer must also update conflict information if such information changes after the submission of the proposal. Information provided on the form will constitute a material representation as to the award of this Contract. Mn/DOT reserves the right to cancel or amend the resulting Contract if the successful proposer failed to disclose a potential conflict, which it knew or should have known about, or if the proposer provided information on the disclosure form that is materially false or misleading.

Approach to Reviewing Potential Conflicts. Mn/DOT recognizes that proposer’s must maintain business relations with other public and private sector entities in order to continue as viable businesses. Mn/DOT will take this reality into account as it evaluates the appropriateness of proposed measures to mitigate potential conflicts. It is not Mn/DOT’s intent to disqualify proposers based merely on the existence of a business relationship with another entity, but rather only when such relationship causes a conflict that potentially impairs the proposer’s ability to provide objective advice to Mn/DOT. Mn/DOT would seek to disqualify proposers only in those cases where a potential conflict cannot be adequately mitigated. Nevertheless, Mn/DOT must follow statutory guidance on Organizational Conflicts of Interest.

Statutory Guidance. Minnesota Statutes §16C.02, Subdivision 10 (a) places limits on state agencies ability to Contract with entities having an “Organizational Conflict of Interest”. For purposes of this checklist and disclosure requirement, the term “Vendor” includes “Proposer” as defined above. Pursuant to such statute, “Organizational Conflict of Interest” means that because of existing or planned activities or because of relationships with other persons: (1) the vendor is unable or potentially unable to render impartial assistance or advice to the state; (2) the vendor’s objectivity in performing the contract work is or might otherwise be impaired; or (3) the vendor has an unfair advantage.

Additional Guidance for Professionals Licensed by the Minnesota Board of Engineering. The Minnesota Board of Engineering has established conflict of interest rules applicable to those professionals licensed by the Board (see Minnesota Rules Part 1805.0300) Subpart 1 of the rule provides “A licensee will avoid accepting a commission where duty to the client or the public would conflict with the personal interest of the licensee or the interest of another client. Prior to accepting such employment the licensee will disclose to a prospective client such facts as may give rise to a conflict of interest”.

An organizational conflict of interest may exist in any of the following cases:

- ❑ The proposer, or its principals, own real property in a location where there may be a positive or adverse impact on the value of such property based on the recommendations, designs, appraisals, or other deliverables required by this Contract.
- ❑ The proposer is providing services to another governmental or private entity and the proposer knows or has reason to believe, that entity's interests are, or may be, adverse to the state's interests with respect to the specific project covered by this contract. **Comment:** the mere existence of a business relationship with another entity would not ordinarily need to be disclosed. Rather, this focuses on the nature of services commissioned by the other entity. For example, it would not be appropriate to propose on a Mn/DOT project if a local government has also retained the proposer for the purpose of persuading Mn/DOT to stop or alter the project plans.
- ❑ The Contract is for right-of-way acquisition services or related services (e.g. geotechnical exploration) and the proposer has an existing business relationship with a governmental or private entity that owns property to be acquired pursuant to the Contract.
- ❑ The proposer is providing real estate or design services to a private entity, including but not limited to developers, whom the proposer knows or has good reason to believe, own or are planning to purchase property affected by the project covered by this Contract, when the value or potential uses of such property may be affected by the proposer's performance of work pursuant to this Contract. "Property affected by the project" includes property that is in, adjacent to, or in reasonable proximity to current or potential right-of-way for the project. The value or potential uses of the private entity's property may be affected by the proposer's work pursuant to the Contract when such work involves providing recommendations for right-of-way acquisition, access control, and the design or location of frontage roads and interchanges. **Comment:** this provision does not presume proposers know or have a duty to inquire as to all of the business objectives of their clients. Rather, it seeks the disclosure of information regarding cases where the proposer has reason to believe that its performance of work under this Contract may materially affect the value or viability of a project it is performing for the other entity.
- ❑ The proposer has a business arrangement with a current Mn/DOT employee or immediate family member of such employee, including promised future employment of such person, or a subcontracting arrangement with such person, when such arrangement is contingent on the proposer being awarded this Contract. This item does not apply to pre-existing employment of current or former Mn/DOT employees, or their immediate family members. **Comment:** this provision is not intended to supercede any Mn/DOT policies applicable to its own employees accepting outside employment. This provision is intended to focus on identifying situations where promises of employment have been made contingent on the outcome of this particular procurement. It is intended to avoid a situation where a proposer may have unfair access to "inside" information.
- ❑ The proposer has, in previous work for the state, been given access to "data" relevant to this procurement or this project that is classified as "private" or "nonpublic" under the Minnesota Government Data Practices Act, and such data potentially provides the proposer with an unfair advantage in preparing a proposal for this project. **Comment:** this provision will not, for example, necessarily disqualify a proposer who performed some preliminary work from obtaining a final design Contract, especially when the results of such previous work are public data available to all other proposers. Rather, it attempts to avoid an "unfair advantage" when such information cannot be provided to other potential proposers. Definitions of "government data", "public data", "non-public data" and "private data" can be found in Minnesota Statutes Chapter 13.
- ❑ The proposer has, in previous work for the state, helped create the "ground rules" for this solicitation by performing work such as: writing this solicitation, or preparing evaluation criteria or evaluation guides for this solicitation.
- ❑ The proposer, or any of its principals, because of any current or planned business arrangement, investment interest, or ownership interest in any other business, may be unable to provide objective advice to the state.

Disclosure of Potential Conflict of Interest

Having had the opportunity to review the Organizational Conflict of Interest Checklist, the proposer hereby indicates that it has, to the best of its knowledge and belief:

_____ Determined that no potential organizational conflict of interest exists

_____ Determined a potential organizational conflict of interest as follows:

Describe nature of potential conflict:

Describe measures proposed to mitigate the potential conflict:

Signature

Date

If a potential conflict has been identified, please provide name and phone number for a contact person authorized to discuss this disclosure form with Mn/DOT Contract personnel.

Name

Phone

Sample Work Order Language

STATE OF MINNESOTA IT Professional/Technical Services Master Contract Program Work Order

Project Identification: _____

This work order is between the State of Minnesota, acting through its Commissioner of Transportation ("State") and [GIVE THE FULL NAME OF THE CONTRACTOR INCLUDING ITS ADDRESS (STREET, CITY AND STATE) ALSO INDICATE WHETHER THE CONTRACTOR IS A CORPORATION, PARTNERSHIP, LIMITED LIABILITY COMPANY (LLC) OR SOLE PROPRIETOR] ("Contractor"). This Work Order is issued under the authority of Master Contract T-Number 902TS, CFMS Number XXXXX, and is subject to all provisions of the Master Contract which is incorporated by reference.

Recitals

1. Under Minn. Stat. § 15.061 the State is authorized to engage such assistance as deemed necessary.
2. The State is in need of [Add brief narrative of the purpose of the contract].
3. The Contractor represents that it is duly qualified and agrees to perform all services described in this work order to the satisfaction of the State.

Work Order

1 Term of Work Order; Incorporation of Exhibits; Survival of Terms

- 1.1 **Effective date.** This Work Order will take effect on the date the State obtains all required signatures as required by Minn. Stat. § 16C.05, subd. 2. *The Contractor must not begin work under this work order until it is fully executed and the Contractor has been notified by the State's Authorized Representative to begin the work.*
- 1.2 **Expiration date.** This Work Order will expire on [fill in date], or when all obligations have been satisfactorily fulfilled, whichever occurs first.
- 1.3 **Exhibits.** Exhibits [fill in, e.g. A – D] are attached and incorporated into this Work Order.
- 1.4 **Survival of terms.** All clauses which impose obligations continuing in their nature and which must survive in order to give effect to their meaning will survive the expiration or termination of this Work Order including, without limitation, Clause 5: Indemnification.

2 Contractor's Duties

- 2.1 The Contractor, who is not a state employee, will:
[Provide a detailed scope of services. The services must define specific duties, deliverables, and deliverable completion dates. Do not simply attach the same scope that was used in the "Statement of Work" (RFP) as a greater level of detail is needed in this work order. If using a separate attachment, use "Perform the duties specified in Exhibit A, "Scope of Services".]

3 Consideration and Payment

3.1 Consideration

The State will pay for all services performed by the Contractor under this work order as follows:

- 3.1.1 **Compensation.** The Contractor will be paid as follows:
[Provide a detailed explanation of how the Contractor will be paid, for example a fixed hourly rate, or a lump sum per deliverable, some examples may be: an Hourly Rate of \$_____ up to maximum of _____ hours, but not to exceed \$_____.

a Lump Sum of \$_____].

[Rate: rates paid may not exceed the Contractor's rates specified in their Master Contract.]

- 3.1.2 **Travel Expenses.** Reimbursement for travel and subsistence expenses actually and necessarily incurred by Contractor, as a result of this Work Order, will be reimbursed for

travel and subsistence expenses in the same manner and in no greater amount than provided in the current Minnesota Department of Transportation Travel Regulations. Contractor will not be reimbursed for travel and subsistence expenses incurred outside Minnesota unless it has received State's prior written approval for out of state travel. Minnesota will be considered the home state for determining whether travel is out of state. See Exhibit ____ for the current Minnesota Department of Transportation Reimbursement Rates for Travel Expenses.

- 3.1.3 *Total Obligation.* The total obligation of the State for all compensation and reimbursements to the Contractor under this Work Order will [not exceed / be] \$ [fill in].

3.2 Payment

- 3.2.1 **Invoices.** Contractor must submit invoices electronically for payment, using the format set forth in Exhibit _____. Contractor will submit invoices for payment in accordance with the following schedule: [INDICATE WHEN YOU WANT THE CONTRACTOR TO SUBMIT INVOICES, FOR EXAMPLE: "MONTHLY" OR "UPON COMPLETION OF SERVICES," OR IF THERE ARE SPECIFIC DELIVERABLES, LIST HOW MUCH WILL BE PAID FOR EACH DELIVERABLE. THE STATE DOES NOT PAY MERELY FOR THE PASSAGE OF TIME.]
- 3.2.2 **Progress Reports.** Contractor must submit progress reports to the State's Project Manager, using the format and timeline set forth by the State's Project Manager.
- 3.2.3 **State's Payment Requirements.** State will promptly pay all valid obligations under this Contract as required by Minnesota Statutes §16A.124. State will make undisputed payments no later than 30 days after receiving Contractor's invoices and progress reports for services performed. If an invoice is incorrect, defective or otherwise improper, State will notify Contractor within 10 days of discovering the error. After State receives the corrected invoice, State will pay Contractor within 30 days of receipt of such invoice.
- 3.2.4 **Invoice Package Submittal.** Contractor must submit the signed invoice, the signed progress report and all required supporting documentation, for review and payment, to State's Consultant Services Section, at ptinvoices.dot@state.mn.us. Invoices will not be considered "received" within the meaning of Minnesota Statutes §16A.124 until the signed documents are received by State's Consultant Services Section.
- 3.2.4.1 Each invoice must contain the following information: Mn/DOT Contract Number, Contractor's invoice number (sequentially numbered), Contractor's billing and remittance address, if different from business address, and Contractor's signature attesting that the invoiced services and costs are new and that no previous charge for those services and goods has been included in any prior invoice.
- 3.2.4.2 Except for Lump Sum Contracts, direct nonsalary costs allocable to the work under this Contract, must be itemized and supported with invoices or billing documents to show that such costs are properly allocable to the work. Direct nonsalary costs are any costs that are not the salaried costs directly related to the work of Contractor. Supporting documentation must be provided in a manner that corresponds to each direct cost.
- 3.2.4.3 Except for Lump Sum Contracts, Contractor must provide, upon request of State's Authorized Representative, the following supporting documentation:
- Direct salary costs of employees' time directly chargeable for the services performed under this Contract. This must include a payroll cost breakdown identifying the name of the employee, classification, actual rate of pay, hours worked and total payment for each invoice period; and
 - Signed time sheets or payroll cost breakdown for each employee listing dates and hours worked. Computer generated printouts of labor costs for the project must contain the project number, each employee's name, hourly rate, regular and overtime hours and the dollar amount charged to the project for each pay period.
- 3.2.5 **Subcontractors.** If Contractor is authorized by State to use or uses any subcontractors, Contractor must include all the above supporting documentation in any subcontractor's Contract and Contractor must make timely payments to its subcontractors. Contractor must require subcontractors' invoices to follow the same form and contain the same information as set forth above.

3.2.6 **Retainage.** Under Minnesota Statutes §16C.08, subdivision 5(b), no more than 90% of the amount due under this Contract may be paid until State's agency head has reviewed the final product of this Contract. The balance due will be paid when State's agency head determines that Contractor has satisfactorily fulfilled all the terms of this Contract.

3.2.7 **Federal Funds.** If federal funds are used, Contractor is responsible for compliance with all federal requirements imposed on these funds and accepts full financial responsibility for any requirements imposed by Contractor's failure to comply with federal requirements.

4 Authorized Representatives

4.1 **State's Authorized Representative.** State's Authorized Representative will be:

NAME, TITLE
ADDRESS
TELEPHONE NUMBER
FAX NUMBER
E-MAIL ADDRESS

State's Authorized Representative or his /her successor, will monitor Contractor's performance and has the authority to accept or reject the services provided under this Work Order.

4.2 **State's Project Manager.** State's Project Manager will be:

NAME, TITLE
ADDRESS
TELEPHONE NUMBER
FAX NUMBER
E-MAIL ADDRESS

State's Project Manager, or his/her successor, has the responsibility to monitor Contractor's performance and progress. State's Project Manager will sign progress reports, review billing statements, make recommendations to State's Authorized Representative for acceptance of Contractor's good or services and make recommendations to State's Authorized Representative for certification for payment of each Invoice submitted for payment.

4.3 **Contractor's Authorized Representative.** Contractor's Authorized Representative will be:

NAME, TITLE
ADDRESS
TELEPHONE NUMBER
FAX NUMBER
E-MAIL ADDRESS

If Contractor's Authorized Representative changes at any time during this contract, Contractor must immediately notify State.

4.4 **Contractor's Key Personnel.** Contractor's Key Personnel will be:

[Names, Titles]

Key Personnel assigned to this project cannot be changed without the written approval of the State's Project Manager. Contractor will submit a change request in writing to the State's Project Manager along with a resume for each potential candidate. Potential new or additional personnel may be required to participate in an interview. Upon approval of new or additional personnel, the State's Authorized Representative may issue a change order to add or delete key personnel.

5 Indemnification

In the performance of this contract by Contractor, or Contractor's agents or employees, the Contractor must indemnify, save, and hold harmless the State, its agents, and employees, from any claims or causes of action, including attorney's fees incurred by the state, to the extent caused by Contractor's:

- 4) Intentional, willful, or negligent acts or omissions; or
- 5) Actions that give rise to strict liability; or

6) Breach of contract or warranty.

The indemnification obligations of this section do not apply in the event the claim or cause of action is the result of the State's sole negligence. This clause will not be construed to bar any legal remedies the Contractor may have for the State's failure to fulfill its obligation under this contract.

6 Nonvisual Access Standards

Nonvisual access standards require:

- The effective interactive control and use of the technology, including the operating system, applications programs, prompts, and format of the data presented, are readily achievable by nonvisual means;
- That the nonvisual access technology must be compatible with information technology used by other individuals with whom the blind or visually impaired individual must interact;
- That nonvisual access technology must be integrated into networks used to share communications among employees, program participants, and the public; and
- That the nonvisual access technology must have the capability of providing equivalent access by nonvisual means to telecommunications or other interconnected network services used by persons who are not blind or visually impaired.

7 Time

The Contractor must comply with all the time requirements described in this Work Order. In the performance of this Work Order, time is of the essence.

8 E-Verify Certification (In accordance with Minnesota Statutes §16C.075)

For services valued in excess of \$50,000, Contractor certifies that as of the date of services performed on behalf of the State, Contractor and all its subcontractors will have implemented or be in the process of implementing the federal E-Verify program for all newly hired employees in the United States who will perform work on behalf of the State. Contractor is responsible for collecting all subcontractor certifications and may do so utilizing the E-Verify Subcontractor Certification Form available at <http://www.mmd.admin.state.mn.us/doc/EverifySubCertForm.doc>. All subcontractor certifications must be kept on file with Contractor and made available to the State upon request.

9 Additional Provisions

The Contractor will comply with the Minnesota Electronic and Information Technology Accessibility guidelines (IRM guideline 19) available at <http://www.state.mn.us/portal/mn/jsp/content.do?id=-536891917&subchannel=null&sc2=null&sc3=null&contentid=536880882&contenttype=EDITORIAL&programid=536911233&agency=OETweb>

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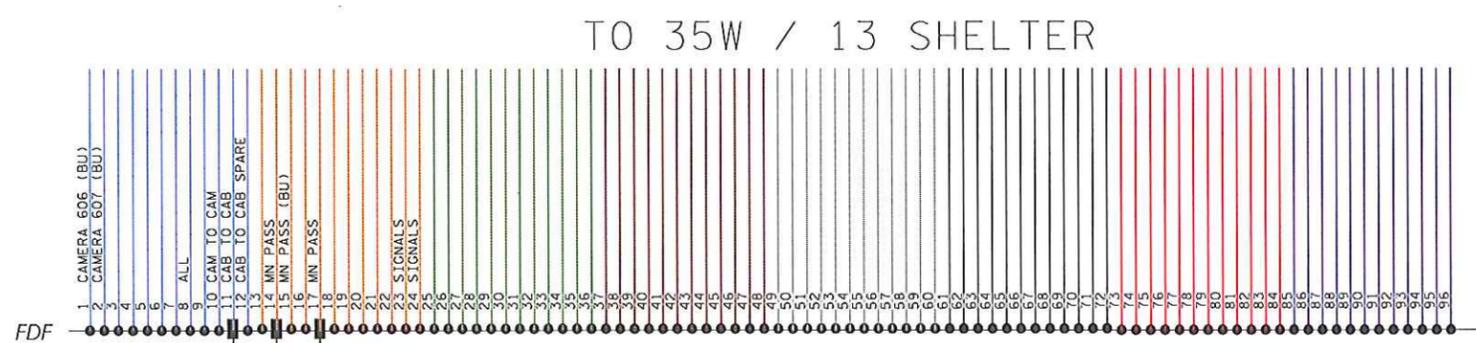
APPENDIX A

35W.35
 (SOUTH)

TO 35W / 13 SHELTER

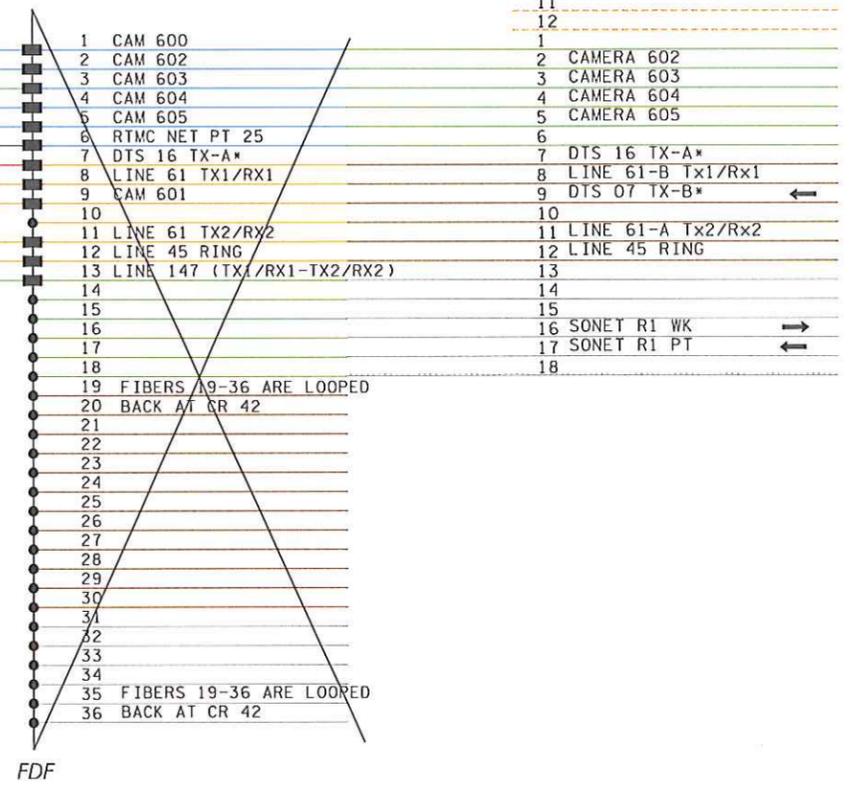
F-35WU.01
 (NORTH)
 TO TH 13 SHELTER

SALVAGE INPLACE 96 SM
 FO CABLE
 F&I NEW 96 SM FO CABLE



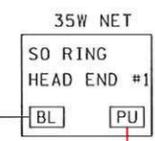
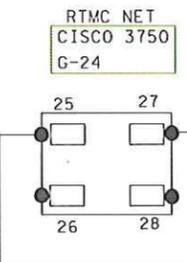
RELOCATE THESE FIBERS
 ONTO INPL. 96 SM TO NORTH

35W.36
 ABANDONED



TO 35W / 13 SHELTER

TO CABINET ON
 COMMON FOUNDATION
 @ SOUTHCROSS



40 KM OPTICS

RELOCATE THESE FIBERS
 ONTO PROP. 36 SM TO SOUTH

F-35XO1 FROM VAULT
 ABANDON FIBERS 1-36
 & REMOVE FROM PATCH PANEL

****NEW** F-35.1
 REPLACE INPLACE 1-36SM
 WITH THESE IN PATCH PANEL**

DROP THESE FIBERS & REMOVE FROM
 PATCH PANEL (CURRENTLY SPLICED TO
 F-35.1 ON 35 SOUTH)

- FD = FIBER DISTRIBUTION FRAME
- = DIRECT PIGTAIL TERMINATION FROM TRUNK LINE TO FRONT OF FDF
- = FDF TERMINATED FIBER
- = FDF TERMINATED FIBER W/ PATCHCORD CONNECTION
- = SINGLE-MODE (MAIN FIBERS ONLY)
- - - = MULTI-MODE (MAIN FIBERS ONLY)
- ... = BAD FIBER (DON'T USE)
- * = DENOTES 1550 LASER FOR DV6000

FIBERS 1-36 SPLICED TO F-35.1 AT VAULT
 FIBERS 37-72 SPLICED TO F-35E.17 AT VAULT
 FIBERS 73-78 SPLICED TO PIGTAIL (CAB 35-88.40) AT VAULT
 FIBERS 79-84 LOOPED BACK AT VAULT
 FIBERS 85-96 DEADEND AT VAULT

TO 35E / 77 SHELTER

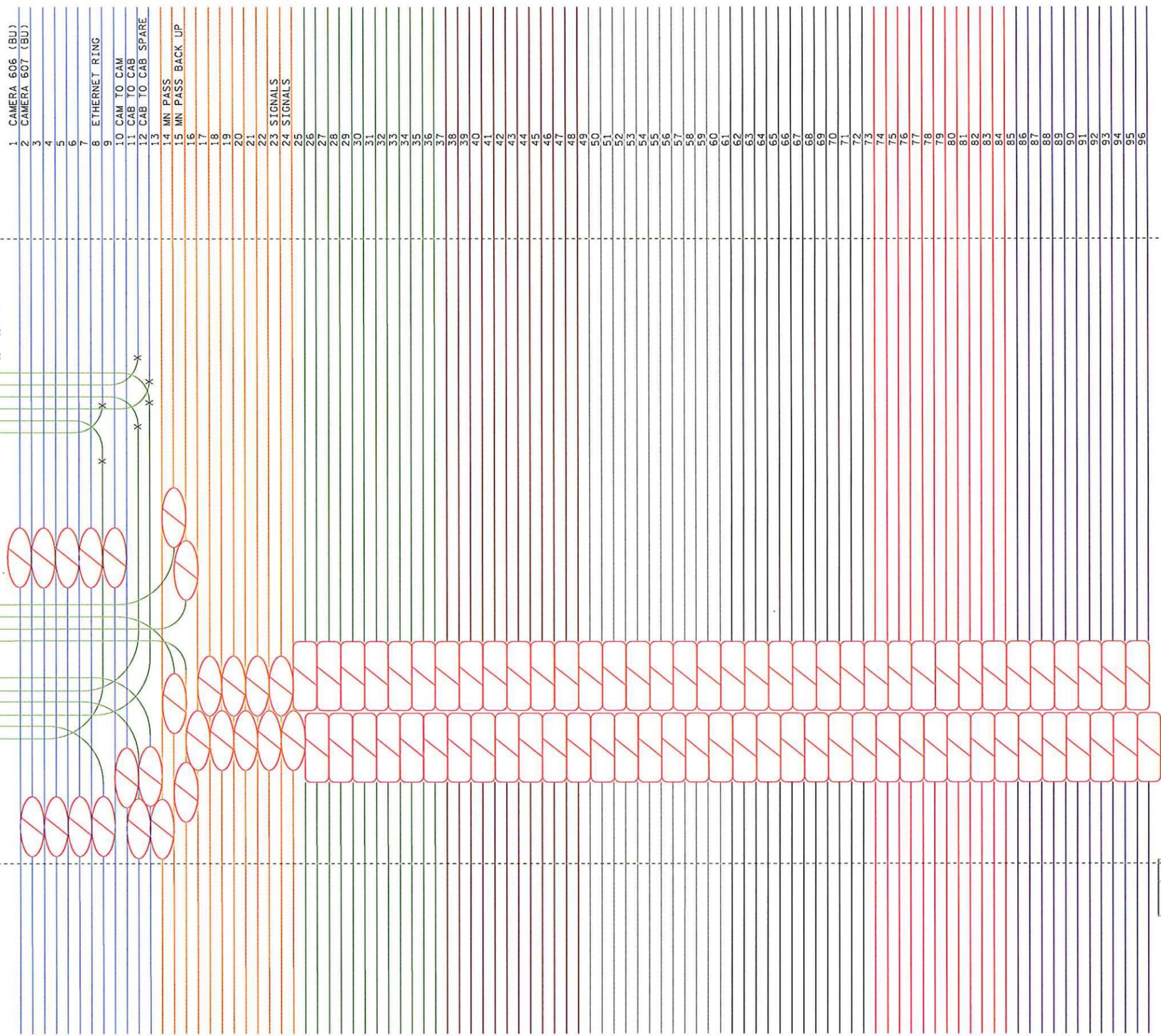
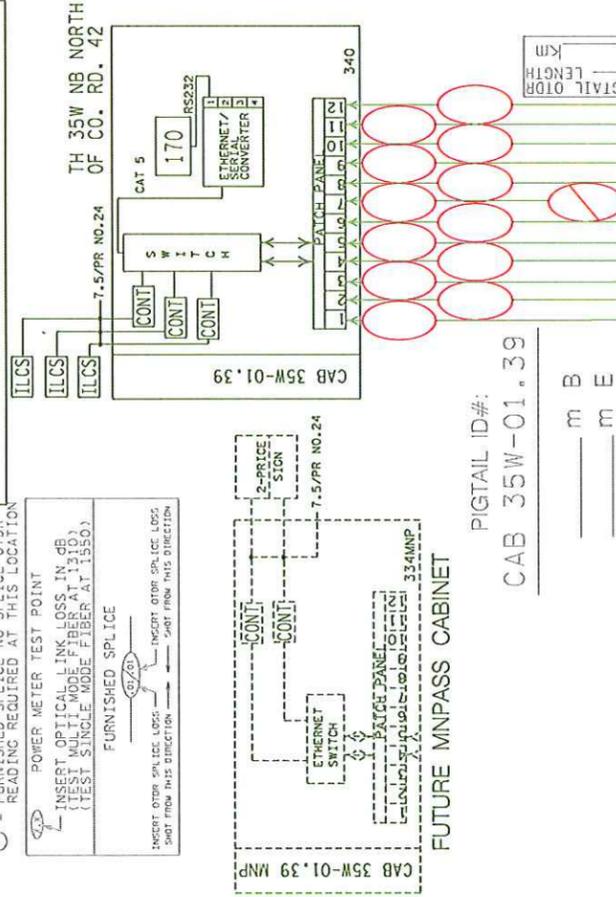
FIBERS 1-36 & 73-78 TO 48 PATCH PANEL
 (F-35.1 & PIGTAIL CAB 35-88.40)
 FIBERS 37-72 TO 36 PATCH PANEL (F-35E.17)
 FIBERS 79-84 LOOPED BACK AT VAULT
 FIBERS 85-96 DEADEND IN TRAY

35E & 35W SO SPLIT

REV. NO.	DATE: / /
REV. NO.	DATE: / /

NEW COMMON FOUNDATION

U = FURNISHED SPLICE NO SPLICE OTDR READING REQUIRED AT THIS LOCATION
 POWER METER TEST POINT
 INSERT OPTICAL LINK LOSS IN dB (TEST MULTI-MODE FIBER AT 1310) (TEST SINGLE-MODE FIBER AT 1550)
 FURNISHED SPLICE
 INSERT OTDR SPLICE LOSS SHOT FROM THIS DIRECTION (TEST MULTI-MODE FIBER AT 1310) (TEST SINGLE-MODE FIBER AT 1550)



MINDOT INSTALLED PATCHCORDS

PIGTAIL ID#: CAB 35W-01.49

PIGTAIL ID#: CAB 35W-01.39

FIBER OPTIC CABLE MARKINGS @
 SPLICE ENCLOSURE _____
 VAULT ENTRY _____

FIBER OPTIC CABLE MARKINGS @
 SPLICE ENCLOSURE _____
 VAULT ENTRY _____

F-35WU.04

F-35WU.07

VAULT @
 McANDREWS
 (WEST)

THIS FIBER SCHEMATIC WILL CHANGE UNDER SP 1981-120 & 8825-386. THIS CONSTRUCTION IS PLANNED FOR 2011

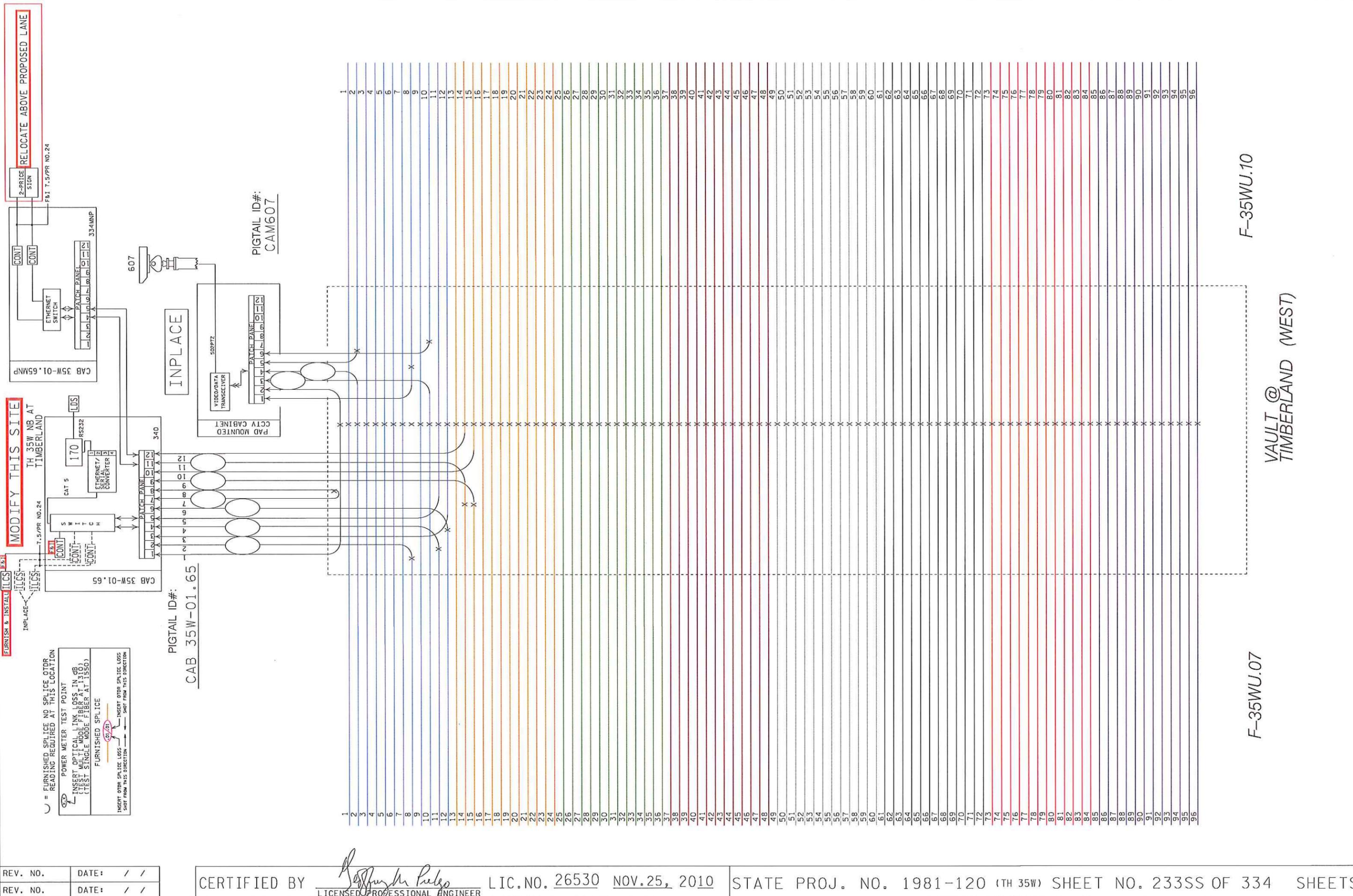
REVISED

REV. NO. 1	DATE: 05/05/11
REV. NO. 2	DATE: 12/06/11

CERTIFIED BY *[Signature]*
 LICENSED PROFESSIONAL ENGINEER

LIC.NO. 26530 NOV.25, 2010

STATE PROJ. NO. 1981-120 (TH 35W) SHEET NO. 233RR OF 334 SHEETS



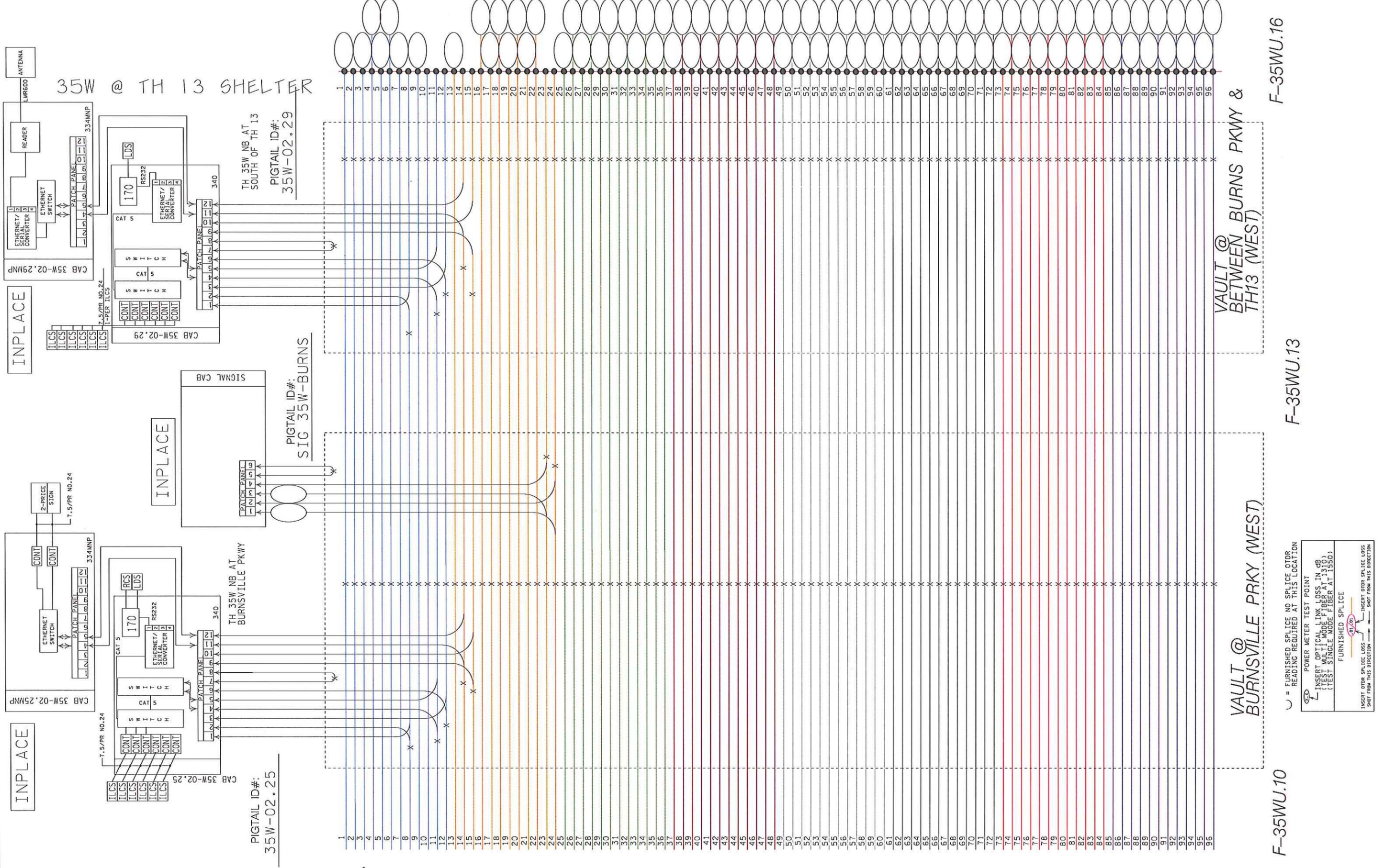
REV. NO.	DATE:	/ /
REV. NO.	DATE:	/ /

CERTIFIED BY Jeffrey M. Pulley LIC. NO. 26530 NOV. 25, 2010 STATE PROJ. NO. 1981-120 (TH 35W) SHEET NO. 233SS OF 334 SHEETS

F-35WU.10

VAULT @
TIMBERLAND (WEST)

F-35WU.07



F-35WU.10

F-35WU.13

F-35WU.16

REV. NO.	DATE:	/ /
REV. NO.	DATE:	/ /

CERTIFIED BY *[Signature]* LIC. NO. 26530 NOV. 25, 2010

STATE PROJ. NO. 1981-120 (TH 35W) SHEET NO. 233TT OF 334 SHEETS

TRUNK ID# 13-06

35W.35 (TO SOUTH)
 ABANDONED

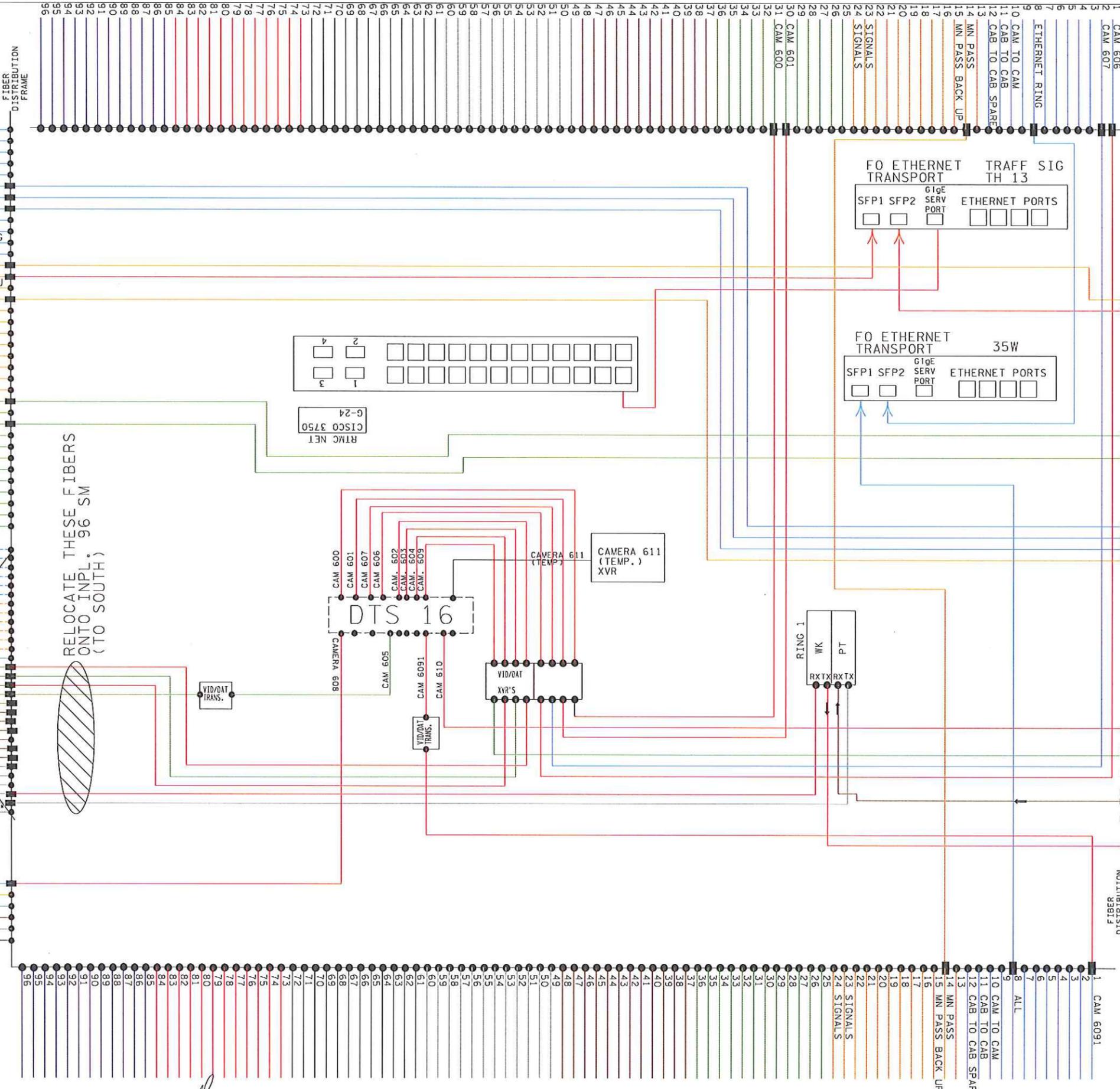
TH 13 WEST

- 1 CAMERA 321 BU
- 2 CAMERA 320 BU
- 3 CAMERA 319 BU
- 4 CAMERA 318 BU
- 5 CAMERA 317 BU
- 6 CAMERA 1316
- 7 CAMERA 1315
- 8 CAMERA 1314
- 9 CAM TO CAM
- 10 DATALINK SERIAL RING BU
- 11 DATALINK CAB SERIAL RING
- 12
- 13 ETHERNET RING-TMC
- 14 ETHERNET RING-SIGNALS
- 15 ETHERNET RING-SIGNALS BU
- 16 CAMERA 1313
- 17
- 18
- 19
- 20
- 21
- 22
- 23
- 24
- 25 DMS DATA LINK
- 26
- 27 DMS DATA LINK BACKUP
- 28
- 29
- 30
- 31
- 32
- 33
- 34
- 35
- 36

- 1
- 2
- 3
- 4
- 5
- 6
- 7 DTS 16 TX-A*
- 8 LINE 61-B TX1/RX1
- 9 DTS 07 TX-B*
- 10
- 11 LINE 61-A TX2/RX2
- 12 LINE 45 RING
- 13 LINE 25 TX1/RX1-TX2/RX2
- 14
- 15
- 16 SONET R1 WK
- 17 SONET R1 PT
- 18 ** DROPPED IN FIRST CAB SO. **

- 1 CAMERA 608
- 2
- 3
- 4
- 5
- 6

CAM 608
 PIGTAIL ID#:
 C608
 _____ m B
 _____ m E



35WU.16
 (SOUTH)

TH 13 EAST
 TRUNK
 ID# 13-07

- 1 CAMERA 1312 BU
- 2 CAMERA 1311 BU
- 3 CAMERA 1310 BU
- 4 CAMERA 1309 BU
- 5 CAMERA 1308 BU
- 6 CAMERA 1307 BU
- 7 CAMERA 1306 BU
- 8
- 9 CAM TO CAM
- 10 DATALINK BACKUP SERIAL RING
- 11 DATALINK CABINET SERIAL RING
- 12
- 13 ETHERNET RING-TMC
- 14 ETHERNET RING-SIGNALS
- 15 ETHERNET RING-SIGNALS BACKUP
- 16
- 17
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- 19
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- 22
- 23
- 24
- 25 DMS DATA LINK
- 26
- 27 DMS DATA LINK BACKUP
- 28
- 29
- 30
- 31
- 32
- 33 CAMERA 1316
- 34 CAMERA 1315
- 35 CAMERA 1314
- 36 CAMERA 1313

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35W.34
 (NORTH)

35WU.17
 (NORTH)

TH 35W & T.H. 13
 FIBER SCHEMATIC

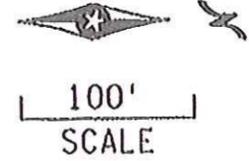
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REV. NO.	DATE: / /

CERTIFIED BY *[Signature]* LIC.NO. 26530 NOV.25, 2010
 LICENSED PROFESSIONAL ENGINEER

STATE PROJ. NO. 1981-120 (TH 35W) SHEET NO. 233UU OF 334 SHEETS

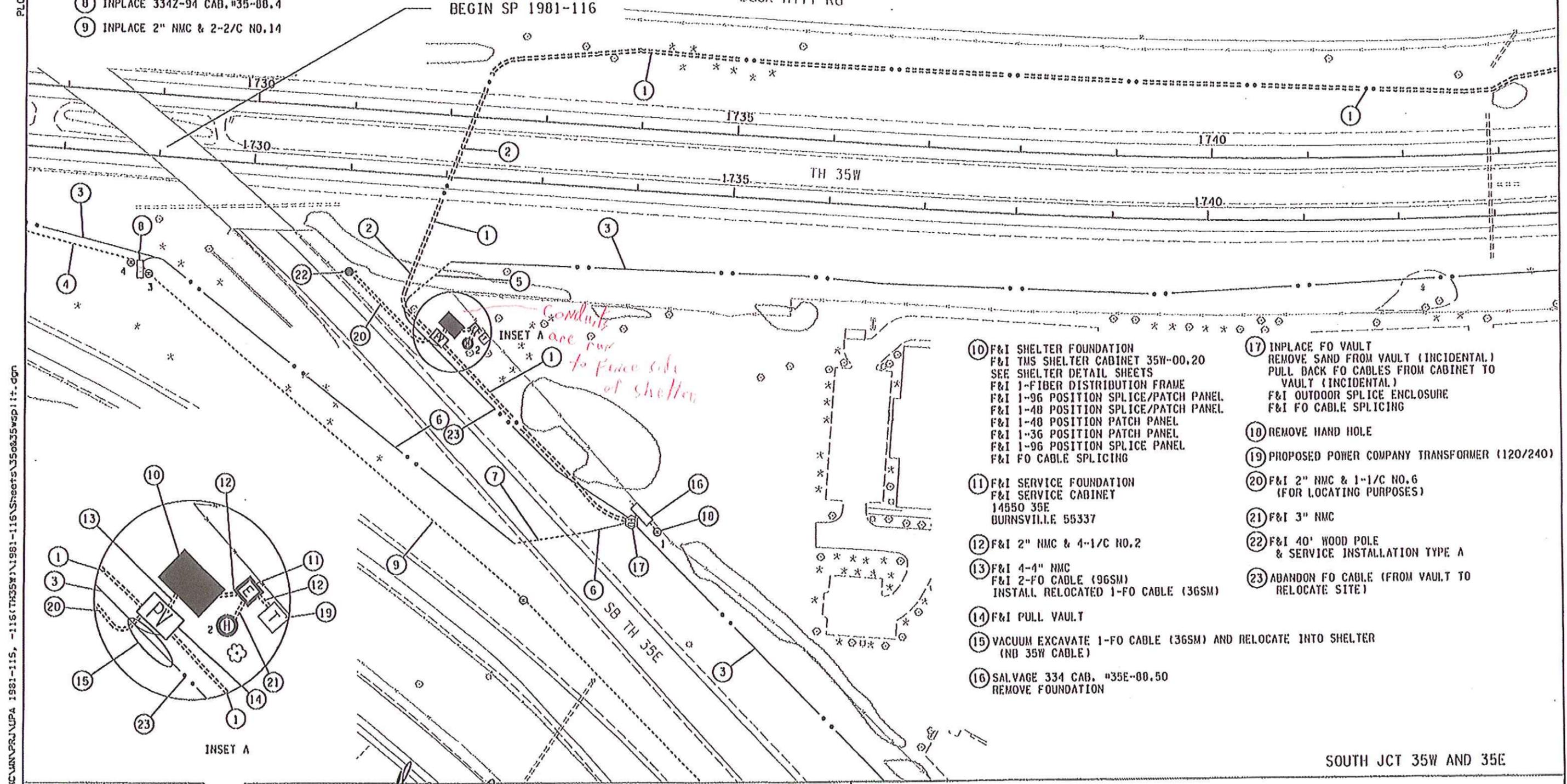
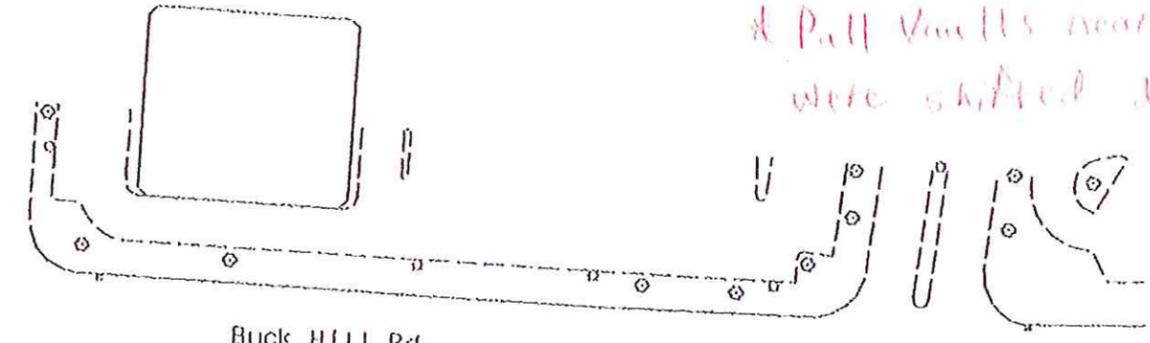
All Pull Vaults near common foundations were shifted due to staging.

*UPA 35W
ASBUILTS*



Kobbitom COROSTOXD013 TMS
PLOTTED: 7/29/2008 12:25:20 PM

- ① F&I 1.5" NMC & 1-FO CABLE (96SM)
- ② F&I 1.5" NMC BORE & 1-FO CABLE (96SM)
- ③ INPLACE 1-FO CABLE (36SM)
- ④ INPLACE 2" NMC & 3-1/C NO.4
- ⑤ INPLACE 2" NMC & 1-FO CABLE (36SM)
- ⑥ INPLACE 1-FO CABLE (36SM) & 1-FO PIGTAIL (6SM)
- ⑦ INPLACE 2" NMC, 1-FO CABLE (36SM) & 1-FO PIGTAIL (6SM)
- ⑧ INPLACE 334Z-94 CAB. #35-00.4
- ⑨ INPLACE 2" NMC & 2-2/C NO.14



- ⑩ F&I SHELTER FOUNDATION
F&I TMS SHELTER CABINET 35W-00.20
SEE SHELTER DETAIL SHEETS
F&I 1-FIBER DISTRIBUTION FRAME
F&I 1-96 POSITION SPLICE/PATCH PANEL
F&I 1-48 POSITION SPLICE/PATCH PANEL
F&I 1-48 POSITION PATCH PANEL
F&I 1-36 POSITION PATCH PANEL
F&I 1-96 POSITION SPLICE PANEL
F&I FO CABLE SPLICING
- ⑪ F&I SERVICE FOUNDATION
F&I SERVICE CABINET
14550 35E
BURNSVILLE 55337
- ⑫ F&I 2" NMC & 4-1/C NO.2
- ⑬ F&I 4-4" NMC
F&I 2-FO CABLE (96SM)
INSTALL RELOCATED 1-FO CABLE (36SM)
- ⑭ F&I PULL VAULT
- ⑮ VACUUM EXCAVATE 1-FO CABLE (36SM) AND RELOCATE INTO SHELTER (NB 35W CABLE)
- ⑯ SALVAGE 334 CAB. #35E-00.50
REMOVE FOUNDATION
- ⑰ INPLACE FO VAULT
REMOVE SAND FROM VAULT (INCIDENTAL)
PULL BACK FO CABLES FROM CABINET TO VAULT (INCIDENTAL)
F&I OUTDOOR SPLICE ENCLOSURE
F&I FO CABLE SPLICING
- ⑱ REMOVE HAND HOLE
- ⑲ PROPOSED POWER COMPANY TRANSFORMER (120/240)
- ⑳ F&I 2" NMC & 1-1/C NO.6
(FOR LOCATING PURPOSES)
- ㉑ F&I 3" NMC
- ㉒ F&I 40' WOOD POLE
& SERVICE INSTALLATION TYPE A
- ㉓ ABANDON FO CABLE (FROM VAULT TO RELOCATE SITE)

S:\TMC\UNPR\UPA 1981-115, -116\TH35W\1981-116\Sheets\350235wp1.t.dgn

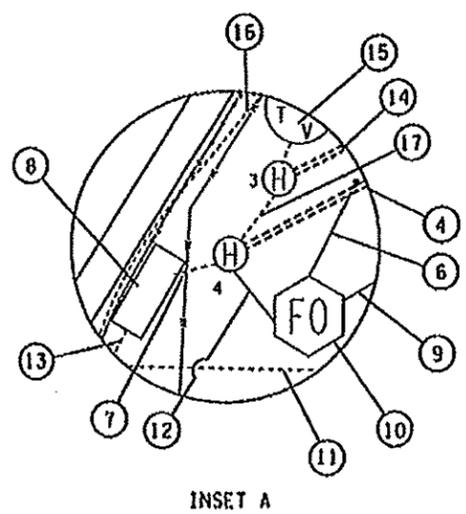
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CERTIFIED BY *[Signature]* LIC. NO. 26530 JUNE 20 2008
LICENSED PROFESSIONAL ENGINEER

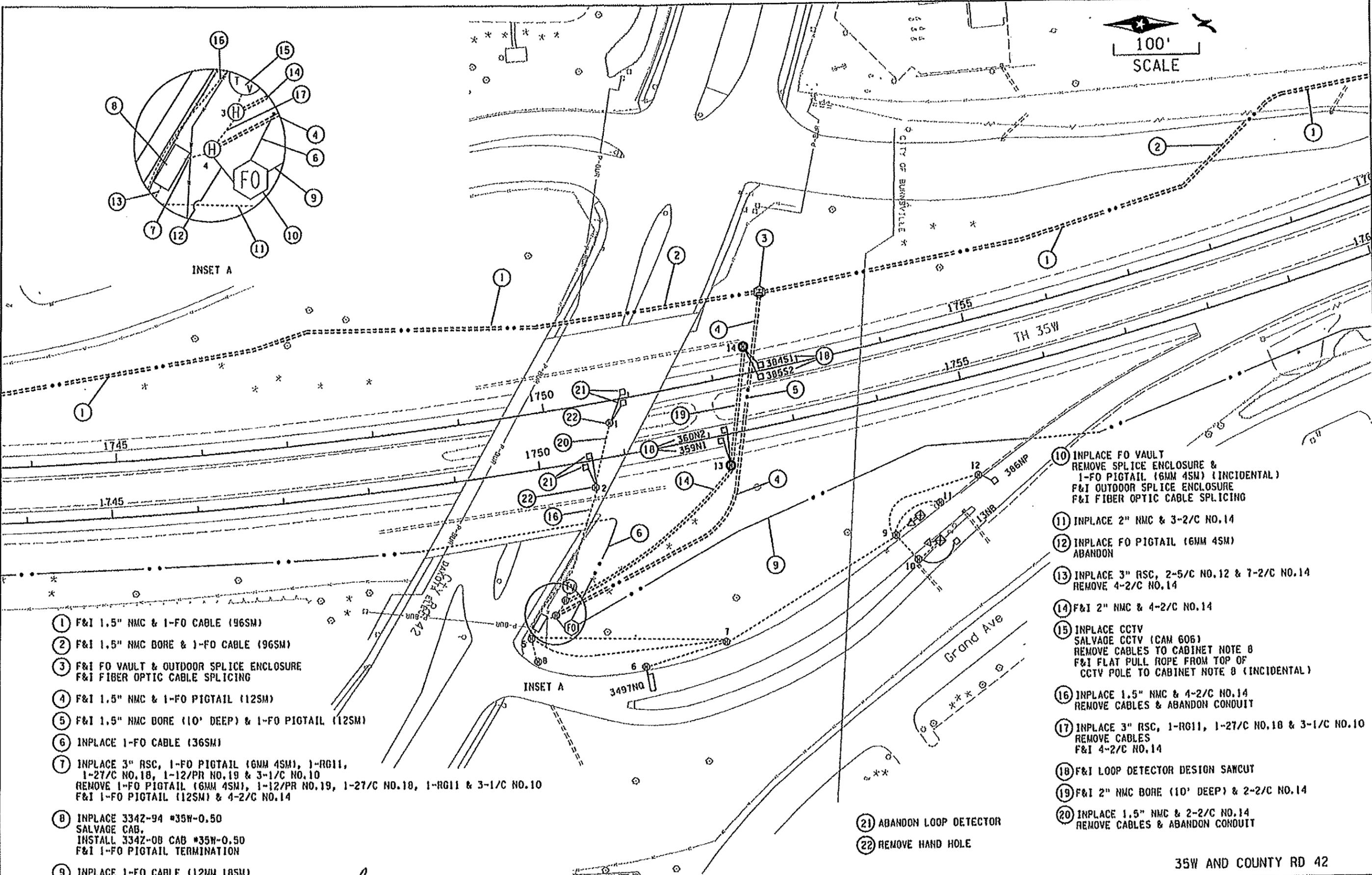
STATE PROJ. NO. 1981-116 (TH 35W) SHEET NO. 10 OF 159 SHEETS

SOUTH JCT 35W AND 35E

CONSTRUCTION PLAN



INSET A

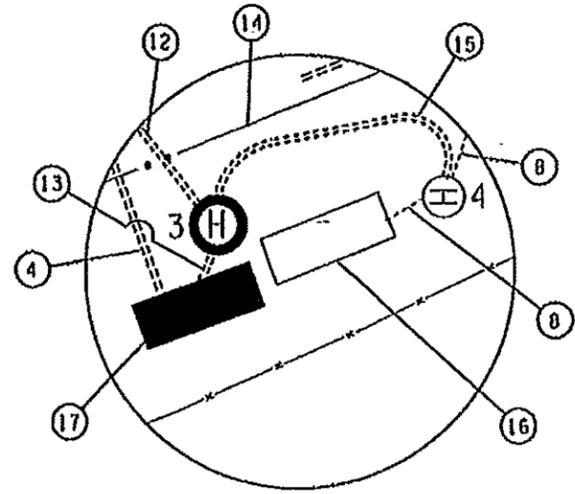


- ① F&I 1.5" NMC & 1-FO CABLE (96SM)
- ② F&I 1.5" NMC BORE & 1-FO CABLE (96SM)
- ③ F&I FO VAULT & OUTDOOR SPLICE ENCLOSURE
F&I FIBER OPTIC CABLE SPLICING
- ④ F&I 1.5" NMC & 1-FO PIGTAIL (12SM)
- ⑤ F&I 1.5" NMC BORE (10' DEEP) & 1-FO PIGTAIL (12SM)
- ⑥ INPLACE 1-FO CABLE (36SM)
- ⑦ INPLACE 3" RSC, 1-FO PIGTAIL (6MM 4SM), 1-RG11,
1-27/C NO.18, 1-12/PR NO.19 & 3-1/C NO.10
REMOVE 1-FO PIGTAIL (6MM 4SM), 1-12/PR NO.19, 1-27/C NO.18, 1-RG11 & 3-1/C NO.10
F&I 1-FO PIGTAIL (12SM) & 4-2/C NO.14
- ⑧ INPLACE 3342-94 #35W-0.50
SALVAGE CAB.
INSTALL 3342-08 CAB #35W-0.50
F&I 1-FO PIGTAIL TERMINATION
- ⑨ INPLACE 1-FO CABLE (12MM 10SM)

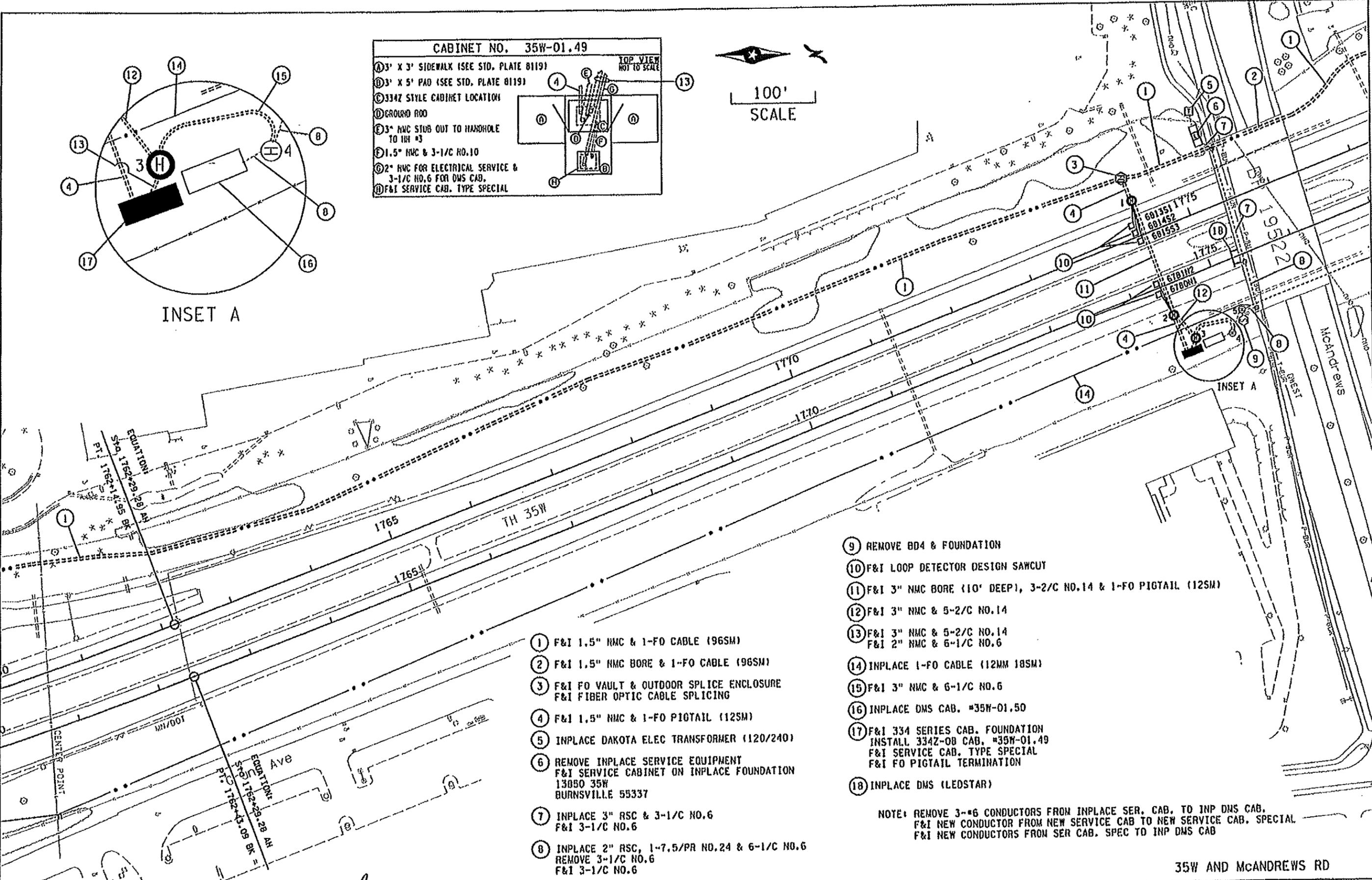
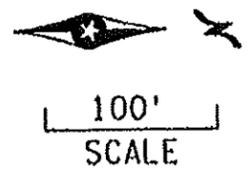
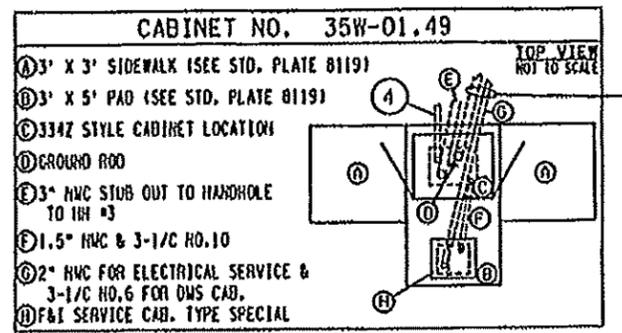
- ⑩ INPLACE FO VAULT
REMOVE SPLICE ENCLOSURE &
1-FO PIGTAIL (6MM 4SM) (INCIDENTAL)
F&I OUTDOOR SPLICE ENCLOSURE
F&I FIBER OPTIC CABLE SPLICING
- ⑪ INPLACE 2" NMC & 3-2/C NO.14
- ⑫ INPLACE FO PIGTAIL (6MM 4SM)
ABANDON
- ⑬ INPLACE 3" RSC, 2-5/C NO.12 & 7-2/C NO.14
REMOVE 4-2/C NO.14
- ⑭ F&I 2" NMC & 4-2/C NO.14
- ⑮ INPLACE CCTV
SALVAGE CCTV (CAM 606)
REMOVE CABLES TO CABINET NOTE B
F&I FLAT PULL ROPE FROM TOP OF
CCTV POLE TO CABINET NOTE B (INCIDENTAL)
- ⑯ INPLACE 1.5" NMC & 4-2/C NO.14
REMOVE CABLES & ABANDON CONDUIT
- ⑰ INPLACE 3" RSC, 1-RG11, 1-27/C NO.18 & 3-1/C NO.10
REMOVE CABLES
F&I 4-2/C NO.14
- ⑱ F&I LOOP DETECTOR DESIGN SANCUT
- ⑲ F&I 2" NMC BORE (10' DEEP) & 2-2/C NO.14
- ⑳ INPLACE 1.5" NMC & 2-2/C NO.14
REMOVE CABLES & ABANDON CONDUIT

- ㉑ ABANDON LOOP DETECTOR
- ㉒ REMOVE HAND HOLE

35W AND COUNTY RD 42



INSET A



- ① F&I 1.5" NMC & 1-FO CABLE (96SM)
- ② F&I 1.5" NMC BORE & 1-FO CABLE (96SM)
- ③ F&I FO VAULT & OUTDOOR SPLICE ENCLOSURE
F&I FIBER OPTIC CABLE SPLICING
- ④ F&I 1.5" NMC & 1-FO PIGTAIL (12SM)
- ⑤ INPLACE DAKOTA ELEC TRANSFORMER (120/240)
- ⑥ REMOVE INPLACE SERVICE EQUIPMENT
F&I SERVICE CABINET ON INPLACE FOUNDATION
13050 35W
BURNSVILLE 55337
- ⑦ INPLACE 3" RSC & 3-1/C NO.6
F&I 3-1/C NO.6
- ⑧ INPLACE 2" RSC, 1-7.5/PR NO.24 & 6-1/C NO.6
REMOVE 3-1/C NO.6
F&I 3-1/C NO.6

- ⑨ REMOVE BD4 & FOUNDATION
- ⑩ F&I LOOP DETECTOR DESIGN SAWCUT
- ⑪ F&I 3" NMC BORE (10' DEEP), 3-2/C NO.14 & 1-FO PIGTAIL (12SM)
- ⑫ F&I 3" NMC & 5-2/C NO.14
- ⑬ F&I 3" NMC & 5-2/C NO.14
F&I 2" NMC & 6-1/C NO.6
- ⑭ INPLACE 1-FO CABLE (12MM 18SM)
- ⑮ F&I 3" NMC & 6-1/C NO.6
- ⑯ INPLACE DMS CAB. #35W-01.50
- ⑰ F&I 334 SERIES CAB. FOUNDATION
INSTALL 334Z-08 CAB. #35W-01.49
F&I SERVICE CAB. TYPE SPECIAL
F&I FO PIGTAIL TERMINATION
- ⑱ INPLACE DMS (LEDSTAR)

NOTE: REMOVE 3-*6 CONDUCTORS FROM INPLACE SER. CAB. TO INP DMS CAB.
 F&I NEW CONDUCTOR FROM NEW SERVICE CAB TO NEW SERVICE CAB. SPECIAL
 F&I NEW CONDUCTORS FROM SER CAB. SPEC TO INP DMS CAB

35W AND McANDREWS RD

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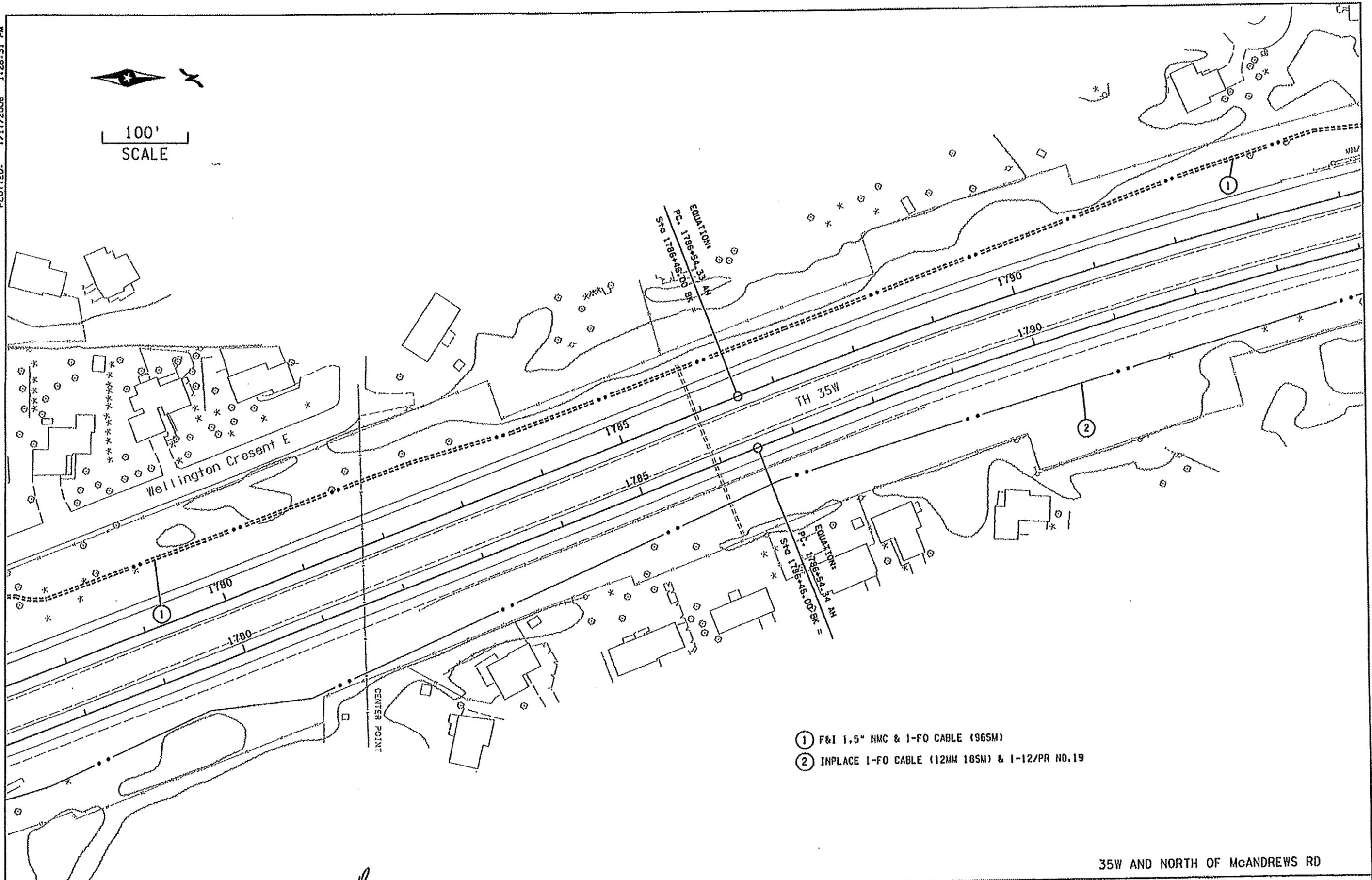
CERTIFIED BY *[Signature]* LIC. NO. 26530 JUNE 20 2008
 LICENSED PROFESSIONAL ENGINEER

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100'
SCALE



- ① F&I 1.5" NMC & I-FO CABLE (96SM)
- ② INPLACE I-FO CABLE (12MM 10SM) & I-12/PR NO.19

35W AND NORTH OF McANDREWS RD

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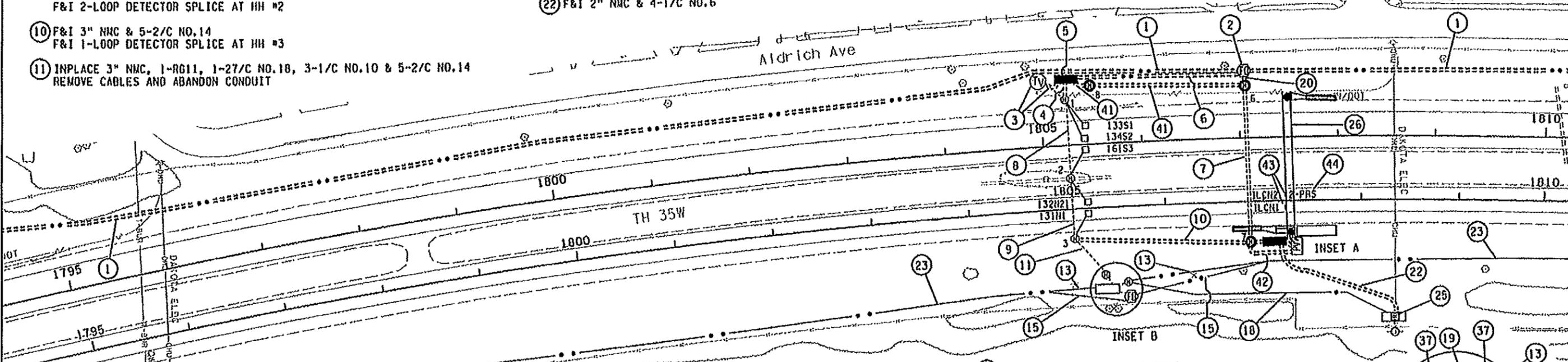
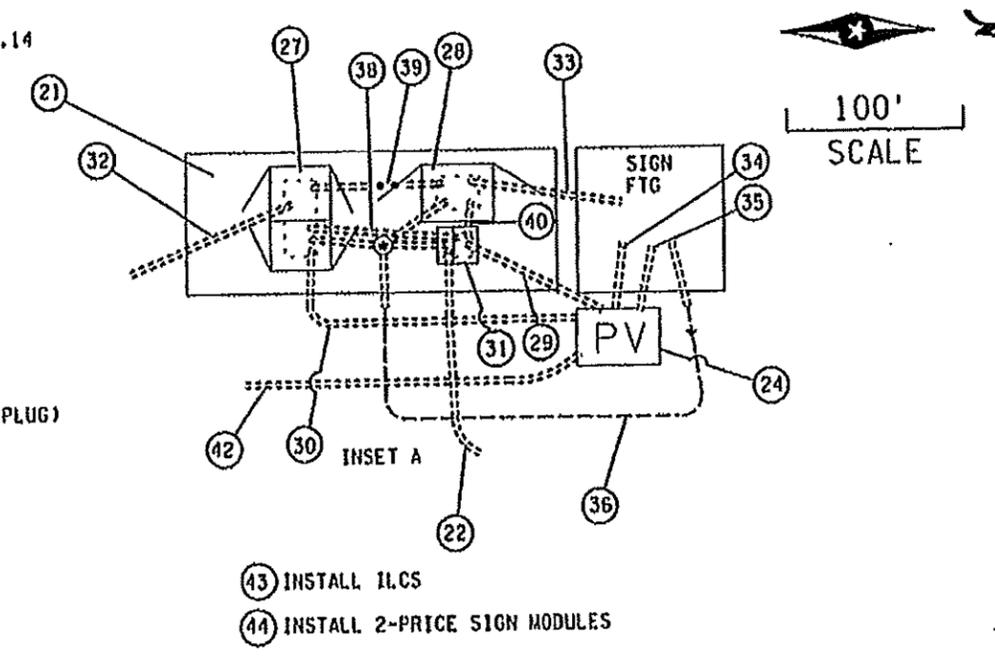
CERTIFIED BY *Robert M. Kelly* LIC. NO. 26530 JUN 20 2008
 LICENSED PROFESSIONAL ENGINEER

STATE PROJ. NO. 1981-116 (TH 35W) SHEET NO. 13 OF 159 SHEETS

KOOB1Tom COROSTSOXD013 TMS
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 S:\TMC\WYPR\JLUPA 1981-115, -116\TH35W\1981-116\Sheets\imfresoburnspkwy.dgn

- ① F&I 1.5" NMC & 1-FO CABLE (965M)
- ② F&I FO VAULT & OUTDOOR SPLICE ENCLOSURE
F&I FIBER OPTIC CABLE SPLICING
- ③ INPLACE 2"RSC, 1-RG11, 1-27/C NO.18 & 3-1/C NO.10
REMOVE CABLES
INTERCEPT CONDUIT F&I 2" NMC TO CABINET NOTE 5
INPLACE CCTV
SALVAGE CCTV (CAM 607)
F&I FLAT ROPE FROM TOP OF CCTV POLE TO CABINET NOTE 5 (INCIDENTAL)
- ④ F&I 2" NMC
- ⑤ F&I 334 SERIES FOUNDATION
INSTALL CABINET (#C-607)
F&I FO PIGTAIL TERMINATION
- ⑥ F&I 1.5" NMC & 1-FO PIGTAIL (65M)
- ⑦ F&I 3" NMC BORE (10' DEEP), 3-1/C NO.6 & 1-FO PIGTAIL (125M)
- ⑧ INPLACE 3" RSC, 1-RG11, 1-27/C NO.18, 3-1/C NO.10 & 2-2/C NO.14
REMOVE CABLES
F&I 2-2/C NO.14
F&I 2-LOOP DETECTOR SPLICE AT HH #1
- ⑨ INPLACE 3" RSC, 1-RG11, 1-27/C NO.18, 3-1/C NO.10 & 4-2/C NO.14
REMOVE CABLES
F&I 4-2/C NO.14
F&I 2-LOOP DETECTOR SPLICE AT HH #2
- ⑩ F&I 3" NMC & 5-2/C NO.14
F&I 1-LOOP DETECTOR SPLICE AT HH #3
- ⑪ INPLACE 3" NMC, 1-RG11, 1-27/C NO.18, 3-1/C NO.10 & 5-2/C NO.14
REMOVE CABLES AND ABANDON CONDUIT

- ⑫ INPLACE 3" RSC, 1-RG11, 1-27/C NO.18, 3-1/C NO.10 & 5-2/C NO.14
REMOVE CABLES AND ABANDON CONDUIT
- ⑬ INPLACE 1-12/PR NO.19
ABANDON CABLE
- ⑭ INPLACE 334Z CAB. #35H-01.60
SALVAGE CAB
REMOVE SERVICE EQUIPMENT
REMOVE FOUNDATION
- ⑮ INPLACE 1-FO CABLE (12MM 185M)
- ⑯ INPLACE 2" NMC & 1-FO PIGTAIL (6MM 45M)
REMOVE CABLE AND ABANDON CONDUIT
- ⑰ INPLACE FO VAULT & SPLICE ENCLOSURE
REMOVE 1-FO PIGTAIL (6MM 45M) (INSTALL ENCLOSURE COMPATIBLE PLUG)
F&I FIBER OPTIC CABLE SPLICING
- ⑱ INPLACE 1-3/C NO.4
ABANDON CABLE
- ⑲ INPLACE 2" RSC, 1-3/C NO.4 & 1-12/PR NO.19
REMOVE CABLES AND ABANDON CONDUIT
- ⑳ F&I 1.5" NMC & 1-FO PIGTAIL (125M)
- ㉑ F&I COMMON FOUNDATION
- ㉒ F&I 2" NMC & 4-1/C NO.6



- ⑳ INSTALL 334 CAB. (SHELL) #35H-01.65MNP
 - ㉑ 4" NMC F&I 3-1/C NO.6 & 4-3/C NO.14
 - ㉒ F&I 4" NMC, 2-3/C NO.14, 2-7.5/PR NO.24 & 1-FO PIGTAIL (125M)
 - ㉓ F&I SERVICE CABINET TYPE SPECIAL
 - ㉔ F&I 3" NMC (TO STUB OUT) & 5-2/C NO.14
 - ㉕ 4" NMC F&I 2-7.5/PR NO.24
 - ㉖ 4" NMC F&I 4-3/C NO.14
 - ㉗ 4" NMC F&I 2-7.5/PR NO.24
- ⑳ INPLACE 1-FO CABLE (12MM 185M) & 1-12/PR NO.19
 - ㉑ F&I PULL VAULT
 - ㉒ INPLACE SERVICE EQUIPMENT
REMOVE SERVICE EQUIPMENT
F&I SERVICE CABINET (OVER INPLACE CONDUITS ON FOUNDATION)
13400 35W
BURNSVILLE 55337
 - ㉓ SIGN BRIDGE OH #404-35W (INSTALLED UNDER SP1981-115)
 - ㉔ INSTALL 340 STYLE CAB. #35H-01.65
F&I FO PIGTAIL TERMINATION

- ⑳ 1-1/C NO.0 BARE GROUND WIRE
- ㉑ REMOVE HAND HOLE
- ㉒ 1.5" NMC F&I 6-1/C NO.10 (340 CAB POWER) (INCIDENTAL)
- ㉓ 1.5" NMC (FOR PATCH CORDS TO MN PASS CAB)
- ㉔ 2" NMC F&I 3-1/C NO.10 (334 CAB POWER) (INCIDENTAL)
- ㉕ F&I 3" NMC & 3-1/C NO.6
- ㉖ F&I 4" NMC, 1-FO PIGTAIL (125M) & 3-1/C NO.6

CONDUITS IN NOTES 33, 34 & 35 SEE SP 1981-115

35W AND 3/4 MILE SOUTH OF BURNSVILLE PARKWAY

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CERTIFIED BY *[Signature]* LIC. NO. 26530 JUNE 20 2008
 LICENSED PROFESSIONAL ENGINEER

STATE PROJ. NO. 1981-116 (TH 35W) SHEET NO. 14 OF 159 SHEETS

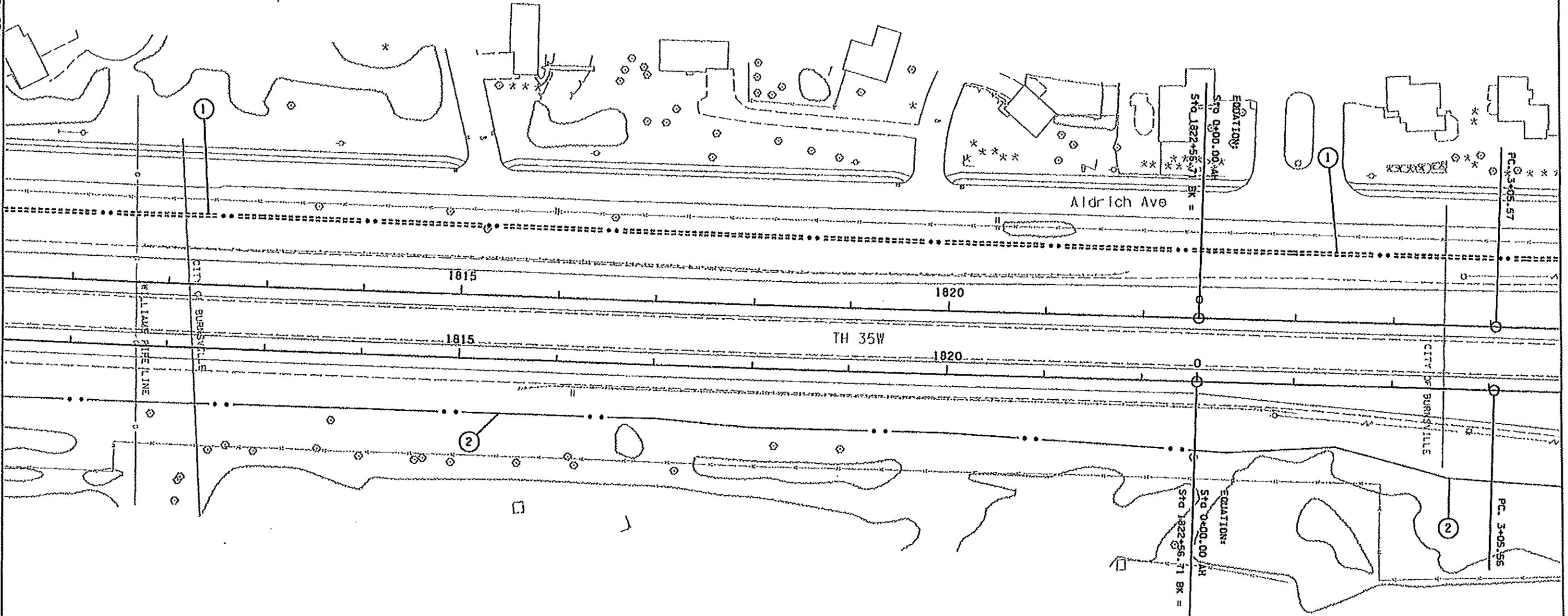
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100'
SCALE

- ① F&I 1.5" NMC & 1-FO CABLE (96SM)
- ② INPLACE 1-FO CABLE (12MM 18SM) & 1-12/PR NO.19



35W AND SOUTH OF BURNSVILLE PARKWAY

REV. NO.	DATE: / /
REV. NO.	DATE: / /

CERTIFIED BY *Robert M. Puleo* LIC. NO. 26530 JUN 20 2008
LICENSED PROFESSIONAL ENGINEER

STATE PROJ. NO. 1981-116 (TH 35W) SHEET NO. 15 OF 159 SHEETS

- 1 F&I 1.5" NMC & 1-FO CABLE (96SM)
- 2 F&I 1.5" NMC BORE & 1-FO CABLE (96SM)
- 3 F&I FO VAULT & OUTDOOR SPLICE ENCLOSURE
F&I FIBER OPTIC CABLE SPLICING
- 4 F&I 1.5" NMC & 1-FO PIGTAIL (12SM)
- 5 F&I 1.5" NMC BORE & 1-FO PIGTAIL (12SM)
- 6 INPLACE 2" NMC & 1-FO PIGTAIL (6SM)
(SIGNALS) (SP 1901-110)
- 7 INPLACE 2" NMC & 1-2/C ON,14
REMOVE CABLE
F&I 1-2/C NO.14
- 8 INPLACE SIGN BRIDGE OH #403-35W (SP 1981-115)
- 9 INPLACE LOOP DETECTORS
(NB LOOPS INSTALLED UNDER SP 1981-117)
F&I 2-LOOP DETECTOR SPLICE (SB RIGHT 2 LANES)
- 10 INPLACE 3" RSC & 4-2/C NO.14
REMOVE CABLES
F&I 5-2/C NO.14
- 11 INPLACE 3" RSC & 6-2/C NO.14
REMOVE CABLES
F&I 5-2/C NO.14
- 12 INPLACE 2" NMC & 8-2/C NO.14
REMOVE CABLES
F&I 8-2/C NO.14
- 13 INPLACE 3" RSC, 1-5/C NO.12 & 9-2/C NO.14
REMOVE CABLES
F&I 2-2/C NO.14 & 1-5/C NO.12
(5/C NO.12 TO RAMP CONTROL SIGNALS)
- 14 INPLACE 1.5" NMC & 1-2/C NO.14
REMOVE CABLE
F&I 1-2/C NO.14
- 15 INPLACE 12/PR NO.19 (ABANDON)
- 16 INPLACE BD4 & FOUNDATION
REMOVE BD4 & FOUNDATION
- 17 INPLACE 2" NMC & 1-6/PR NO.19
REMOVE CABLE & ABANDON CONDUIT
- 18 INPLACE 334 CAB, #35W-02.30
SALVAGE CABINET
REMOVE FOUNDATION
- 19 INPLACE 3" RSC, 3-1/C NO.6, 2-5/C NO.12 & 10-2/C NO.14
REMOVE CABLES AND ABANDON CONDUITS
- 20 INPLACE 2-2" CONDUITS, 2-5/C NO.12 & 10-2/C NO.14
REMOVE CABLES
F&I 1-2/C NO.14 IN ONE CONDUIT ABANDON OTHER CONDUIT
- 21 INPLACE 1-FO CABLE (12MM 18SM) & 1-12/PR NO.19

- 22 F&I 3" NMC, 11-2/C NO.14 & 2-5/C NO.12
- 23 POKER COMPANY TRANSFORMER (120/240)
- 24 F&I 2" NMC & 4-1/C NO.6
- 25 F&I COMMON FOUNDATION
- 26 INSTALL 340 STYLE CAB, #35W-02.25
F&I FO PIGTAIL TERMINATION
- 27 INSTALL 334 CAB #35W-02.25MNP (SHELL)
- 28 F&I SERVICE CABINET TYPE SPECIAL
- 29 4" NMC
- 30 F&I 4" NMC, 11-2/C NO.14, 2-5/C NO.12 & 6-7.5/PR NO.24
- 31 F&I PULL VAULT
- 32 F&I LOOP DETECTOR SPLICE
(SPLICE TO NEW 2/C NO.14)
- 33 1-1/C NO.0 BARE GROUND WIRE
- 34 4" NMC
F&I 2-7.5/PR NO.24
- 35 4" NMC
F&I 8-3/C NO. 14
- 36 4" NMC
F&I 6-7.5/PR NO.24
- 37 4" NMC
F&I 8-3/C NO. 14
- 38 1.5" NMC (FOR PATCH CORDS TO MN PASS CAB.)
- 39 1.5" NMC
F&I 3-6/C NO.10 (340 CAB POWER) (INCIDENTAL)
- 40 3" NMC-CAPPED
- 41 2" NMC
F&I 3-1/C NO.10 (334 CAB POWER) (INCIDENTAL)
- 42 F&I SERVICE FOUNDATION
F&I SERVICE CABINET
13000 35W
BURNSVILLE MN 55337
- 43 F&I 2" NMC BORE & 4-1/C NO.6
- 44 INPLACE 3" RSC & 3-1/C NO.6
REMOVE CABLES
- 45 INPLACE 1.5" RSC & 3-1/C NO.6
REMOVE CABLES
- 46 INSTALL ILCS
- 47 INSTALL 2-PRICE SIGN MODULES
- 48 F&I LOOP DETECTOR DESIGN SANCUT
(ABANDON INPLACE LOOP DETECTOR, SAW NEW LOOP TO H#2)
- 49 INPLACE SOURCE OF POWER
- 50 INPLACE SIGNAL CABINET

CONDUITS IN NOTES 34, 35 & 36 SEE SP 1981-115

NOTES FOR SHEET 16
35W AND BURNSVILLE PARKWAY

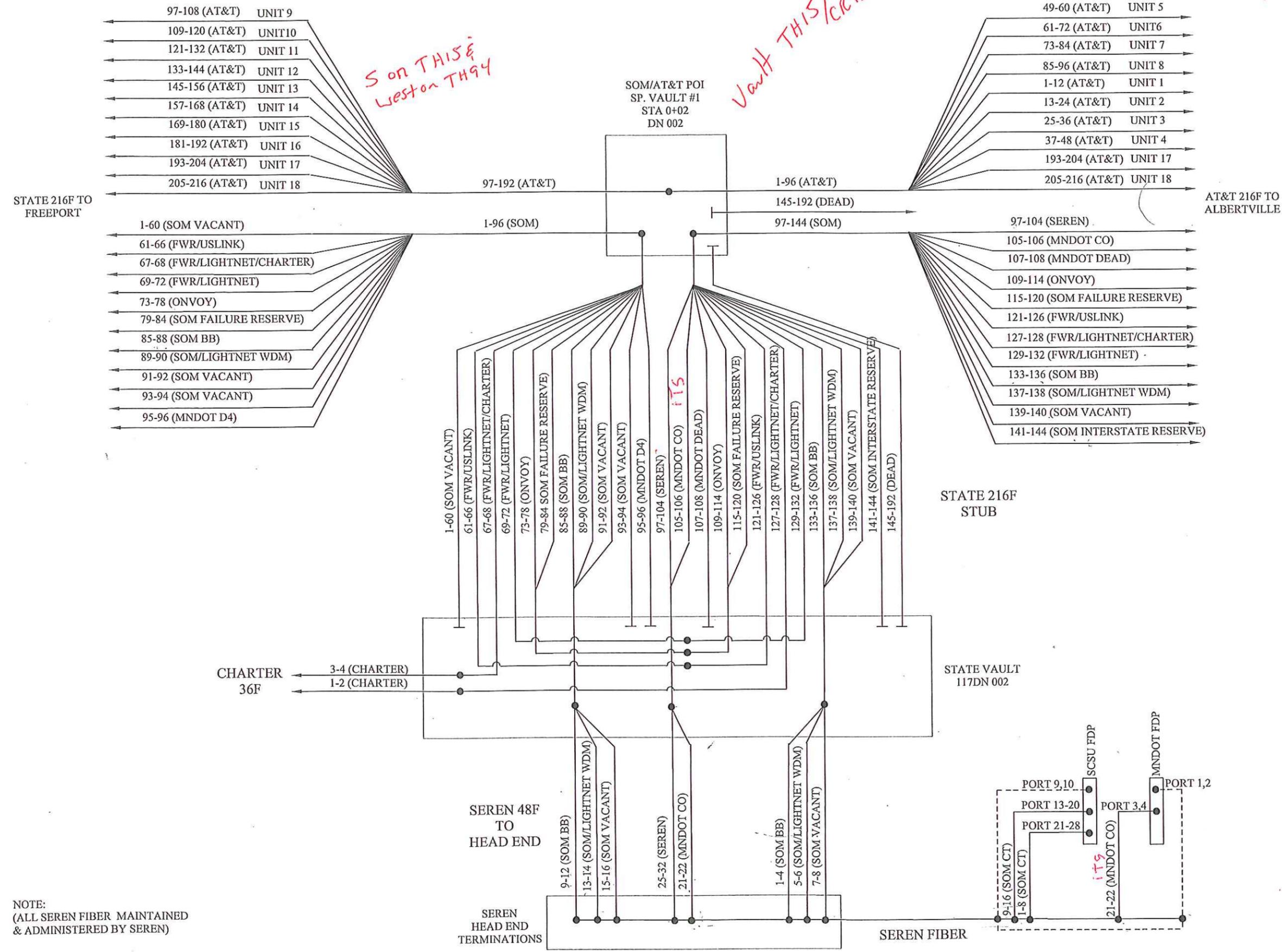
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CERTIFIED BY

Jeffrey M. Puley
 LICENSED PROFESSIONAL ENGINEER

LIC. NO. 26530 JUNE 20 2008

STATE PROJ. NO. 1981-116 (TH 35W) SHEET NO. 17 OF 159 SHEETS



NOTE:
(ALL SEREN FIBER MAINTAINED
& ADMINISTERED BY SEREN)



PREPARED FOR RECORD
I HEREBY CERTIFY THAT THIS DOCUMENT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY REGISTERED ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.
SIGNED _____
DATE _____ REG. NO. _____



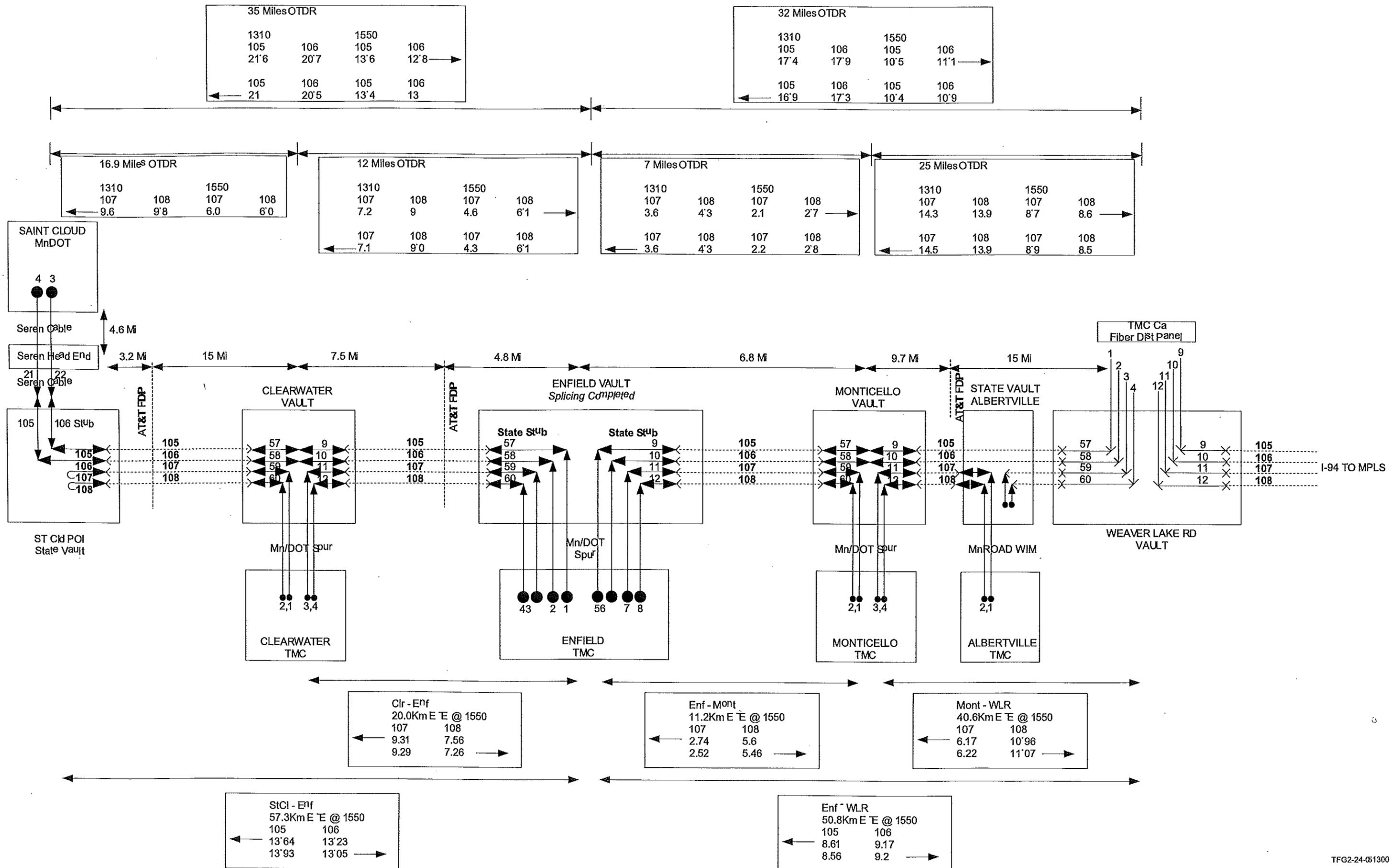
SAINT PAUL, MN
TO MOORHEAD, MN
FO CABLE SYSTEM

ST. CLOUD, MN
CABLE
ASSIGNMENTS

CB005

OET VISIO ASBUILT

TIGER - Mn/DOT Splicing Overview



RTMC DEVICE LIST - APPENDIX D

Description	GPS (With Prefix Inplace or Abandoned)			DGN	GIS	Proposed FINAL
	Adam Proposed GPS	Korth GPS	Survey GPS	Peploe Cell	GIS	
Handhole	HH	HH	EHH			HH
Camera	CAM	ICAM	CAM	ICAM, PCAM, ACAM, Z-ICAM		CAM
Gate Arm	GA	IGA				GA
Ramp Control Signal one head screw in base	RCS1					
Ramp Control Signal one head	RCS1A					
Ramp Control Signal two head screw in base	RCS2					
Ramp Control Signal two head	RCS2A					
Back Flasher	FL					FL
Overhead Dynamic Message Sign	DMS	IDMS				DMS
Shoulder Changeable Message Sign	CMS	?				CMS
Fiber Optic Splice Vault	FOV					FOV
Connect Minnesota Vault	CONNMN	CONNMN				CONNMN
U of M Vault	UofM					UOFM
Pull Vault	PV					PV
RTMC Cabinet	CAB ?	ICAB				CAB
Signal Cabinet	SIGCAB	SIGCAB				SIGCAB
Lighting Cabinet	LTGCAB	LTGCAB				LTGCAB
Automated Traffic Recorder Cabinet	ATRCAB	ATRCAB				ATRCAB
Shelter	HOUSE	IHOUSE				HOUSE
Patching Shelter	PS	IPS				PS
Source of Power/Metered Service	SOP	ISOP	EMTR?			
Power Pole	PP	IPP	EP			
Transformer	TRANS	TRANS				TRANS
Electrical Service Pad	EPAD	IEPAD				EPAD
Electrical Service Pedestal			EPED			
Electric Meter			EMTR			SOP SERVICE METERED?
Transmission Tower		POW-TOWER	ETOW?			
Power Manhole		PMH	EMH			EMH
Power Cable	PO	CABLE1	ELIN			ELIN
Power Cable in Conduit	POCD	POCD	ECIC?			ECIC
Fiber Optic Cable	FO		FO			FO
Fiber Optic Cable in Conduit	FOCD		FOCD			FOCD
Loop Cable	LO					
Loop Cable in Conduit	LOCD					
Communication Cable	CO	CO	CLIN			CLIN
Communication Cable in Conduit	COCD					
Communication/Telephone Pole			T			T
Cell/ Radio Towers			CTOW			CTOW
Communication Manhole			CMH			CMH
EMTY Conduit	CON	CON				
Coax Cable						
Telephone Cable			TLIN			TLIN
Telephone Cable in Conduit			TCIC			TCIC
BD4 Pedestal	BD4	IBD4				BD4
BD7 Pedestal		IBD7				BD7
Telephone Pedestal			TPED			
Telephone Manhole			TMH			TMH
Loop Detector	LOOP					LOOP
Preform Loop		PLOOP				PLOOP
Sawcut Loop		SLOOP				SLOOP
Non-Intrusive Detector	NID					NID
Virtual Detection Location	VDL					
Microwave Detector	MWD					MWD
MnPass Sign	MNPASS	TOLL SIGN				MNPASS
Illuminated Lane Control Sign	ILCS	LANE CONTROL SIGNAL				ILCS
MnPass Reader	MNPASR	TOLL READER				MNPASR
Mile Post Marker Sign		MPM				SGNP
Fiber Optic Sign		FOS	SGNP			SGNP
Ramp Meter Ahead Sign		W3-X1	SGNP			SGNP
Junction Box	JB	IJB				JB
In Road Lighting	IRL					IRL
Generator	GEN					GEN
Signal Pole		SGL.PL	SGL			

Light Pole		LP	LP		LP
Storm Manhole			STMH		STMH
Gas Manhole			GMH		GMH
Gas Meter			GMTR		GMTR
Gas Line			GLIN		GLIN
Water Line			WLIN		WLIN
Water Manhole			WMH		WMH
Sewer Line			SLIN		SLIN
Sewer Manhole			SWMH		SWMH
Misc					
Ped Gate					
Fence			FENC		FENC
Catch Basin		CBINP	CB		CB
Curb & Gutter		BHCG			
Culvert		APRCE	BOX		BOX
Edge of Concrete			EOC		
Flag Pole			FLAGP		FLAGP
Noise Wall			NWAL		NWAL
Bridge Pier Abutment			BRBP		BRBP
Guard Rail		8307	GRPB		GRPB
Hydrant		HYD	HYD		HYD
Tree		TREE	TREE		TREE
Building		BLDG	BLDG		BLDG
Bike Path		BPATH			BPATH
Rail Road Crossing		RRX	RRR		
Irrigation Sprinkler Head			SPR		SPR
Gas Pumps					
Stock Pile Bins					
Retaining Wall Bottom			RTWB		RTWB
Way Station Scale					
Septic Tank			SEP		SEP
Well			WELL		WELL
Existing RW			ERW		ERW



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MnDOT OI&TS-APPDEVGIS

Technical Development Architecture Guide GIS Software Development

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1. Introduction

This document describes the general software development environment to be used for GIS projects at MnDOT. It is the basic environment that is used at MnDOT using the ArcGIS version 10 technologies.

Tailored and more specific versions of this document can be developed to fit project needs, during project elaboration phases.

This document applies to software development projects for or integrating with desktop ArcGIS, ArcGIS Geoprocessing, ArcGIS Server applications, GIS based web services, and mobile GIS/GPS development at MnDOT.

MnDOT GIS projects are developed primarily in Microsoft .NET environment. There exists mobile environments and integration efforts that require several different development environments.

Although there is the ability to develop in server side Java or Asp.Net with ArcGIS ADF, MnDOT will no longer do any ArcGIS ADF based projects. ArcIMS is also a technology MnDOT no longer works with going forward.

Increasingly, ArcGIS Rest API, ArcGIS Flex API, ArcGIS Silverlight API, ArcGIS JavaScript API, and supporting technologies such as HTML5 (IE 9.0, Chrome, etc), .Net (asp.net, wcf, etc), Android OS, and iOS are being worked with in the MnDOT GIS development environment. Consult with project managers and project architects about where these transitions are.

The supported data and system architecture for GIS projects are described in this document. If you do not see a particular database, application server environment, or development framework mentioned here, it is likely not supported and would require extensive and timely change management processes to consider using it.

2. Benefits

The following benefits are expected from this development architecture and its description.

- Conforms to an environment that is easy for MnDOT OI&TS' Infrastructure Services to support.

- Allows for the proper handling of GIS data from ArcGIS Services.
- Conforms to the main GIS software used at MnDOT – ESRI’s ArcGIS Suite (Enterprise Levels).
- Is object-oriented, which promotes component-based, reusable, and extendable code. This makes it relatively easy to change, add functionality, and interface to other systems / services.
- Is service-oriented, which promotes the use of common services such as directory-based authentication, standard map services, location services (as web services), and special application specific services.
- Is cost effective when considering 5-10 development projects per year, over several years that these related technologies will be supported.
- Low entry cost for developers outside of OI&TS-APPDEVGIS
- A robust and well exercised development environment accrues benefits towards solutions building.

GIS Architectural Overview

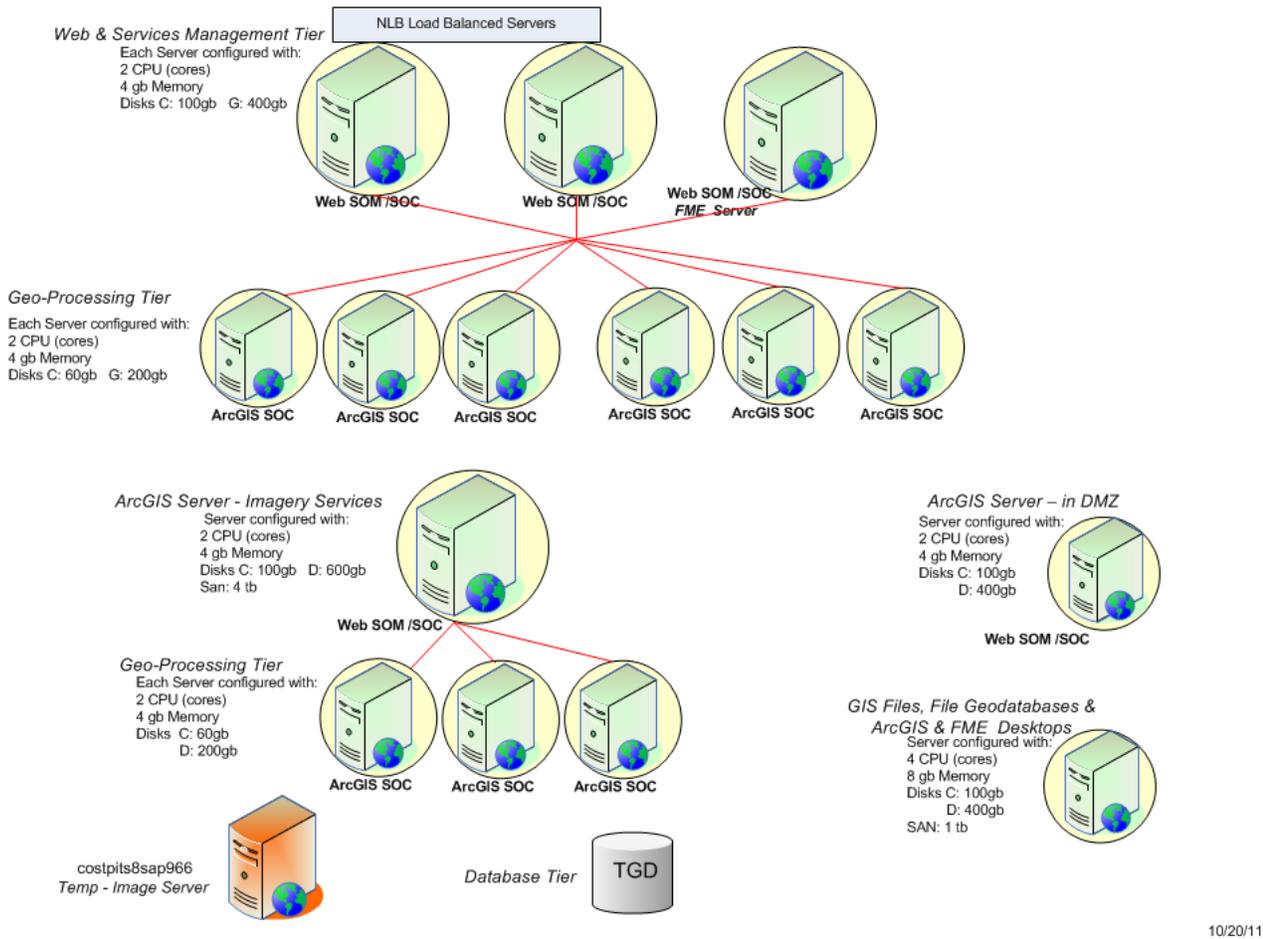
Development/Test/Production Server Configuration

MnDOT Development, Test, and Production servers are now virtually served, using VMware software and large shared data center technologies.

The following virtual GIS Server Development environment will be the environment that projects are initially deployed to. The TEST and PRODUCTION versions are the same.

The database tier is represented by the Oracle TGD instance. Schema changes using developer accounts are allowed on TGD, and once the schema is understood, it is transferred to application accounts on TGD where no schema changes are allowed, only CRUD changes to data. This same transfer then will occur to test and production data environments, where only CRUD changes are allowed. Data Management tools or administrative tools **are almost always needed** to keep most applications data up to date, and they should be planned for.

Proposed Development - Virtual GIS Server Architecture



Note that two of the three Application SOM/SOC machines (at top level) are network load balanced machines and these are the primary targets of deployment. One SOM/SOC machine is not load balanced and is in place for legacy applications that do not perform well in a load balanced environment. All development should be designed for load balancing – and this means **NO LOCAL DATA IS STORED** on the application servers. All data is stored in an enterprise database separate from these machines.

Direct access is not given to the ArcGIS Image servers – any image or raster aspects of development must be handled by MnDOT staff for deployments.

GIS Files, File Geodatabase, and FME conversion processes can run on a provided server, however, the output is intended to be published to enterprise databases, GIS files and File Geodatabase structures are not to be used by the application servers and ArcGIS services directly.

Developers are not granted access or control to TEST and PRODUCTION server environments. All applications developed must port and install to these environments without any help needed from the developer directly.

All development must be deployable (installable and configurable) with the minimum amount of effort to ALL levels of server environment.

A file system structure of where an applications' files reside exists, and is presented in another document available at project start. Logfiles, web site, shared map cache's, web input and output directories are made clear to each project developer.

Beyond development, all subsequent data and application management tasks must be thought out and a management console or tool and process provided to perform management tasks at the TEST and PRODUCTION levels. There is no direct editing of supporting database tables at these higher levels, it must be done via application or well understood and related COTS software available to MnDOT Data and application stewards. There is no direct configurations of applications at the TEST and PRODUCTION levels...a well understood process and software tool must do this management, securely.

Application Technology

The application development / maintenance technology for ArcGIS Services applications is as follows:

Application architecture:	Microsoft .Net 4.0, ArcGIS Server 10.1 or above ESRI's ArcGIS Web and Mobile SDK's, this includes the Flex (Flash builder 4), Silverlight API's, Java Script API. This architecture also includes Latitude Geographics' Geocortex Essentials layered over the ESRI rest based services.
Primary Architecture for services tier:	Microsoft Windows 2008 64 Server & .NET 4.0 and above.
Application development language:	C# (MS Visual Studio 2010, 2008 for MS 6 Mobile)
Scripting Language:	JavaScript (jQuery), Python, MS Power shell.
Reports solution:	Crystal Enterprise 11
Database:	Oracle 11g2
Database Middleware:	ArcSDE (at 10.1 or higher level) with various Geometry Direct Connects. DevArt dotConnect for Oracle and DevArt OraDevelopers tools for Visual Studio 2010 are used for those needed Microsoft entity framework tools. Oracles tools for entity framework may be used when they are released to production.
Object/Relational mapping:	ESRI's ArcSDE, ESRI's ArcObjects, and .NET, Microsoft's Entity Framework.
Controller framework:	MS .NET 4.0 (et al), ESRI's Web and Mobile .NET with its supported API's. Latitudes Geographics' Geocortex Essentials are also available.
View / presentation framework:	Windows XP or Windows 7 PC with .NET 4.0

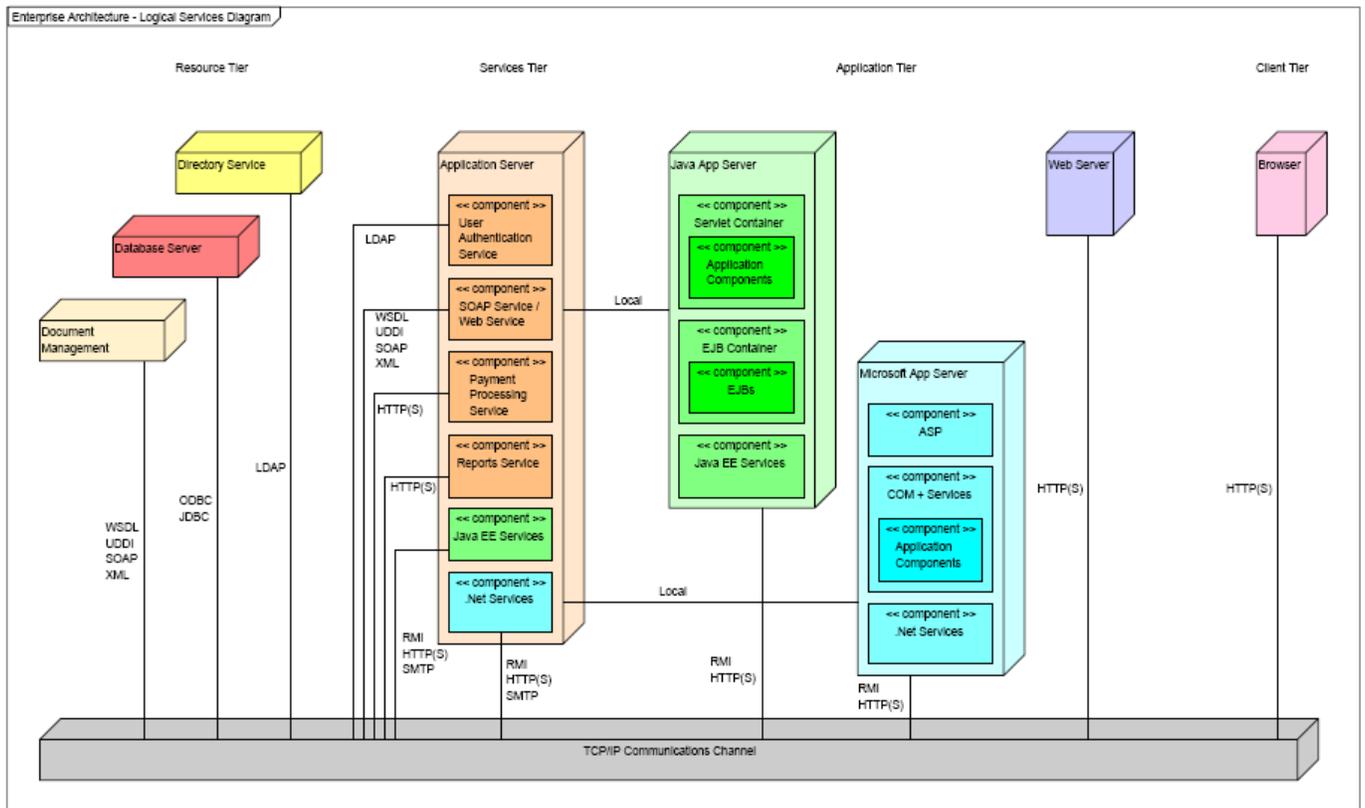
Windows Internet Explorer 8 and Windows IIS Server
Windows Mobile Device with Compact Framework 2.0
HTML, CSS, and ASP.NET Technologies. Note that
HTML5 (IE 9.0, Chrome), Android OS, and iOS are starting
to emerge within MnDOT.

ASP.NET application server:	MS .Net 4.0
Code version control system / repository:	MnDOT's CVS
Build / deploy / dependency tool:	MS Visual Studio 2010 Professional Edition
Integrated Dev Environment (IDE):	MS Visual Studio 2010 Professional Edition
Detail modeling / design tool:	MS Visio UML, Microsoft Visual Studio 2010 Tools, Quest Software's TOAD for Oracle, and ArcGIS Diagram tool are commonly used.
Primary detail build / programming tool:	MS Visual Studio 2010 Professional Edition SP1
Primary testing tools:	MS Visual Studio 2010 Pro Ed.SP1 tools, Premium Edition Tools are available for code reviews. OpNet and Solar Winds application monitoring technologies are also available for comprehensive enterprise environment testing.
CVS interface tools:	Tortoise CVS.
Defect / Issue tracking tool:	Atlassian JIRA (requires AD account)

Terminology used above is based on Model, View, Controller Architectural Pattern used in OI&TS-Applications section for web based applications. Using Microsoft's ASP.NET MVC framework is a welcome practice.

Enterprise Architecture – Logical Services Diagram for both .Net and Java

The primary focus of the GIS development framework will be .NET based. The reality on the ground is that MnDOT's current Enterprise Architecture is and will be for the foreseeable future, a mixture of Java/J2EE and Microsoft .NET components, as well as emerging mobile technologies. Projects, with needs for Web and Mobile technologies, can take some direct advantage of this mixture. The Enterprise Architecture is presented here to give a picture of what the .NET and JAVA environment looks like. There may be some interoperability offered by Web Services and common SOAP/REST and XML protocols in both architectures, this is extremely powerful and leverages our existing resources to benefit our customers. Web Service supported development or centric development is welcome.



Development / Maintenance Environment Model:

The following are required learning for those new to developing software at MnDOT. Obtaining proper access to systems is required to build, deploy and maintain a web or mobile solution using ArcGIS Server at MnDOT:

- Developer must be aware of MnDOT and OET IT policies as concerns data, security, and the dev, test, production progression of software development.
- Developer must have an AD (active directory) account (all employees have this, all contractors must get this via an access authority).
- Obtain Application Server access via APPDEVGIS staff.
- Obtain enterprise spatial database access via APPDEVGIS staff.
- Obtain issue tracking to JIRA by having AD account placed in proper group. Via APPDEVGIS staff.
- Obtain a development desktop/laptop that has ArcGIS 10.1 as well as development tools as necessary to work with the ArcGIS servers and Oracle databases.
- Understand ArcGIS web based services and how to author and provision.

- Understand how development work progresses from developer credentials to project credentials (APPDEVGIS staff will assist), at the development level.
- Understand how development work progresses from project credentials at the development level to the test level.
- Provide management tools for data and application management that allow for appending to application management data (no schema changes once project credentials are used).
- Provide software and written processes to construct/deploy data structures, to install developed application code, to configure database and applications, to configure the application platform (IIS application pools, security, network proxies), and to seed or load sufficient data as agreed to allow testing of the application.

3. GIS Application Standards

MnDOT's Office of Information and Technology Services (OI&TS) has specifications for GIS Applications that software developers will follow. These include:

Coding Standards:

Web and Mobile GIS Developers will follow coding practices that provide the following:

- Easy to understand and read source code.
- Clear and concise logical and physical system models
- Clear and concise logical/conceptual and physical data models
- Use the CVS for all works, and be sure code can be extracted, built, configured , and deployed from the CVS source and all stored there.
- Frameworks and Patterns to assist in application structure understanding and interfaces.

Graphics User Interface (GUI) Standards:

GUI standards follow Microsoft .NET GUI recommendations in combination with ESRI's standard industry practices as they relate to GIS and various devices as a base.

From the design process, the MnDOT Office of Communications provides a document on External reaching Web Site Rules and Goals that covers:

Structure

Tools

Rules for Content, Writing and Style

Logos, Fonts, Colors, Meta Tagging, Tables.

Video, PDFS, Audio, Power points

Applications items, FTP locations for large transfers

Naming and Hosting.

Americans with Disabilities Act Accessibility

And all items web site construction related.

MnDOT's Web Template Application includes pages that meet GUI standards. It's best to start with these pages and a thorough review of the Office of Communications External Guidelines as mentioned above. Note that these apply to the initial or splash page for external sites. See your project contact for these materials. Applications are not specifically held to these standards.

For desktop applications, the design process will introduce required specifications in the areas of:

- Screen Resolution
- Screen Layout
- Navigation Bars
- Logos Usage
- Security (Pre-Login, Login, Logout)
- Fonts and Colors
- Graphics
- Error and Messaging
- All Controls for Application (GIS and standard)
- Windows and panels.

Versioning Standards:

Developers will follow Apache Software Foundation's versioning guidelines. Located at <http://apr.apache.org/versioning.html>

OI&TS's simple description of versioning guidelines are as follows:

A <Major>-<Minor>-<Patch> numbering system is recommended to track software revisions when a new version is released. Note that CVS system has its own internal revision numbering system, and it will not match this standard. Use CVS Tags to assign this <Major>-<Minor>-<Patch> numbering system within the CVS storage system.

A Major Release is a full product upgrade of the software containing significant new functionality. A Major Release is necessary if there are changes to the model or compatibility with previous versions cannot be maintained. When the Major Release version number is incremented, the Minor and Patch version numbers are reset to zero.

A Minor Release is a planned update to the existing software incorporating standard maintenance, improvements to existing features, enhancements and bug fixes. When a Minor Release number is incremented, the Major Release version number remains unchanged and the Patch Release version number is reset to zero.

A Patch Release is distributed when necessary to correct critical or significant problems that impact a customer's use of the system. When the Patch Release version number is incremented, the Major and Minor Release version numbers remain unchanged.

Software build, dependency, and version management:

- Developers will use Visual Studio 2008, 2010 SP1 and CVS for build, dependency, and version management when building Mobile and Custom works for Web Based applications.
- Developers will build .MSI or EXE files or appropriate scripts for deployment operations of the clients and associated data for the services and the ASP.NET web site structures for the web site files.
- Developers will at all times consider the automation of deployments to speed the process of deploying and keeping this critical process moving as fast as possible.

Source Code Maintenance:

Developers will provide and maintain application source files, configuration files, database schemas and scripts, developer documentation, and other related artifacts in MnDOT's CVS.

Follow these rules for naming CVS Modules:

One module (directory) per application (including all variants of that application).

This module (directory) can be under a top level module that indicates the organizations functional unit for which this work is being developed.

The top level module name should be short (3-6 character), all lower case letters and/or digits with no "-"(dash), and "_"(underscore), "."(period), or spaces. The module name may also be used in the JIRA project key, database schema name, and/or AD role name

The module name is short to facilitate naming of resources and artifacts where long user-friendly names would be problematic. For example, database table names are often pre-pended with the application name. Projects should determine the application's name (typically an acronym) early in the project so project artifacts and configuration files can use this name.

Use of CVS Tagging will allow for the Major Minor Patch pattern. The auto revision number that CVS assigns will be different than the Major Minor Patch pattern and should be left alone.

Documentation Tags (Visual Studio XML Document Tags):

It is suggested that developers will use XML Document tags or suitable source code comment notation for automatic assembly of documentation from source codes in C# with automated tools.

Object / Relational Mapping (SDE and ADO.Net):

Developers will use ADO.Net and ESRI's SDE technologies for Object / Relational Mapping for tabular and geographic data. Oracles SDO Geometries are permitted and welcomed in the SDE environment. DevArt tools for entity framework usage are licensed at MnDOT for enterprise usage.

Code Portability:

Developers will follow practices that insure code portability. Peer reviews and documented justification is required for the use of proprietary application server extensions or libraries. If such libraries are used, its suggested to us NuGET to keep these up to date via VS2010 extensions.

Developers **MUST ALWAYS** collaborate with MnDOT APPDEVGIS staff on technology libraries they wish to introduce. MnDOT's OI&TS decides what will be used.

Deployment:

Please consult with the Project Manager and APPDEVGIS staff for doing an initial deployment from Developer credentials to Project credentials. Good and fast deployments take planning and coordination amongst a number of people and groups.

Auditing:

Models and code will be reviewed for compliance to the specifications listed in Section 3.

Controller Standards

Developers will use MS .NET 4.0 , ESRI's Web .NET, ESRI's Mobile .NET and Latitude Geographics™ Geocortex® Essentials framework for most web and mobile applications work.

Application Security:

Developers will use the appropriate security mechanisms as per project needs. There is a wide range of tools and techniques and many considerations. Security will be a primary consideration and requirement for all projects "upfront" and not a last minute consideration. All levels of security are to be considered for all applications.

Scripting Standards

Developers will use JavaScript for client-side scripting, and JavaScript or Python for server-side scripting. jQuery and JavaScript libraries friendly to ESRI development are to be used.

Naming Standards for Web applications ('User friendly' name)

The user-friendly name is the descriptive or popular name that identifies the application. The user-friendly name should be chosen by the project sponsor, application owner, with the project manager. Projects should determine the application's user-friendly name early in the project so it can be used in documentation.

URL

The URL is the application's Web address.

Projects should determine the URL for the application. The URL is typically based on the user-friendly name, and should follow these examples:

Production URL = appname.state.mn.us

Test URL = appnamet.state.mn.us

Development URL = appnamed.state.mn.us

Short-name

The application short-name is used to name application and data resources and artifacts where long user-friendly names would be problematic. For example, database schema names are often pre-pended with the application short-name.

Projects should determine the application's short-name (typically an acronym) early in the project so project artifacts and configuration files can use this name.

Oracle Data Storage and Deployment Progression

Applications data will always start out on a development schema on a development server offered by MnDOT's OI&TS DATABASE unit (and arranged by MnDOT/ EGIS staff). This data will then progress to a test and finally to a production version, losing the ability to alter schema (make any data definition language changes) while in "Test" or "Production".

Good solid data normalization is required to allow for expansion of the application without altering the schema. Typically some kind of application data management tool is needed as well, or at least a clear manual process needs description. Furthermore, meta data in 2 distinct forms is required, one set is in Oracle Meta data and Comments and one set in ESRI's formats suitable for inclusion to a Metadata portal application.

A data base standards document will be provided. This document deals with commenting and proper object naming.

There are important items to consider when existing MnDOT applications are being outfitted with GIS functionality, and these may or may not be in the Scope of Work (SOW) that has been developed or in the Project Plan the work is being performed under.

Ideally, GIS (or other integrations) will have been considered in the development of the original application, however, this is not always the case and many existing applications have their data in non-spatial capable instances of Oracle. Specifically, pay attention to the following items and be prepared to ask requirements types of questions for:

- Movement of existing application data to Oracle instances that support spatial data are desired and will almost always need to occur (TGP instances).
- Existing Data Integrity is a big issue. Having more than one application able to update the same data introduces many problem areas. Good business process integrity (how data is edited (insert, updates, deletes)) and by who can prevent collisions, but these processes tend to change over time and a false sense of good data integrity might occur if the software isn't designed to check for these business rules related to collisions. The following designs guides should be considered always:
 - Always use the existing applications API to update/add data, when they are provided.
 - Shorten the transaction timings. GIS and specifically MOBILE GIS has the concept of long transactions (those lasting many minutes to days).

- GIS data alone can use ESRI’s VERSIONING (and attendant Reconcile and Post) operations. Existing tabular data under business rules probably cannot take advantage of this mechanism.
- Consider using LOCKS on any existing business data that goes out with GIS and MOBILE GIS edit sessions, so that NO ONE can update until that data comes back, and locks are released. Consider the Management tools needed to unlock records and track editors and their checkouts.
- Consider mechanisms to perform DELTA change detection, along the lines of staging tables, so that changes can be seen.
- Consider using “additive inserts only” data design and application data flow for editing. This is an asset/sample or inspection type of scenario. In order to get the most current data about that asset or sample/inspection taken, a MAX function on DATE is needed. All inspections are available with this concept of data design, all are stored.
- Consider using “view” only “Mapit now” buttons in the application to tie the GIS and existing business application together. Geography and business attributes are loosely joined and each is edited in separate processes. The inability to join data will point out where bad data is or where the two editing processes are out of sync.
- Database account patterns will be along the following examples table. All ArcGIS services get a separate account. These patterns exist to help see who or what is working against the various data. This is not the full list, but a good representative example.

AGS_?????	ArcGIS Service account, used by ArcGIS server to access oracle. General Map services
AGS_?????_MOBILE	ArcGIS Service account, used to ArcGIS server to access oracle for MOBILE services.
AGS_?????_!!!!	ArcGIS Service Account, used special access as described by !!!!
MCCA1CHA	Developers Personal account on TGD, this one for Charlie McCarty (as represented in the AD domain).
?????_ADMIN	All schema controlled by this account – for DBA’s to control all other project accounts
?????_USER	CRUD or as needed access by this account – for non ArcGIS oracle access.
?????-BUILD_USER	CRUD or as needed access by this account, for iterations where the new iteration of development gets done in the “BUILD” version and then deployed to the non-build account, after that development has been moved up to the higher TEST level.

????_MAINT_USER	CRUD Maintenance account, used to maintain tables, views, lookup tables, by the maintenance tools when in test and production.
????_LOAD_USER	Used for applications that must load data in bulk to tables/objects for further processing on the Oracle side.
????_REPORTS	Used for report writing

- MAINT accounts in Oracle can be set up for ArcCatalog specifically to deal with DOMAINS and SUBTYPES – it owns the GB Domain works, and can be established for just the purpose of keeping domains up to date. This account updates the DOMAIN values as needed, at TEST and PROD levels, using a tool like ArcCatalog if necessary, or a Management page. All other accounts simply use its data. The Project acronym should be used in prefix of name of all ArcGIS domains so we know what they are for, when looking at the bunch in ArcCatalog or other tools.

Issue / Bug Tracking (JIRA)

Developers will use [JIRA](#) for software issue / software bug tracking.

MnDOT’s JIRA is located at <http://jira> . You must be connected to a MnDOT network for access.

Developer Team Collaboration (Wiki)

OI&TS has a [Wiki](#) available for collaboration, documentation, and real-time information exchange. Be aware this Wiki is not a production service. Availability is not guaranteed.

MnDOT’s Wiki is located at <http://wiki.dot.state.mn.us>. You must be connected to a MnDOT network for access.

It is hoped that MS SharePoint and Team Foundation Server abilities will soon be available for project collaboration.

Logging Standards

Developers should use Standard Windows Logging methods for capture of application and installation events of interest. For web based applications, a special directory is created for logs and messages is created called g:\arcgisserver\arcgiserror, and in here log files of application interest can be created with the project name abbreviation, or functional units abbreviation, to keep them separate from other projects.

MnDOT Network Standards:

MnDOT has a network policy of least privilege when it comes to access of resources by people, processes, and devices. This means that the FEWEST privileges will be assigned that are consistent with the duties and functions of the software developed. Protocols not needed,

messaging formats not needed, will not be available to use. SOAP is recognized, but is pushing the edge of what is allowable as for rich messaging. There are many items to consider in this area, including reverse proxies usage for external facing apps, ftp, email, and ssh, as well specific software packages. For SMTP email to work from a web based application, the server needs to have McAfee Virus Scan Access Protection Rules modified to allow this to happen, in addition to other asp.net and code setups.

All web based applications for MnDOT must be aware of network proxies to access resources correctly. For ASP.NET applications, this means the following type tags are needed in the web.config file:

```
<System.Net>
  <defaultProxy>
    <proxy autoDetect="True" />
  </defaultProxy>
</System.Net>
```

4. Hosting Environment:

Application hosting services are typically provided by OI&TS's Infrastructure Section. OI&TS-EGIS Applications are hosted by Windows IIS and ArcGIS Server on Windows 2008 R2 64 bit servers.

Database hosting services are typically provided by OI&TS's Infrastructure Section. Databases reside on a Dell storage area network (SAN) managed by an Oracle RDBMS running on Microsoft Windows server.

Reports hosting services are typically provided by OI&TS's Infrastructure Section. The reporting solution is typically Crystal Enterprise.

All servers are likely to be virtual, and will be established in one of two data centers connected to SAN storage and very high speed networks.

5. Development / Test Environment

Unit testing is done on development servers.

Integration testing is done on development servers.

System testing and user acceptance testing is done on test servers that reside in the same environment as the development servers. Developers and business unit staff are responsible for all testing.

Code must reside in MnDOT's CVS repository and compile at MnDOT in MnDOTS environment, and perform according to specifications.

6. Production Environment

Production instances are deployed on production servers that typically reside in the same environment as the development and test servers.

When external user access is required.

MnDOT has no directory service for external users (at this time). External users will be either automatically allowed to access web systems as an anonymous user, or will need to exist in an application database. If an external user authentication and authorization will be implemented user credentials and roles will reside in the application database, using the concepts of role based security. This is accomplished, for example, by having Oracle tables accessible from the application that store all pertinent information about the users and the roles they carry. When a user logs in, their credentials are verified against information in these Oracle tables and other user persisted data is accessed and used.

This table or list is then maintained by a set of administrators that have administrative level roles on the system. These administrators can add, delete, update, and approve users for access. The Oracle tables can be used to support self-help routines for regular users with none or existing credentials, to email a forgotten or new password, or to request a user account. Some administrative tool coding will be required.

External browser to server communication may be encrypted. MnDOT will use 128 bit encryption via SSL.

7. MnDOT Personal computer and mobile field units.

A wide variety of Personal Computer and Mobile Field Collection units are capable of performing work that conforms to practices with in MnDOT. All hardware considerations for all projects should be reviewed by the project manager and system architect as part of the projects scope.

For field units, with a GPS involved, it is desirable to be able to achieve 1 meter or better location accuracy, which means some form of reliable differential correction (real time or post process) must be used. WAAS, Beacon, or VRS are typical real-time correction sources.

Recently, many new tablet devices (Apple iPad, Android based) and mobile phone devices have gained usage in MnDOT via exceptions. A generic Mobile framework is in development. If you are doing any mobile GIS/GPS work, please check in with APPDEVGIS staff on the progress of these developments, as you will likely need to consider them in your works.