Modernization of Iowa Transportation Program Management System

TPMS 2020

FINAL REPORT

TR-726

July 30, 2021

Sponsored by:
Iowa Highway Research Board
Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010

Disclaimer

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the information presented herein. The opinions, findings, and conclusions expressed in this publication are those of the authors and not necessarily those of the sponsors.

The sponsors assume no liability for the contents or use of the information contained in this document. This report does not constitute a standard, specification, or regulation. The sponsors do not endorse products or manufacturers. Trademarks or manufacturers' names appear in this report only because they are considered essential to the objectives of the document.

Statement of Non-Discrimination

Federal and state laws prohibit employment and/or public accommodation discrimination on the basis of age, color, creed, disability, gender identity, national origin, pregnancy, race, religion, sex, sexual orientation or veteran's status. If you believe you have been discriminated against, please contact the Iowa Civil Rights Commission at 800-457-4416 or Iowa Department of Transportation's affirmative action officer. If you need accommodations because of a disability to access the Iowa Department of Transportation's services, contact the agency's affirmative action officer at 800-262-0003.

Final Report, User's Manual, and Application Specifications for

Iowa Highway Research Board

Project No. TR-726

Modernization of Iowa Transportation Program Management System

Authorized Start: August 1, 2017
Actual Start Date: March 1, 2018
Project Completion Date: Sept. 30, 2021

ICEA Service Bureau
5500 Westown Parkway Suite #190
West Des Moines, IA 50266

Principal Investigator: Danny R. Waid, P.E.
Co-Principal Investigator: Brian P. Moore, P.E.
Database & Coding: Brandy Thomason
User Interface: Jennifer Johnson
Developer: Bob Gray
Developer: Matt Hobbs
IT Manager: Matt Mathers

Sponsored by: Iowa Highway Research Board
Iowa Department of Transportation
800 Lincoln Way
Ames, IA 50010

A report on the Modernization of the TPMS 2020, including the functional needs and processes involved in Programming, Budgeting, and Developing transportation and transit projects from concept to contract. Including comparison of Legacy TPMS verses TPMS 2020 applications, technical specifications, and user's instructional manual. This report is prepared and presented in accordance with the authorization and participation of the Iowa Department of Transportation and the Iowa Highway Research Board, Project TR-726, with direction and support of the Iowa County Engineers Association.

SPECIAL APPRECIATION, RECOGNITION, AND HONOR FOR THE WORK AND LEGACY OF

Stephen W. De Vries, P.E.

Author and Creator of Legacy TPMS,

Founder of the ICEA Service Bureau,

Original ICEA Service Bureau Executive Director

County Engineer and Champion of Transportation and Secondary Roads

Thanks for the legacy left to Iowa County Engineers and the transportation engineering community as a whole.

TECHNICAL REPORT DOCUMENTATION PAGE

1. Report No. TR-726	**2. Government Accession No.**	**3. Recipient's Catalog No.**
4. Title and Subtitle Modernization of Iowa Transportation Program Management System		**5. Report Date** July 2021 **6. Performing Organization Code**
7. Author(s) Danny R. Waid, PE, Project Principle Investigator 0000-0002-1652-2028 Brian Moore, P.E. – Co-Principle Investigator 0000-0003-1746-009X Brandy Thomason, Project Lead Developer – Technical Specs 0000-0002-9782-8597 Jenn Johnson – Project User Interface Developer – User Manual 0000-00030-0428X Bob Gray – Developer – User and Authentication 0000-0003-3035-7409 Matt Mathers – IT Manager 0000-0001-9770-5223 Niki Stinn P.E., Local Systems Bureau, Iowa DOT 0000-0002-3763-9006		**8. Performing Organization Report No.**
9. Performing Organization Name and Address Iowa County Engineers Association Service Bureau 5500 Westown Parkway, Suite #190 West Des Moines, Iowa 50266		**10. Work Unit No.** **11. Contract or Grant No.** **Iowa Highway Research Board – Contract # TR-726**
12. Sponsoring Agency Name and Address Iowa Department of Transportation 800 Lincoln Way Ames, Ia 50010		**13. Type of Report and Period Covered** Final Report - August 1, 2017 to September 30, 2021 **14. Sponsoring Agency Code**

15. Supplementary Notes
TPMS 2020 Web-based Application: https://www.iceasb.org (User credentials required)

16. Abstract

The TR-726 research project investigates and produces the modernization of the Iowa Transportation Program Management System, TPMS. This report describes TPMS background information, application development processes, and User Manual and Developmental Specifications used to create the web-based application modernization and incorporated improvements. The three distinct sections of this report include research activities, a User Manual, and functional/technical specifications for the newly created TPMS 2020 application.

TPMS 2020 is a modern multi-modular web-based software application designed to augment programming, review and acceptance, and project development requirements of Iowa's transportation projects. The full functional process spans project concept development and programming to project turn-in for letting, with all intermediate milestone submittals and reviews documented throughout the process. The TPMS 2020 processes allow for coordinated interaction of multi-agency participants including local, regional, and state representatives.

The final TPMS 2020 product will be housed and maintained by the ICEA Service Bureau, with access to all authorized users through a secure user interface, and will accommodate "real-time" secure API data exchange with the Iowa DOT PPMS software application.

17. Key Words Program Management, Project delivery, Web Applications, Interactive Computer Systems, Project Planning, Planning and design			
19. Security Classification (of this report) Unclassified	**20. Security Classification (of this pg)** Unclassified	**21. No. of Pages** 135	

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

TR-726 – TPMS 2020 Research Overview

Modernization Specifications for web application renewal and improvement

Version Dated: 6-1-2021

Problem Statement

The Iowa Transportation Program Management System (TPMS), is a four-part, web based application designed to assist the State's Local Public Agencies (LPA's), plan, program, budget, and develop public road (and Transit) improvement projects. The four main modules cover a) County Five Year Programs (CFYP) & Secondary Road Fund budgets, b) Statewide Transportation Improvement Program (STIP), and SWAP project programming and authorization, c) Transportation Project Development (TPDev), from Concept Statement to final Plans Turn-in, and d) Transit program management.

Legacy TPMS was first coded in 1997 through 2001 and has been serving cities, counties, Iowa DOT, FHWA, RPA's, MPO's, consultants, and others since that time. But, being based on specifications included in HR-394, an Iowa Highway Research Board project authorized in June 1996, and a multitude of user work practice changes and needs over the years, it is due for renewal.

After development, Legacy TPMS had been hosted from and delivered by the Iowa County Engineers Association Service Bureau (ICEASB), a 28-E agreement special government agency established by the counties in 1997, to both provide secondary road specific services and operate TPMS. Given the age of Legacy TPMS and the much advanced technologies needed for today's software products, TPMS 2020 will require a total application rewrite.

To undertake the full rebuild and code modernization project hereafter defined, ICEASB applied to and received new one-time research funding from the IHRB. These resources have been used to research performance of the Legacy TPMS, learn what users would like to see in the future, develop this specification and then recode and deploy the application. This work has been formally approved as project TR-726 and funds have been sufficient to pay for the bulk of capital investment of coding and development of the new software. ICEASB will handle all subsequent operations, upgrades, and maintenance expense. Now complete, the ICEASB has committed to again host and maintain the system on site within the ICEASB network or in alternative cloud capable networks.

A key difference between HR-394 and TR-726 is that, at the time when the former was being created, the Internet was only in its infancy and none of the real-world tasks involved had previously been automated. No users could be asked for opinions and guidance. Today, after roughly twenty years of operation and use, extensive investigation into user perceptions, recommendations and wishes have been performed and incorporated into the new application. Their insights and preferences have been used to improve the way the application works and improve the 'fit and feel' of the screens and options to what people need to accomplish.

While Legacy TPMS performs its tasks well with minimum downtime or problems, a number of deficiencies and factors create a need to modernize and enhance the system:

- Having been written piece by piece over seventeen years, the code is convoluted, difficult to maintain, is somewhat based on fading technologies and isn't able to take advantage of today's more efficient code design methods.
- User management and application security need to be improved.
- In some areas, the way that TPMS presents key tasks to end users still falls short of being intuitive and self-explanatory.
- The current implementation is designed for and only works well on a desktop or laptop PC. However, users nowadays use a much wider variety of devices, and wish to access TPMS via multiple platforms.
- The business processes that TPMS supports have changed over time. These changes have been accommodated by add-on patches that should become fully integrated in the main application.
- TPMS – DOT data transfers are currently limited to a once-per-day operation, conducted shortly after midnight. Users, however, want and need real-time updates between the agencies.
- While the TPMS Development tracking module works well, it still falls short of providing full automation of review processes. It's currently set up to enable sponsors to ship documents to DOT reviewers, who mark up the content as needed, return the edited copy, and then mark the results of their action in a status panel. The next stage would be to set things up so that the composition, submission, and review would all be online – with the status update changed from manual to automatic on conclusion of a review.

Objectives

The research aspect of this project will consist of cataloging, evaluating and optimization of operations, while remedying deficiencies identified in the legacy version. It will explore the processes by which Iowa Local Public Agency transportation projects are chosen, programmed, prepared and delivered, with the goal of optimizing the utilization of human resources. The project will also seek to replace exchanges of documents for review/approval with actually storing the document data online and facilitating performance of processing/review steps within the application itself.

Phases I and II will seek to acquire a multi-layered understanding of underlying business processes, user decision and perception patterns, function delivery, and technical needs. In Phase III, as an operations research effort, the project will seek to fulfill the Iowa Code 310.35 objective of "the more efficient use of funds and materials that are available for the construction and maintenance of secondary roads" by providing road agencies with on-line process and communication tools that minimize engineering staff time required to be spent on the programming, budgeting, and development tasks involved.

The deficiencies of the legacy code and design will be addressed, security will be enhanced to meet modern threat levels, the code will become capable of functioning on a larger slate of devices, and support integrated submittal/review/update processing. By improving process efficiency, the modernized system will, consistent with the intent of the FHWA's "Make Every Day Count" initiative, help reduce the cost and time required to deliver bid-ready projects for public benefit.

Purpose of this document

This report is intended to document the activities, findings and results of this research project at the time of final acceptance by the IHRB. The software itself stands as the best and ultimate documentation of the research results and will be an ongoing living document as enhancements, improvements, and modifications are necessary throughout the useful life of the application. This report describes research activities associated with the project, in Chapter 1, and it provides description of specifications used to address the functional and technical workings of the application, in Chapter 2. It also contains instructions in Chapter 3 that are intended to function as a user manual. Chapter 4 summarizes the finding, results, and recommendations identified over the years of development of the TPMS 2020 system.

This report consists of 4 chapters along with two appendixes:

Chapter 1 gives background information including a description of the problem statement and objectives.

Chapter 2 describes the functional and technical specifications used in developing the TPMS 2020 application.

Chapter 3 provides step-by-step guidance for users to become acquainted with the application features and functions in the form of a User Manual.

Chapter 4 discusses the finding and results in relationship to the intended objectives of the project. Including future modifications and potential enhancement recommendations for subsequent version development.

Appendix A includes a forensic review of the Legacy TPMS file structure.

Appendix B provides notes, comments, and general feedback pertaining to the user input sessions assisting in guiding the initial project concept investigations.

Appendix C includes a copy of the “Instructions to Prepare the FY 2022 County Secondary Roads Budget and Construction Program”, provided by the Iowa DOT Local Systems Bureau (LSB).

Review Methods Implemented

The legacy TPMS review methods for implementation can be classified under three general categories. Results of investigation and collaboration combine to generate, review, and catalog project needs.

First, ICEASB staff developed a forensic code analysis tool. This was used to identify all code files belonging to the previous version of TPMS, describe their purpose, determine where they were being used, and by whom. The goal of this analysis was to form a complete, detailed picture of the current application's capabilities. This information then became a framework in which to identify where enhancements should be made, what could be jettisoned, and elucidate the business rules implicit in the application's design. See Appendix A for the detailed list of results.

Second, a series of personal contacts and listening sessions were arranged to seek input from users as to how they perceive and use the existing TPMS screens and functions. Attendees were asked to think about and then share what they would change, what they would keep the same and what they might like to see added in. Topics included screen layouts, screen contents and organization thereof, work sequence, whether or not controls are self-evident and intuitive to use, etc. See Appendix B for a tally of comments received.

Legacy TPMS – Review, Listening Sessions, and User Input Meeting

A series of listening sessions were scheduled to present, brainstorm, and vet application concepts and layouts. A diverse cross section of potential end users were exposed to and allowed to comment and critique future development. Individual DOT Bureau meetings were held to garner specific business processes and efficiency measures to build into the application features. Besides the list of advanced scheduled meeting listed below, numerous personal stakeholder conversations also proved invaluable in shaping the end products included in TR-726.

February 2, 2018 – group training with Office of Location and Environment staff
March 20, 2018 – met with Shawn Majors, Office of Program Management & Eric Cowles, Office of Local Systems
March 28, 2018 – met with Matt Chambers, Office of Program Management
May 2, 2018 – met with DOT Office of Systems Planning, and with Modal Office Transit staff

Multi-user meetings hosted at DOT District Offices:
District 4: April 12, 2018, Listening Session - County Engineers, DOT Staff - Atlantic
District 5: April 18, 2018, Listening Session – County Engineers and Staff, DOT District Staff – Fairfield
District 6: April 20, 2018, Listening Session – County Engineers and Staff, DOT District Staff – Cedar Rapids
District 1: April 20, 2018, Listening Session – County Engineers and Staff, DOT Staff, and Consultants –Ames
District 3: May 3, 2018, Listening Session – County Engineers and DOT District Staff – Sioux City
District 2: May 4, 2018, Listening Session – County Engineers and DOT District Staff – Mason City

Overall the scheduled meeting were well attended and cultivated significant user input to act as a springboard for the Technical Advisory Committee (TAC) members deliberation.

The third user review method implemented was to create a TAC. This TAC was made up of a multi-discipline group of end users which provided valuable ongoing input and direction. Member selection, to be part of the ongoing conversation and direction for the TPMS rebuild, included a concerted effort to establish a wide cross-section of representation across the various users of the TPMS system. The ICEA Computer and Information Technology Committee, (CIT) also contributed review of various stages of development. The project input collected from the listening sessions and all other feedback provided by potential users, were presented, discussed, and evaluated during the initial and subsequent TR-726 TAC meetings. This group is to be credited for guiding the end product layout, functionality, and modernization of the suite of apps that make up the new TPMS 2020. The following list of TAC members served to provide significant and valued input. Without their input and guidance, the deliverables may have only consisted of an upgrade of the existing legacy version rather than a full and complete renewal, a truly modernized application intended to serve users for the foreseeable future.

TPMS 2020 Technical Advisory Committee Members:

Adam Clemons – ICEA Computer and Information Technology Committee Chair
Todde Folkerts – ICEA Exec Board
Niki Stinn – Local Systems Engineer, (previously District 1 Representative)
John Riherd – District 2 Representative
Laura Sievers – District 3 Representative, (currently Iowa DOT)
Trudy Seng – Plymouth County Office Manager
Brad Skinner – ICEA Rep to the ISAC Board, previously District 4 and currently District 5 Representative
Dillion Davenport – District 5 Representative
Rob Fangmann – District 6 Representative
Eric Cowles – Previous Local Systems Engineer
Matt Chambers – Program Management Bureau
Greg Durbin – DOT District 1 Local Systems Engineer
Christy Van Buskirk – Project Development Engineer
Deb Arp – Systems Planning Bureau

Technical Advisory Committee Meetings

The user input meetings provided an initial foundation for the TAC to begin the process of honing in on the desired look and functionality of the new TPMS 2020. Besides the many TAC meetings, the research team sought many opportunity to expose potential users to the developing research. Many group sessions, like the ICEA CIT Committee and Iowa DOT staff interviews and conversations, became valuable second opinions and focus groups for vetting the software development progress. ICEASB developers presented mock screen layouts and functional concepts to obtain user acceptance and insight into desired add-on features. The list below documents some of the TAC meeting history and other user input and software development review afforded to future users and project stakeholders.

TPMS User Input Meetings

Initial TAC	August 17, 2018 – Began Work on TPMS Concept for CFYP, Budget, and STIP
CIT	September 7, 2018
TAC	September 21, 2018
TAC	October 23, 2018
TAC	November 13, 2018
Iowa DOT	November 16, 2018 - District Re-Org meeting
CIT	November 30, 2018
TAC	January 22, 2019
TAC	February 12, 2019
Iowa DOT	April 29, 2019
CIT	May 17, 2019
Iowa DOT	June 5, 2019
CIT	September 6, 2019
SB Fall Training	October 3, 17, 18, 24, & 25, 2019
ICEA Dec Conf.	December 12, 2019
1st Roll-Out	December 23, 2019 – Deployed CFYP, Budget, & STIP
SB Team	January 3, 2020 - Initial TPDev Concept meeting
CIT	January 24, 2020
Initial TAC	February 5, 2020 – TPDev Concept review
DOT	February 19, 2020 – Reviewer Training
DOT	February 28, 2020 – STIP Reviewer Training
TAC	March 26, 2020
DOT - SB Team	April 16, 2020 – Project Agreements with LSB and SPB
DOT	April 29, 2020 – Systems Planning Bureau
CIT	May 1, 2020
DOT	May 7, 2020 – Data Exchange w/ LSB
DOT	July 16, 2020 – STIP
TAC	July 22, 2020
DOT	August 5, 2020 – LSB
DOT	August 26, 2020 – LSB & SPB Input
CIT	August 28, 2020
SB Fall Training	October 2, 2020
DOT	October 26, 2020 – Turn-In Checklist meeting
DOT	November 10, 2020 – Turn-In Checklist w/ Contracts
DOT	December 15, 2020 – Turn-In Checklist w/ LSB
DOT	January 7, 2021 – FM Estimate Balance Sheet w/ LSB
CIT	February 12, 2021 - TPDev review
DOT	February 16, 2021 – TRANSIT Kick-off Meeting
DOT	February 24, 2021 – Project Funding w/ LSB
DOT	March 1, 2021 – LSB TPMS Training
TAC	May 7, 2021 – TR-726 Final review
SB	May 20, 2021 - TPDev 2020 Beta Testing
SB	June 3 & 4, 2021 – User training sessions
SB	June 15, 2021 – User Training – City & Consultant Focus
SB	June 16, 2021 – User Training – County Engineer Focus
DOT	July 5-7, 2021 – Deployed Full TPMS application

TPMS <-> PPMS Data Exchange Meetings

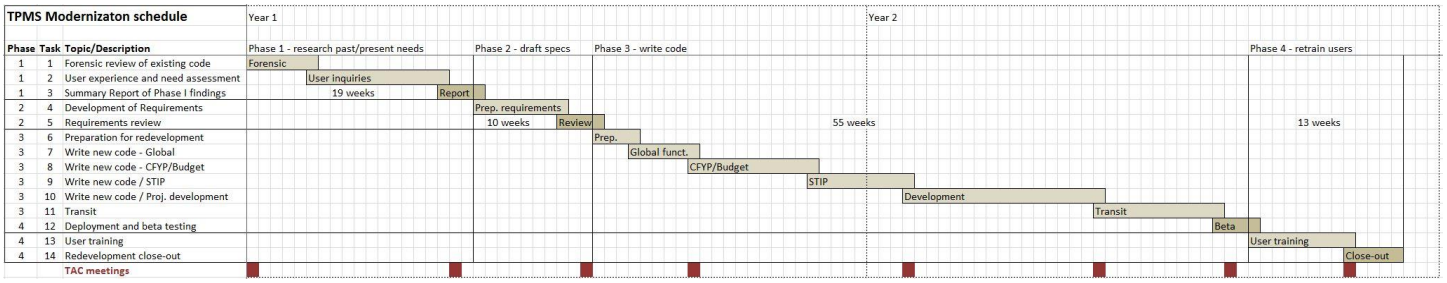
Initial SB/DOT Contact	September 19, 2019
Initial Concept Mtg	October 22, 2019
Functional Specs	January 22, 2020
Data Exchange	February 25, 2020
Functional Specs	March 4, 2020
Functional Specs	March 27, 2020
API Initial Concept	May 5, 2020
Integration meeting	May 20, 2020
Final Functional Specs	July 30, 2020
Integration	August 5, 2020
Data Migration	August 12, 2020
Mar 1 Deploy Date	August 31, 2020
Integration Touchpoint	September 21, 2020
SIT Testing Kick-off	October 22, 2020
SIT Testing	November 4, 2020
Bid Items	November 12, 2020
Testing	December 10, 2020
UAT Testing	February 18, 2021
Revised Roll-Out (June)	February 24, 2021
PPMS UAT Testing	March 18, 2021
PPMS Deployment Set	March 24, 2021
PPMS Committee	June 16, 2021
PPMS Deployment	June 30, 2021

The above listed meetings and group reviews provided valuable guidance and direction for TPMS developers throughout the research project. The TR-726 project schedule has been greatly influenced by the TPMS and PPMS data integration development schedule, as shown on the right side column above. It was important for both software development schedules to coincide due to the updated protocols for data

exchange between the two applications. The DOT's MasterWorks data integration committee assisted greatly in coordination of the redesigned TPMS & PPMS data exchange application programming interface (API).

Additional acknowledgement is due for DOT staff in the Local Systems Bureau, Systems Planning Bureau, Program Management Bureau, and Contracts Bureau for contributing and defining the business concepts and work flow of their offices.

TR-726 Research Plan and Schedule



The original research phase/task plan and schedule is shown above with a contract start date of August 1, 2017. Due to a late start on the project, with actual work beginning in the spring of 2018, and the additional time necessary for coinciding with the Iowa DOT's PPMS software development, the project included three contract amendments. These included two no cost extensions and one with time and cost increase to cover added scope of work for feature enhancements and API data exchange design and coordination with the PPMS project. The bulk of the planned tasks identified above, with the exception of transit and user training, were substantially completed by the end of November 2020, with all obligated funding complete around that same time. The major time extension requirement occurred in the STIP and TPDev development tasks.

Phase 1 Tasks: Results of User Interviews

As user input was received around the state and at various meetings, a readily apparent general theme from many diverse groups and individuals emerged from the conversations. The general sentiment was that, although there are improvements that should be made to bring TPMS to a current standard of functionality and security, users desire the look and feel of the application be familiar. Many stated they are used to the current screen format and would prefer the new TPMS be easily recognizable when completed. This may be due to users needing to access the application only a few times over the course of the year, usually when time is critical to complete the program and budget or process development milestones and deadlines. On the other side of the discussion, many say they are familiar with the "branded" screen layout other Service Bureau apps utilize and would prefer the consistency of these screen layouts. So, there is great value in the format and process being familiar, user-friendly, and intuitive.

Another general observation is that users are, for the most part, satisfied with the level of functionality that has been built into the application. Some suggestions of added or redesigned features and layout were received, but there was very little dissatisfaction with the overall current level of service or performance of the application. The following is a list of preference items representing the majority of opinion, as interpreted and compiled by service bureau staff, from all the user input sessions held over the initial review period.

User Preferences and Take-a-ways:

- Reduce "learning curve" time by keeping screens similar to a current look and feel.
- Current screen color formats are acceptable, with some color easing being potentially beneficial.
- Some sort of limited read-only viewing of counties programming side could assist project reviewers.

- Initial start-up screen is acceptable – increased box size and separation could improve legibility. More transparency behind tab selection would improve user's expectations and increase intuitive use of interface.
- Combining screens to minimize unnecessary tabbing between screens.
- Project set-up screens should be combined to reduce screen "jumping" and streamline project set-up process.
- Project list screen should be retained with minor adjustments – keep program funding table with rounded programmed amounts, actual whole dollar funding amounts captured for accumulative project cost tallies.
- Budget screen to remain as is with auto-populating from Annual Reports of Actual Receipts/Expenses for Prior years 1 and 2.
- TP-Dev screen is acceptable with continued ability to see Project Development Status at a glance.
- TP-Dev Status screen could be improved using new expandable bar layout allowing single page submittal access.
- TP-Dev Set-up, Log, and Contact screens could be kept with minimal layout and functional changes required or possibly combined to minimize the need for users to remember which screen to find the functions they are looking to modify.
- Project close-out screen should include three options: Project Let, Project on Hold, and De-activate.
- Transit module users are not using the contract administration portion.
- Consider obligation and cash flow review of projects and provide cash flow report as year-end approaches.

This list is not exhaustive and represents consensus of issues of a very broad and general scope, but will provide a point of reference as the eventual layout and features are determined. These and other ongoing suggested improvements will assist in the general acceptance and satisfaction of the TAC and all parties utilizing TPMS 2020.

In the discussion to follow, we identify and discuss how the Service Bureau development team adopted modern design methodologies to accomplish the task required to deliver the TR-726 Modernization of Iowa Transportation Program Management System, TPMS 2020.

Phase 2 Tasks: Software Development Methodology Utilized for TPMS 2020

In today's practices of modern software development you will hear terms like agile design, Micro-Services, DevSecOps, CI/CD, and many other descriptions of methodologies, processes, and configurations. While some may consider these modern software development methods useful only to large enterprise sized development teams, they can be just as beneficial to small teams like the SB. Each of these component methodologies, although pure in theory, must be adopted and adapted to meet the particular team's level of expertise, hardware architecture availability and intended software deliverables. The SB team utilized many modern software development practices to deliver the TR-726 project. Some of these are identified, described, and discussed herein.

The Agile Design Process

The Agile design concept was developed in the early 2000's, with variations of the process developed over the last couple decades. The Agile design process was developed to replace, or at least provide an alternative to, the Waterfall design concept utilized almost exclusively at the time. The waterfall design model defines the project in sequential phases, with each phase dependent on completion of the one

before, much like a critical path method used effectively in the construction industry. But this model applied to software development requires all steps within the process to be known and conceptualized at the beginning of the project. The users and developers of a proposed software application rarely, if ever, truly know or can envision the final product deliverable. The waterfall method risks wasting valuable development time and costs on producing a product that does not completely hit the intended target of acceptance and waits until the final product is delivered to even find out what it looks like or if it fulfils the intended purpose. The agile design model builds in flexibility and course correction as the software is being developed. This is done by incorporating short runs of known, well defined, and feasible pieces of the overall product. Each additional iteration of work, once completed can be vetted by users and the next development piece can be worked on and added. This allows for more mid-course correction and less time wasted pursuing development in the wrong direction.

The SB team implemented our form of agile design process more than six and a half years ago, consisting of two week iteration runs. Each iteration period marks a time of review of the work of the past two weeks and planning of work expected to be accomplished for the next iteration. Initial project planning consisted of laying out the overall project goals and evaluating a long term schedule by loosely outlined a breakdown of major tasks and final product completion estimates. The application was conceptualized and modeled with anticipated dependencies identified and diagrammed. Once the initial concept was defined, detailed project development tasks were identified and included in the iteration process.

In the past three years, the SB team has adopted DevSecOps strategies. This term describes an integrated team approach including the philosophy of integrating security practices within the DevOps process. It involves an environment where IT operations and Application Developers work together in a culture of ongoing collaboration. The SB team applied the DevSecOps philosophy of integration with the agile design method to develop the TR-726 project. This allowed actual coding work to begin earlier, accommodated a greater frequency of user reviews and feedback, and enhanced security measures throughout the development process.

Benefits of Modular Construction

The legacy TPMS could best be described as originally being built as a monolithic application. This means any changes to the legacy app would require updating and re-deploying the entire application each time. Or in other words a monolithic application is self-contained and independent from other computing applications. There are many benefits of using more modern design concepts like modular development or separate but integrated modules. Each of the separate pieces of TPMS 2020, which include CFYP/Budget, STIP, TPDev, Transit, and FM, were able to be built as integrated but separate modules. This allow the SB team to work on multiple pieces and deploy modules when they were completed and ready for use. One example of this is that the CFYP/Budget and STIP modules were able to be deployed in December of 2019. Early deployment not only allowed county engineers to work with the new app earlier, but also provided early testing and training response, instead of waiting for all modules to be developed. Another advantage of early deployment was that a beta version could be distributed and features tested, allowing bugs to be recognized and fixed prior to committing to further project development. This was especially true for the STIP module. The early rollout and initial use showed many desired enhancements to the new module and the SB team was able to focus our attention on this separate piece where users needed the technical support most.

Micro services is another term that some use to describe modular applications. In this context, micro services refers to the way the hosting network architecture handles the application. The SB team has implemented micro services architecture over the past few years as the primary system configuration for any future development projects. This enables developers to address needed application modifications

and apply them to the system more readily and with less potential of effecting other pieces of the application. It provides for more network security and reliability by separating or partitioning services. Additionally, as technology advances, the system can change with the advancements by using this structure to minimize the requirement to apply wholesale changes and modify only the areas of the application that are in need of updating. TPMS incorporates this technology. The CFYP/Budget module was built with the prior system architecture and the remaining modules are built using the micro services system structure. Future modification to TPMS will be much easier to accomplish and minimize the effect on other previously deployed modules with this new architecture in place. Now, after users have been through two years of submittal iterations, the Programming and Budgeting process has been successfully completed with minimal delays and difficulties.

CI/CD

CI/CD generally refers to continuous integration and continuous deployment. In software engineering it describes an automated process of continuously creating and integrating new code, testing the product, and deploying the new build into the application. During the development of TR-726, the SB team designed and implemented an automated software development pipeline to merge the newly built, tested, and deployed code. With this automated process, developers could rapidly integrate newly written code with greater consistency and confidence. Code updates can be frequently pushed multiple times each day, allowing immediate feedback on code validation. The SB team implemented these and other modern technologies and processes which combined to assist in the modernization of TPMS 2020.

TP-726 Phase 1-2: Legacy TPMS Review Results

Results of tasks in Phase 1 and 2 showed what most would suspect of a 20 year old software application. Changes in business processes, project development requirements, and bug patches in coding were found to leave fragmented and fragile scripts. Some code was hard to follow and some no longer functioning but still remained as cruft in the software. Much of the patch work over the years were less than robust and provided uncertainty about effects of future modifications. While Legacy TPMS had performed valiantly for many years and processed over 40,000 projects, the urgency to replace it with a modern, secure, and reliable web-based application was apparent.

Phase 3 Tasks: Project Development and Coding

Once the Service Bureau team completed forensic investigation of Legacy TPMS and analysis of initial user input for the new application, initial modeling and coding could begin. Staff concept meetings, beginning in late summer of 2018, helped to synthesize input and provide context for the new application structure, dependencies, and potential screen layout. After TAC acceptance and direction to proceed with the grid layout concept, SB staff provided mock up screen concepts as a model and guide for future service side and user interface specifications. The project development team consisted of a lead server-side and database developer, a user interface developer, and two other SB developers to perform code review and internal alpha testing.

CFYP and Budget

The SB team began working on the CFYP and Budget sections, with a goal of deploying these modules by the end of the next calendar year. This deployment schedule would allow these modules to be available to county engineers for preparation of their FY 2021 CFYP and Budgets. Again, utilizing the module roll-out of pieces of TPMS 2020, this first iteration of CFYP and Budget would allow evaluation of how intuitive the beta version would be. Not only did these modules prove to be relatively intuitive for counties to use, there were very few support calls even after a minimal level of training. The main training sessions were held during the SB fall training tour and normal mid-year and annual conference introductions to the software. The 2019 ICEA Annual Conference provided an opportunity for attendees to speak to the developers and inquire of these new products. While county engineers and office staff had only a few questions at this time, we expected additional support would be needed as they put next year's program and budget together. In early 2020, the SB team were able to field support calls and find and fix coding bugs for these first two modules.

STIP

After the CFYP and Budget modules were substantially complete, work could begin on the STIP, which was the remaining construction programming module to be coded. Once again, the TAC reviewed, contributed, and directed the grid layout be adopted for STIP screen format. STIP coding began in the summer of 2019, with an intended substantial completion by the end of the year, to be deployed along with the other programming modules.

The STIP is the Statewide Transportation Improvements Program. Each year project sponsors from all parts of the State, submit Federal-Aid eligible projects through one of Iowa's 27 Metropolitan Planning Organizations (MPO), or Regional Planning Agencies (RPA). These regional plan lists, called TIPs, are compiled and combine to make up the STIP.

Planning agencies use the STIP module in TPMS to process their region's projects planned to be completed over the next four years. All Federal Aid and SWAP projects in the TIPs must precisely match in the STIP. For more details about the requirement for the TIPs and STIP, refer to the Program Management Bureau page on the Iowa DOT Website. Each of the projects advanced through the regional review process and ultimately the approved STIP, complete the following project status levels:

- In-Prep – project being worked on for potential inclusion in the TIP
- Submitted – project submitted and ready for regional review
- Draft TIP Approved – project with regional approval and eligible for TIP approval
- TIP Approved – project approved by Iowa DOT staff to be included in Draft STIP
- DOT Approved – project approved to be included in the STIP
- FHWA Approval – Federal approval of the STIP

Once a project has successfully advanced through these stages of planning review, the project is ready to be advanced to letting with Federal Authorization.

TPDev

Of course, prior to proceeding to letting, all locally sponsored projects need to be designed and developed through the appropriate milestones and clearances. The TPDev module in TPMS provides a framework for sponsors, design engineers, and reviewers to coordinate and collaborate in the project development process.

The TPDev module is much like the others in that it's default screens are geared to and different for each type of user accessing the application. This "customer aware" feature attempts to predict the most desired screen information to display for the particular user. If the user leaves, the system remembers were they left off and brings them back to that point the next time the user returns. In some cases a user may like various screen layouts depending on what information they desire or business function they are working on. TPDev includes a reports feature that allows user defined layouts to be stored and quickly returned to by selecting that report. Reports contain dynamic and current data so returning to a custom report includes up to date information for that particular screen layout being viewed.

Users of the system will utilize various parts of TPDev differently. A local sponsor will be more interested in the ability to input project data and design development updates. A DOT reviewer will focus on project submittals and project review requirements. All users will want to make sure the data they are working with is the most current. The new TPDev will provide more real-time data. In the legacy app, daily project updates would wait in holding until that night when the data would be transferred by exchanging files between TPMS and the DOT's Project Specification and Scheduling (PSS) software. TPDev 2020 replaces the old exchange process with scheduled API runs that automatically search for any updated information and exchange that data with the new MasterWorks PPMS software system. The scheduled task will run every few minutes, allowing data exchange throughout the work day rather than having to wait for the next day's updates.

The SB staff began coding the TPDev module in summer of 2020. The bulk of TPDev coding was substantially completed in late fall of 2020. Testing of the data exchange with PPMS system required frequent modifications as both programs where being created at the same time. Changes in one software effected the other and necessitated periodic modifications to both applications.

FM Estimates

Tracking the Farm-to-Market (FM) account balances has been a particularly complicated matter in the past. This is due to the ever changing expenses and revenue estimates along the process of programming, developing, letting, and ultimately constructing projects. Program estimates start out as simple total cost estimates with a breakdown of anticipated funding sources. As the project is developed, other funding mechanisms become known and better estimates can be projected, but not until the project is let do you have a good idea of probable costs. And even after letting, extra work or change orders can affect the final costs. Combine these fluctuating cost estimates with other projects that may utilize FM funding with different letting schedules, it is easy to see the difficulty in tracking and projecting balances in the FM account, either in an individual county or in the state as a whole. In the past, the Local Systems Bureau,

(LSB) have tracked these accounts. Also, counties must periodically update their FM balance in order to prove adequate funding is available for them to proceed with another project letting which will use FM funding.

In discussions with LSB and the TAC members, it was decided to consider if TPMS could assist in automating and improving the process. Since this work was not identified in the original research proposal, an amended proposal including this scope of work was submitted and approved by the IHRB in September of 2020. The SB development team began working with LSB in early 2021 to create the FM Balance sheet portion of the application to be deployed as part of the final TPMS 2020 rollout.

Transit

Legacy TPMS include a Transit module which is also included in the new TPMS 2020 application. This module is designed mainly for MPOs and RPAs to plan, program, and track federal aid contract projects that are also required to be part of the annual STIP. The Iowa DOT Program Management Bureau (PMB) administer these projects in the STIP and assists planning agencies with these activities. The Transit module is included as part of the final TPMS 2020 deployment.

Phase 4 Tasks: User Training and Development Close-out

Design and development of CFYP, Budget, and STIP modules were completed in late 2019 and deployed for early beta version trial by sponsors and reviewers. This allowed initial user feedback to influence later module concept and layout development. The response from this early roll-out was mostly positive for the CFYP and Budget, while the STIP received more scrutiny and required additional modifications for the next several months after initial deployment. Some of the issues with the beta version of the STIP were due to the difficulties in migrating the initial data to new TPMS 2020, but once the annual planning process had been completed, the following year was much improved and needed few system modifications. Additionally, the ICEASB team believed more initial formal group training sessions would have been beneficial prior or even after initial deployment.

During development of TPMS, the ICEASB system architecture changed dramatically. A major improvement was the addition of a testing environment to accommodate user access and alpha testing prior to committing the application to the production environment. Once the remaining parts of TPMS, specifically TPDev, FM, and Transit modules, was mostly complete in the spring of 2021, volunteer members of the TAC and CIT Committee were given access to test and comment on the user experience. ICEASB incorporated the user feedback and proceeded to scheduling training sessions for specific user groups in June of 2021 prior to going live with the application. These four training sessions included:

June 3 – Local Systems Bureau staff with 18 in attendance.

June 4 – County Engineers and staff with 42 in attendance.

June 15 – City, Consultant, and Planning Agency staff with 119 in attendance.

June 16 – County Engineers and staff with 53 in attendance.

Final full application deployment to production was coordinated with the schedule of the DOT's PPMS project performed with the assistance of Aurigo and the MasterWorks program. The coordination team decided on a June 30, 2021 shutdown of PSS, the previous DOT system. This allowed approximately one week for PPMS data migration, deployment, and integration of TPMS. ICEASB estimated one to two days of downtime for TPMS while the new system was deployed and legacy TPMS was retired. The main objective was to have both systems back up and exchanging data with each other by a July 7th online deadline. During the shutdown period, the DOT would also perform validation testing prior to going back online. If this schedule was accomplished without breaking changes occurring, then minor debugging, data discrepancies, and system enhancements would be fixed while the new applications were in production and functioning adequately.

Legacy TPMS Operations

Security, User Log-ins and roles

The Legacy versions of TPMS have, since 2002, functioned with a simple log-in protocol: each organization that connects to and uses the system has one, global log-in ID and a PIN-code that can be used by all staff members. The ID code ranges from 1 to 9999. The PIN-code is always four digits and ranges from 0000 to 9999. The PIN-codes were partially randomized in 2002 via use of a Pseudo-random number generator. Since that time, they have been assigned, along with ID numbers, so that no two user organizations ever have the same ID or PIN-code. No individual user differentiation is made within Programming and Budget modules, but for project development tracking, it is necessary to know the specific person who is using the system. Therefore, ICEASB maintains a database of people associated with each Organization. When a person elects to enter the Development module, they must select their name from a drop down list.

The old Log-in system has functioned adequately for 18 years but in light of current and future cyber-security threats, it is no longer sufficient.

ICEASB has revamped the log-in and security protocols as follows:

1. Login will become token based and use of cookies will be discontinued
2. Each user will set their own encrypted password and be responsible to reset it when needed. No one else, not even ICEASB staff members, will be able to know a specific individual's password.
3. Organizations will be enabled to have designated Administrative users who can add/change/edit/delete other users and send them invitations to establish passwords and log in.
4. ICEASB will retain the ability to act as Administrator for any organization, since some of them will not have enough experience with TPMS to be able to designate a Local Administrator.
5. County user log-in credentials i.e. email and password will be the same as for use of the ICEASB's county-only website.

TPMS 2020 Operations

Users and Security

Several enhancements to user login, user management, and security were necessary to meet the demands of the new version of TPMS. As a result of these enhancements, TPMS is now more secure and more user friendly.

User Login

TPMS login is now completed by entering the user's email address and password. Previously a numeric ID and PIN was required instead. This ID and PIN was shared by the entire organization and users were individually identified by choosing their name from a dropdown. This second step is eliminated because users are uniquely identified by their email addresses. ID and PIN are no longer shared and users are able to individually set passwords that are memorable and secret.

Many TPMS users have an existing account and password to log into applications hosted on www.iceasb.org. TPMS now allows single sign-on for these users. When a user is logged into www.iceasb.org, TPMS communicates securely with www.iceasb.org to authenticate the user and bypass the TPMS login screen. This single sign-on solution also works the opposite direction. Users only need one password for both systems. If they have access to both and are logged into either, they will be logged in automatically when accessing the other.

User Management

The SB has long considered the users to be the custodians of the data they choose to place within the framework of the apps created and maintained at the SB. For certain tasks, self-service is often faster and more convenient than relying on others for assistance. TPMS now offers administrators of organizations a self-service option for adding, updating, and removing users when there are changes within their organization. Organization administrators are no longer required to wait for system administrators to make these changes for them. If someone needs access to TPMS, it can be granted directly inside TPMS within minutes. In addition, many self-service options for an individual's own account extend beyond organization administrators and are available to all users. This means no user is required to wait for action by a system administrator for resetting a password or updating their profile information such as phone number, email address or name. Of course, these self-service options don't replace the user's access to direct support. Direct support remains available by contacting the ICEASB staff.

User management for both TPMS and www.iceasb.org is consolidated for organizations that manage www.iceasb.org users. For these organizations, administrators can give users TPMS or www.iceasb.org user roles using the same application and they don't need to manage users in both systems independently.

It is now possible for organization administrators to see who in their organization has access to TPMS and what they have access to. Organization administrators can manage a list of their users - including profile information and a list of each users' roles. Many functions within TPMS are reserved for users with given

roles. These user roles can be assigned to and unassigned from users by organization administrators. Each organization has access to assign only the user roles that are needed by their users.

User Roles

TPMS

- **Viewer**
  Can view all programs, projects, and budgets.
- **Contact**
  Contact for system notifications.
- **Administrator**
  Manage users.

CFYP & Budget

- **Sponsor**
  Can manage the County Five Year Program and Budget.
- **Reviewer**
  Can approve or reject County Five Year Programs and Budgets.

STIP

- **Sponsor**
  Can manage STIP projects.
- **PA Administrator**
  Can add, edit, and approve STIP projects.
- **IA DOT Administrator**
  Can add, edit, and approve STIP projects.
- **FHWA Administrator**
  Can add, edit, and approve STIP projects.

Project Development

- **Sponsor**
  Can activate, edit, and cancel projects. Can submit schedule items and upload files.
- **Consultant**
  Can submit schedule items and upload files.
- **Reviewer**
  Can activate, edit, and cancel projects. Can manage schedule items and upload files.
- **Primary Reviewer**
  Assigned as reviewer for applicable DOT let projects.

Security

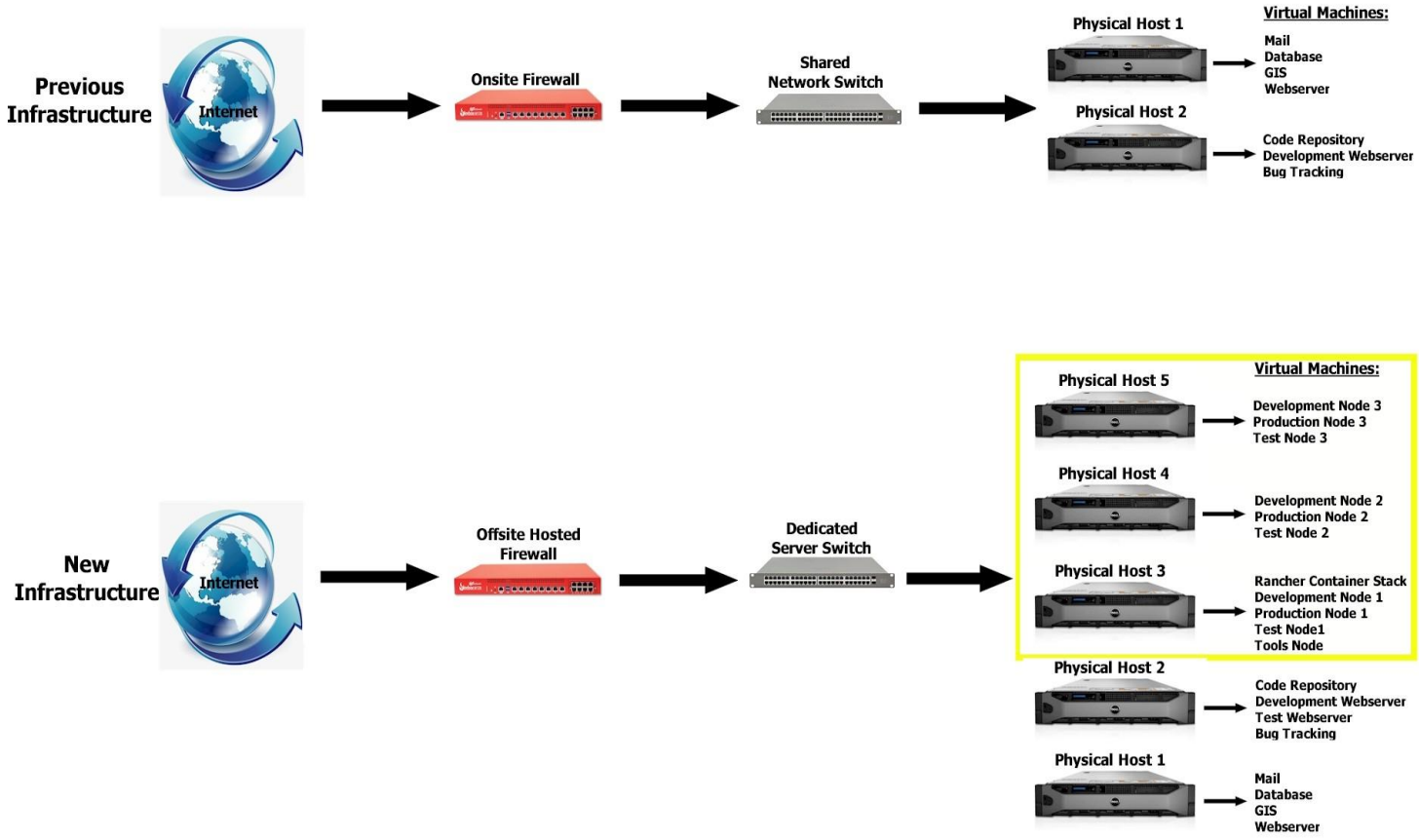
Security continues to be an important topic in technology and in particular for internet accessible applications. TPMS is hosted on the public internet. We recognize that unauthorized access to alter TPMS data would likely be expensive to rectify. TPMS now uses JSON Web Tokens, JWT Tokens for authentication. This offers many advantages over the prior custom cookie authorization scheme. JWT Tokens are digitally signed with cryptographically strong, secret signing keys. This allows the claims of the token to be verified and therefore trusted. TPMS stores these tokens in local storage instead of cookies and sends them to the TPMS API as OAuth 2.0 Bearer Tokens. Cookies are vulnerable to Cross Site Request Forgery (CSRF) where Bearer Tokens are not. A successful CSRF attack allows a third party site to gain access to an internet application on behalf of a user without the user's intent or knowledge. JWT Tokens have other security advantages including the ability to be revoked and they expire.

Before storing passwords, TPMS hashes them with a one-way cryptographic hash function. Hashed passwords are of limited use to a potential attacker and cannot directly be used to gain access to a system. Additionally, passwords in TPMS now are required to adhere to a password policy that ensures they are not easily guessed and they expire – shortening the time allowed for a brute force reversal of the hashing algorithm if the password database is compromised.

If a password is entered incorrectly more than three time within five minutes, the system will lock that user account for five minutes. This limits the number of attempt an attackers is able to make at guessing the password and renders an automated attack ineffective

Internet Connection

The amount of anticipated incoming Internet data from the ICEASB's developing services, as well as adding more Secondary Road employees access to these services, justified an upgrade in data rate from 100mb/sec to 200mb/sec. Future increases will only require communication with our Internet Service Provider (ISP) without the need for additional equipment purchases.



Firewall

Prior to the upgrade, the firewall - designated for small to medium business traffic -was managed onsite. To prevent potential traffic bottlenecks, a more robust enterprise class firewall is in place at IPPathways, the Internet Service Provider (ISP), where network professionals will manage and monitor traffic. The ISP also has multiple firewalls in place to provide redundancy in case of a mechanical failure of the firewall unit. This will prevent a single point of failure in this critical network component.

Network Switch

An additional network switch was placed onsite and dedicated specifically for server traffic. Prior to this, a single network switch shared between workstation and server traffic, slowed some network connections and introduced another single point of failure. Dual switches allows the network to stay online in case of a mechanical failure in a single unit.

Physical Servers

To satisfy the need for a more robust and dynamic server environment, a dual-server environment was replace with a five-server environment. A decision to move from Microsoft Windows Server to Microsoft Hyper-V on Bare Metal was also implemented. This significantly lowers the attack surface on the servers as well as removes some of the overhead associated with running a full Windows Server operating system. Since all servers are running the same base operating system, the movement of virtual machines from one server to another becomes an easy task. At the same time, ICEASB shifted programming mentality from a single, monolithic server to a more distributed system running Kubernetes containers. The move to a five-server environment also provides the computing power and redundancy needed for this purpose.

Kubernetes Containers

Kubernetes containers replicates and distributes applications across multiple servers – making better use of the available resources. Redundancy is achieved by running the same component on multiple computing units. If one component goes down or reports problems, it is quickly replaced on any available server.

ICEASB currently uses a software package called Rancher to implement these containers. This software allows the easy creation and distribution of these components into Testing, Development, and Production nodes. This separation of environments ensures a smooth transition throughout a components lifecycle.

Future Technologies and Direction

Due to the potential of significantly increased traffic and data, ICEASB has designed a system that allows moving components into a cloud based infrastructure. Rancher makes it possible to quickly acquire more computing units and storage space without the need for additional hardware or software – is made possible with Rancher. Several cloud providers are compatible with this setup – giving several options for future expansion.

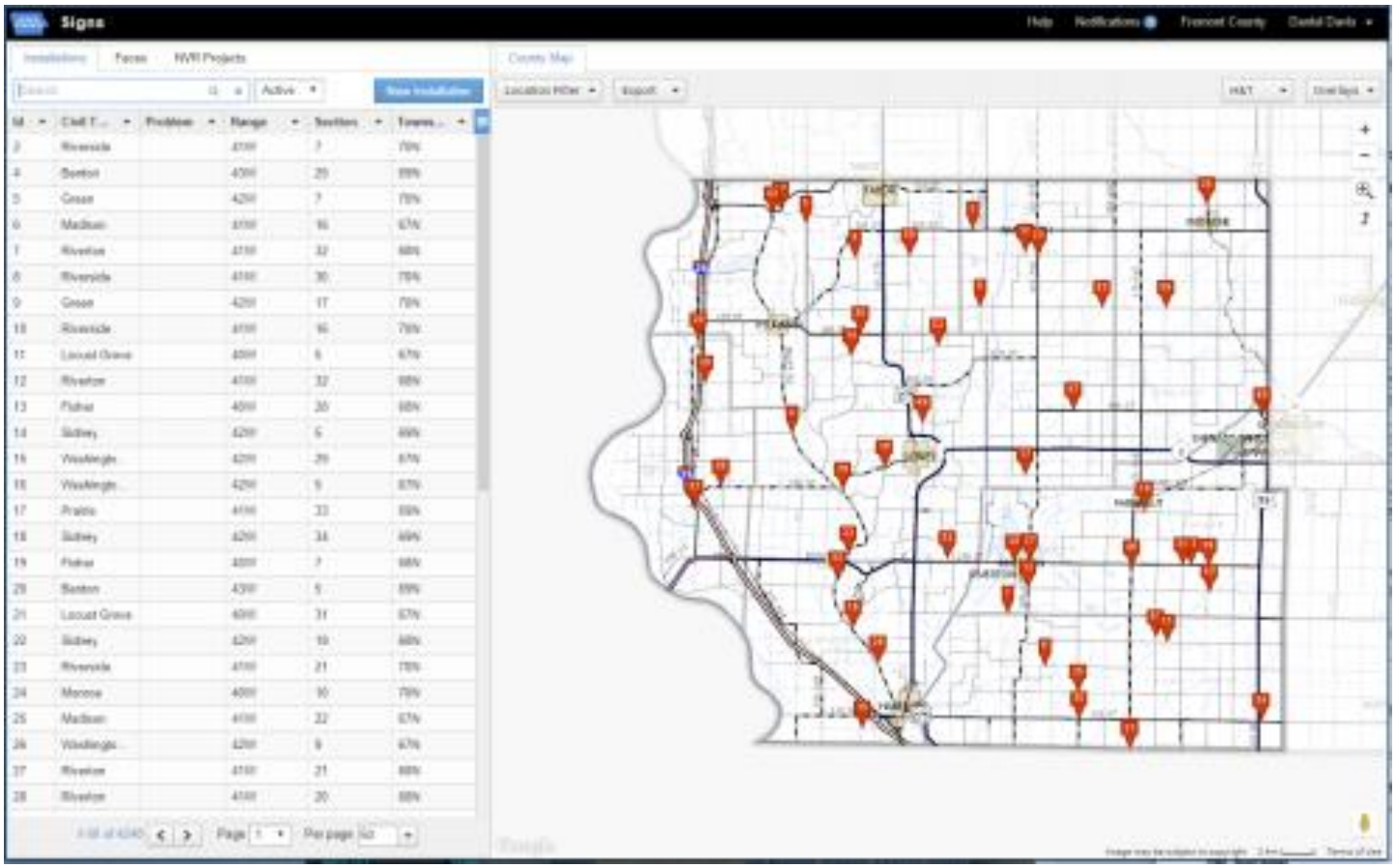
TPMS User Interface

Standards and Considerations

TPMS renewal had to find a balance between two competing imperatives:

On one hand, the user interface standards developed for and used in the ICEA Service Bureau website merit serious consideration. It is based on the concept that most automation projects can be accomplished using a minimal set of on-screen features. This allows a user to become proficient at using all applications, based on the features, after learning any one of them. The ICEASB grid design concept is illustrated below by a snapshot of the ICEASB Signs Application:

List header & controls	Tabbed view of items selected on left
1 single line row per item	This panel displays the details of any item selected from the LH listing. This is where users can view, add, edit or delete information. Appearance can vary with type of data: labels & fields, tables, map views, etc.
This view, called a 'grid' displays a	
list of items in rows and columns	
Users can re-arrange columns, sort	
and filter, and obtain outputs	
Clicking on an item causes a view	
thereof to open in the RH panel	

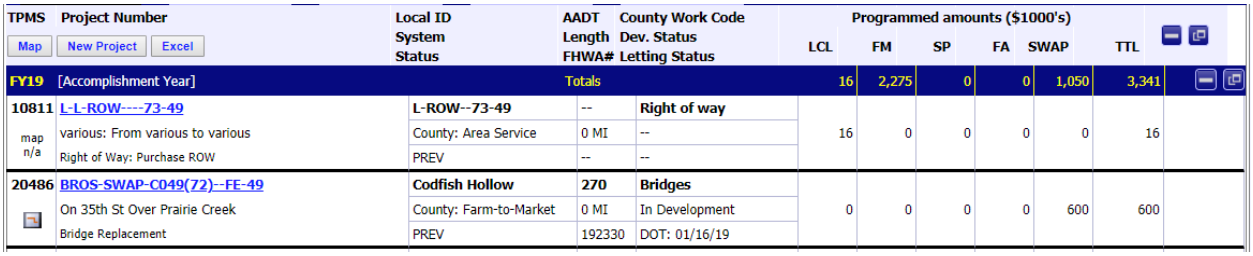


This multi panel concept can be adapted to a wide range of tasks and issues. To date it has been used in the ICEASB main web site, for a work orders tool, for sign and culverts asset inventory tracking, and road closure notifications. But it may not prove suitable in all circumstances. The 'grid' view works best if the number of columns in the listing remains at six or less. Displaying more columns than that results in the user being unable to clearly read the column headers and content. This can be partially alleviated by sliding the mid-screen divider to the right – but beyond a certain limit, doing so ends up cramping the right hand views. This viewable content limitation needed to be overcome for the grid concept to win out as the preferred layout option.

On the other hand, TPMS itself contains data display conventions that have been developed and refined over an eighteen year period of usage. While these formats aren't so authoritative as to be immune from modification, neither should they be discarded without due consideration of their utility, and the fact that some users have previously adapted to them.

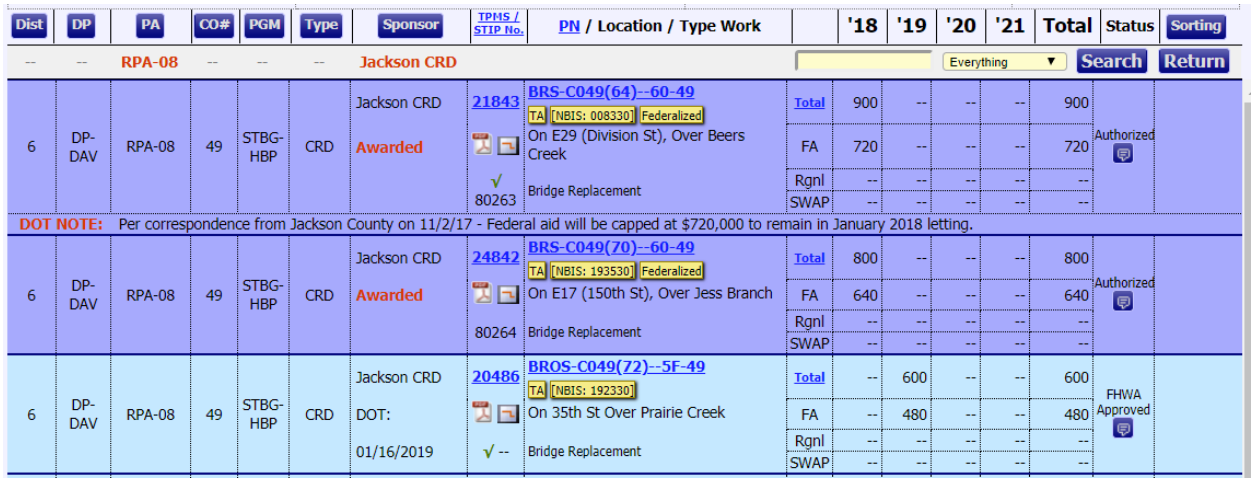
The block style presentation of programming elements in both the County Five Year Program and the STIP/SWAP Program displays all relevant information in the same format in which it will appear on final, official printed documents.

CFYP



TPMS	Project Number	Local ID / System / Status	AADT / Length / FHWA#	County Work Code / Dev. Status / Letting Status	LCL	FM	SP	FA	SWAP	TTL
Map New Project Excel					Programmed amounts ($1000's)					
FY19	[Accomplishment Year]		Totals		16	2,275	0	0	1,050	3,341
10811	L-L-ROW----73-49	L-ROW--73-49	--	Right of way						
map n/a	various: From various to various	County: Area Service	0 MI	--	16	0	0	0	0	16
	Right of Way: Purchase ROW	PREV	--	--						
20486	BROS-SWAP-C049(72)--FE-49	Codfish Hollow	270	Bridges						
	On 35th St Over Prairie Creek	County: Farm-to-Market	0 MI	In Development	0	0	0	0	600	600
	Bridge Replacement	PREV	192330	DOT: 01/16/19						

STIP/SWAP



Dist	DP	PA	CO#	PGM	Type	Sponsor	TPMS / STIP No.	PN / Location / Type Work		'18	'19	'20	'21	Total	Status	Sorting
--	--	RPA-08	--	--	--	Jackson CRD						Everything	Search	Return		
6	DP-DAV	RPA-08	49	STBG-HBP	CRD	Jackson CRD Awarded	21843 √ 80263	BRS-C049(64)--60-49 TA [NBIS: 008330] Federalized On E29 (Division St), Over Beers Creek Bridge Replacement	Total FA Rgnl SWAP	900 720 -- --	-- -- -- --	-- -- -- --	-- -- -- --	900 720 -- --	Authorized	
DOT NOTE: Per correspondence from Jackson County on 11/2/17 - Federal aid will be capped at $720,000 to remain in January 2018 letting.																
6	DP-DAV	RPA-08	49	STBG-HBP	CRD	Jackson CRD Awarded	24842 80264	BRS-C049(70)--60-49 TA [NBIS: 193530] Federalized On E17 (150th St), Over Jess Branch Bridge Replacement	Total FA Rgnl SWAP	800 640 -- --	-- -- -- --	-- -- -- --	-- -- -- --	800 640 -- --	Authorized	
6	DP-DAV	RPA-08	49	STBG-HBP	CRD	Jackson CRD DOT: 01/16/2019	20486 √ --	BRS-C049(72)--5F-49 TA [NBIS: 192330] On 35th St Over Prairie Creek Bridge Replacement	Total FA Rgnl SWAP	-- -- -- --	600 480 -- --	-- -- -- --	-- -- -- --	600 480 -- --	FHWA Approved	

These multi-row and column blocks are not as easily rearranged, sort and filtered as would be the case in a 'grid' view. But they do present most relevant information in a compact format. And they offer the possibility of having multiple different options, such as View project, Jump direct to funding table, Open map view, Move to a different year; all available within each project. While the block style layout uses color shades to represent progress towards approval, it is not always intuitive or even easy to remember

where you need to go to find the data being looking for. So, while the block option may give a better display of the resulting printed product, the grid layout displays much of the pertinent data without jumping from screen to screen hunting to find the data or how to modify the data.

To explore the pros and cons of the two competing concepts, essentially ‘grid’ vs. ‘block’, users have been asked to comment on several different potential interface ideas:

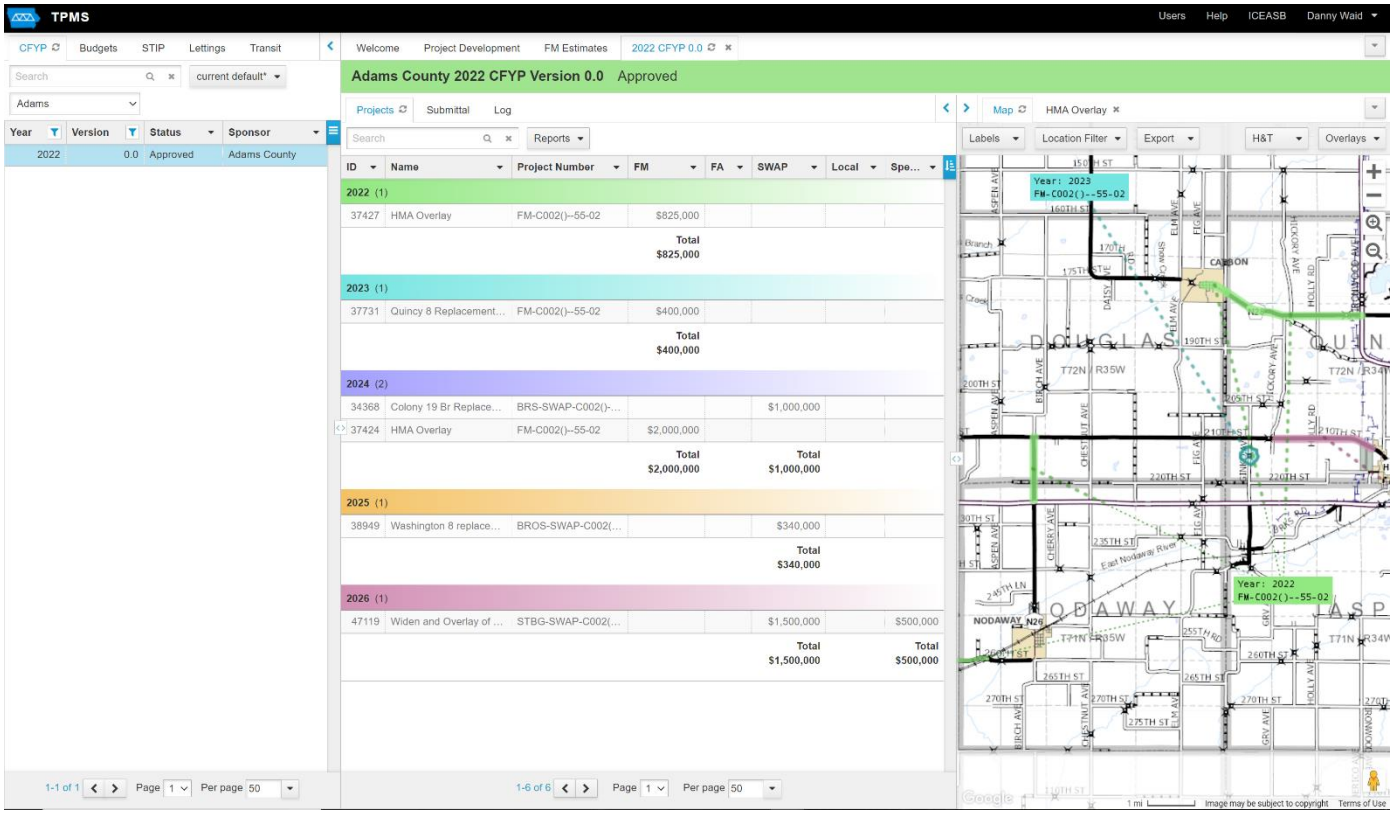
- Use a two or three panel ‘grid’ based concept where the ‘grid’ displays an abbreviated set of data in a one-row-per-project fashion.
- Use a format in which, regardless of grid or block, a project opens in new tab, utilizing the full screen to display the single record detail.
- Use a format in which, regardless of grid or block, the project is presented as a set of summary bars, each of which can be expanded to see the underlying detail and then reclosed.

The idea is to expose users to enough options so as to elicit genuine responses that will help the TPMS redevelopment team decide on the best user-interface for the tasks to be performed.

TPMS 2020 Selection of User Interface

Over the course of users input meetings and personal interviews with a vast cross-section of stakeholders the Service Bureau team prepared mock-up layouts depicting potential arrangements for development. The mockups were presented and the ultimate determination and development direction was selected by the TAC, a modified grid prototype was chosen. The grid style interface, as selected, would include collapsible multi-panels, enhanced mapping features, and expandable detail section bars. While the layout would still conform to the SB branded grid look, TPMS 2020 users would recognize the common "TAB" → "List" → "Detail" format, providing logical processes and data transparency. This format improves the sorting and filtering capabilities and provides a report feature to quickly access pre-determined data sets stored as user defined reports, allowing almost unlimited user defined viewing options. This allows more self-service and customizable viewing layouts catering to a disparate user cliental.

The typical tri-panel screen layout is shown below. Across the top, is the TPMS banner which indicates who is logged-in and what organization they belong to, in the upper right of the screen. This is an example of the tri-panel screen layout for the CFYP. A "Help" tab next to this give users quick access to instructions and frequently asked questions. Below the banner, is the tab line for selecting between CFYP, Budget, STIP, Lettings, and Transit. Once a tab is selected the left panel will display a list and status of past work. For CFYP, clicking on a past or recent program will cause the center panel to display projects included in that program. The right panel also displays the corresponding map of the information in the center panel. Clicking on a project in the center panel, places a new project tab next to the map tab. Selecting the project tab on the right screen then displays the details of the selected project.



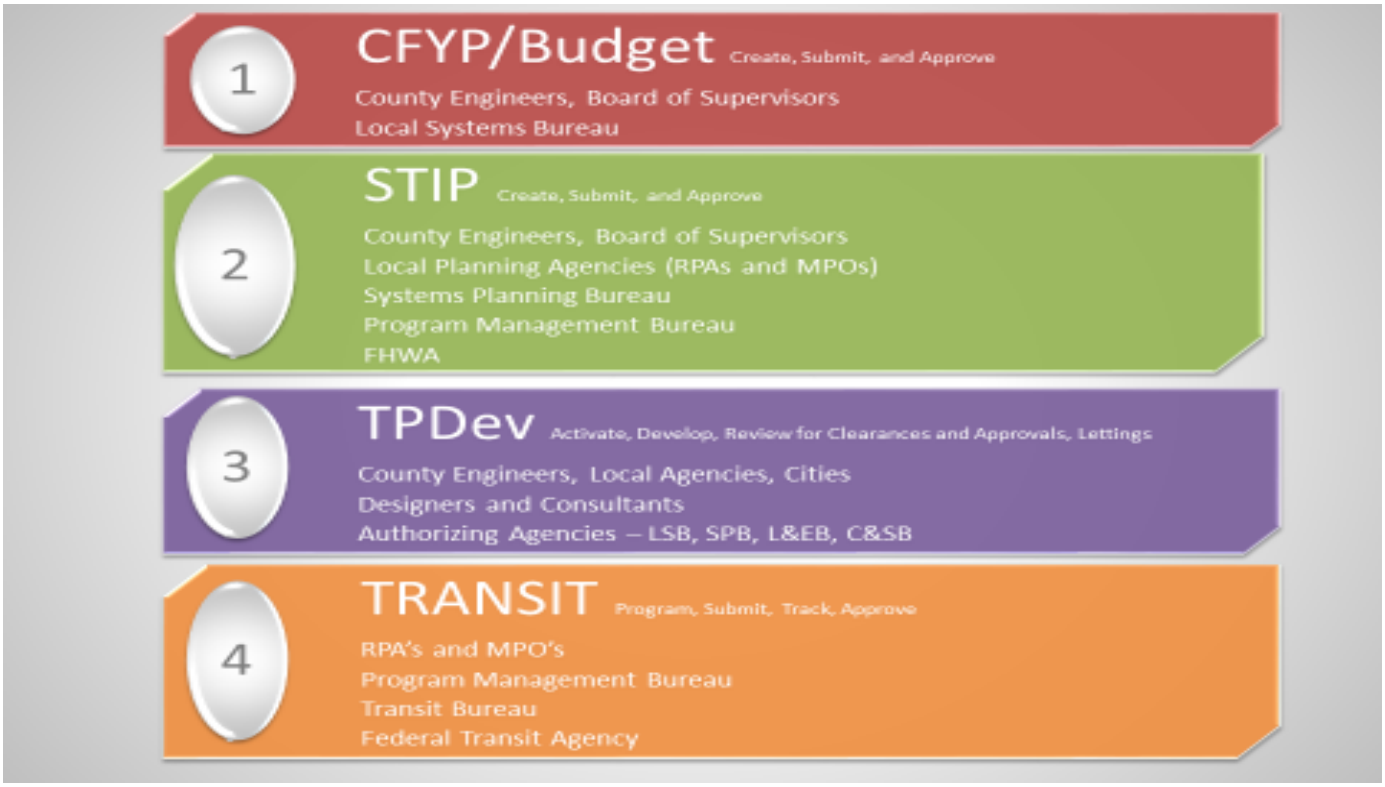
Additional CFYP and Budget module information can be found in the Chapter 3 - User Manual portion of this report and Appendix C – DOT Instructions FY 2022 Program and Budget, attached hereto.

Adaptive Display considerations

In this era of Internet based applications delivered via web browser, software has to be designed and written so that the app can legibly and usefully appear on a wide variety of screens: desktop workstations, laptops, tablets, and even smart-phones. This calls for flexible interfaces that can revise their layout to fit the dimensions and aspect ratio of the device in use. Yet there are times when the data's format is of sufficient importance and detail that small screen devices simply won't support delivery of full functionality. The selected application design incorporates panel collapsing and rubber stretching features to facilitate various screen and data visibility.

Facilitation of inter-user communication and data transfer

The fundamental purpose of TPMS is to facilitate prepare-submit-review-approve processes via improved communications between participants. This is accomplished at a number of levels. The interface assures that all users see the updated, current data for any given project, regardless of location or time of access. The system also provides the mechanisms via which items are created, edited, checked, submitted, reviews and – if compliant – marked approved. The system also notifies participants when they need to do something, when someone else has taken action, or alerts them when automatic adjustments, such as resetting a late project's letting date, have happened. Support for entry of notations, emails and file upload/download further the 'communication' options. The system seeks to make contact information about other participants available to any given user, so that they can reach out to another party without delay when a question arises. Inter-user relationship as out-lined below are a required consideration in the resulting research project deliverables. The main users of each module are as follows:



Description of Intended User Interface

CFYP Module

The CFYP Module's primarily purpose is to assist in the preparation, submittal, and approval of each County's five year construction program.

Business Objectives:

- County Engineers prepare 5-Year Program (original and revised programs)
- Board of Supervisors Approve Program(s) for Submittal to Local Systems Bureau
- Local Systems Bureau reviews and approves projects detailed in the program
- TPMS CFYP populates draft STIP with required projects

Budget Module

The Budget Module's primary purpose is to assist the preparation, submittal, and review and approval of each County's DOT Budget

Business Objectives:

- County Engineers prepare the Secondary Roads Budget (original and amendments)
- Board of Supervisors Approve Budget for submittal to Local Systems Bureau
- Local Systems Bureau reviews and approves budget or revisions to the budget

STIP Module

The State Transportation Improvement Program (STIP), includes all projects sponsored by Local or State Agencies that are funded in whole or in part by Federal or SWAP funding. When all projects have been submitted and reviewed for inclusion in the draft STIP, the STIP is reviewed and approved by FHWA representatives and constitutes that years official STIP.

Business Objectives

- CFYP Fed-Aid and SWAP Projects that have been submitted by the County Engineer are reviewed and processed by the respective Regional or Metropolitan Planning Agencies.
- Other Sponsors submit projects to their planning agencies for funding requests.
- Regional Planning Agencies and Metropolitan Planning Organizations process projects in their respective jurisdictions for inclusion in the Final STIP
- Program Management Bureau reviews and approves projects for inclusion in the Final STIP
- Final STIP is authorized by FHWA.
- The STIP may be amended as necessary to include changes throughout the year.

Lettings and TPDev Module

The modernized TPMS 2020 includes a new feature that allows sponsors to view and edit project schedules by the letting tab. The lettings tab default screen layout indicates the number of projects for a particular sponsor and whether the development status of each project is on or behind schedule. A companion tab, named Development, is always present in the center panel of the screen layout. Selecting the Development tab will list all projects for the selected letting along with the scheduled tasks and the status of each task. Each project and its status is list on a single line. This layout mimics the project list of the legacy version which should be familiar and which was popular with experienced users of TPMS.

Selecting any project from the center list will bring up the information about that project on the right side screen, where a user can view, edit, and update development information and progress. As project development milestones and clearances are completed throughout the design process, the scheduled task section allows for documentation of submittals, reviews, and correspondence.

Business Objectives

- Projects are activated for development with the associated project information being pulled for the CFYP, STIP, or added as a new project in TPDev.
- Project information includes project details, location and funding information and other pertinent data.
- A section has been added to allow project Bid Items and Specifications to be assigned to a project.
- Scheduled tasks (milestones and clearances) are assigned. Sponsors submit required task documentation and Authorizing Agencies review, comment, and approve each task.
- All in-app communication and activities are stored and logged.
- Project activities and data changes are exchanged with the DOT's Program and Project Management System (PPMS), through real-time data exchange Application Program Interfaces, (API's).
- Data from PPMS data libraries are used by TPMS to allow up-to-date data for uses to select.
- Once all development tasks are satisfied and complete, the project information can be downloaded and shared with Contracts and Specification Bureau to prepare the project for letting.

FM Estimates Module

The purpose of the FM Estimates section of TPMS is to generate an estimate of the balance available to let for a county as of a future letting date. This estimate is then attached as a PDF document to FM projects within Project Development to be reviewed as part of the project review process. Most of the data needed to make estimates is pulled from Project Development or uploaded by DOT staff. Project funding estimates are pulled from Project Development. Post letting figures, quarterly statement figures and yearly allocation forecasts are uploaded by DOT staff. Counties can enter adjustments as needed.

FM Estimates has two sections: a list of counties to choose and a detailed estimate breakdown. To open a detailed estimate breakdown, users can choose a letting date for the list, then choose a county from the list. When a user is ready to generate the estimate PDF document, they can choose Save Estimate, enter notes and submit. The estimate PDF document will then be attached to all the FM projects in Project

Development whose letting date and worksite county correspond to the letting date and county of the estimate. If adjustments are needed, a user can choose Add Adjustments, enter the adjustments and submit.

Estimate calculations start with the statement estimated balance from the most recent quarterly statement available prior to the estimate's letting date. The statement estimated balance is calculated as the cash balance, less the outstanding obligations, plus the outstanding reimbursements. Outstanding obligations are pulled directly from the uploaded statement figures and outstanding reimbursements are calculated from uploaded letting data. A running balance is projected from the statement date through the letting date. Projected allocations are added to the balance, estimated project funding is subtracted, and adjustments are added or subtracted.

Business Objectives

- Local Systems staff update Quarterly Statement and obligations information into spreadsheets.
- FM Balance extracts data from spreadsheets and runs calculations.
- Counties may view or add adjustments as appropriate for their situations.
- Local systems staff verify funding adequacy during project development approval process.
- Counties review funding status to adjust future project letting schedules.

Transit Module

Legacy TPMS included a Transit module which is also included in the new TPMS 2020 application. This module is designed mainly for Transit Agencies to plan, program, and track State and Federal aid contract projects. The Iowa DOT's Public Transit Bureau (PTB) administers these projects in the STIP and assists Transit agencies with these activities. The TPMS Transit module is included as part of the final TPMS 2020 deployment.

Chapter 2 – Functional and Technical Specifications

Structure of Specifications

In this sections, the following organizational structure will be used to outline and specify the details of each functional module and major sub-modules.

- Business activities supported - Description of what a modules is for and what it does
- Users, needs and roles – Information on who can access the module, what they need from it and what they can do in it.
- Key business rules – Abstracted statements of rules that the application must observe or enforce
    - Internal to module – rules specific to a module, task, or type of project.
    - Inter-module – rules about inter-module constraints, (i.e. Module B cannot perform X until Y has occurred in Module A), or data transfer, (i.e. When a CFYP is approved by Office of Local Systems, FA and SWAP projects are automatically posted over to the STIP/SWAP module), or time of year limits, (CFYPs must be submitted by April 15 and go into effect on July 1)
- Screens and functions – This will describe/show anticipated screens and define how they will work
- Filtering and sorting – list of options with constraints
- Outputs – map, text and spreadsheet output options
- Handling of exceptions – will describe possible exceptions to the general rules and outline how they would need to be handled.

Several additional categories have been added where needed: a) Notification requirements, b) Special options, c) Scripts and data exchange protocols, and d) Identify and describe built in forms

TPMS interface design decisions – As discussed and directed by TAC, users, and stakeholders.

<table>
<tr><th>Screen / layout</th><th>Business rules, interface requirements, features</th></tr>
<tr><td>Security, organization and user mgmt.</td><td>Implement single sign on process

Enhanced security and cloud backup capabilities</td></tr>
<tr><td>Starting dashboard

<table><tr><td>Header</td></tr><tr><td>TPMS Banner</td></tr><tr><td>User Administration</td></tr><tr><td>Help</td></tr><tr><td>Organization</td></tr><tr><td>User</td></tr></table></td><td>User Administration menu is dependent on a TPMS admin role</td></tr>
</table>

Multi Panel – Broad Lists

CFYP	List of all county five year programs
Budgets	List of all county budgets
STIP	List of all STIP years
Lettings	List of letting and project counts
Transit	List of transit years

This area resides on the left side of the application. It contains a series of broad level lists within TPMS. It is resizable and collapsible.

Multi panel – Details

Welcome	General welcome information
Project Development	Projects activated for development
FM Estimates	FM Estimates per county for individual lettings

This area begins with a default of 3 tabs; Welcome, Project Development, and FM Estimates. As users open Broad list items, the detail of those items will open on the Details side.

CFYP

List side

Projects	List of county projects with the following columns o ID o Year o Name o Project Number o FM o FA o SWAP o Local o Special o Total o Review Status o Review Notes o Funding Program o Federal Bridge Id o Letting Date o Let o FM Transfer Also contains a search control, reports control, and controls to Add and Import a project
Submittal	Either the summary of the approved Program or controls to submit the program
Log	List of events that happened to the program. The events are separated by day and contains the source of the event, the time and a description

Detail Side

Detail tabs will default to a Map tab showing all the visible projects in the projects tab, plus a Review tab if the user has CFYP Reviewer role. When a project is selected, it will open a tab on this side.

CFYP Detail Side – Project Tab

Tab Title	Either the project name or the project ID
Header	Pertinent identifying information
Controls	Controls to change and print the project

Review Panel	Shows the summary of the project's from Local Systems
Details Panel	Shows information about the Project, Site, Work Codes, Contacts, and Notes
Location Panel	Shows the location description and the map
Funding Panel	Shows the funding breakdown
Programs Panel	Shows all of the programming summaries for the project
Log Panel	Shows everything that's happened to the project

Review Tab

Tab Title	"Review"
Header	"Review" Review Status
Reason	For amendments and revisions, the bona fide reason for the change
Project Review Notes	An aggregate of all of the review notes on projects
Program Notes	General review notes for the program

CFYP Review Tab - Project Review Tab

Tab Title	Either the project name or the project ID
Header	Pertinent identifying information
Controls	Controls to change and print the project
Review Panel	Contains the controls to approved or reject the Location, Paving, and the entirety of a project
Details Panel	Shows information about the Project, Site, Work Codes, Contacts, and Notes
Location Panel	Shows the location description and the map
Funding Panel	Shows the funding breakdown
Programs Panel	Shows all of the programming summaries for the project

Log Panel	Shows everything that's happened to the project

CFYP – Business Rules

The following rules were used as guidelines while writing the software. At any point in the future, stakeholders may desire different business rules, which can then be incorporated into the software.

- Draft Programs
    - Creation of Draft programs can begin after October 1st.
    - When a Draft programs is initiated, all projects that were not let in the last approved program will be carried forward
- New Programs (Drafts, Amendments, Revisions)
    - When a program is created all projects are updated to the latest changes for those projects in the STIP
- Programs
    - When a program is printed, submitted, or approved, none of its projects can be changed
    - When a program is printed, it can be unlocked
- Projects
    - Required fields must have values
        - Description
        - Project Number
        - Federal Functional Class
        - Asset Owner Type
        - Asset Owner Code
        - Worksite County
        - Funding (at least one element)
        - Planning Agency
        - Workcodes (at least 1)
    - At least one element for funding must agree with the project number
    - When a project has its project number set in Project Development, the updated project number will be reflected in the CFYP
- Program submission
    - All projects must be free of errors
    - All first year HBP projects should have letting dates that match the programming
    - The program should have no more than 3 HBP projects in the first year
    - The amount of Farm-to-market transfer money programmed must match the corresponding budget
- Program Approval
    - Upon approval all STIP eligible projects (Federal Aid, SWAP, and Illustrative) will be updated or inserted into the corresponding STIP
- Program Rejection
    - Upon rejection, a program will be set back to In prep and a notice will be sent to the county

Budget

Budget	Holds a display of the budget
Submittal	Either the summary of the approved budget or controls to submit the budget
Log	List of events that happened to the budget. The events are separated by day and contains the source of the event, the time and a description
Edit Budget (optional)	This holds the form to change a budget

Reviewers will have an additional area to review the budget.

CFY Budget Business Rules

The following rules were used as guidelines while writing the software. At any point in the future, stakeholders may desire different business rules, which can then be incorporated into the software.

- Draft Budgets
    - Creation of Draft Budgets can begin after July 1st
- New Programs (Drafts and Amendments)
    - Projects with local funding that is still being spent will be added
- Budget Submission
    - The initial program and budget must be submitted together
    - Budget farm-to-market transfer amount must agree with the corresponding program farm-to-market transfer dollars
- Budget Rejection
    - Upon rejection, a budget will be set back to In prep and a notice will be sent to the county

STIP

List Side

Project List	List of projects with the following columns - ID - Description - Worksite County - Sponsor - Planning Agency - Name - Project Number - STIP ID - Funding Program - Federal Bridge ID - First year - Years - Sponsor Type - Letting Date - Let - Version Type - Approval Level - Approval Level Color - FM - FA - SWAP - Local - Special - Match - Total - Regional - In Revision - FA Percent - Funding Type - Appropriation Codes - In Pep - Submitted - Draft TIP Approved - TIP Approved - DOT Approved - FHWA Approved - Authorized - PA Note - DOT Note

STIP - Detail side

The detail side contains two non-closable tabs; Map and Appropriation Codes (DOT Administrator)

Map	An aggregate map showing locations of projects in the projects list
Appropriation Codes	A list of appropriation codes and dollars assigned by year
Project	A detailed view of a project

Project Tab

Tab Title	Either the project name or the project ID
Header	Pertinent identifying information

Controls	Controls to change and print the project
Details Panel	Shows information about the Project, Site, Work Codes, Contacts, and Notes
Location Panel	Shows the location description and the map
Funding Panel	Shows the funding breakdown
Programs Panel	Shows all of the programming summaries for the project
Log Panel	Shows everything that's happened to the project

STIP Business Rules

The following rules were used as guidelines while writing the software. At any point in the future, stakeholders may desire different business rules, which can then be incorporated into the software.

- Projects
    - Required fields must have values
        - Description
        - Project Number
        - Federal Functional Class
        - Asset Owner Type
        - Asset Owner
        - Worksite County
        - Funding (at least one element)
        - Planning Agency
        - Work Codes (at least one element)
    - At least one element for funding must agree with the project number
    - When a project has its project number set in Project Development, the updated project number will be reflected in the STIP
    - Each project is approved from In Prep to Authorized, individually
    - Sponsors can edit their projects while they are In Prep
    - Planning Agencies can edit projects they are assigned to while they are In Prep, Submitted, Draft TIP Approved, and TIP Approved
    - The DOT can edit projects until they are FHWA Approved (FA projects) or DOT Approved (SWAP projects)
    - When SWAP projects reach DOT Approved, the following can occur
        - If the project has been activated for Development, the project number and description, and location will be reflected in Project Development
        - The project can be revised
    - When Federal Aid projects reach FHWA Approved, the following can occur
        - If the project has been activated for Development, the project number and description, and location will be reflected in Project Development
        - The project can be revised
    - Starting October 1st a new Draft STIP will be created

        - All projects that are not sponsored by the DOT or a County and meet the following criteria, will be included in the new Draft year.
            - The project has not been activated for Project Development
            - If the project has been activated, it has not been Let, Awarded, or Finished
            - The project has reached a minimum approval level of TIP Approved
            - The project is not a revision
    - County projects will be submitted to the STIP through their respective County Five Year Programs
    - DOT projects will be submitted to the STIP through a once a year download to the Service Bureau

Project Development

List side

Project List	List of projects with the following columns - ID - Sponsor Type - Sponsor - Status - Letting Location - Letting Type - Letting Date - Project Number - Reviewer Organization - Reviewer - Design Engineer Organizations - Worksite County - Date Activated - Location Type - Description - Work Codes - Funding Program - Prefix - Alpha Code - FFC - System Class - Federal Bridge ID - Total Engineer's Estimate - Miles - Lanes - Davis Bacon - NPDES - Field Manager - Next Scheduled Item - Late Scheduled Items - Schedule Items - Concept Statement Progress - Concept Statement Status - Concept Statement Status Date - Preliminary Plans Due Date - Check Plans Progress - Check Plans Status - Check Plans Status Date - Check Plans Due Date - Final Plans Progress - Final Plans Status - Final Plans Status Date - Final Plans Due Date - Design Exception Progress - Design Exception Status - Design Exception Status Date - Design Exception Due Date - Hydraulic Review Progress - Hydraulic Review Status - Hydraulic Review Status Date - Hydraulic Review Due Date - Structural Review Progress - Structural Review Status - Structural Review Status Date - Structural Review Due Date - Project Funding Agreement Progress - Project Funding Agreement Status - Project Funding Agreement Status Date - Project Funding Agreement Due Date - ROW Status Date - ROW Due Date - Railroads Progress - Railroads Status - Railroads Status Date - Railroads Due Date - Section 404 Progress - Section 404 Status - Section 404 Status Date - Section 404 Due Date - Flood Plain Progress - Flood Plain Status - Flood Plain Status Date - Flood Plain Due Date - Work In DOT ROW Progress - Work In DOT ROW Status - Work In DOT ROW Status Date - Work In DOT ROW Due Date - NEPA Progress - NEPA Status - NEPA Status Date - NEPA Due Date - SHPO Progress - SHPO Status - SHPO Status Date - SHPO Due Date - Development Certification Progress - Development Certification Status - Development Certification Status Date - Development Certification Due Date

	- Concept Statement Due Date - Preliminary Plans Progress - Preliminary Plans Status - Preliminary Plans Status Date	- Section 4f Progress - Section 4f Status - Section 4f Status Date - Section 4f Due Date - ROW Progress - ROW Status	- Contracts Turn In Progress - Contracts Turn In Status - Contracts Turn In Status Date - Contracts Turn In Due Date - Behind Schedule

Project Development - Detail side

The detail side contains two non-closable tabs; Map and Appropriation Codes (role dependent)

Map	An aggregate map showing locations of projects in the projects list
Calendar	A calendar view of upcoming project schedule items
Project(s)	When a project is opened, it opens on the detail side and can be closed

Project Tab

Tab Title	Either the project name or the project ID
Header	Pertinent identifying information
Controls	Controls to change and print the project
Details Panel	Shows information about the Project, Letting, Site, Work Codes, Asset Owner, Sponsor, Construction Engineer, Design Engineers, and Reviewer
Schedule Panel	Shows the schedule items for the project. The items can be updated by the Sponsor, Design Engineers, and the Reviewer
Location Panel	Shows the location description and the map
Specifications Panel	A list of Developmental or Supplemental specifications
Bid Items	A list of bid item divisions and bid items for the project
Funding Panel	Shows the funding breakdown
Files Panel	A list of files attached to a project
Programing Panel	Shows all of the programming summaries for the project

Messages Panel	A list of messages sent by users attached to the project
Log Panel	Shows everything that's happened to the project

Schedule items

Schedule items include the following

- Concept Statement
- Preliminary Plans
- Check Plans
- Final Plans
- Project Development Certification
- Structural Review
- Design Exception
- Hydraulic Review
- Project Funding Agreement
- HSIP Funding Agreement
- NEPA
- SHPO
- Section 4f
- COE Section 404
- IA DNR Flood Plain
- NEPA Re-evaluation
- ROW Acquisition
- Utilities
- Railroads
- Work in DOT ROW

Project Development Business Rules

The following rules were used as guidelines while writing the software. At any point in the future, stakeholders may desire different business rules, which can then be incorporated into the software.

- Bid Items
  - Bid items are updated by the DOT on a regular basis
- Specifications
  - Developmental and Supplemental specifications are updated by the DOT on a regular basis
- Lettings
  - Lettings are updated by the DOT on a regular basis
- Projects
  - A project may or may not have a letting date
  - Projects that have letting dates and are to be let at the DOT will have their details relayed to the DOT when those details change
  - Projects that have letting dates and are to be let at the DOT will have their schedule items updated by the DOT when those DOT administered items change at the DOT

- Project Number
  - When a project is contained in the STIP, it's project number program cannot be changed in Project Development
- Schedule Items
  - Can be added by sponsors, design engineers, and reviewers
  - Items can only be removed by reviewers
  - Each item has a due date
    - Due dates can be exact dates or relative to the letting date
  - When one or more milestone falls behind schedule, the project will be moved into a later letting.
    - At any point, sponsors and reviewers may change the letting date.
  - Items can have their state updated by sponsors, design engineers, and reviewers
  - Items can have files updated by sponsors, design engineers, and reviewers
- Location
  - When a project is included in the STIP, its location can only be updated in the STIP
  - When a project has no programming or CFYP programming only, its location may be updated in Project Development
- Specifications
  - Can be added by sponsors, design engineers, and reviewers
- Bid Items
  - When bid items are updated the resulting Engineer's estimate is also updated
  - When a bid item is set to expire before a letting, it will be flagged as an error
  - When a bid item has been removed, it will be flagged as an error
  - When a bid item is invalid, it will be flagged as an error
- Funding
  - Can be added by sponsors and reviewers
  - When the funding for a project doesn't match the Engineer's estimate by at least 10%, it will be flagged as a warning
- Files
  - Can be added by sponsors, design engineers, and reviewers
- Messages
  - Can be added by sponsors, design engineers, reviewers, and anyone that was sent a message
- When any of the schedule items are falling behind, they will be flagged as errors
- A project reviewer may re-assign a project to someone in the same organization or a different organization (ie. The sponsor or another reviewing organization)
- A sponsor can be the project's reviewer only when the letting is not at the DOT

Transit

List Side

Project List	List of projects with the following columns ○ ID ○ Year ○ Sponsor ○ Sponsor Type ○ Approval Level Color ○ Approval Level ○ Planning Agency ○ Vehicle ID ○ Vehicle VIN ○ Inventory Vehicle ID ○ Description ○ Sponsor Note ○ PA Note ○ FTA Note

Project Tab

Tab Title	Either the project name or the project ID
Header	Pertinent identifying information
Controls	Controls to change and print the project
Notes	Notes from the sponsor, planning agency, DOT, or FTA
Details Panel	Shows information about the Project, Contacts
Funding Panel	Shows the funding breakdown
Programs Panel	Shows all of the programming summaries for the project
Log Panel	Shows everything that's happened to the project

Transit Business Rules

The following rules were used as guidelines while writing the software. At any point in the future, stakeholders may desire different business rules, which can then be incorporated into the software.

- Projects
    - Required fields must have values

        - Description
        - Type
        - Planning Agency
    - Each project is approved from In Prep to Authorized, individually
    - Sponsors can edit their projects while they are In Prep
    - Planning Agencies can edit projects they are assigned to while they are In Prep, Submitted, Draft TIP Approved, and TIP Approved
    - The DOT can edit projects until they are FTA Approved
    - Starting October 1st a new Draft Transit program will be created
        - All projects that are meet the following criteria, will be included in the new Draft year.
            - The project has reached a minimum approval level of TIP Approved
            - The project is not a revision

Chapter 3 – Users Manual

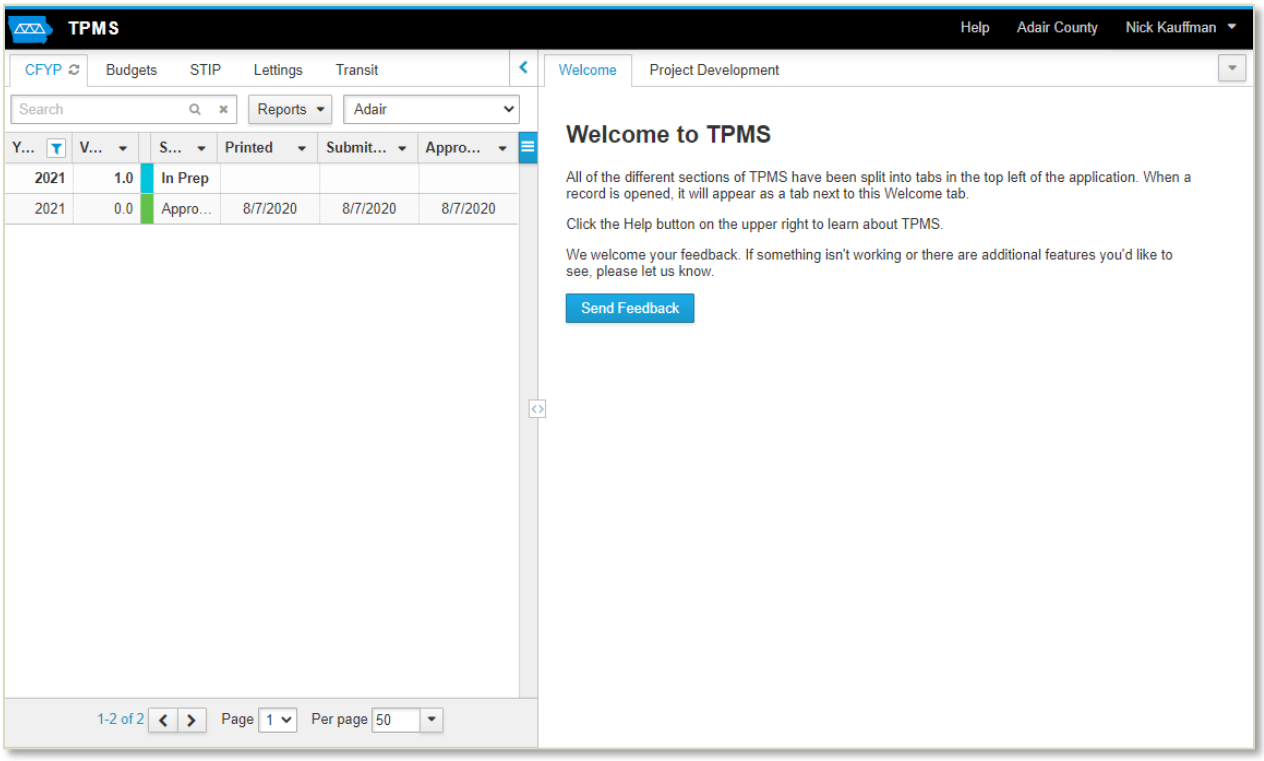
TPMS User Manual

Overview

Transportation Program Management System (TPMS) is used to manage state and county programs, county budgets, project development, and transit investments.

Layout

TPMS is organized into panes and tabs. Panes divide content into side-by-side resizable sections that can be collapsed or expanded. This can be done manually or automatically depending on screen size. Tabs separate content into labeled selectable panels.

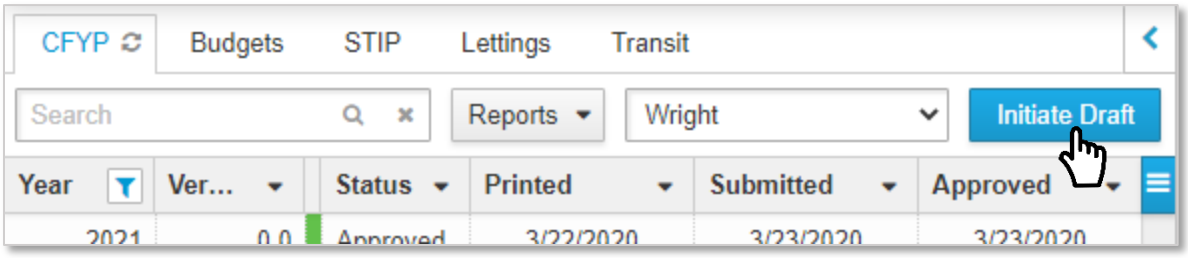


CFYP

Initiating a draft program

Each year the draft program will need to be initiated after the start of the state fiscal year. This will create a new program including all non-let projects that are in the priority years of the previous program.

1. Click on “Initiate Draft”

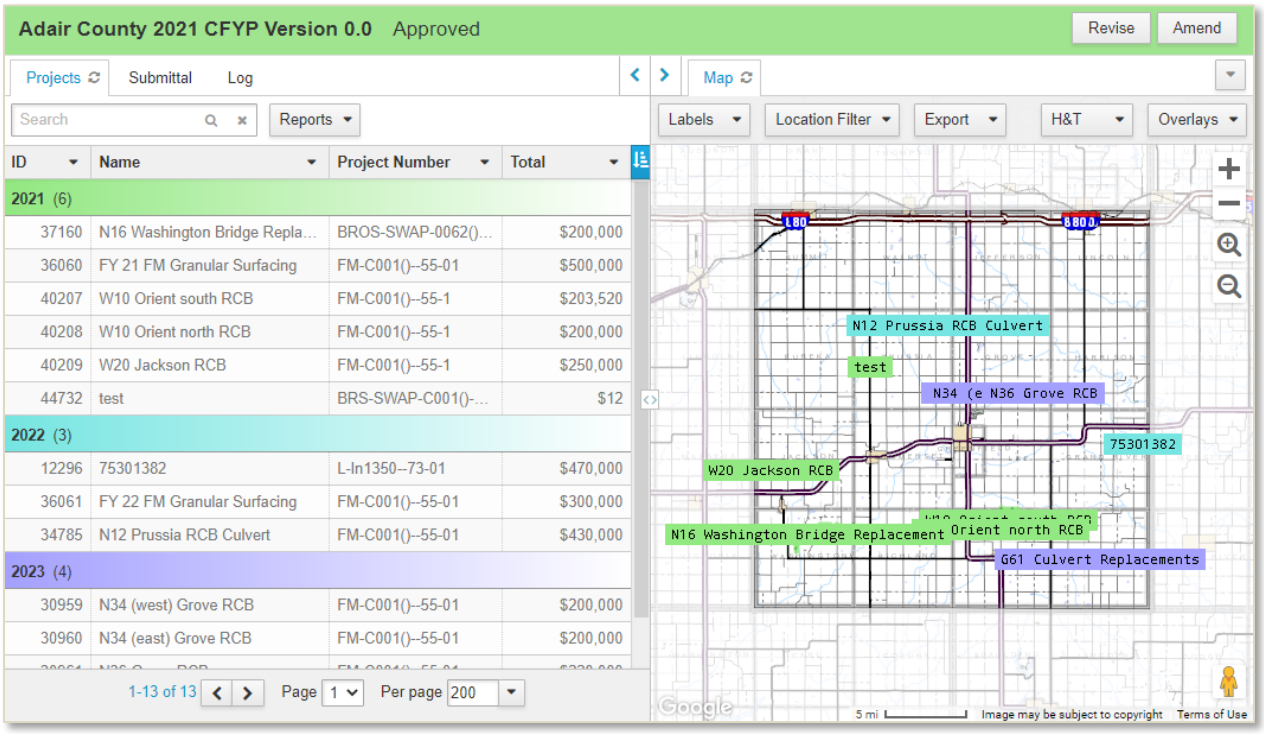


Opening a program

Use the program list to open a program. Once a program is selected, it will open in a tab on the right side of the screen.

Viewing a program

Programs are divided into two main sections, with a title bar at the top. The title bar contains the program year and version as well as its status. This is also where buttons to create amendments and revisions are located. Under the title bar are the sections. The left side contains tabs separating the project list, submittal information, and the program's log. The right side contains tabs for the program map as well as tabs for each project that has been opened.



Project list

Reports

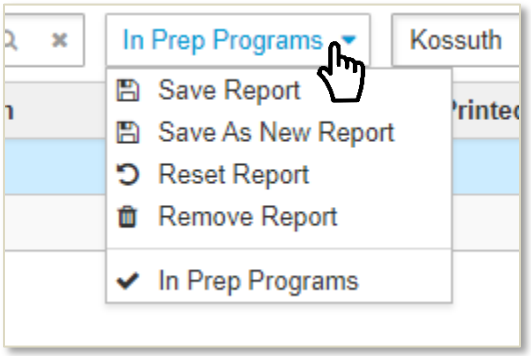
Reports allow you to save multiple layouts of the list.

Saving a report

1. Choose the columns, sort, and filters for the list
2. Click the reports dropdown
3. Click "Save As New Report" to save a new report, or "Save Report" to update your current report with the new changes

Removing a report

1. Click the reports dropdown
2. Click "Remove Report"
    a. This will remove the currently selected report

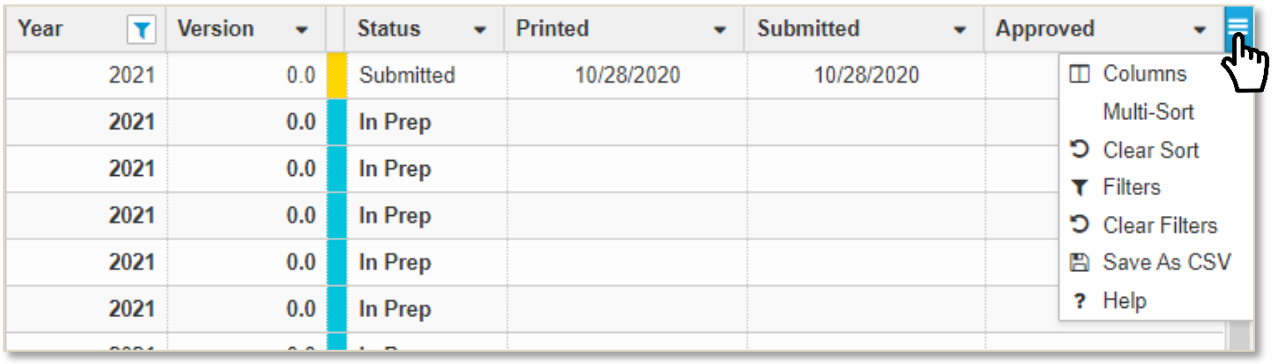


Search

Use the search bar near the project list to find all items that contain the search term.

List Menu

The menu is used to change the columns, sort, and filters for the list. There is also an option to print a CSV and view help content for the list.



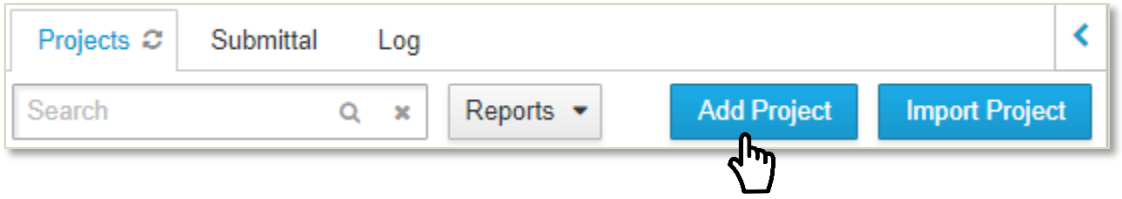
Program Map

The map shows all project locations within the program. The map and project list work together to determine which projects are shown. Filtering on either the map or list will filter the other to the same set of projects. Each location on the map can be selected to open the corresponding project.

Adding a project

Adding a project will add a new project to the program.

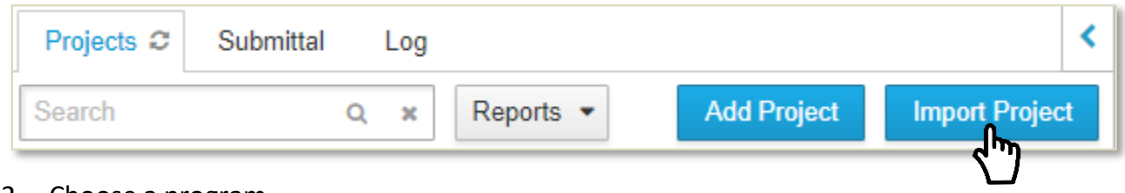
1. Click on “Add Project”



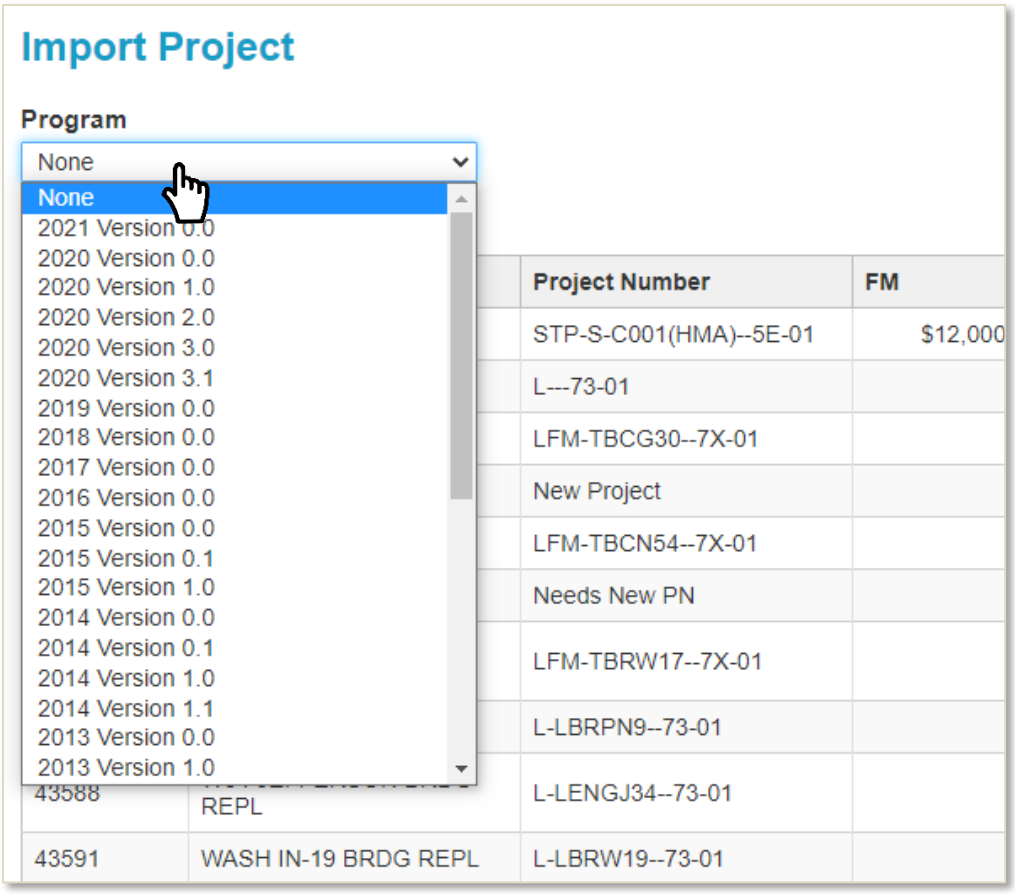
Importing a project

Importing will add a project that has been in a previous program to the current program.

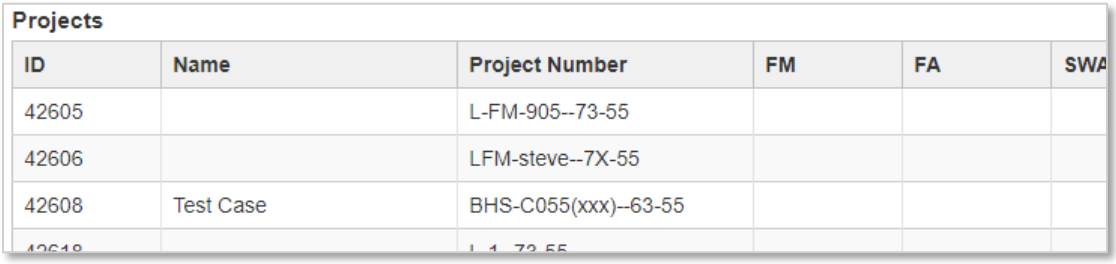
1. Click on “Import Project”



2. Choose a program



3. Choose a project from the list



4. Fill out the project form and click “Submit”

Opening a project

Click a project from the list or map to open it. It will open in a tab, or if it has already been opened, the correct tab will activate.

Viewing a project

All project information will be shown, separated into different sections. These sections can be collapsed and expanded, as well as scrolled to by using the navigation bar.

Problems – Errors and Warnings

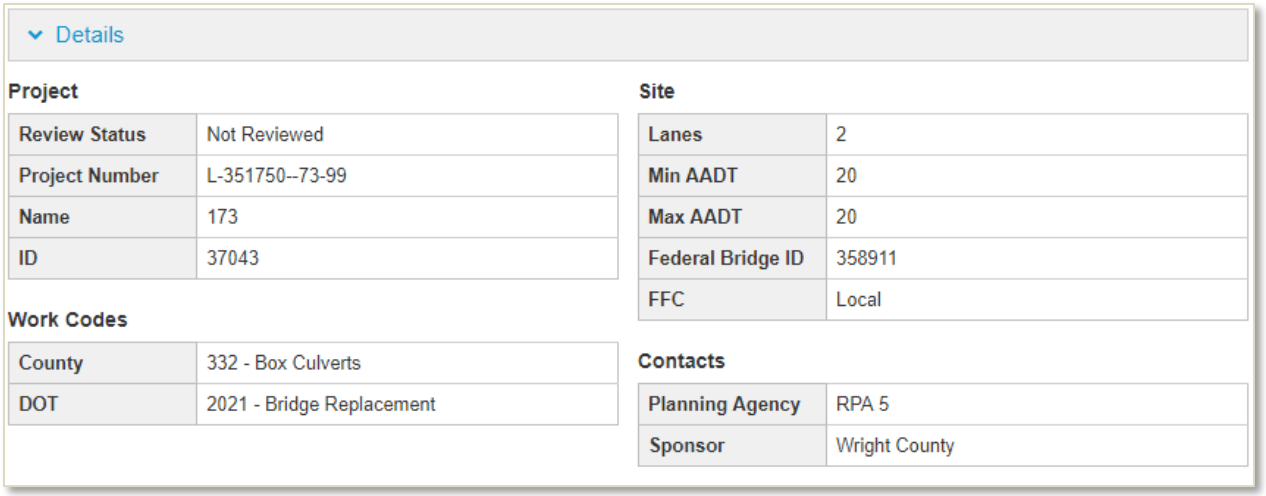
A project may have content the system decides could be a problem. There are two categories of problems: Errors and Warnings.

Errors: These must be fixed before the project or program can be submitted

Warnings: These are just notices that something may be wrong.

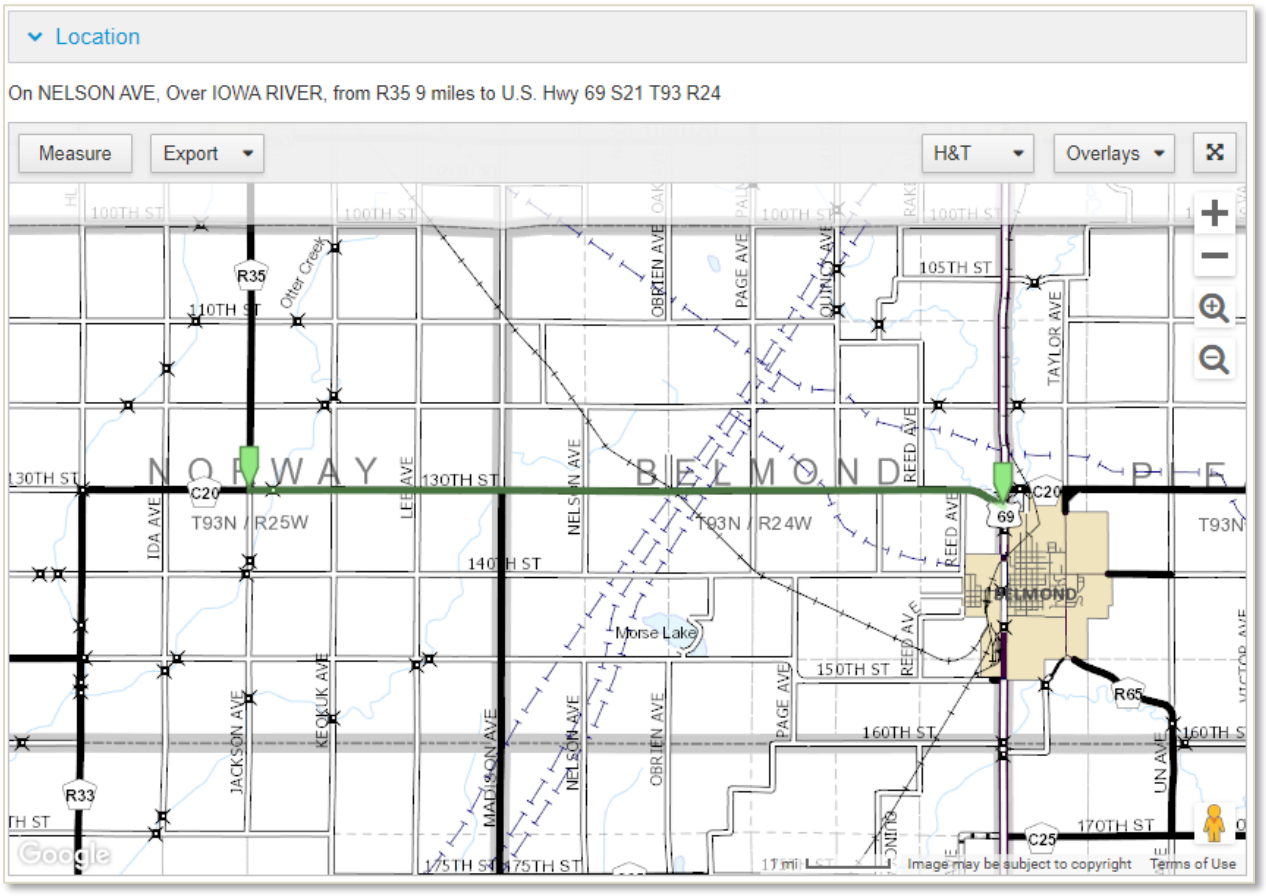
Details

The basic information of a project is shown in the details.



Location

The location shows the written description of the project's location. A map will be included if it is available.



Funding

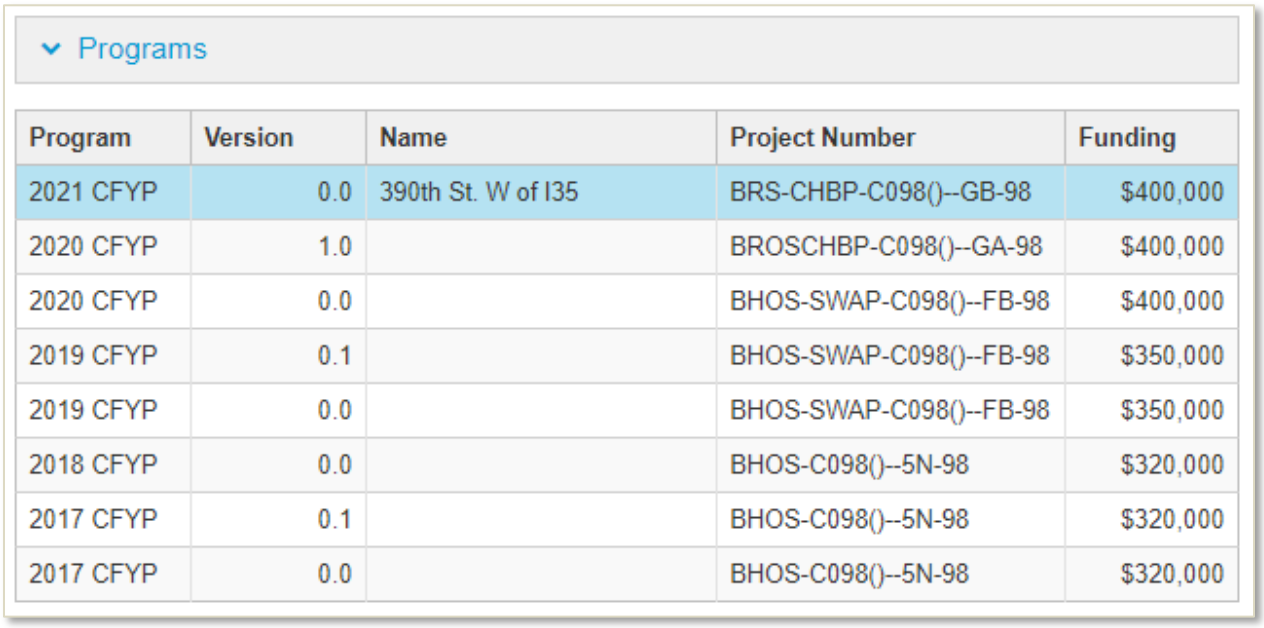
Funding is broken down by source and year. It will also show if there is an FM transfer on the project.

Funding

Source	2021
CHBP (FA)	$220,000
SWAP-HBP (SWAP)	$180,000
Total	**$400,000**

Programs

Each program the project has been in is listed under programs. Each of these can be opened for viewing.

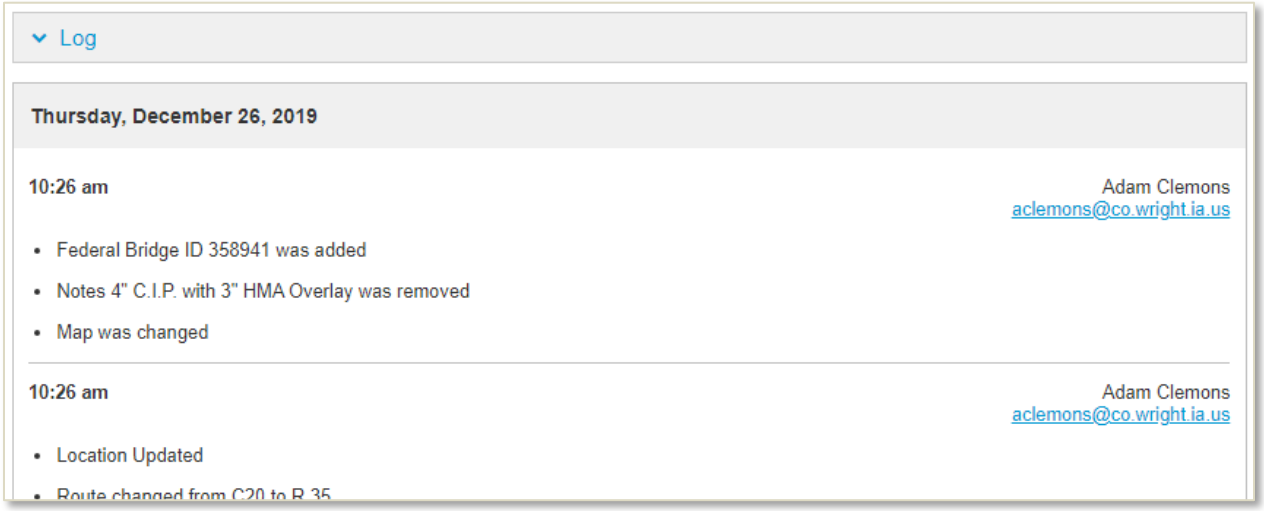


Programs

Program	Version	Name	Project Number	Funding
2021 CFYP	0.0	390th St. W of I35	BRS-CHBP-C098()--GB-98	$400,000
2020 CFYP	1.0		BROSCHBP-C098()--GA-98	$400,000
2020 CFYP	0.0		BHOS-SWAP-C098()--FB-98	$400,000
2019 CFYP	0.1		BHOS-SWAP-C098()--FB-98	$350,000
2019 CFYP	0.0		BHOS-SWAP-C098()--FB-98	$350,000
2018 CFYP	0.0		BHOS-C098()--5N-98	$320,000
2017 CFYP	0.1		BHOS-C098()--5N-98	$320,000
2017 CFYP	0.0		BHOS-C098()--5N-98	$320,000

Log

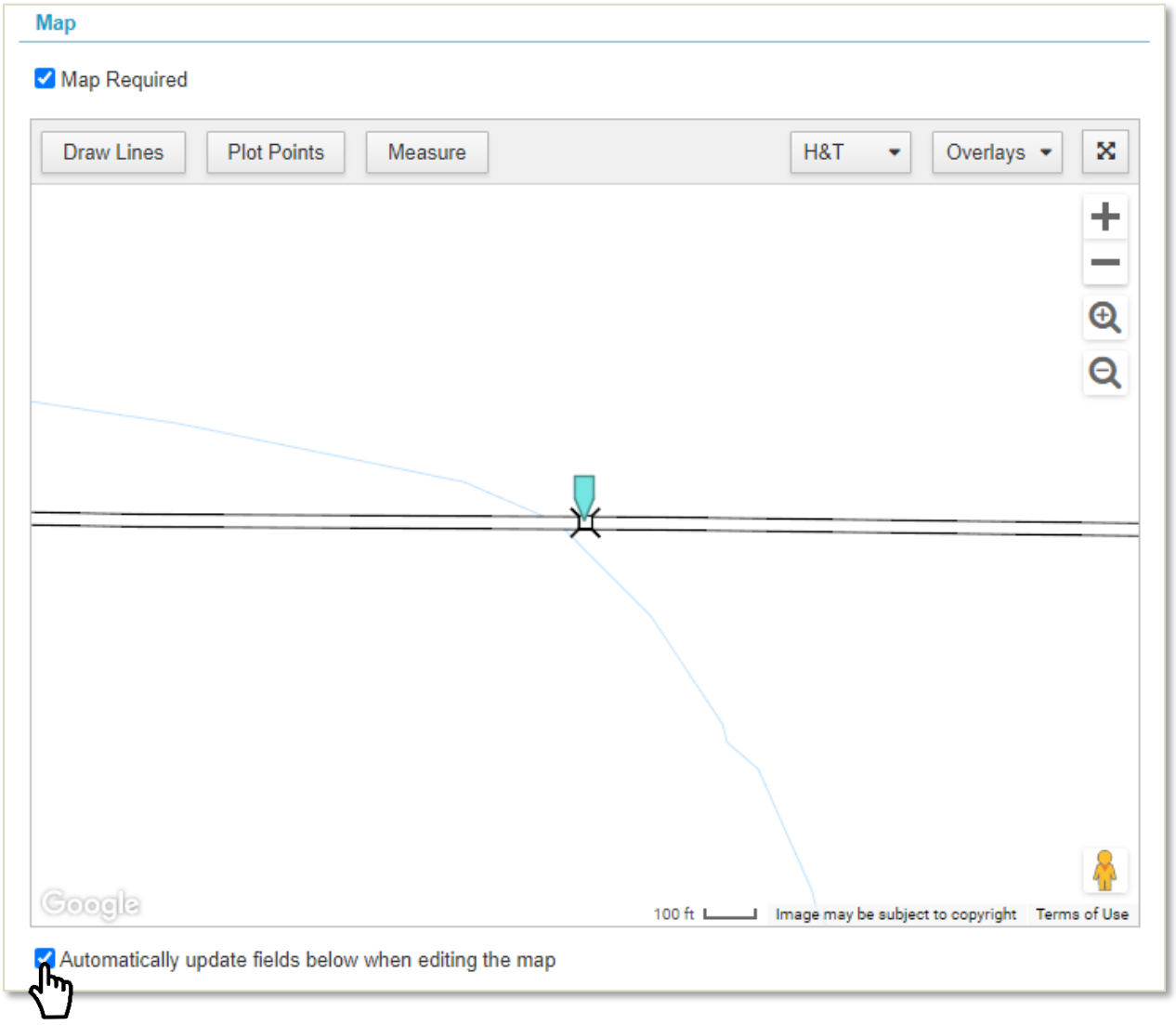
The log shows all changes that were made throughout the project's life.



Editing a project

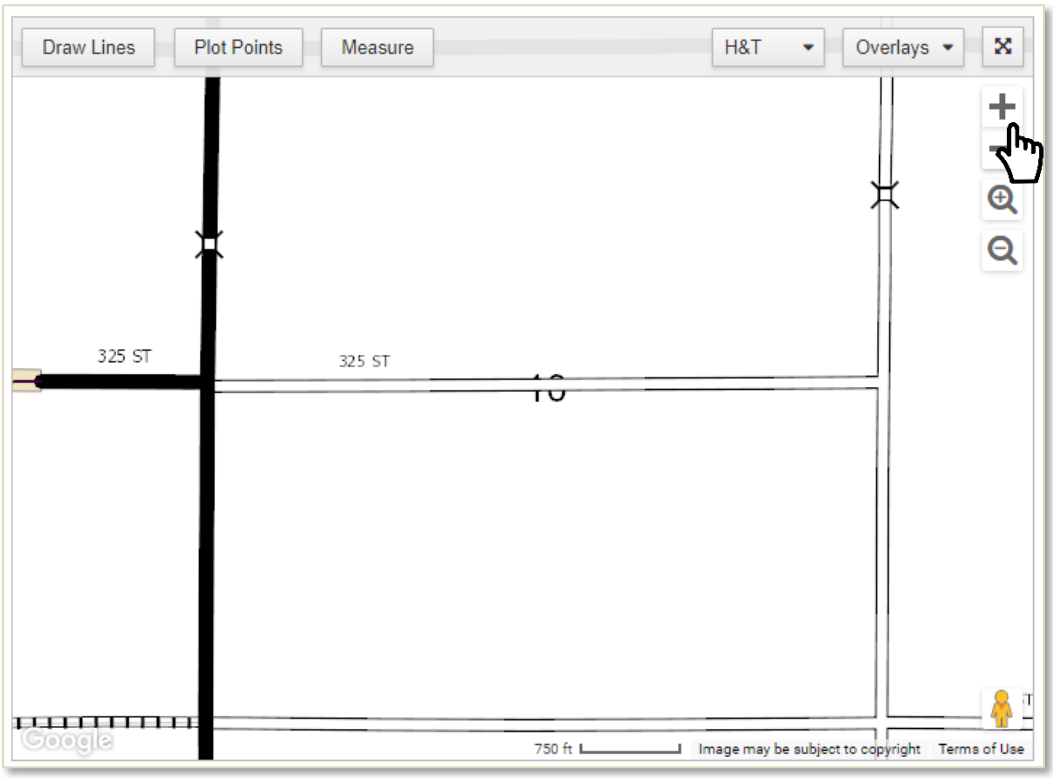
Drawing on the map

Plotting points or lines on the map will update the location fields based on the system data. This can be stopped by unchecking the box labeled “Automatically update fields below when editing the map”.

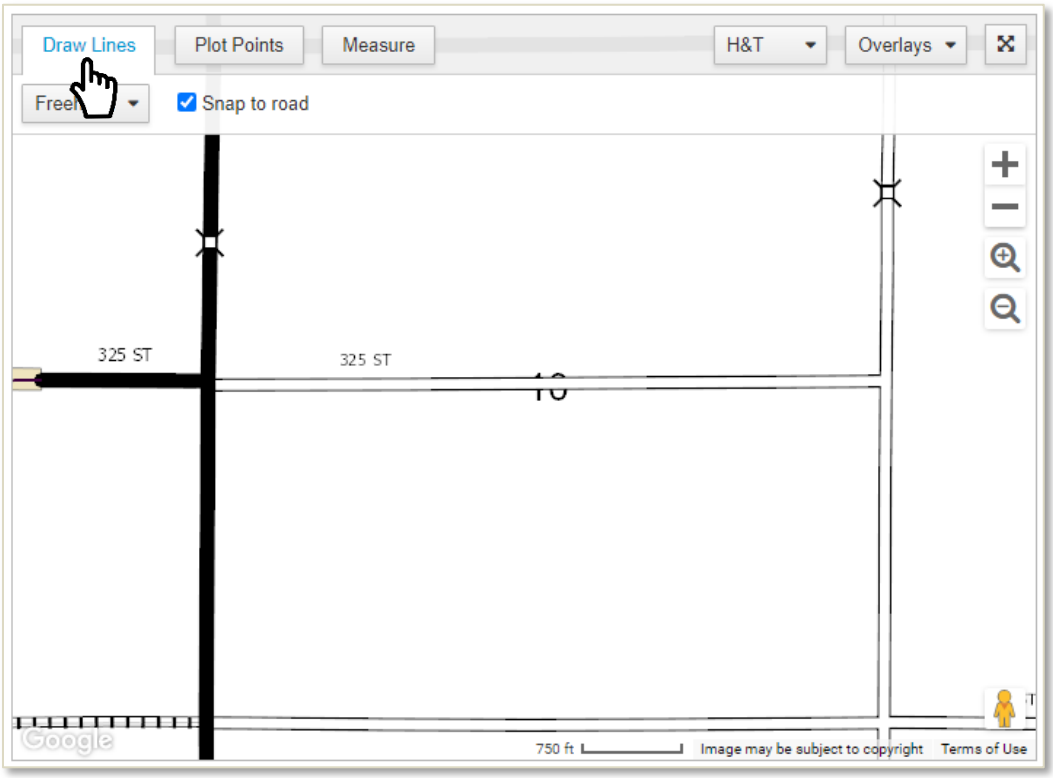


Lines

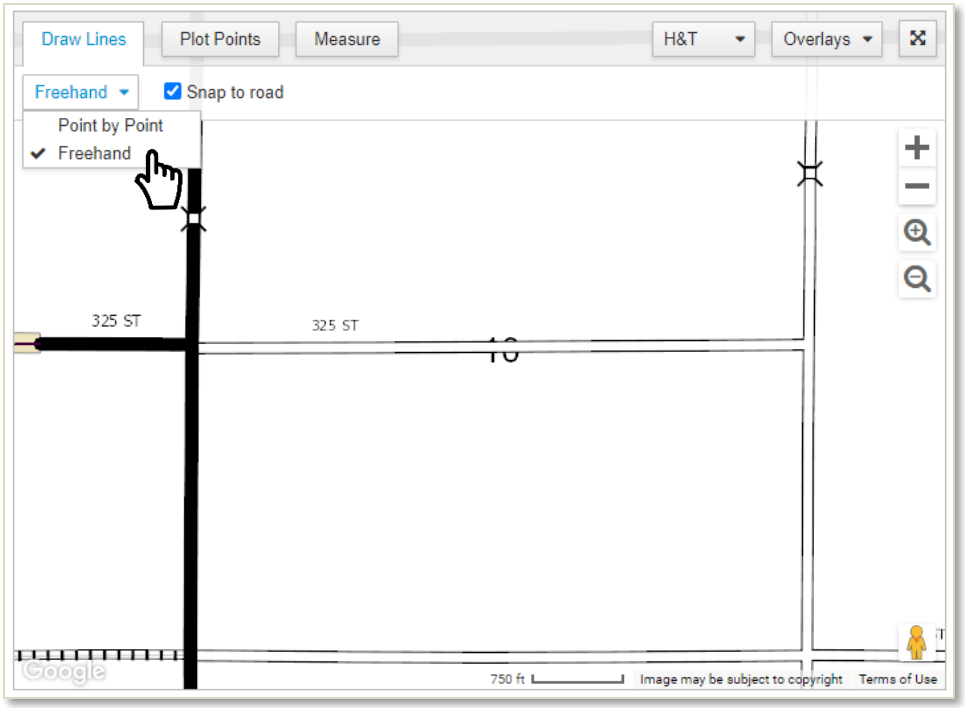
1. Zoom in to the correct location



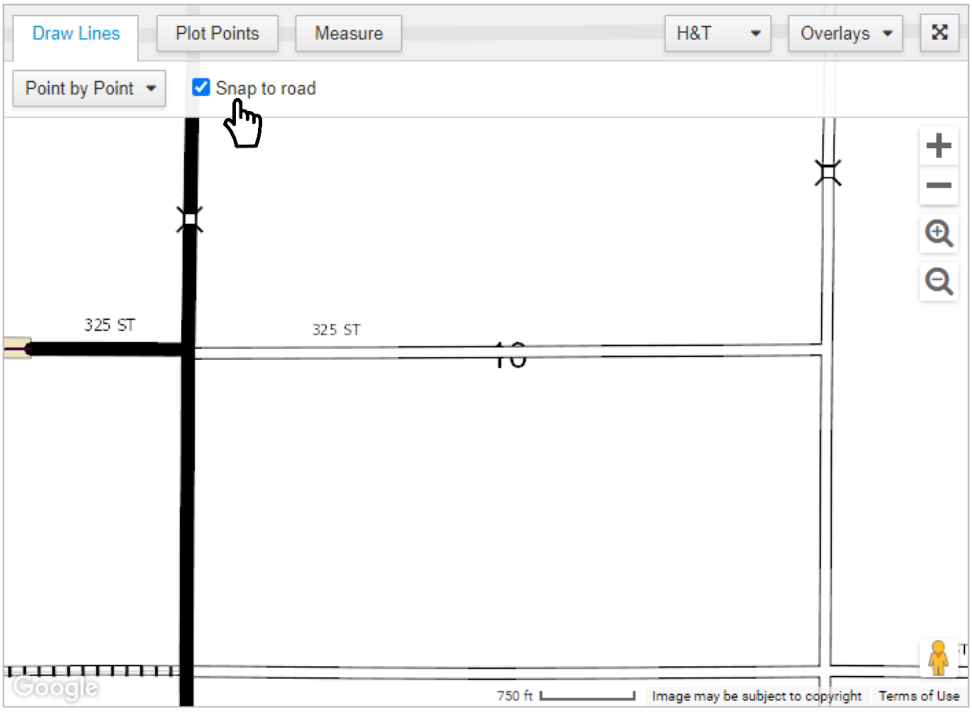
2. Click “Draw Lines”



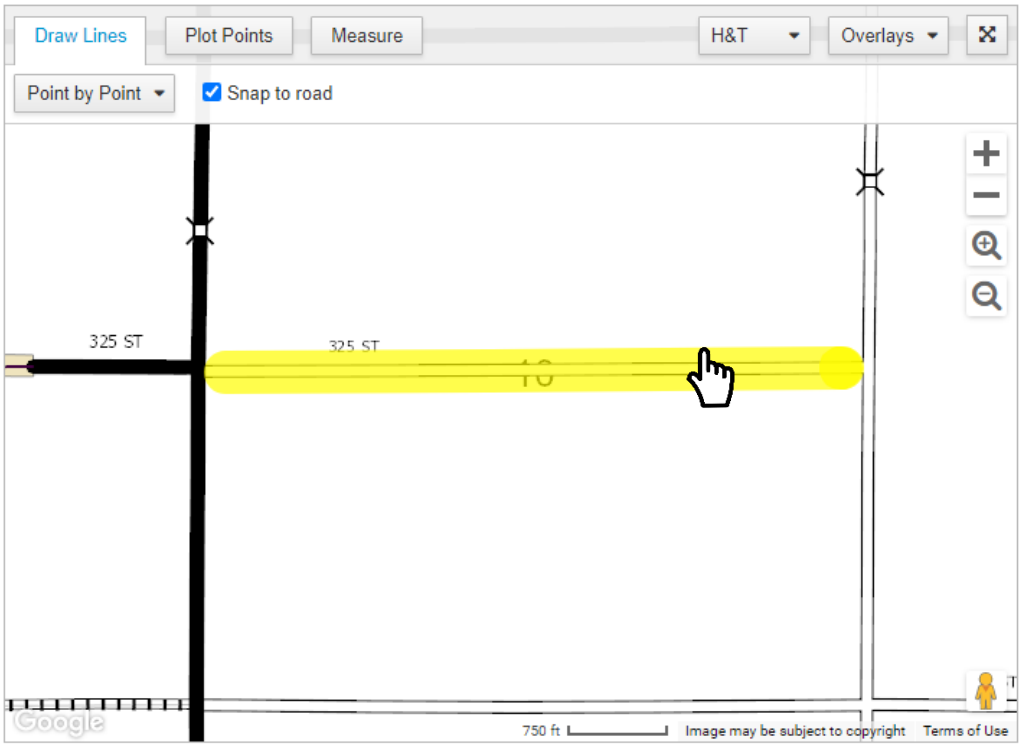
3. Choose drawing mode
    a. Freehand means click and drag your line
    b. Point by Point means click points along your route



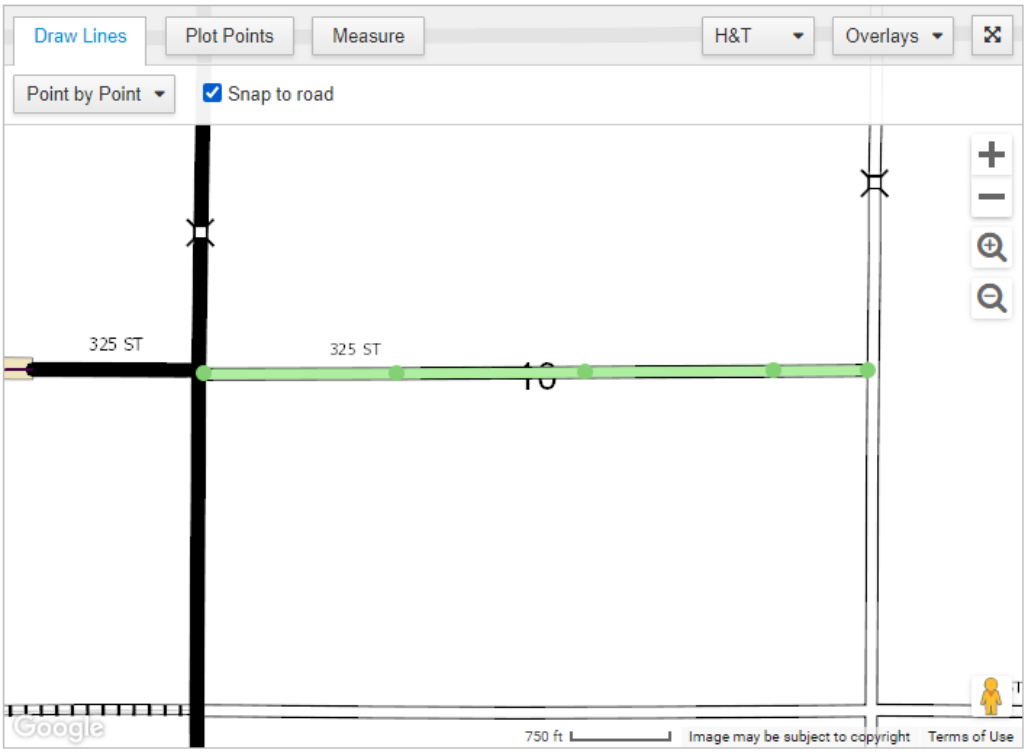
4. Toggle “Snap to road”
    a. If on, the system will make sure your line is on a road
    b. If off, the system will leave your line wherever you draw it



5. Draw the line

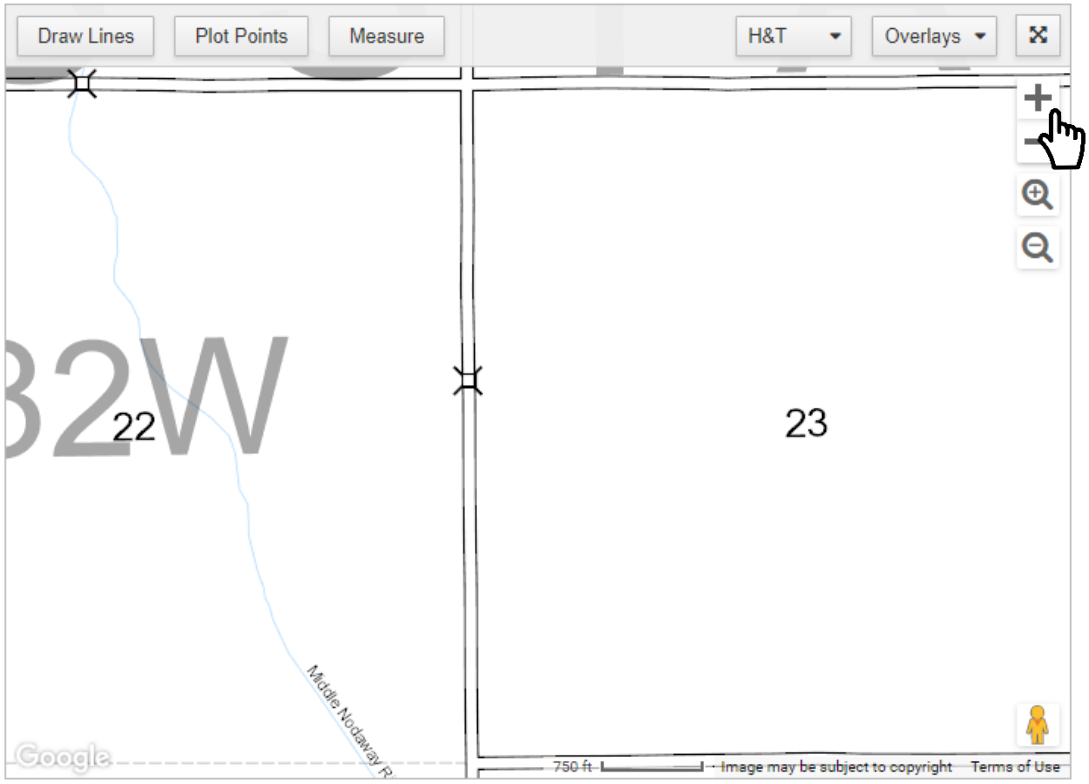


6. Double click to stop drawing

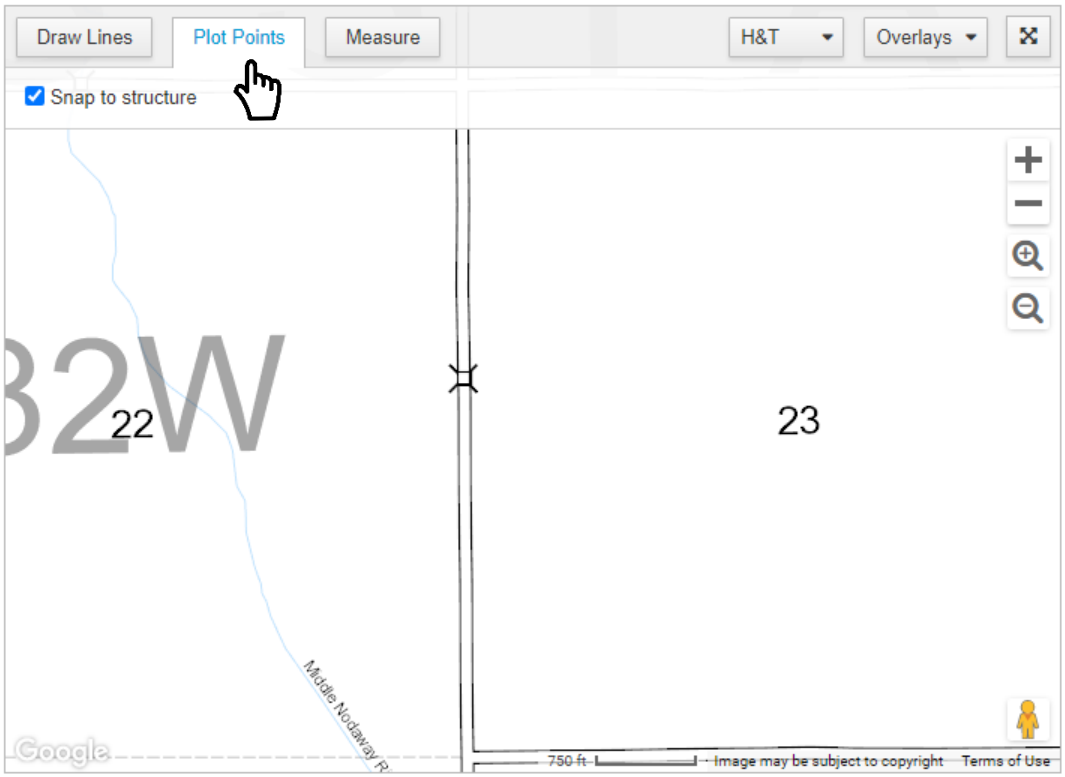


Points

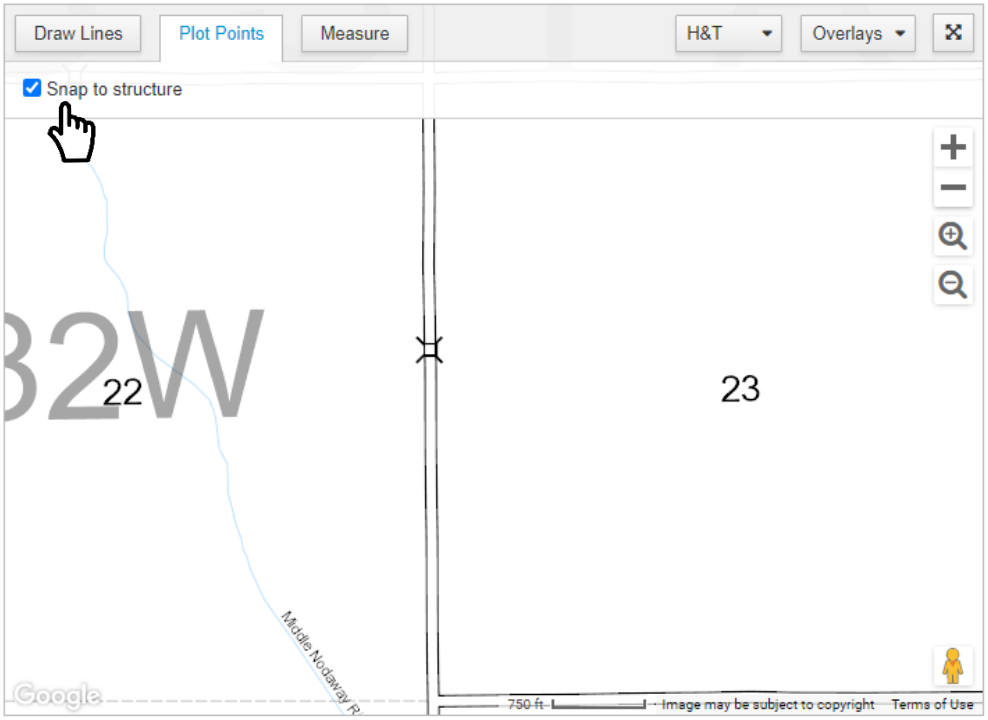
1. Zoom in to the correct location



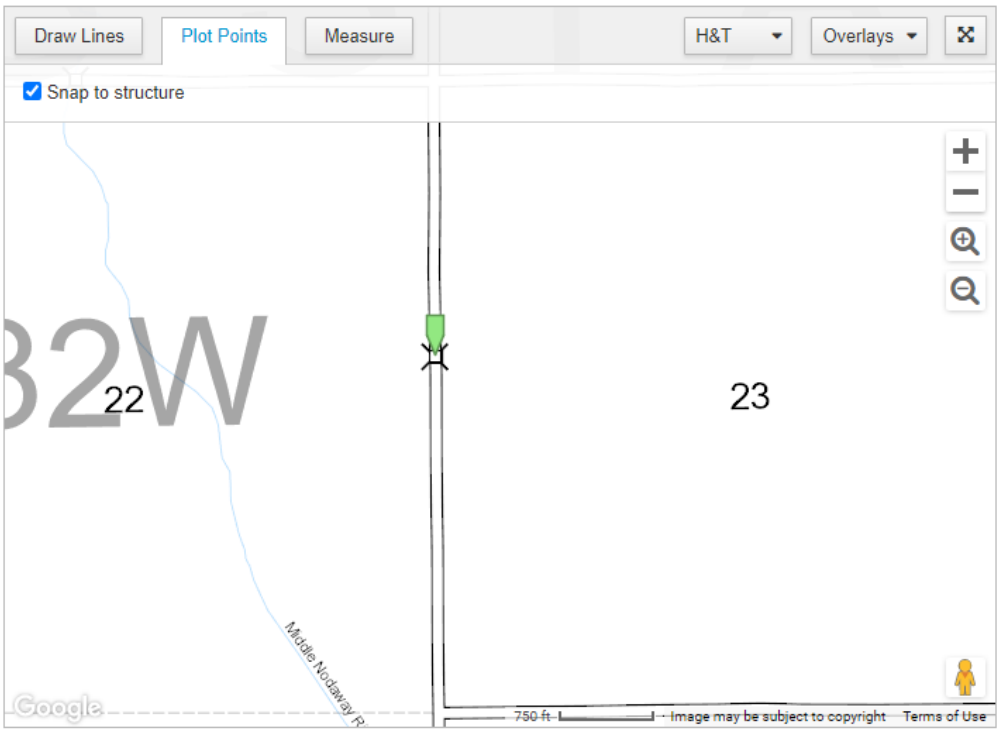
2. Click “Plot Points”



3. Toggle “Snap to structure”
    a. If on, the system will move the point to the nearest structure
    b. If off, the system will leave your point where you plot it

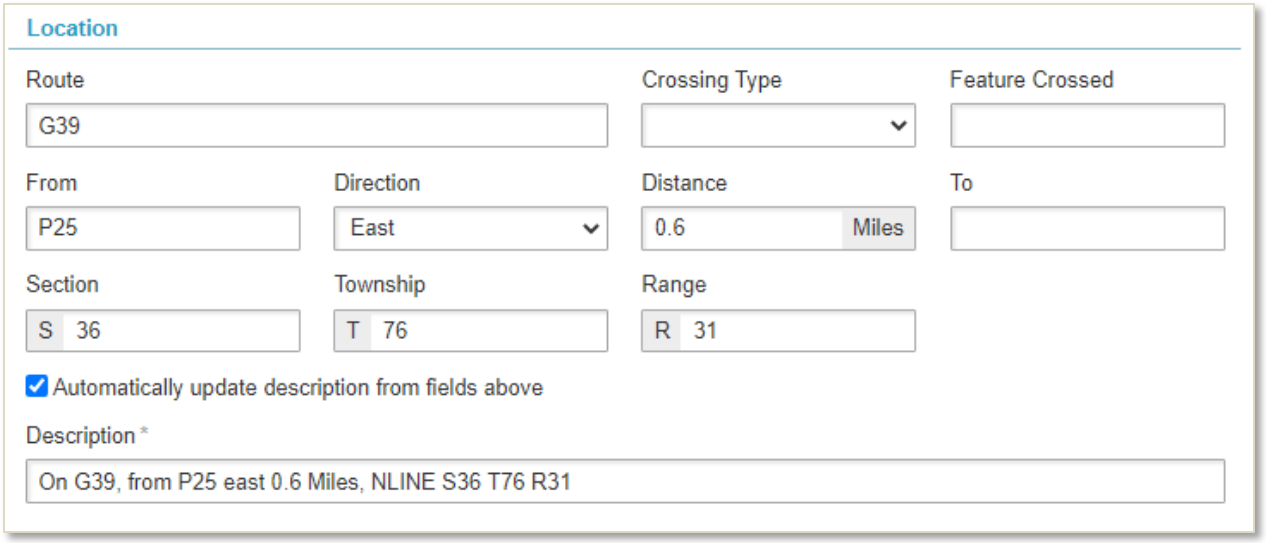


4. Plot the point



Location Description

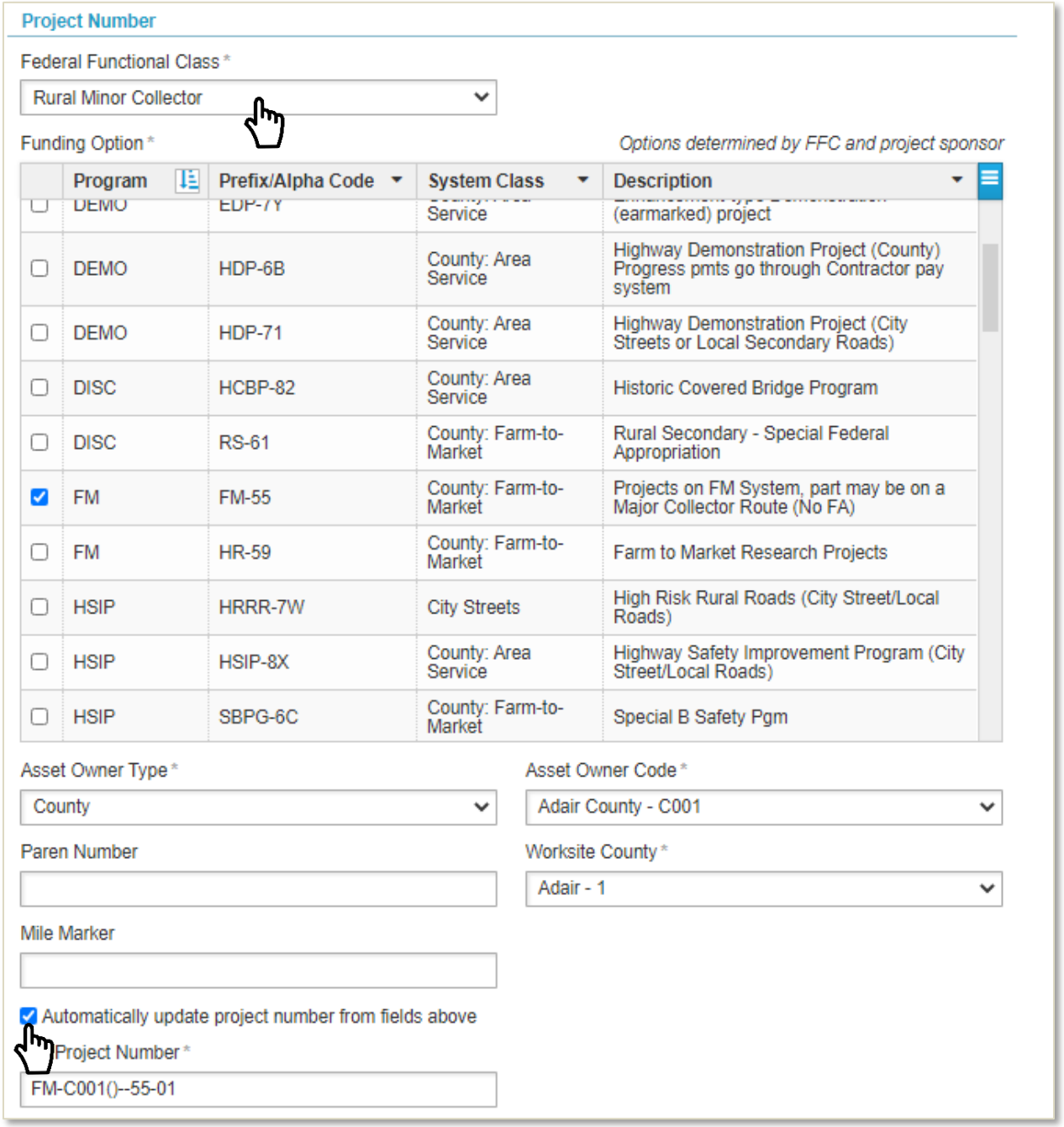
The location description uses a builder to help format the value correctly. This can be turned on or off using the checkbox marked “Automatically update description from fields above”. The builder uses the fields grouped under location to fill in the description.


Location
Route
G39
Crossing Type
Feature Crossed
From
P25
Direction
East
Distance
0.6
Miles
To
Section
S 36
Township
T 76
Range
R 31
Automatically update description from fields above
Description *
On G39, from P25 east 0.6 Miles, NLINE S36 T76 R31

Project Number

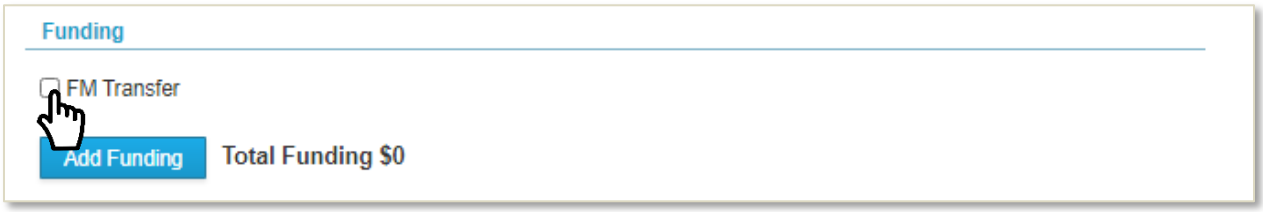
The project number uses a builder to help format the value correctly. This can be turned on or off using the checkbox marked “Automatically update project number from fields above”. The builder uses the fields grouped under project number to fill in the description.

Changing the federal functional class will also change the funding program options.

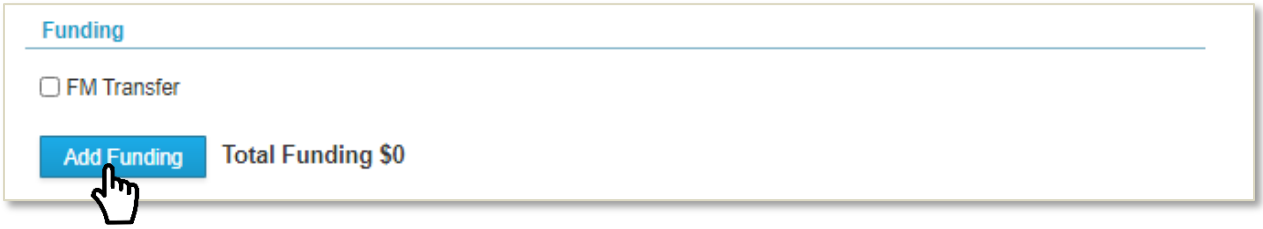


Funding

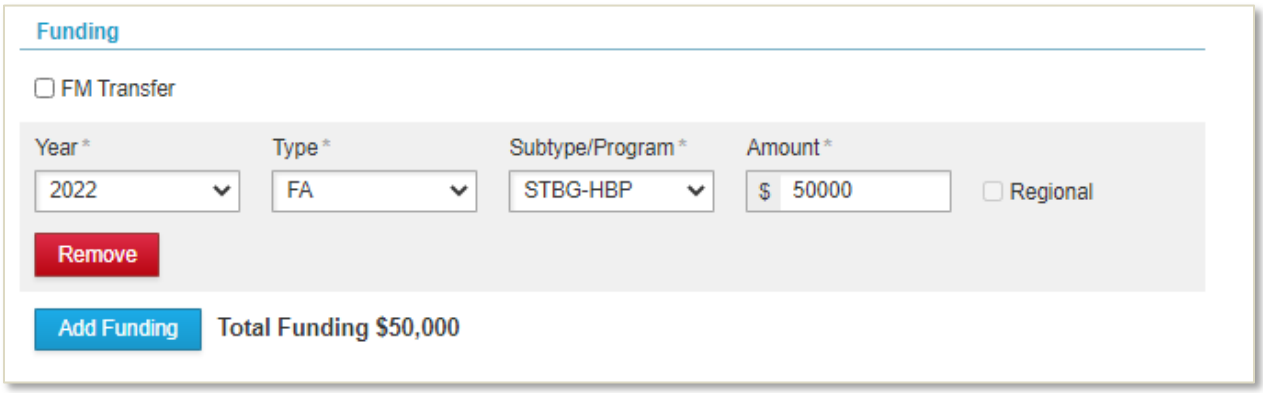
1. Choose FM Transfer if applicable



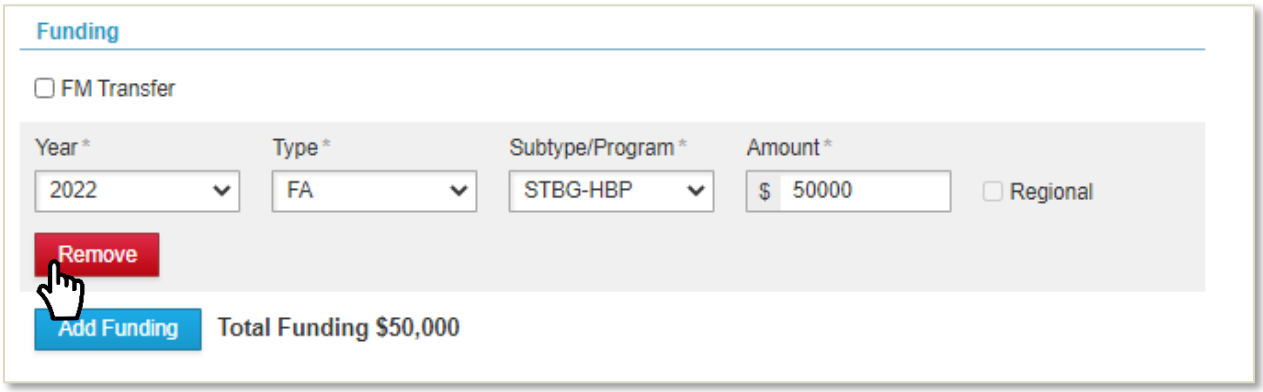
2. Click “Add Funding” to add a line of funding



3. Fill in the year, type, subtype, and amount. Choose “regional” if applicable.



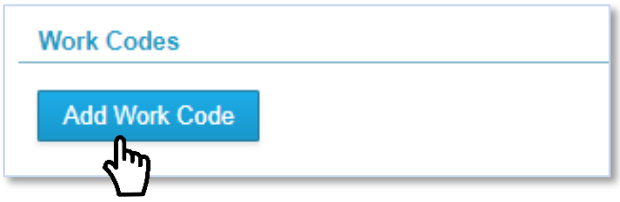
4. Remove a line of funding if needed by clicking “Remove”



Work Codes

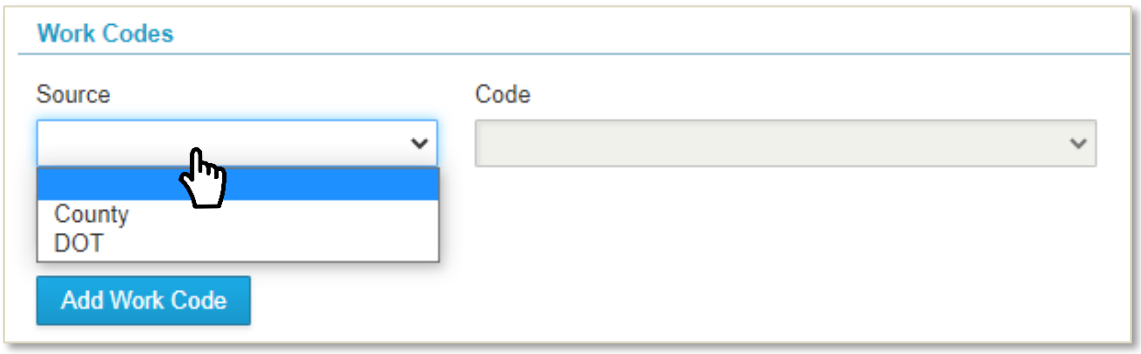
Adding a work code

1. Click “Add Work Code”

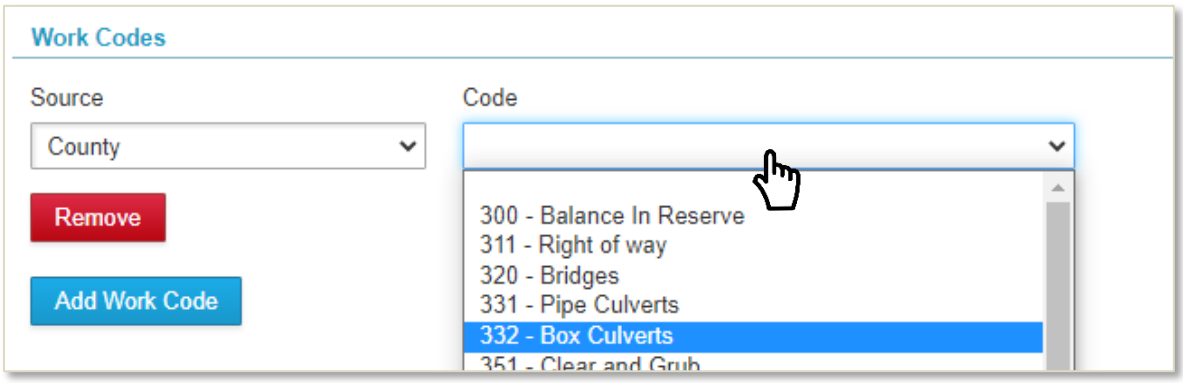


Choosing a work code

1. Select the source

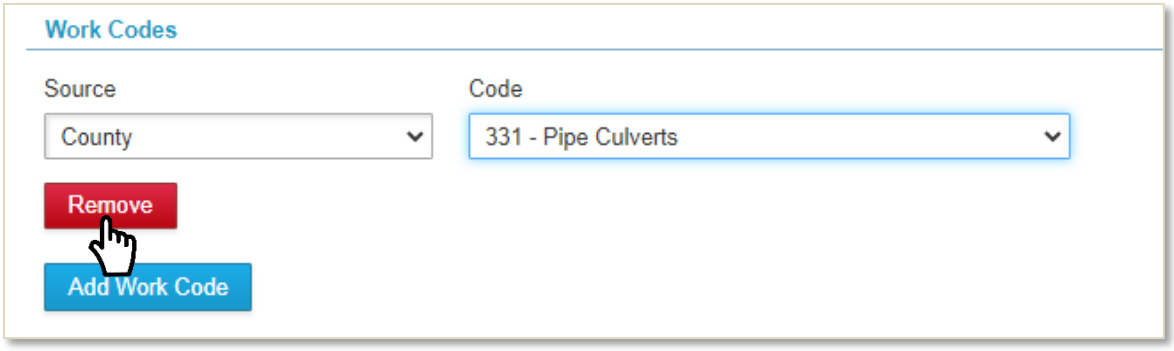


2. Select the code



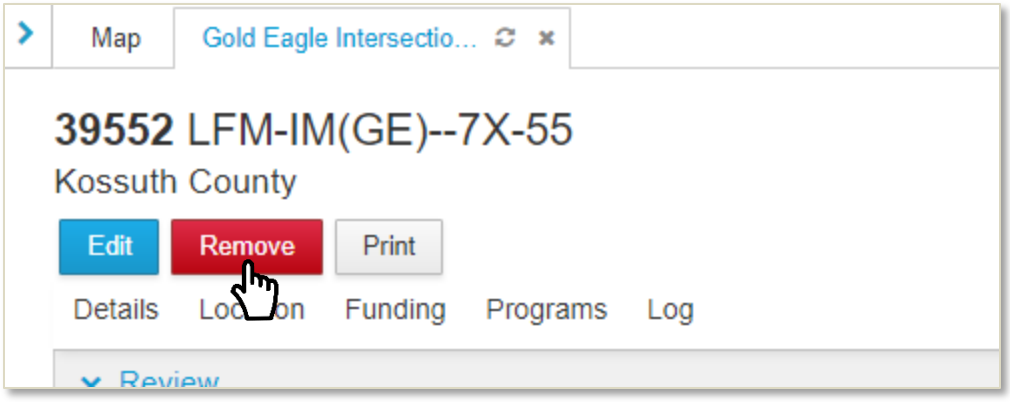
Removing a work code

1. Click “Remove”

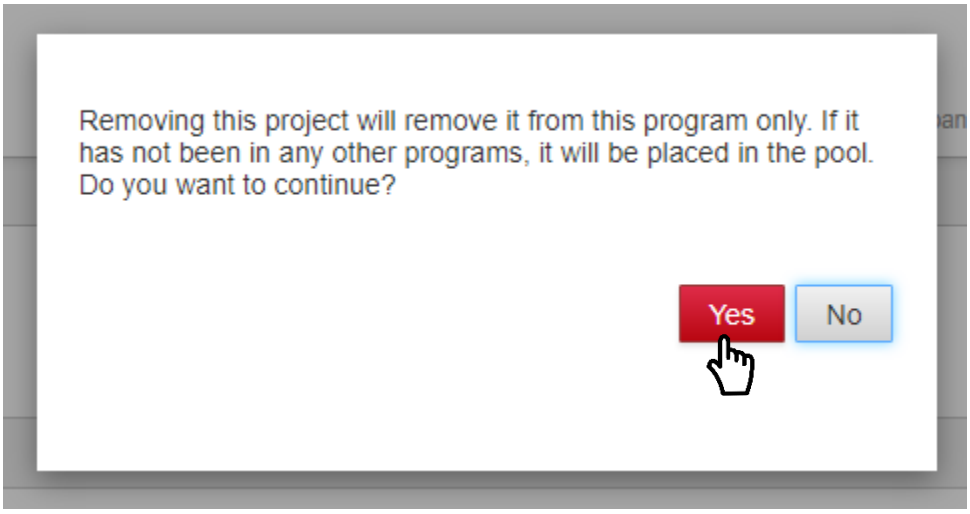


Removing a project

1. Open the project
2. Click remove

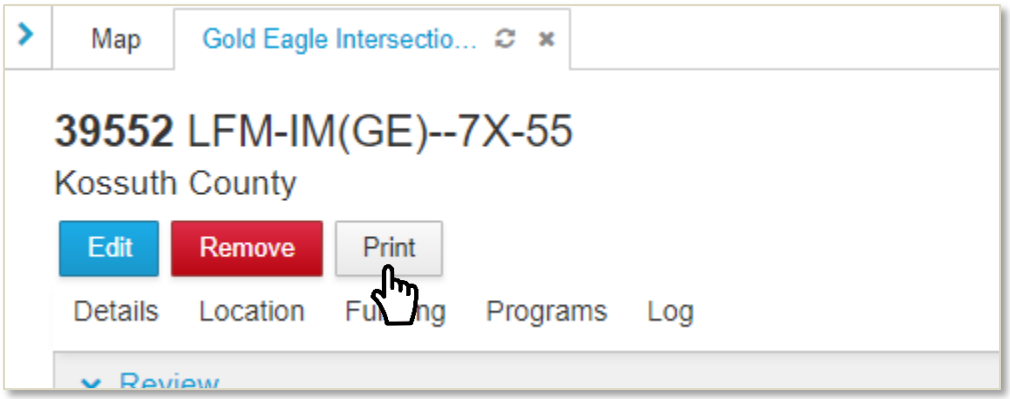


3. Confirm the removal



Printing a project

1. Click “Print”



Submitting a program

Problems

A program may have content the system decides could be a problem. There are three categories of problems: Errors, Issues, and Warnings. Any errors or issues on the project will also be shown here.

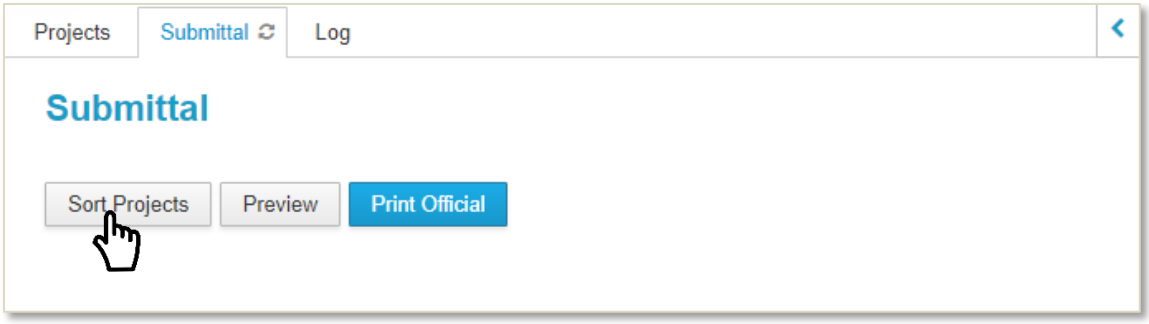
Errors: These must be fixed before the program can be submitted

Issues: These should be fixed unless there is an exception to the rule, in which case the issue needs to be explained to submit the program.

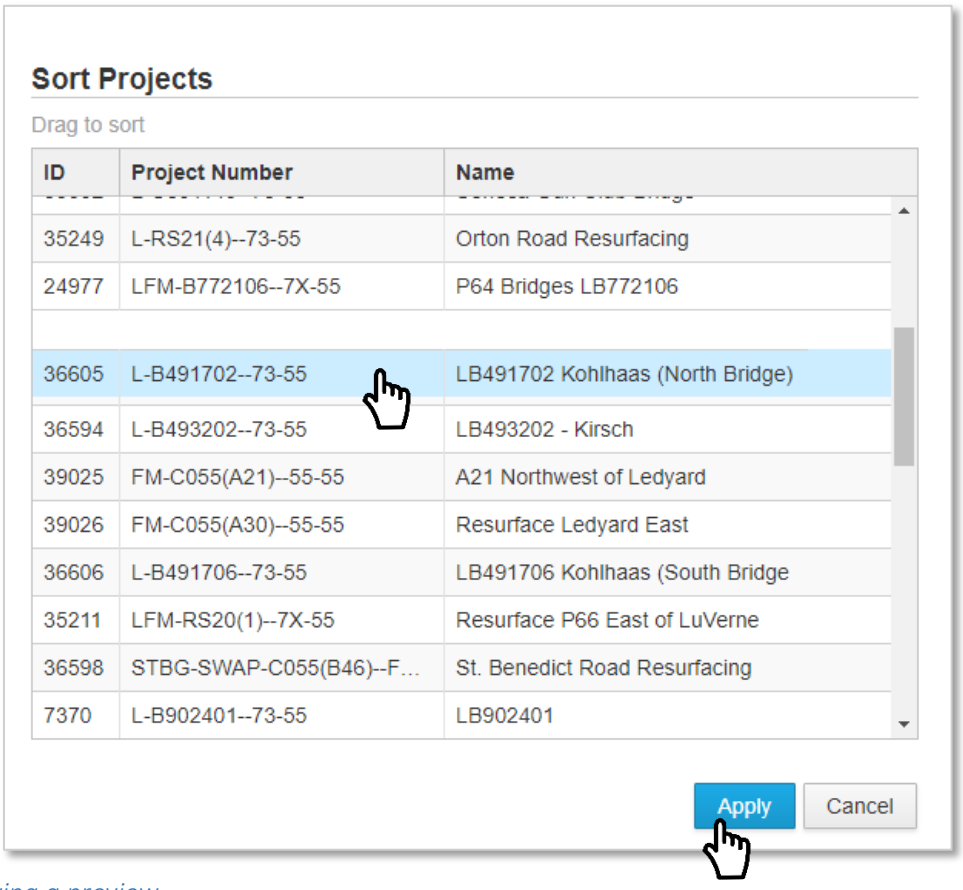
Warnings: These are just notices that something may be wrong.

Sorting projects for the official program printout

1. Click “Sort Projects”

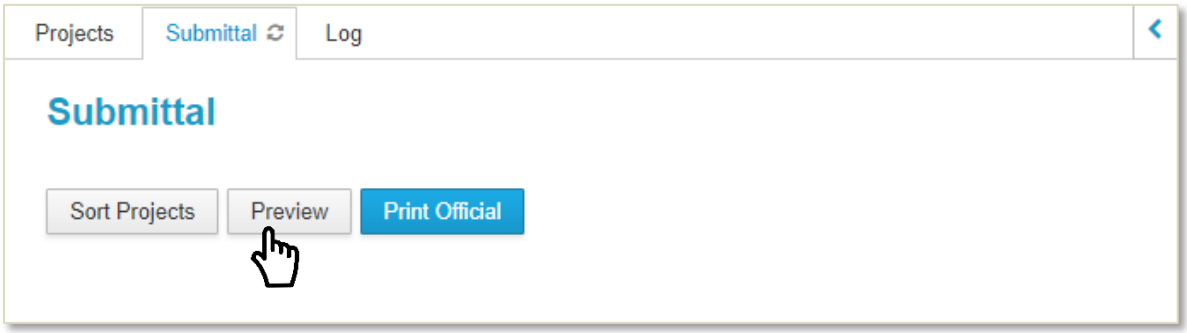


2. Drag the projects into the desired order, then click “Apply”



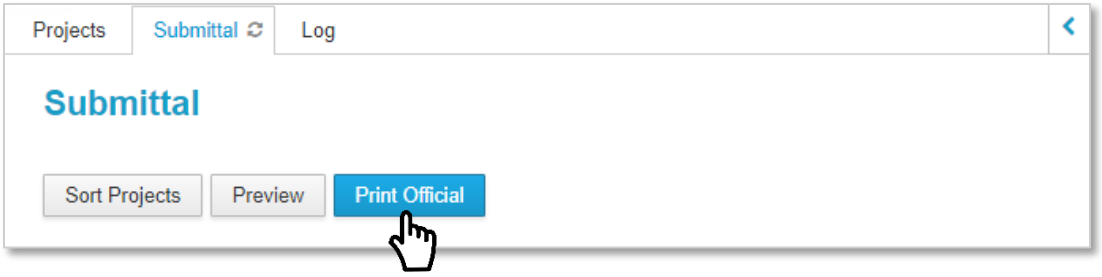
Viewing a preview

1. Click “Preview”

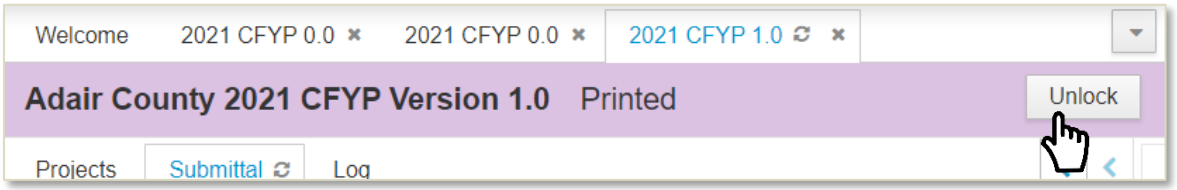


Submitting the official program

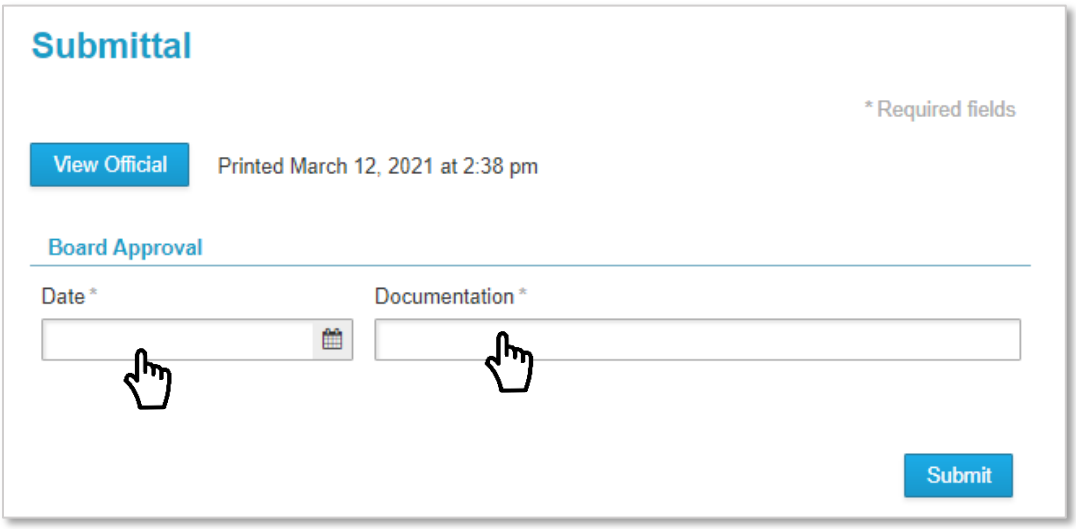
1. Click “Print Official” to open the official program PDF



a. Once the program is printed, it will lock. If can be unlocked by clicking "unlock"



2. Provide Board Approval Date and documentation



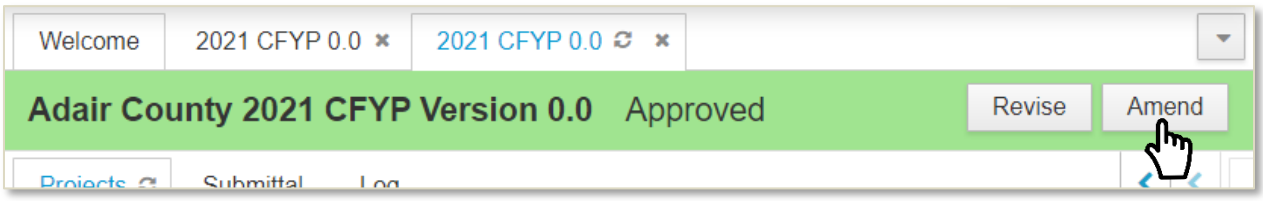
3. Click "Submit"

Coordination with the budget

The program will not be able to be submitted without its corresponding budget. If both are ready to be submitted, submitting one will automatically submit the other. If the budget is not ready, there will be a message explaining why the program cannot yet be submitted.

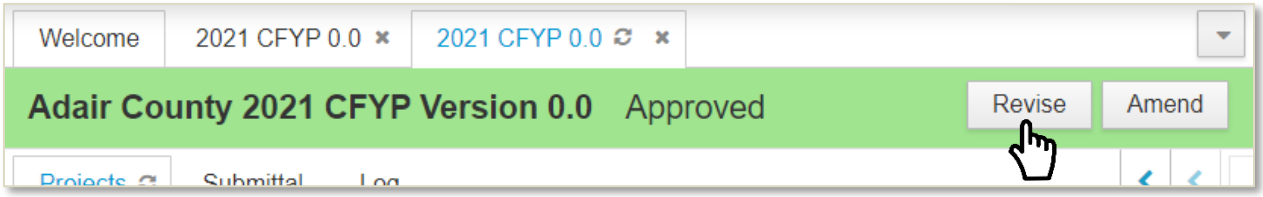
Amending a program

1. Click "Amend" (this will cause a fully amended program)



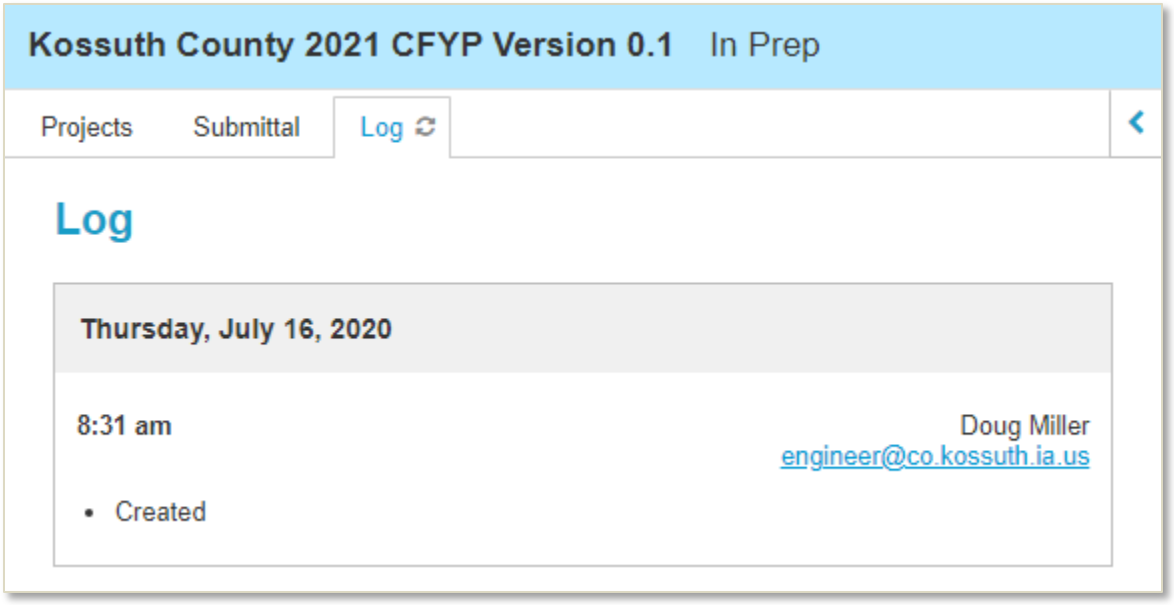
Revising a program

1. Click "Revise" (this will cause a revision by resolution)



Viewing a program's log

1. Open the log tab



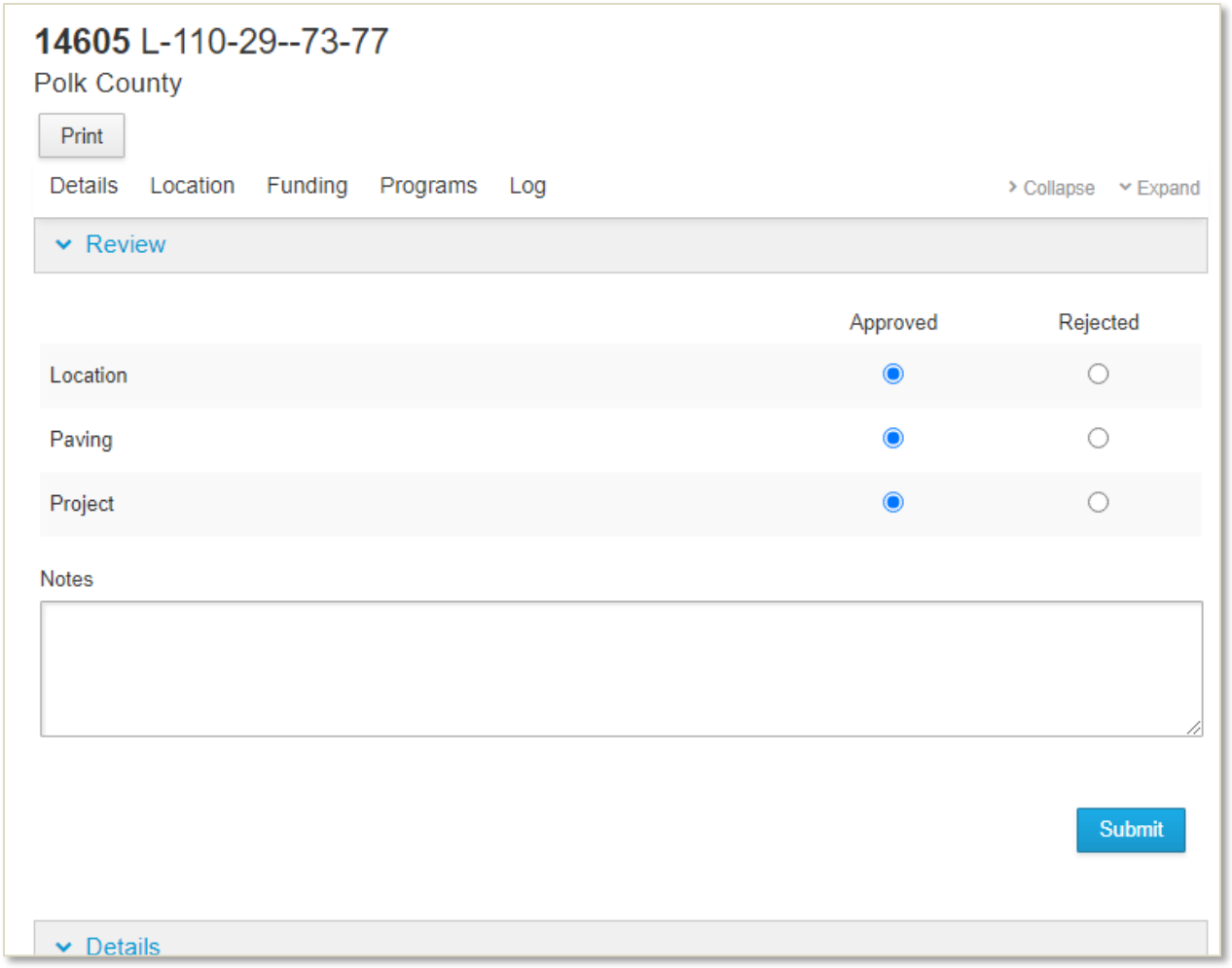
Reviewing a program

Users who have the CFYP Reviewer role are able to review programs. A reviewer needs to review all projects, clear any issues, and then choose to approve or reject the program. If the program is rejected, its status will return to In Prep, and the sponsor will be notified.

Reviewing a project

Each project in the program needs to be individually reviewed. When the project is opened, a review panel will be at the top for the reviewer to approve or reject the project. **To approve the program, each project must be approved.**

1. Verify each section
2. Click Submit

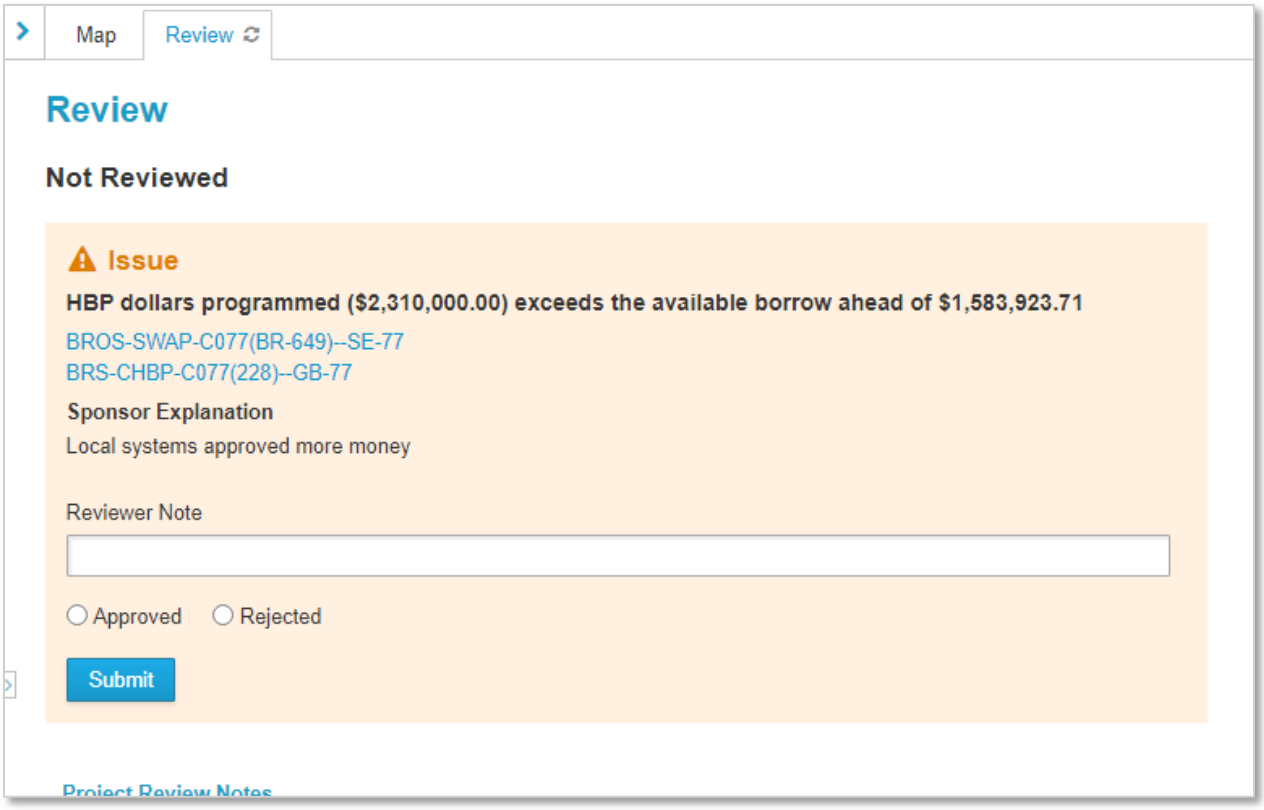


Viewing the review summary (review tab)

The review tab shows the summary of the program's review. If the program is not ready to be reviewed, there will be a message stating why. Otherwise, the tab will show any issues on the program, notes, and reviewer errors. This is also where the program will be approved or rejected.

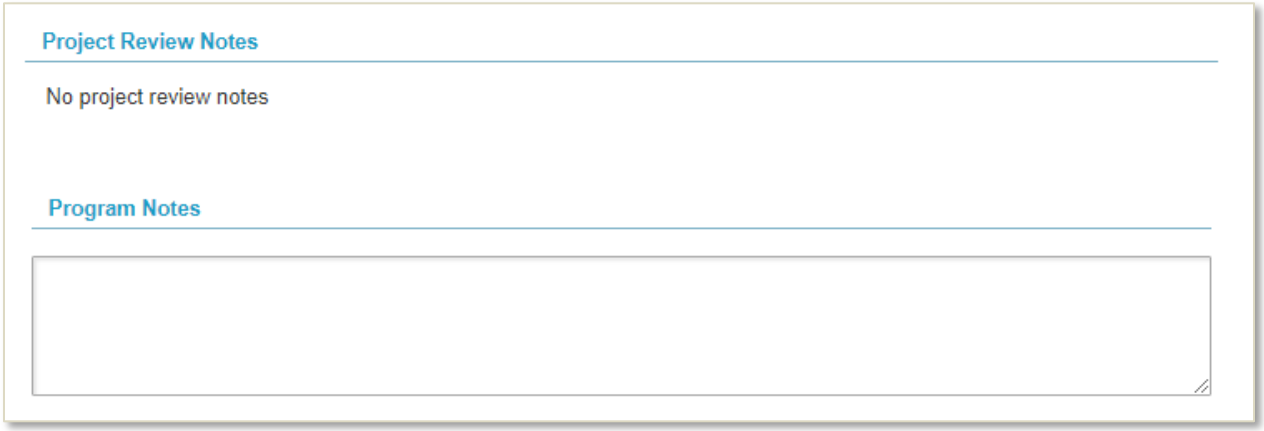
Program Issues

Each issue will need to be approved or rejected individually. There will be a description of the issue, which projects are affected, and the explanation the sponsor gave. The reviewer can leave a note if desired, and then choose whether it is approved or not. **To approve the program, all issues must be approved.**



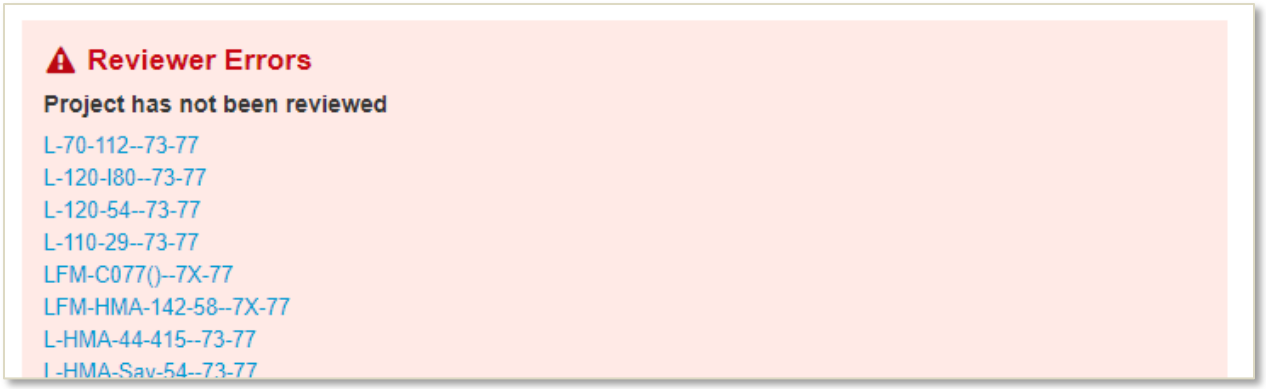
Notes

Project Review Notes will show any notes the reviewer submitted on the individual project review. The reviewer can also add general notes to the program for the sponsor to see as well.



Errors

Errors prevent the program from being approved or rejected. The reviewer must clear these errors before continuing.



Approve/Reject

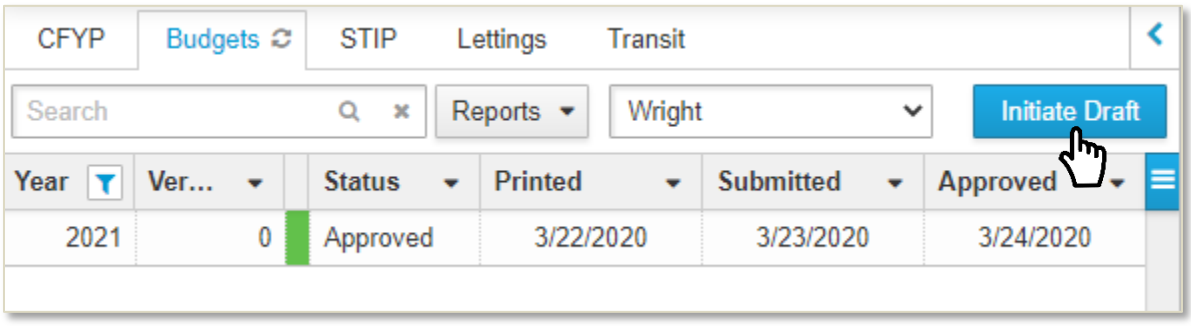
At the end of the review tab, the reviewer can approve or reject the program. A notification will be sent out to the sponsor showing what action was taken, as well as any notes added to the review. If the program was approved, the sponsor will not need to take any action. If it was rejected, the program will return to the In Prep status and the sponsor will need to make the needed changes. The submittal process will start over once they are ready.

Budget

Initiating a draft budget

Each year the draft budget will need to be initiated after the start of the state fiscal year.

1. Click on “Initiate Draft”



Opening a budget

Use the budget list to open a budget. Once a budget is selected, it will open in a tab on the right side of the screen.

Viewing a budget

When a budget is opened, a summary is shown. These numbers cannot be changed, and are for viewing only. The title bar at the top indicates which budget is open, and what the status is. On the right side of the title bar, a button for creating an amendment is shown when applicable.

Filling out a budget

Fill out the budget by entering amounts for each item. The current and next year's amounts can be changed, while the previous two years cannot.

Levy rates

When the budget is initiated, the levy rates are filled in from last year's budget.

Construction projects

Projects will be shown that have Local money assigned to them in the prior years. New projects can be added to show the amount for the current and next years. The project amounts are totaled, but the "Adjusted Construction Program Expenditures" line **will not** add in that total. That value will need to be update manually if desired.

Miscellaneous Receipts

Miscellaneous receipts are itemized at the bottom of the form. Receipts will be shown if they have any amounts for the prior two years. Those can then be filled out for the current and next years. There is also an area for new receipts for the current and next years, which do not have any prior year amounts.

Submitting a budget

Problems

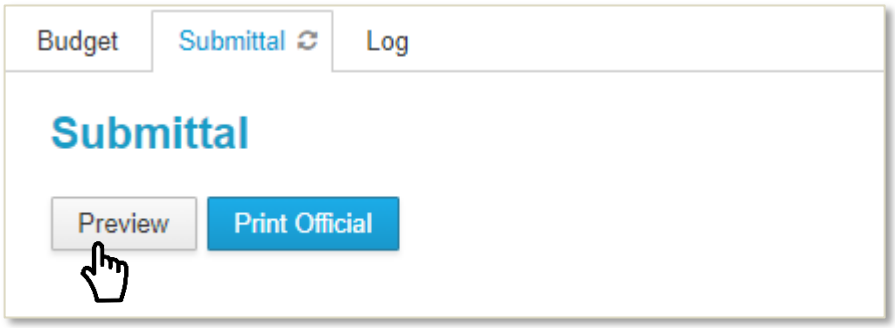
A budget may have content the system decides could be a problem. There are two categories of problems: Errors and Warnings.

Errors: These must be fixed before the program can be submitted

Warnings: These are just notices that something may be wrong.

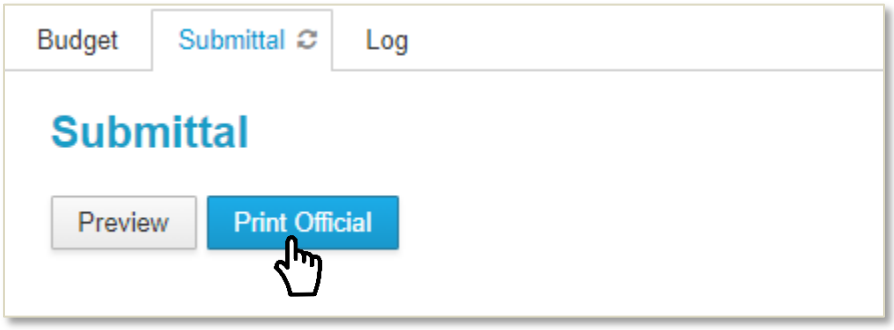
Viewing a preview

1. Click "Preview"

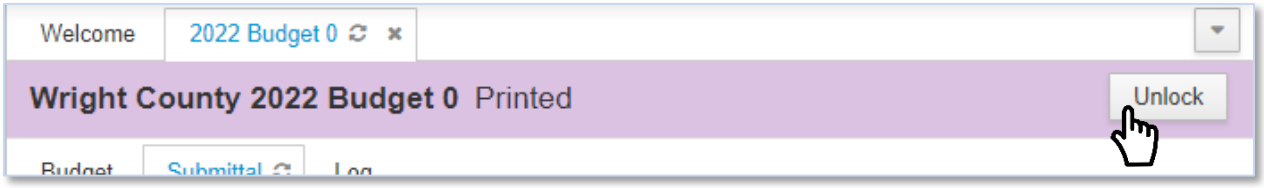


Submitting the official budget

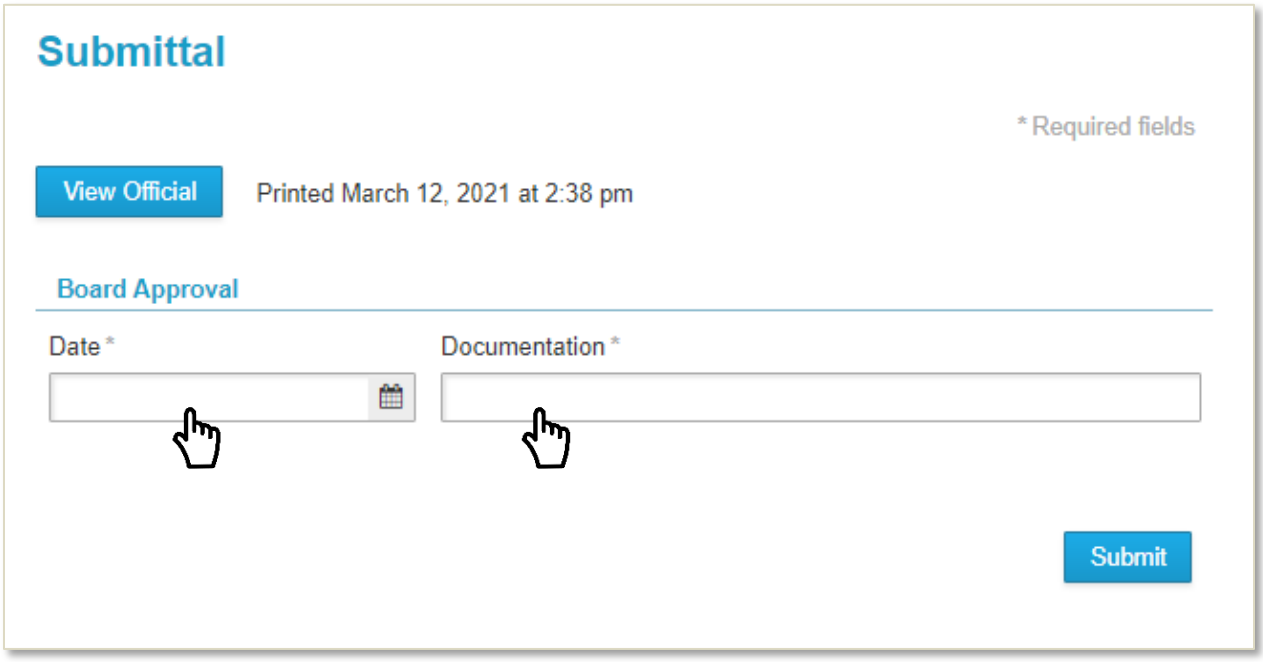
1. Click "Print Official" to open the official budget PDF



   a. Once the budget is printed, it will lock. If can be unlocked by clicking "unlock"



4. Provide Board Approval Date and documentation



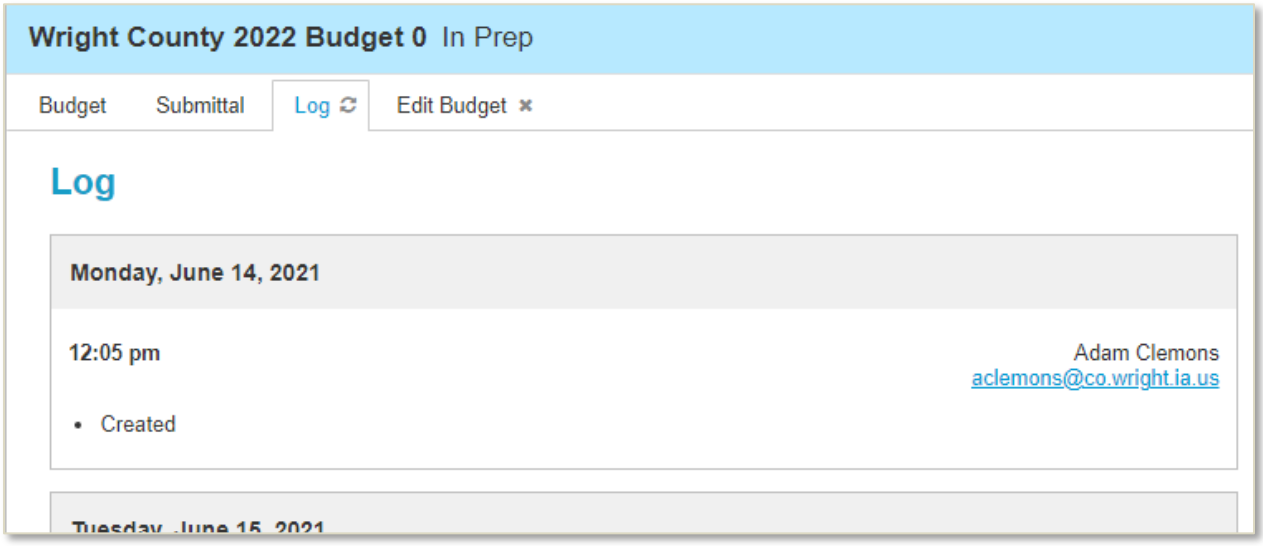
5. Click "Submit"

Coordination with the program

The budget will not be able to be submitted without its corresponding program. If both are ready to be submitted, submitting one will automatically submit the other. If the program is not ready, there will be a message explaining why the budget cannot yet be submitted.

Viewing a budget's log

1. Open the log tab



Reviewing a budget

Users who have the CFYP and Budgets Reviewer role are able to review budgets. If the budget is rejected, its status will return to In Prep, the sponsor will be notified, and the submittal process will start over.

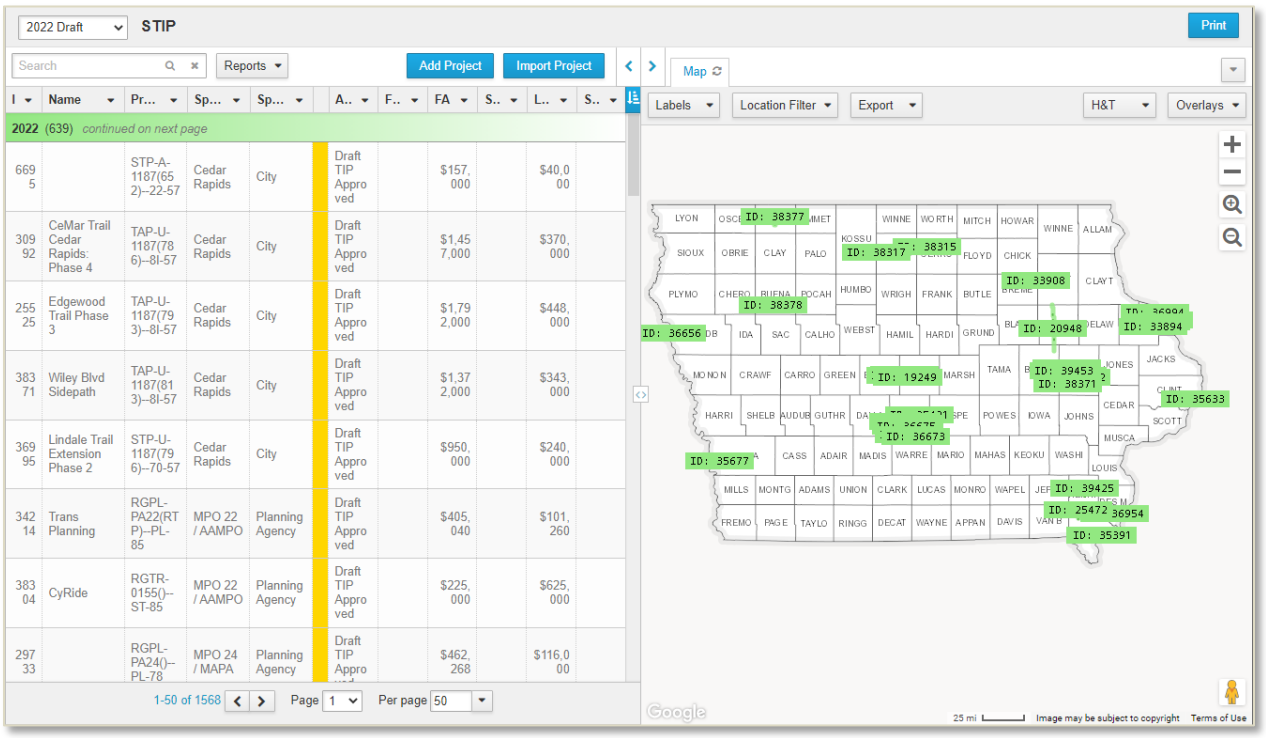
STIP

Opening a STIP program

Use the program list to open a program. Once a program is selected, it will open in a tab on the right side of the screen.

Viewing a program

Programs are divided into two main sections, with a title bar at the top. The title bar contains the program year and version as well as its status. This is also where the button to print the official STIP is located. The left side contains the project list, while the right side contains tabs for the program map as well as tabs for each project that has been opened.



Project list

Reports

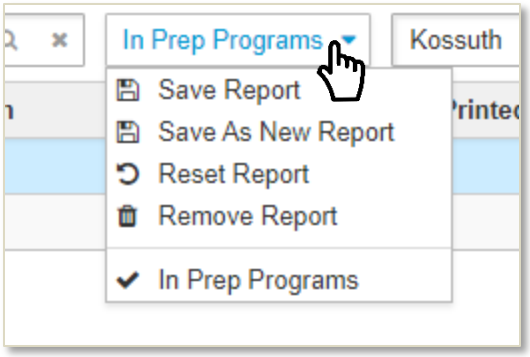
Reports allow you to save multiple layouts of the list.

Saving a report

4. Choose the columns, sort, and filters for the list
5. Click the reports dropdown
6. Click “Save As New Report” to save a new report, or “Save Report” to update your current report with the new changes

Removing a report

3. Click the reports dropdown
4. Click “Remove Report”
    a. This will remove the currently selected report

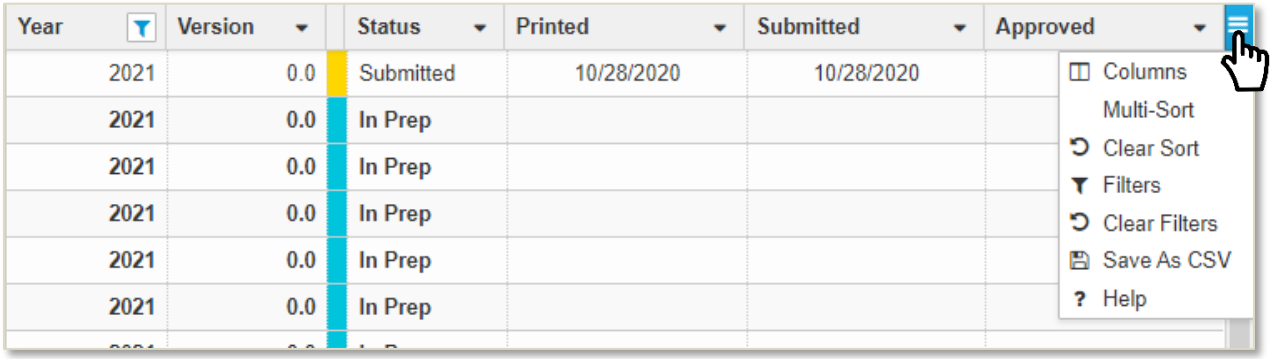


Search

Use the search bar near the project list to find all items that contain the search term.

List Menu

The menu is used to change the columns, sort, and filters for the list. There is also an option to print a CSV and view help content for the list.

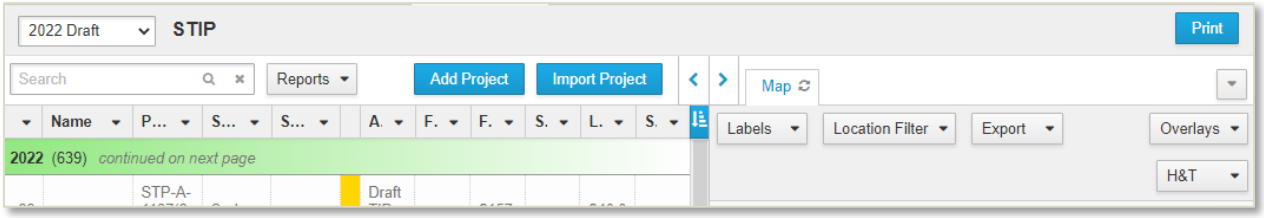


Program Map

The map shows all project locations within the program. The map and project list work together to determine which projects are shown. Filtering on either the map or list will filter the other to the same set of projects. Each location on the map can be selected to open the corresponding project.

Printing a program

Click on the “Print” button located in the title bar on the right side. This will open a new window where the program will be loaded. **This could take a few minutes.**



Opening a project

Click a project from the list or map to open it. It will open in a tab, or if it has already been opened, the correct tab will activate.

Viewing a project

All project information will be shown, separated into different sections. These sections can be collapsed and expanded, as well as scrolled to by using the navigation bar.

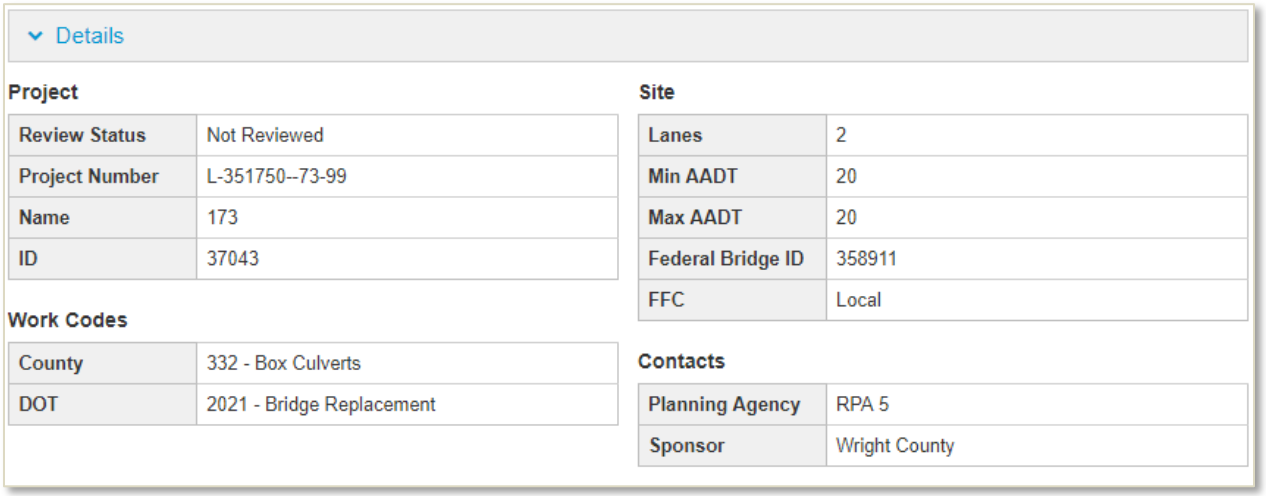
Problems

A project may have content the system decides could be a problem. There are two categories of problems: Errors and Warnings.

Errors: These must be fixed before the project or program can be submitted
Warnings: These are just notices that something may be wrong.

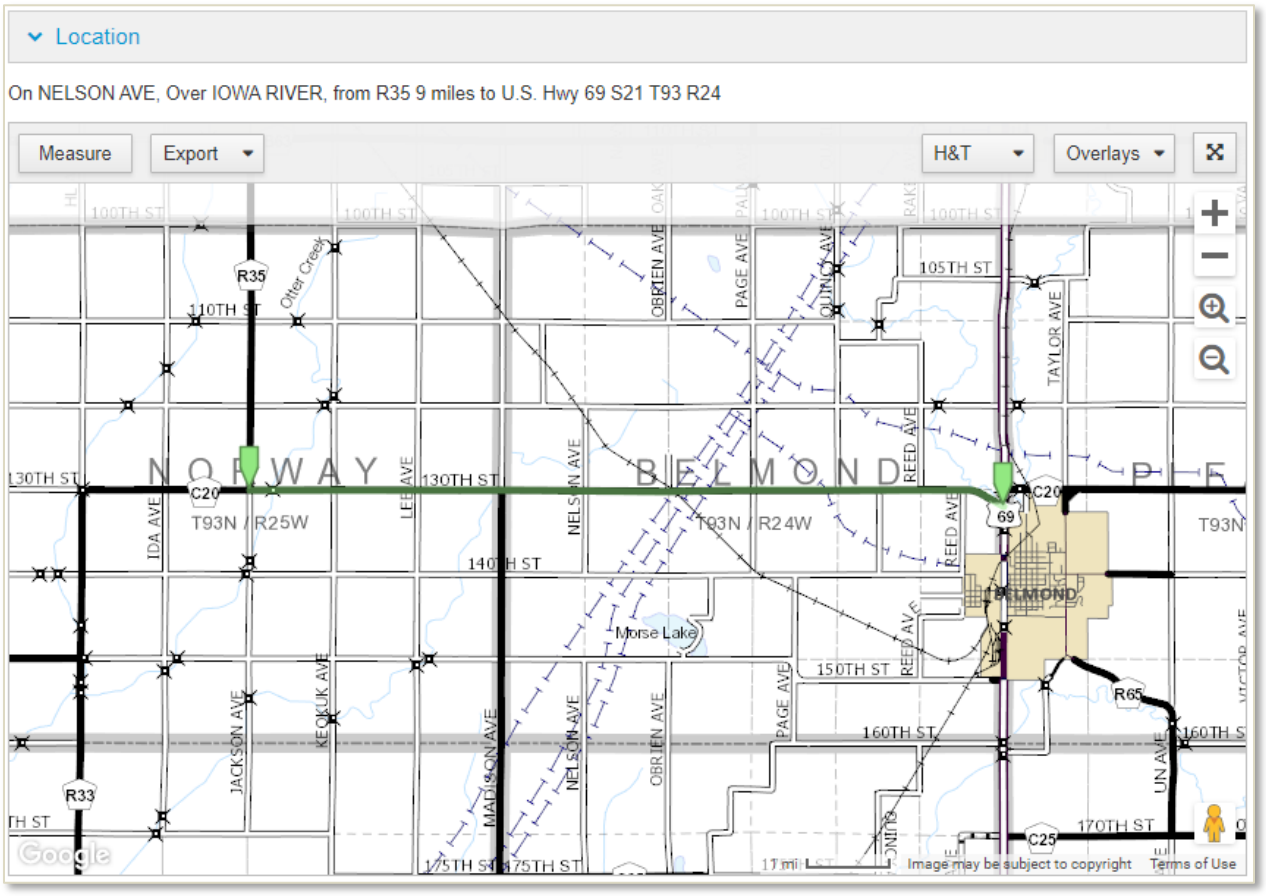
Details

The basic information of a project is shown in the details.



Location

The location shows the written description of the project's location. A map will be included if it is available.



Funding

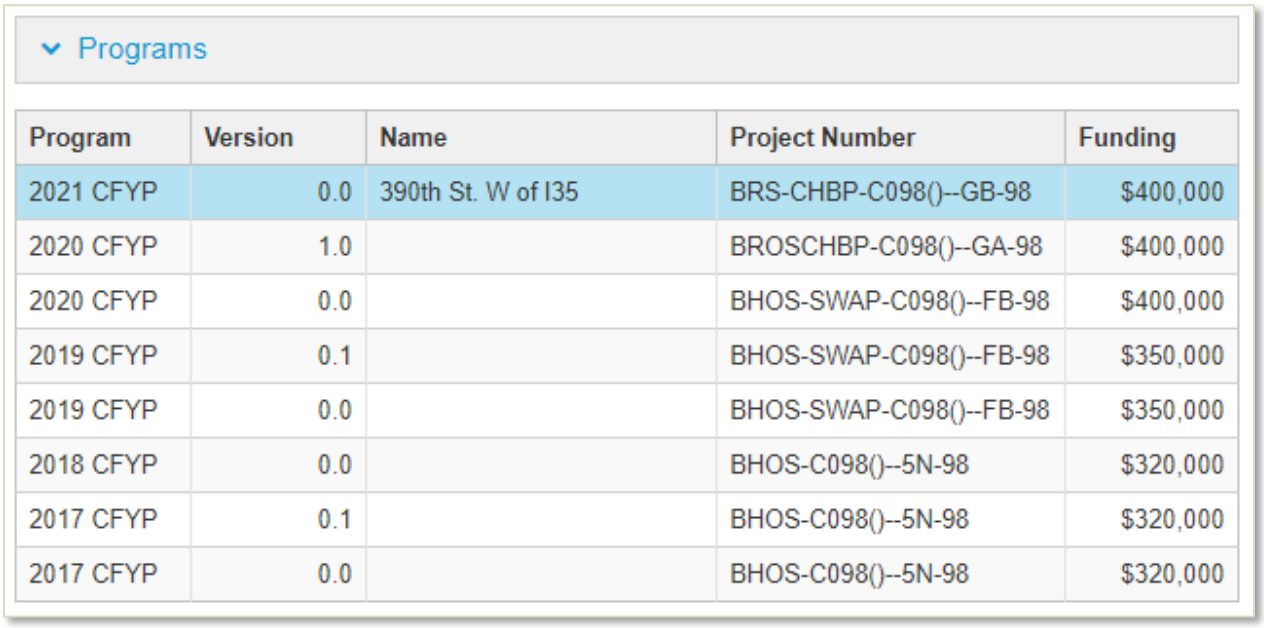
Funding is broken down by source and year. It will also show if there is an FM transfer on the project.

Funding

Source	2021
CHBP (FA)	$220,000
SWAP-HBP (SWAP)	$180,000
Total	**$400,000**

Programs

Each program the project has been in is listed under programs. Each of these can be opened for viewing.

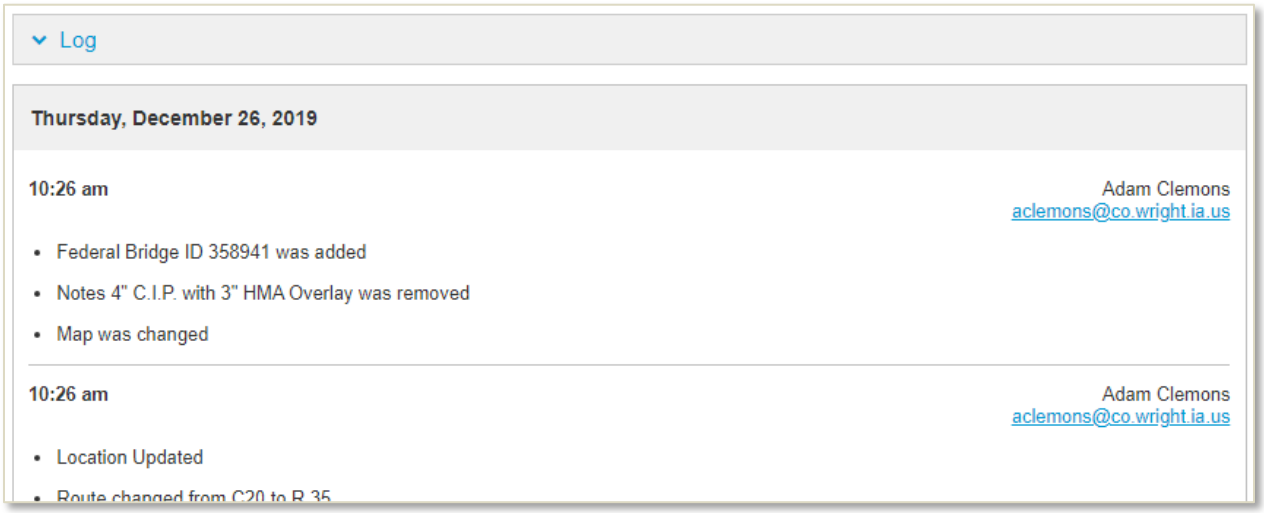


Programs

Program	Version	Name	Project Number	Funding
2021 CFYP	0.0	390th St. W of I35	BRS-CHBP-C098()--GB-98	$400,000
2020 CFYP	1.0		BROSCHBP-C098()--GA-98	$400,000
2020 CFYP	0.0		BHOS-SWAP-C098()--FB-98	$400,000
2019 CFYP	0.1		BHOS-SWAP-C098()--FB-98	$350,000
2019 CFYP	0.0		BHOS-SWAP-C098()--FB-98	$350,000
2018 CFYP	0.0		BHOS-C098()--5N-98	$320,000
2017 CFYP	0.1		BHOS-C098()--5N-98	$320,000
2017 CFYP	0.0		BHOS-C098()--5N-98	$320,000

Log

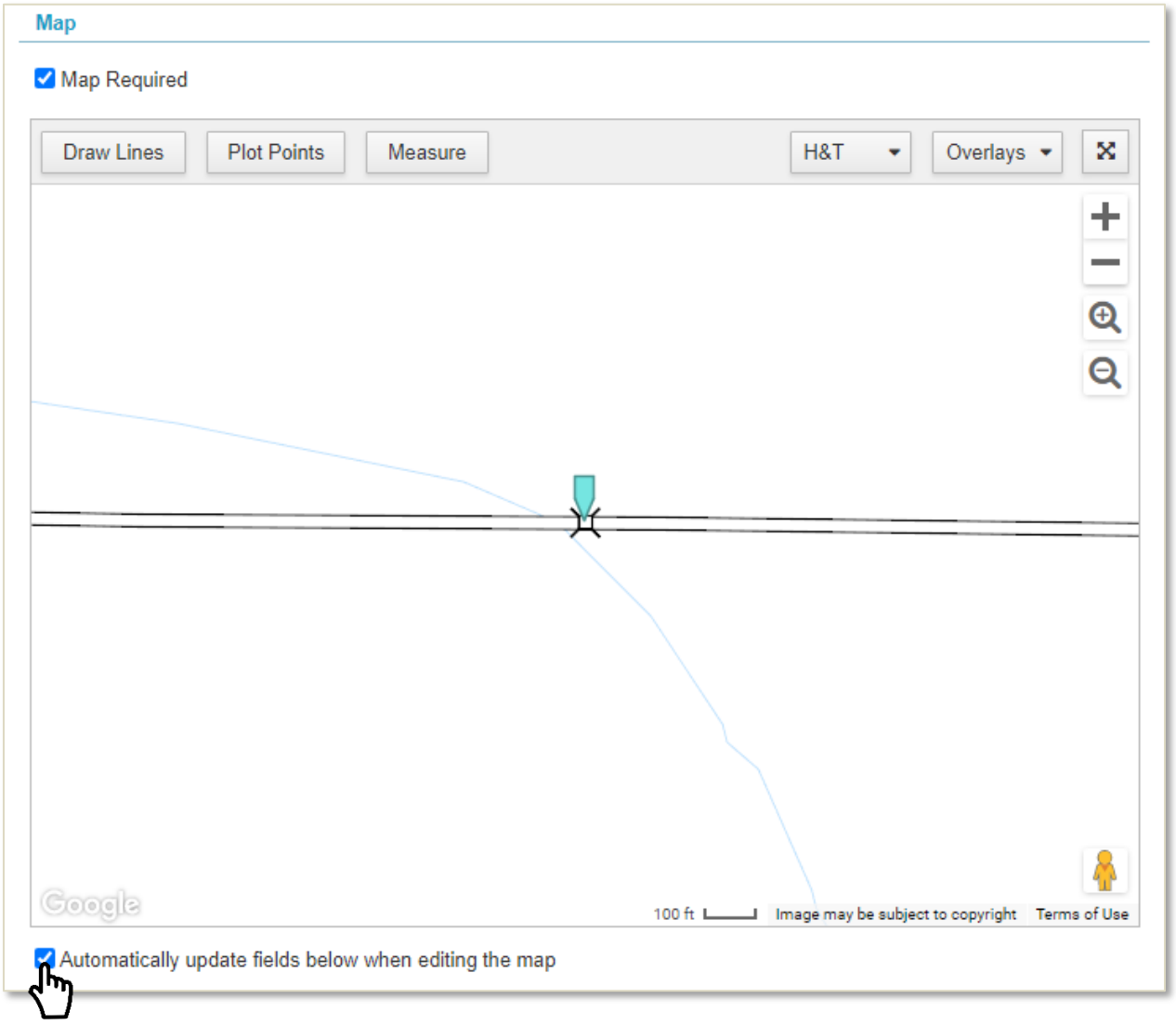
The log shows all changes that were made throughout the project's life.



Editing a project

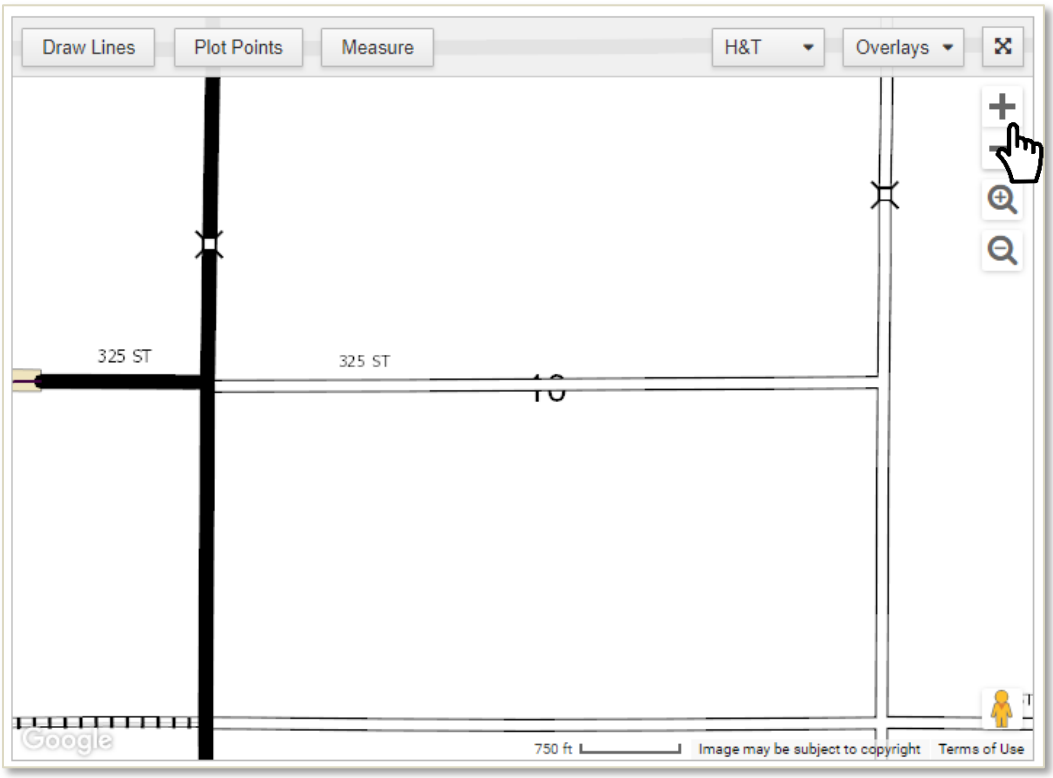
Drawing on the map

Plotting points or lines on the map will update the location fields based on the system data. This can be stopped by unchecking the box labeled “Automatically update fields below when editing the map”.

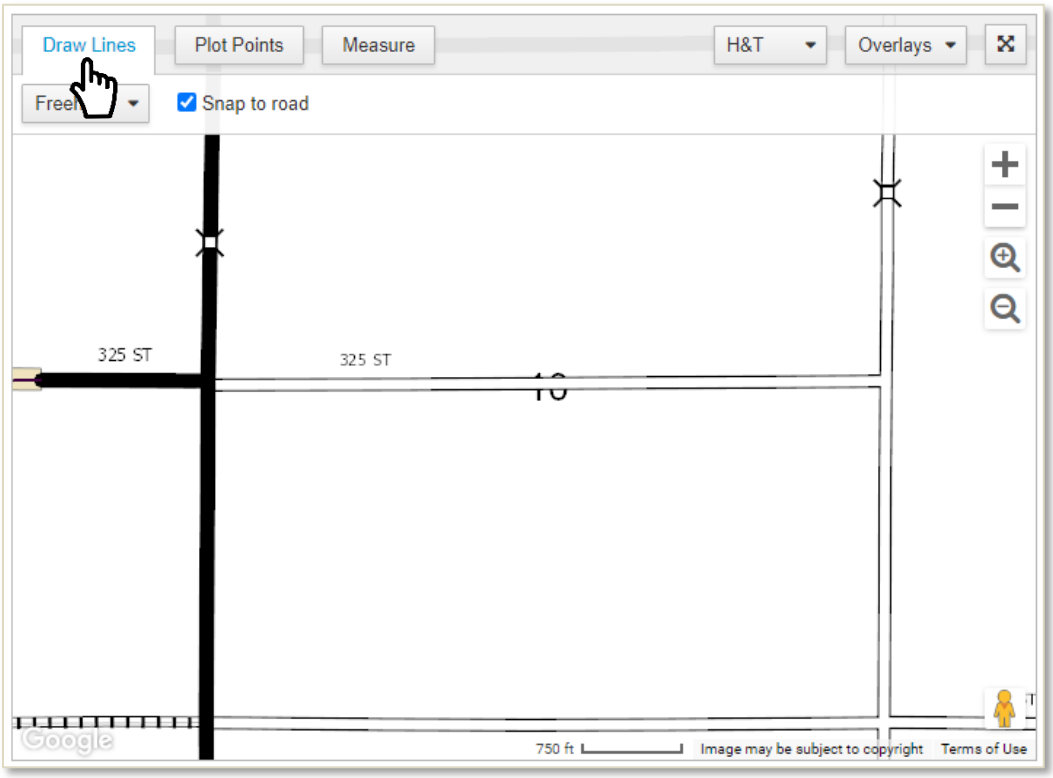


Lines

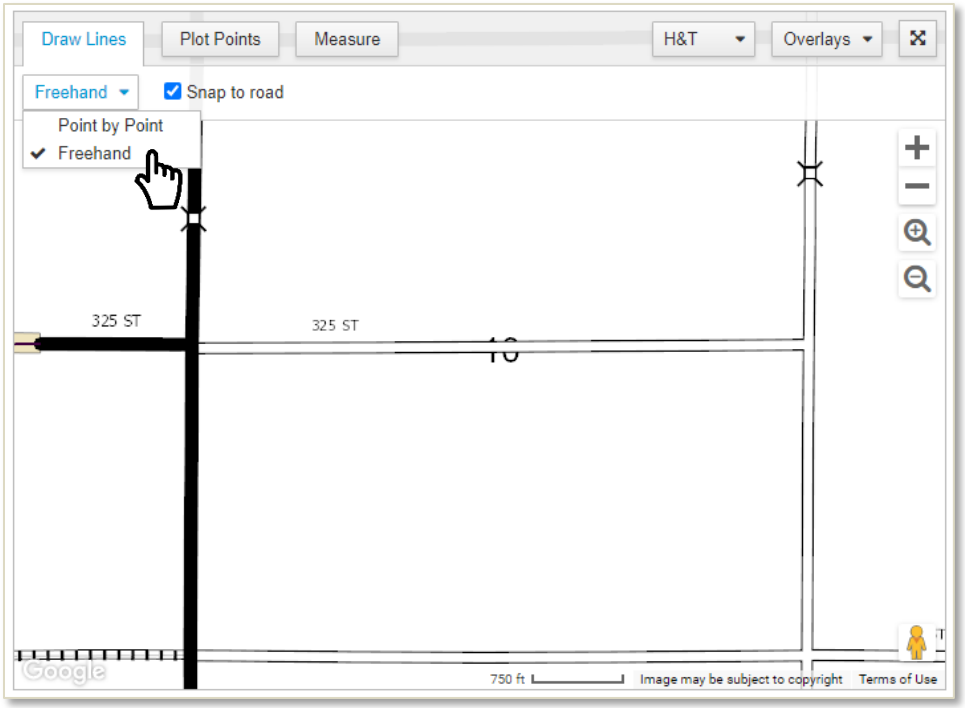
1. Zoom in to the correct location



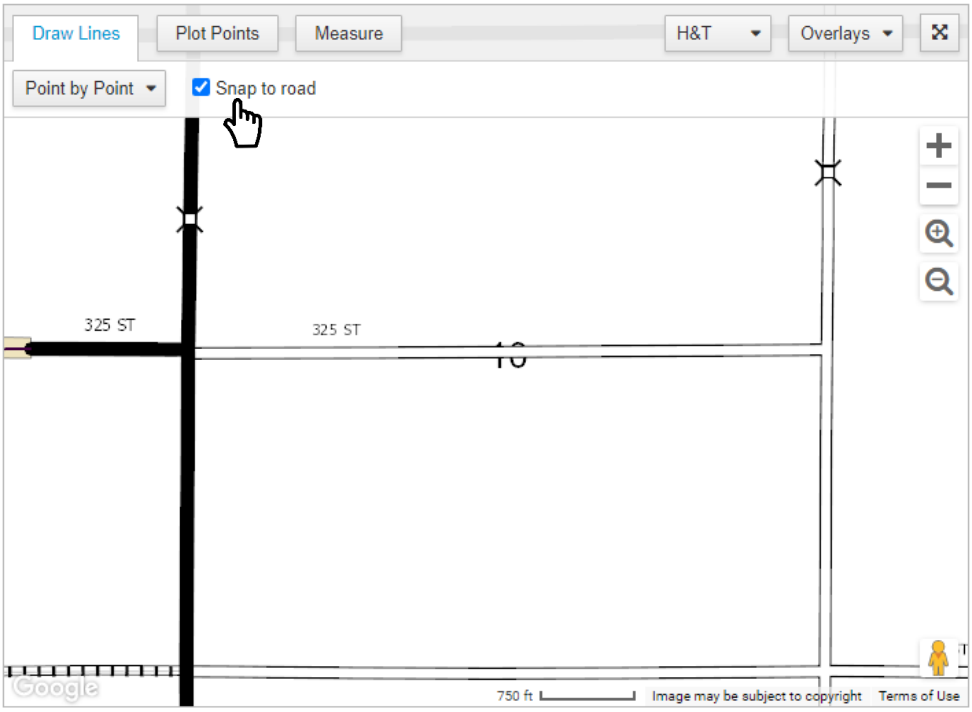
2. Click “Draw Lines”



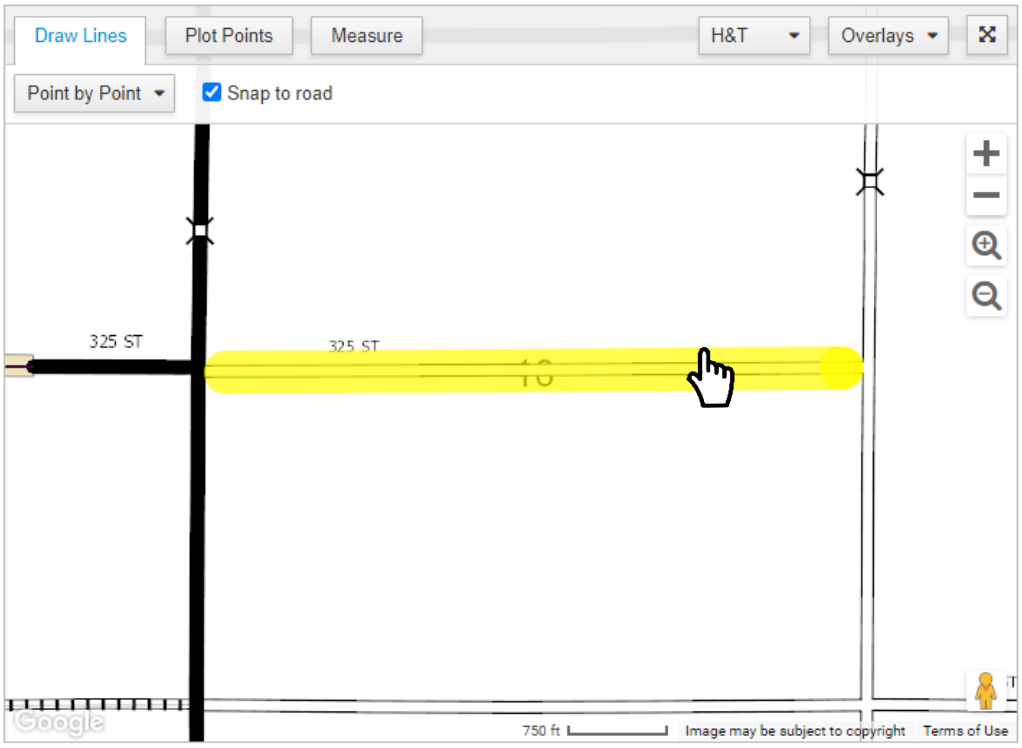
3. Choose drawing mode
    a. Freehand means click and drag your line
    b. Point by Point means click points along your route



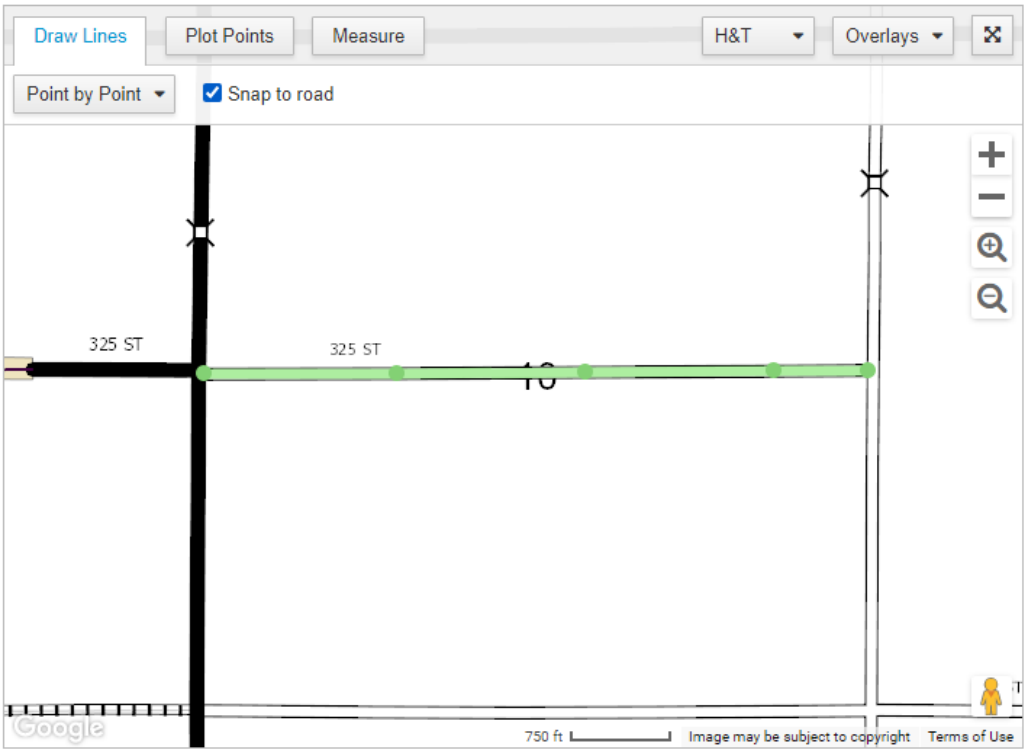
4. Toggle “Snap to road”
    a. If on, the system will make sure your line is on a road
    b. If off, the system will leave your line wherever you draw it



5. Draw the line

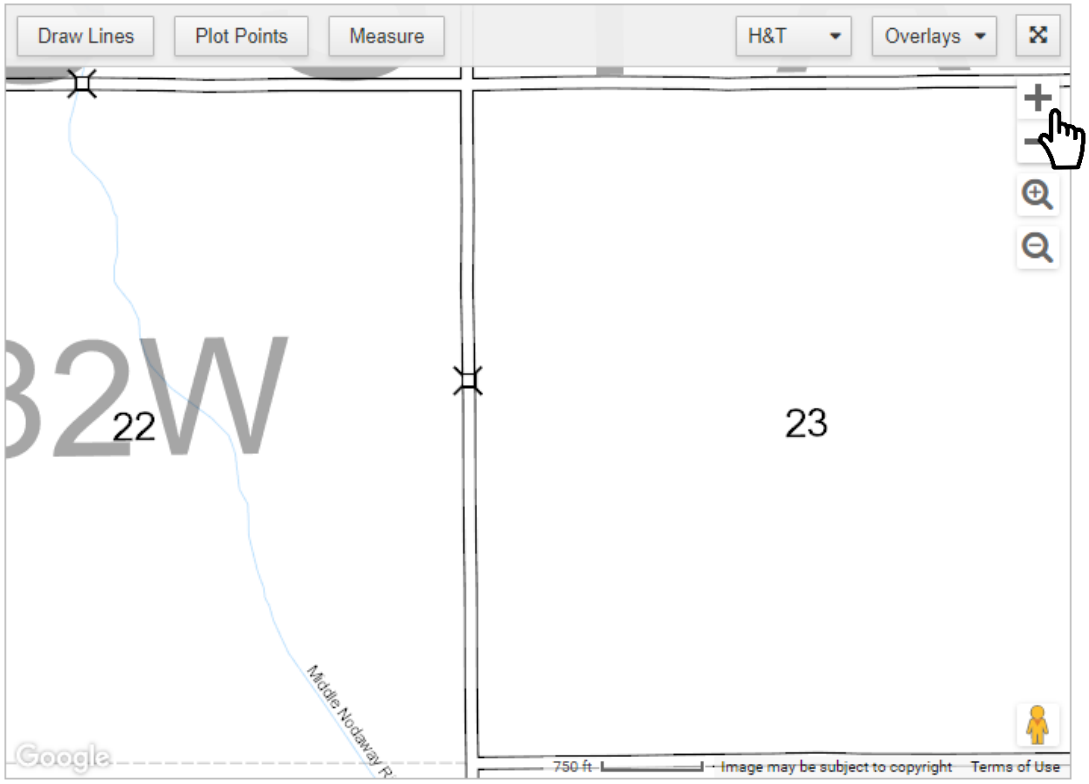


6. Double click to stop drawing

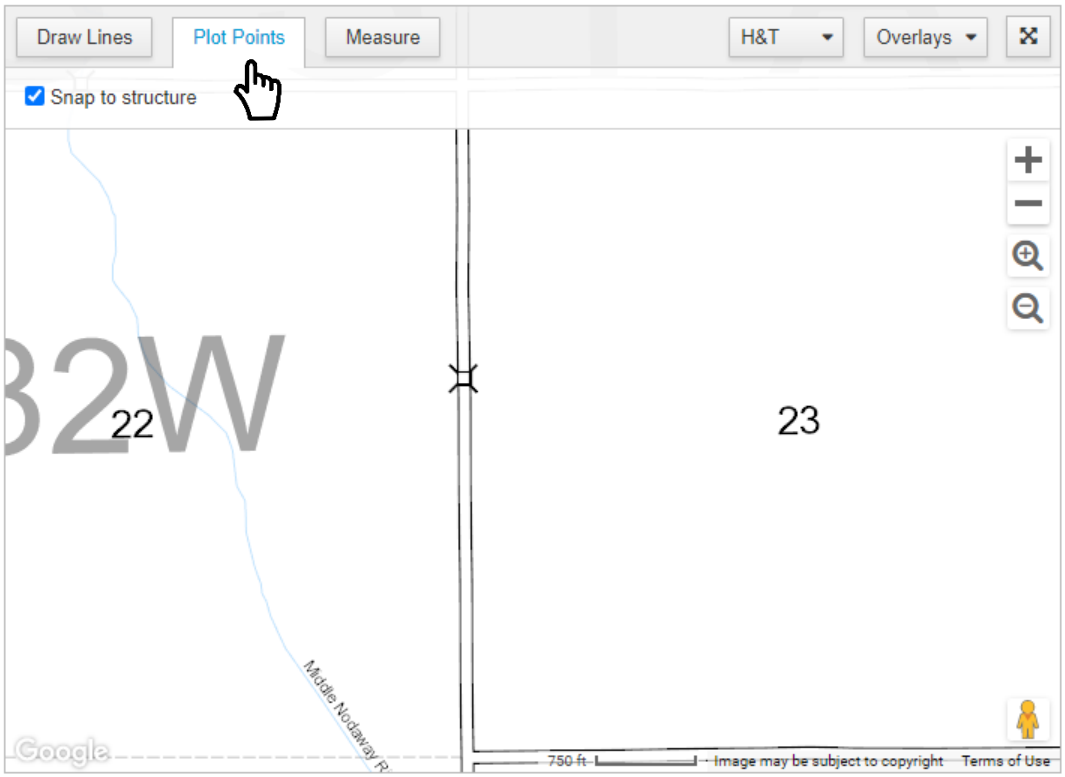


Points

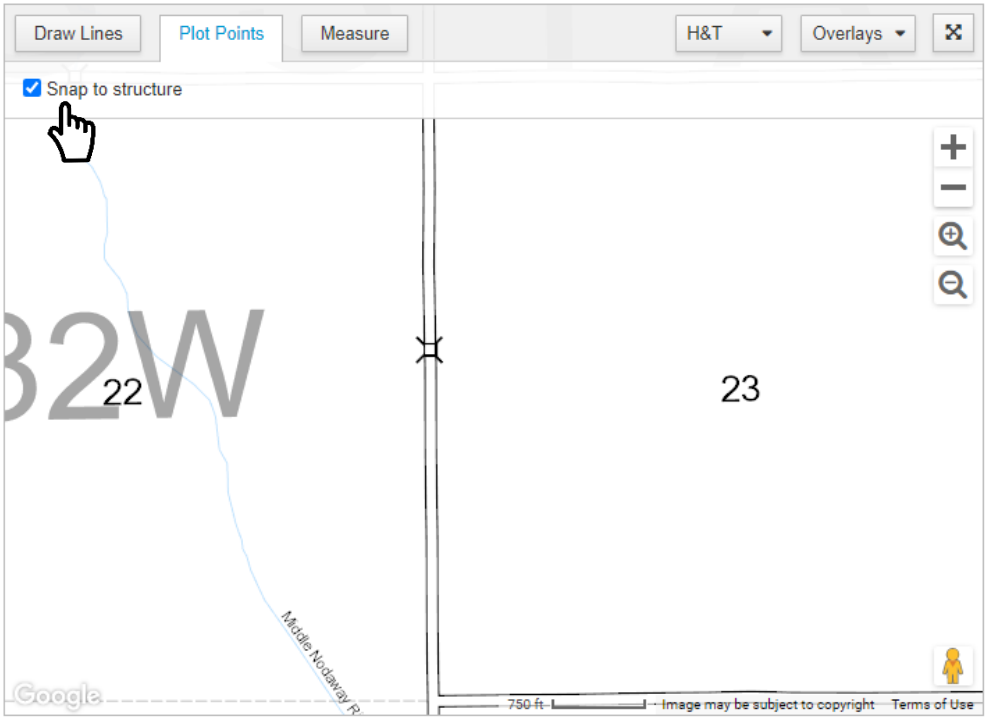
1. Zoom in to the correct location



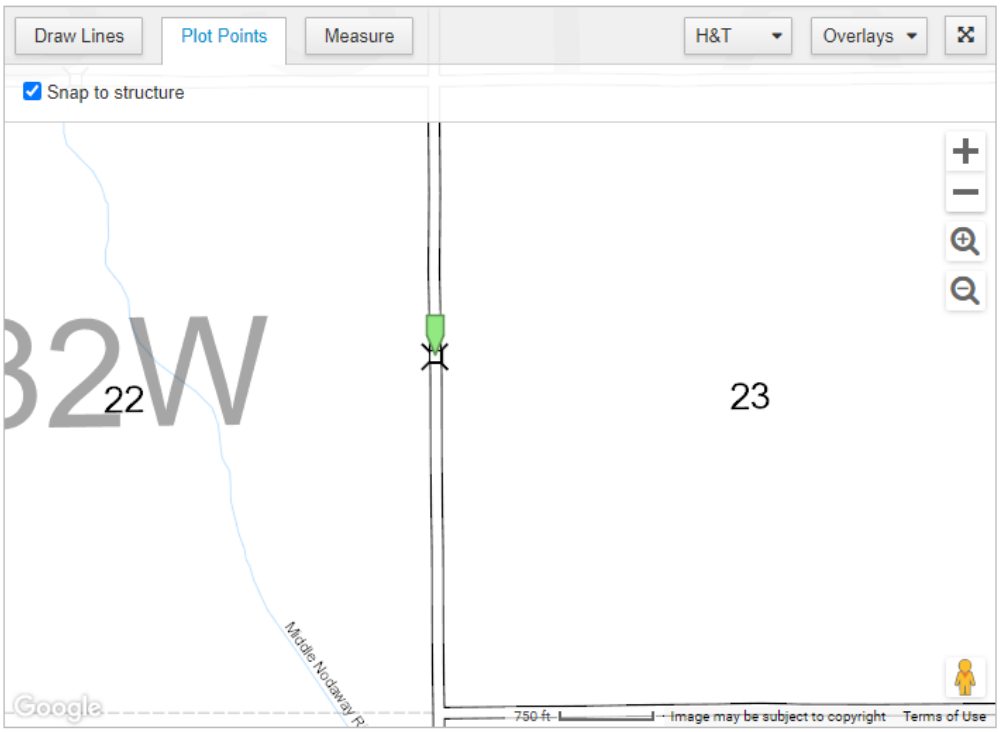
2. Click “Plot Points”



3. Toggle “Snap to structure”
    a. If on, the system will move the point to the nearest structure
    b. If off, the system will leave your point where you plot it

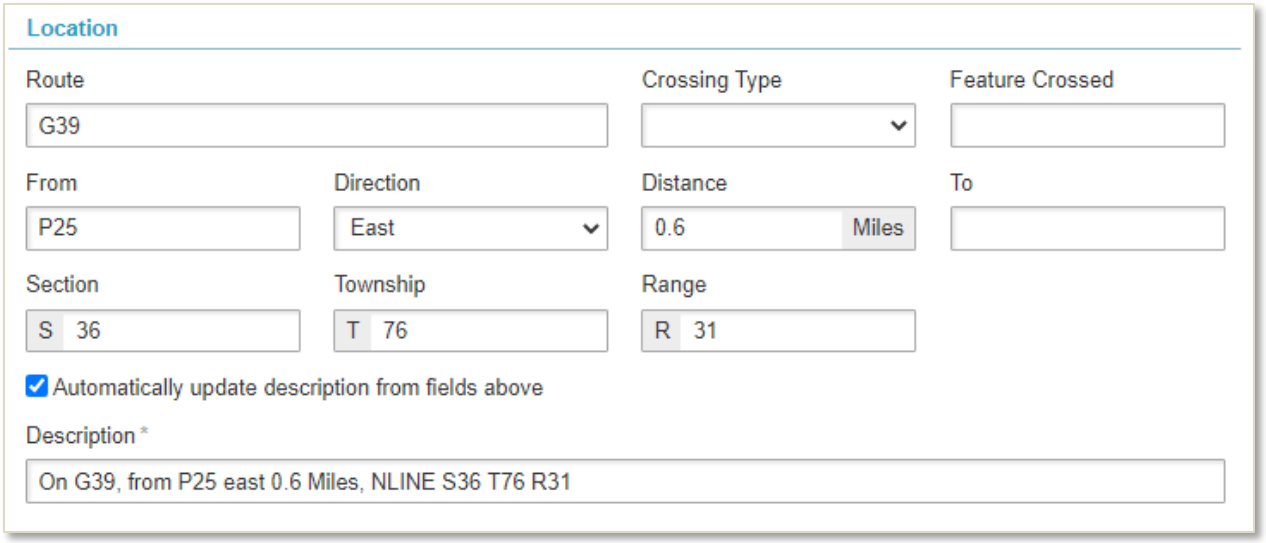


4. Plot the point



Location Description

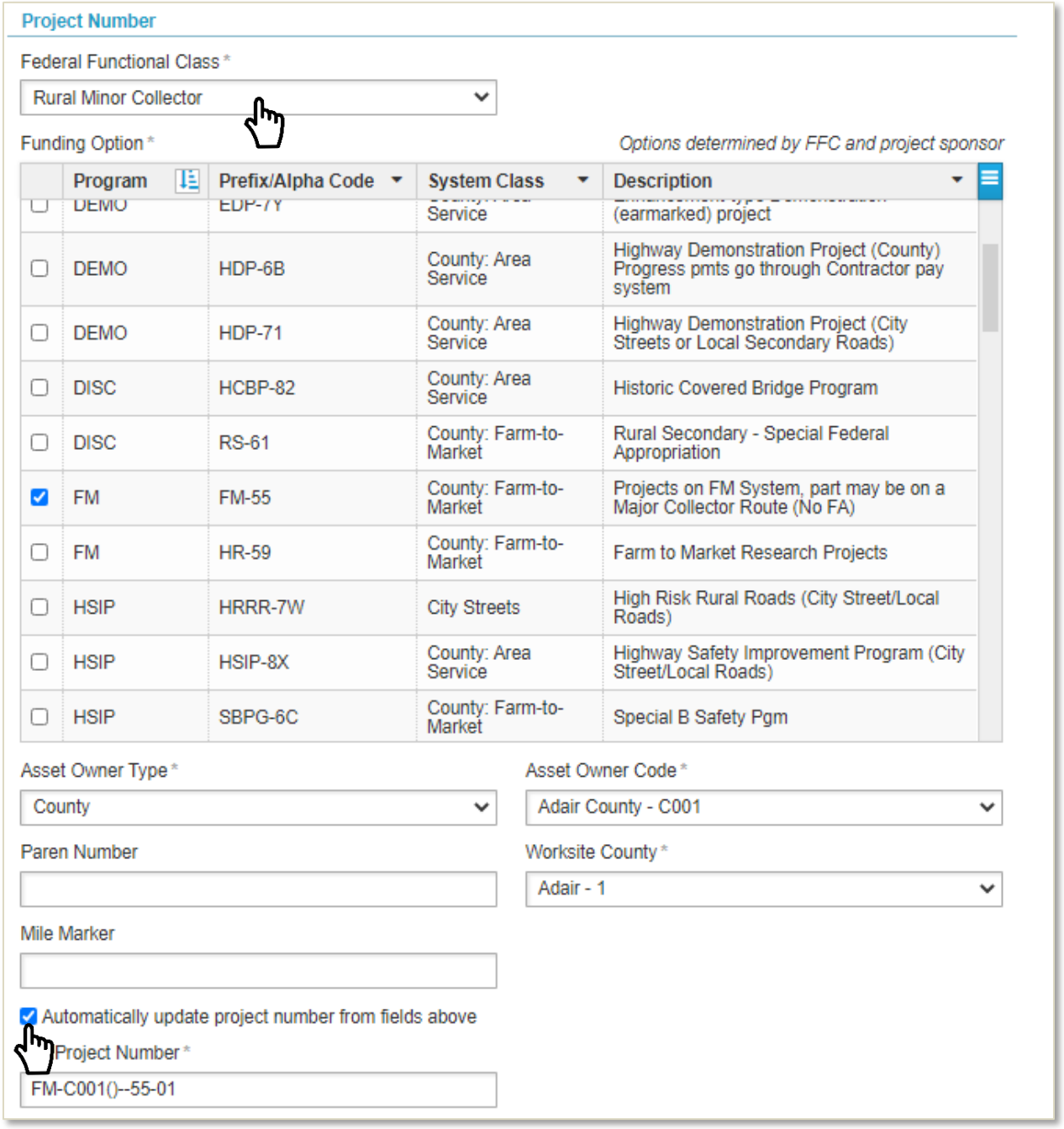
The location description uses a builder to help format the value correctly. This can be turned on or off using the checkbox marked “Automatically update description from fields above”. The builder uses the fields grouped under location to fill in the description.


Location
Route
G39
Crossing Type
Feature Crossed
From
P25
Direction
East
Distance
0.6
Miles
To
Section
S 36
Township
T 76
Range
R 31
Automatically update description from fields above
Description *
On G39, from P25 east 0.6 Miles, NLINE S36 T76 R31

Project Number

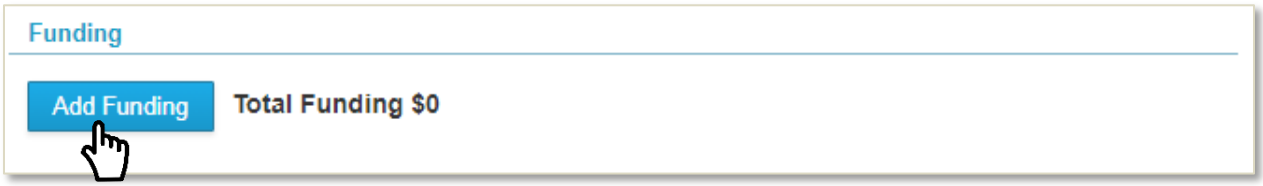
The project number uses a builder to help format the value correctly. This can be turned on or off using the checkbox marked “Automatically update project number from fields above”. The builder uses the fields grouped under project number to fill in the description.

Changing the federal functional class will also change the funding program options.

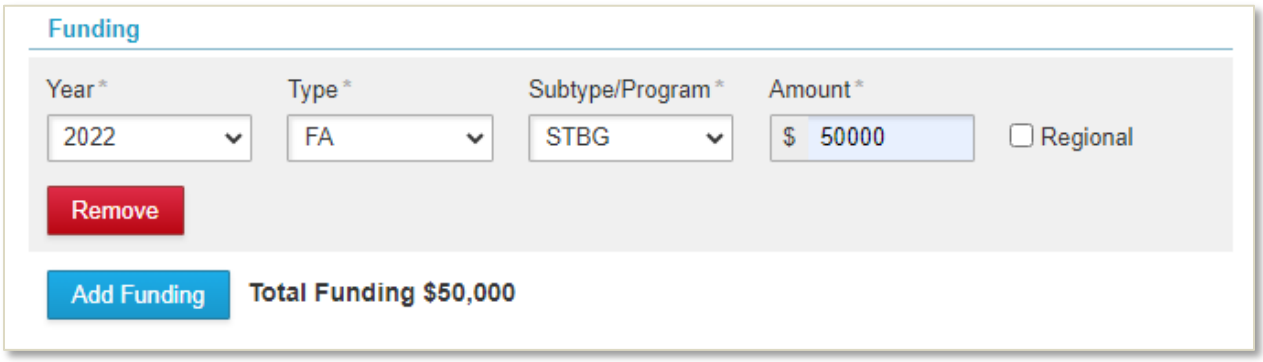


Funding

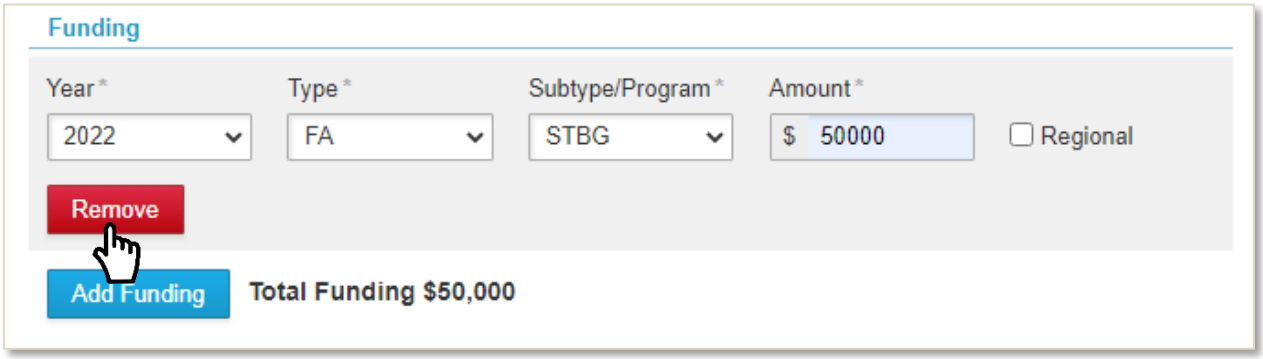
1. Click “Add Funding” to add a line of funding



2. Fill in the year, type, subtype, and amount. Choose “regional” if applicable.



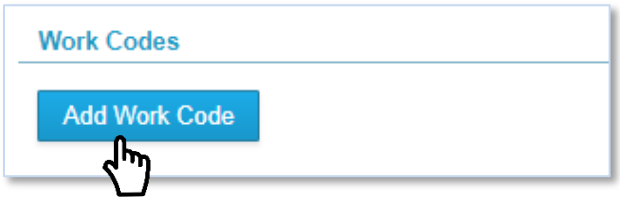
3. Remove a line of funding if needed by clicking “Remove”



Work Codes

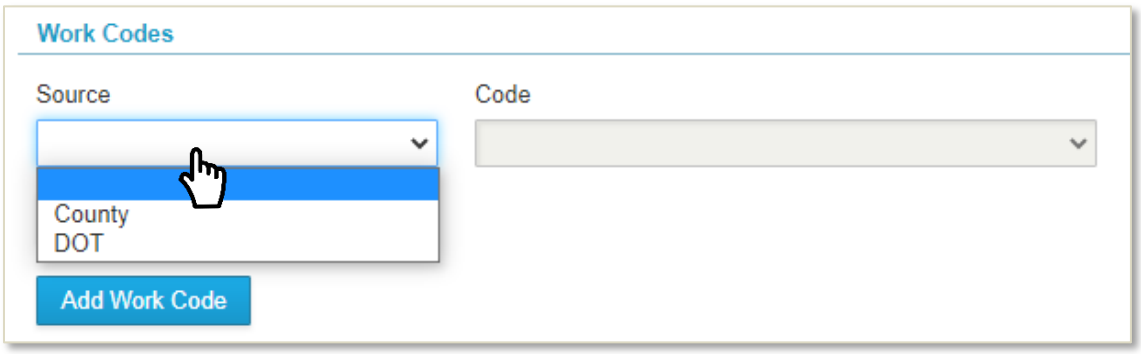
Adding a work code

1. Click “Add Work Code”

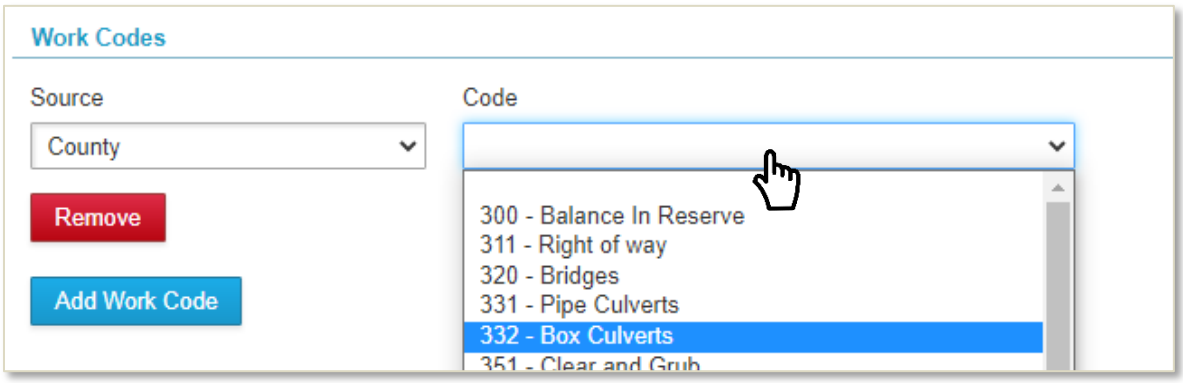


Choosing a work code

1. Select the source

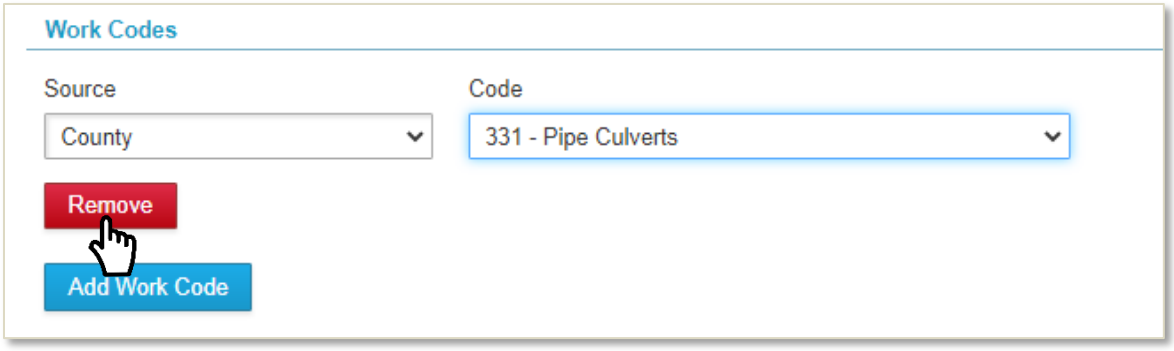


2. Select the code



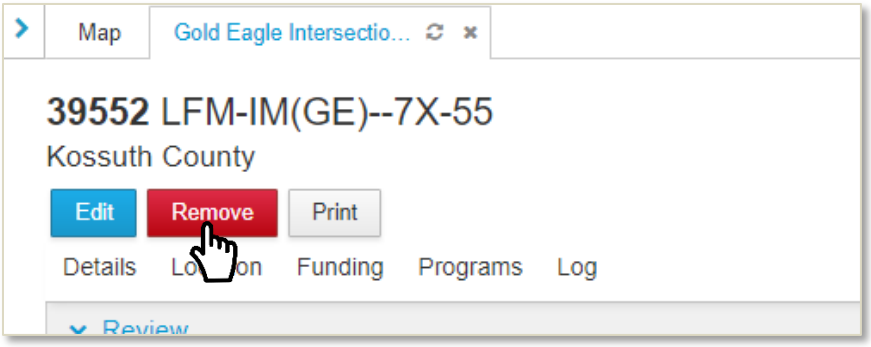
Removing a work code

1. Click “Remove”

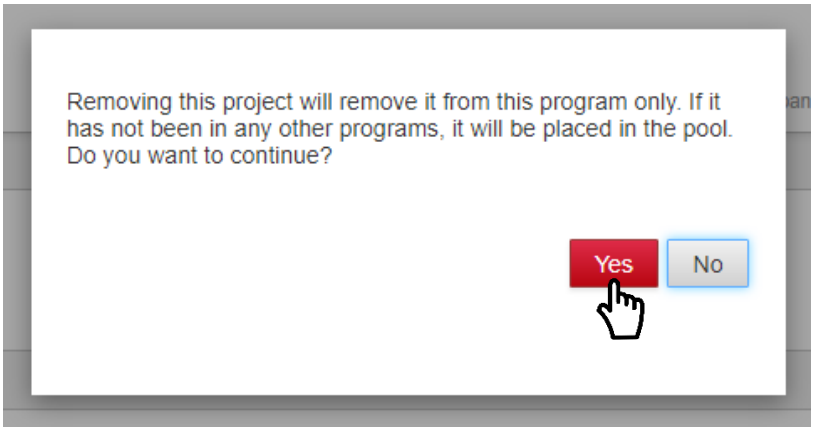


Removing a project (Administrator only)

1. Open the project
2. Click remove

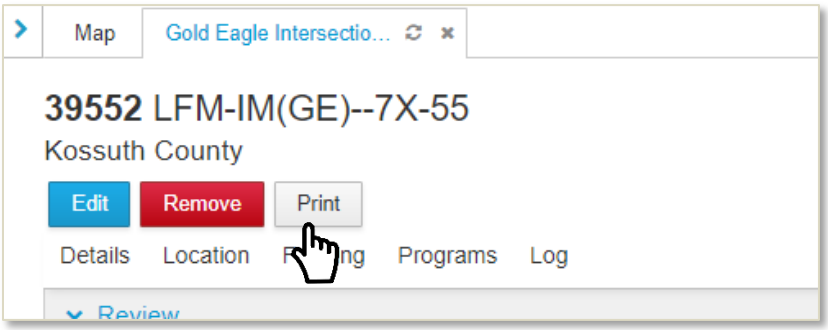


3. Confirm the removal



Printing a project

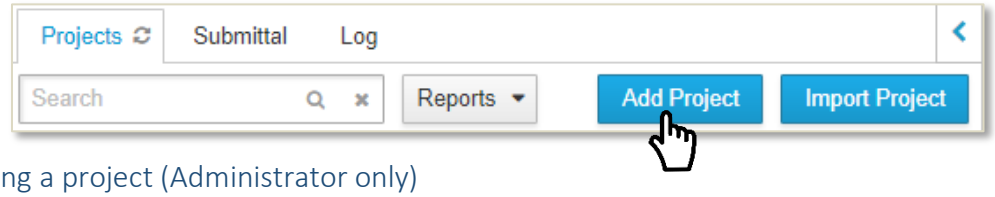
1. Click “Print”



Adding a project (Administrator only)

Adding a project can only be done with an administrator role.

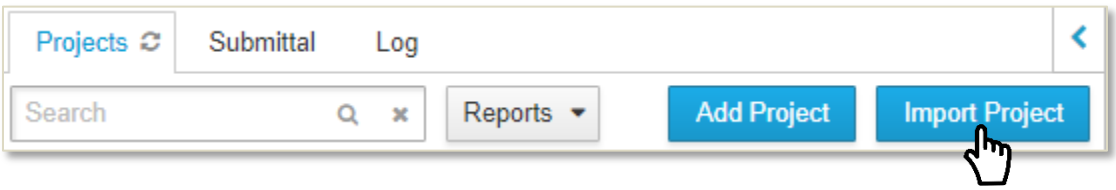
1. Click on “Add Project”



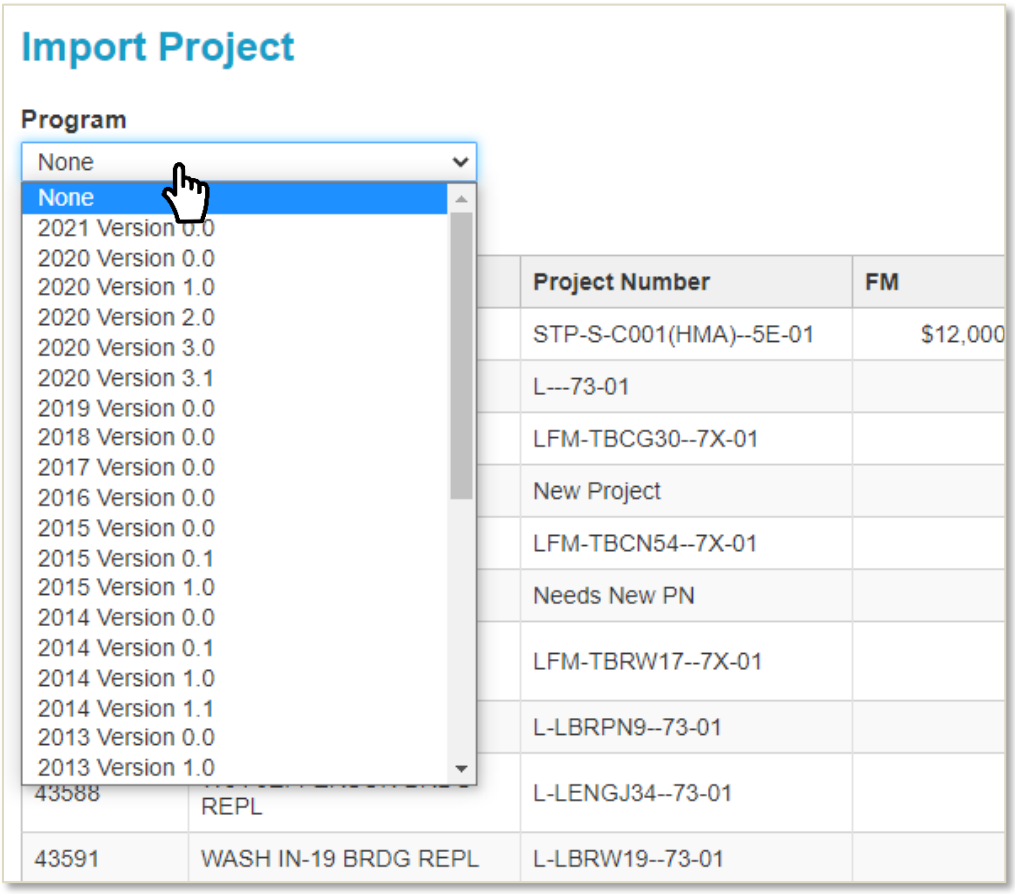
Importing a project (Administrator only)

Importing will add a project that has been in a previous program to the current program. This can only be done with an administrator role.

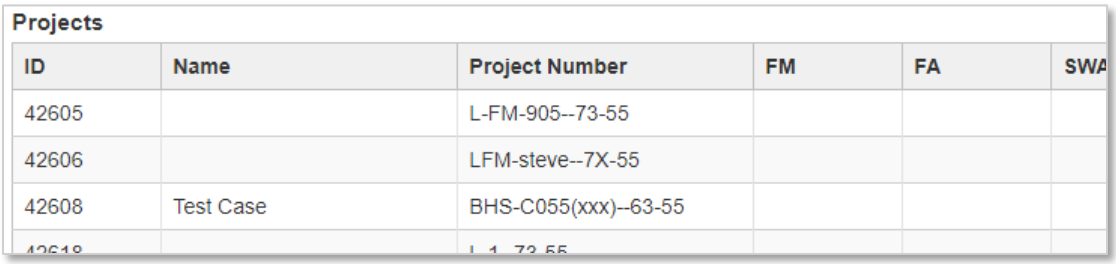
1. Click on “Import Project”



2. Choose a program



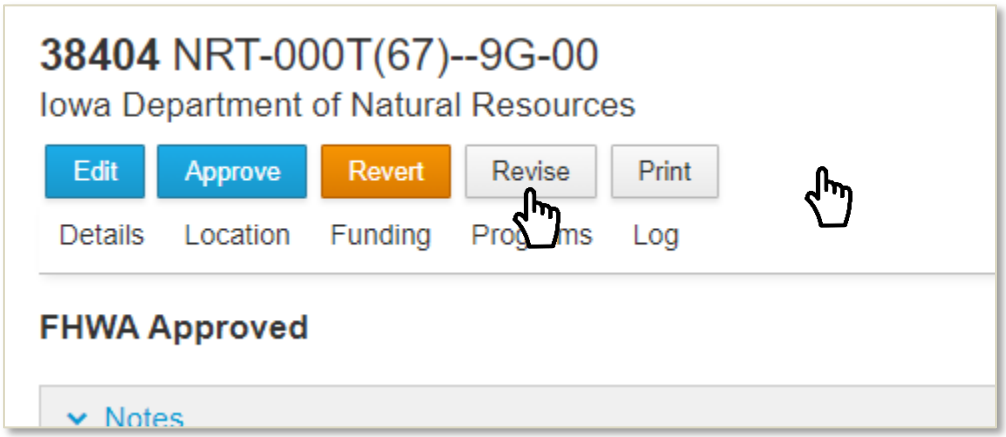
3. Choose a project from the list



4. Fill out the project form and click “Submit”

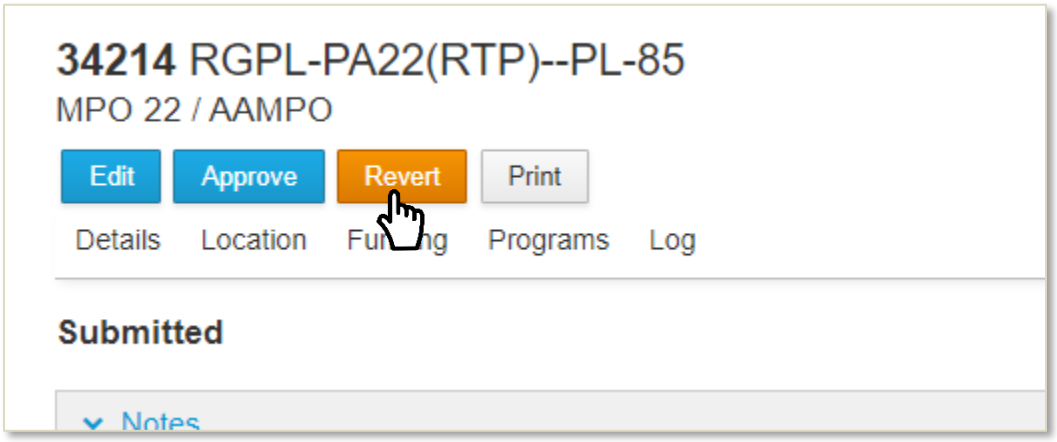
Revising a project (Administrator only)

If the project does not already have a revision, a revision can be created by clicking the “Revise” button on the project. This will allow the project form to be filled out, then once submitted the revision will be created.



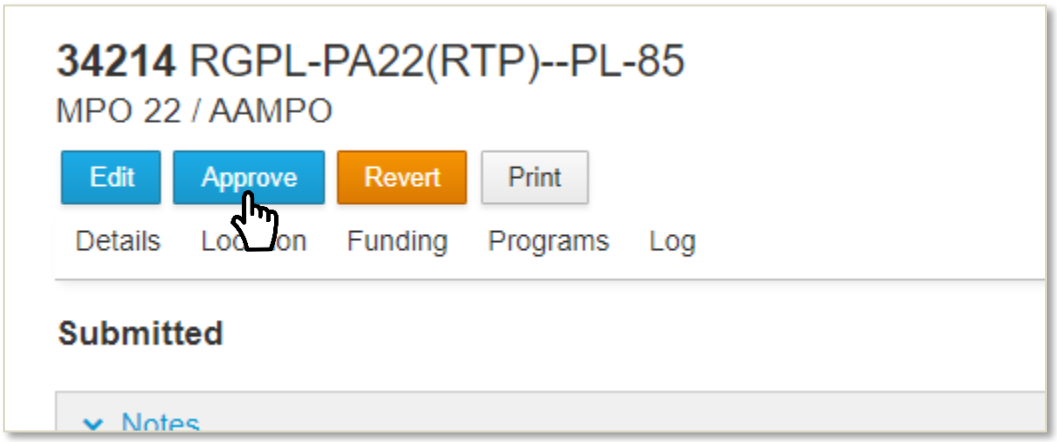
Reverting a project (Administrator only)

Reverting a project will change the approval status to the previous approval level.



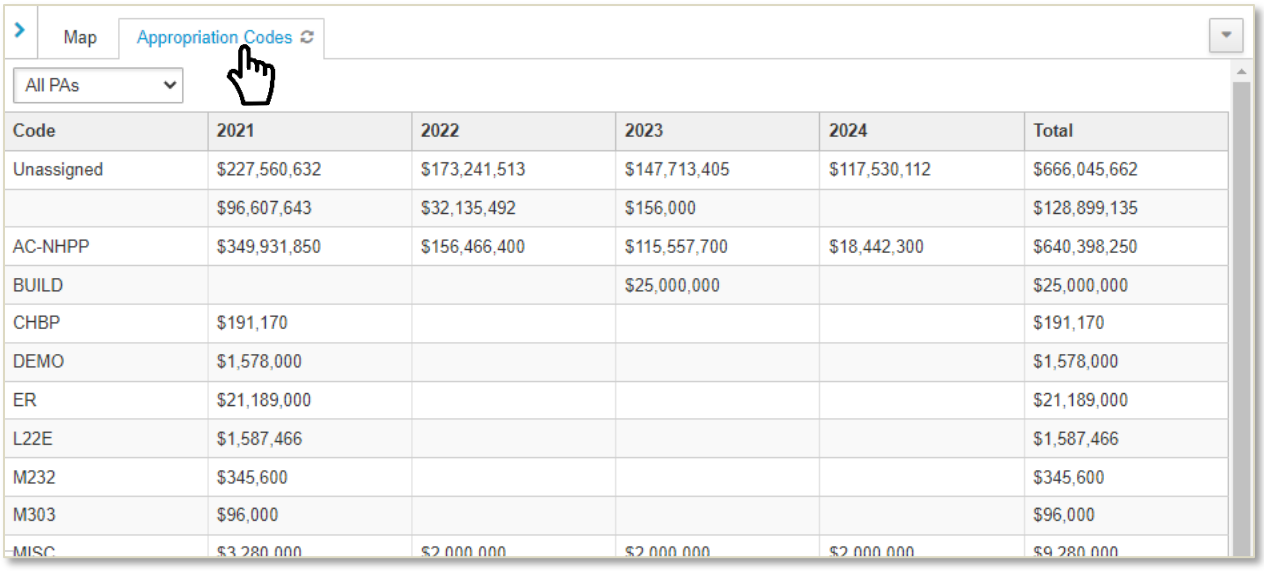
Approving a project (Administrator only)

Approving a project will change the approval status to the next approval level.



Viewing appropriation codes (Administrator only)

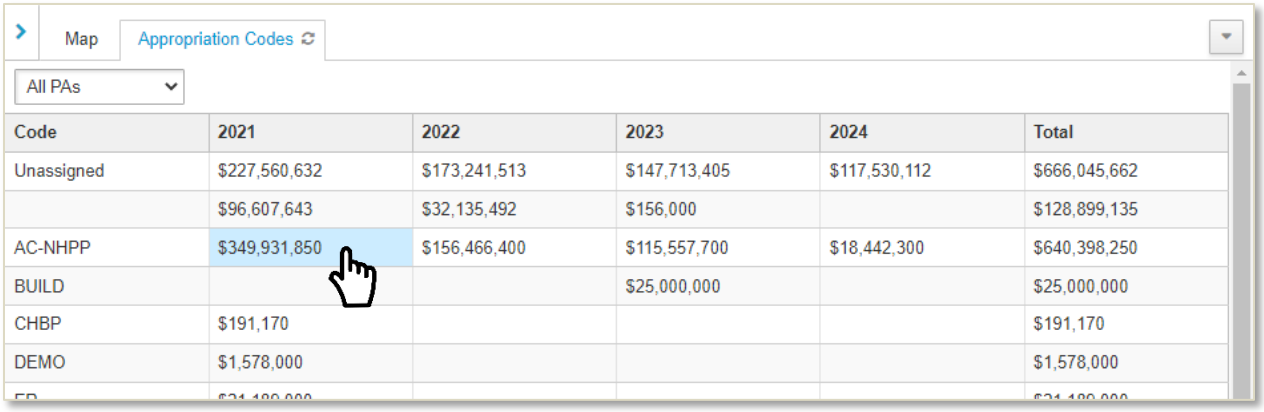
Click on the "Appropriation Codes" tab. Each code shows all dollars for the 4 years of the STIP, as well as the total for that code.



Code	2021	2022	2023	2024	Total
Unassigned	$227,560,632	$173,241,513	$147,713,405	$117,530,112	$666,045,662
	$96,607,643	$32,135,492	$156,000		$128,899,135
AC-NHPP	$349,931,850	$156,466,400	$115,557,700	$18,442,300	$640,398,250
BUILD			$25,000,000		$25,000,000
CHBP	$191,170				$191,170
DEMO	$1,578,000				$1,578,000
ER	$21,189,000				$21,189,000
L22E	$1,587,466				$1,587,466
M232	$345,600				$345,600
M303	$96,000				$96,000
MISC	$3,280,000	$2,000,000	$2,000,000	$2,000,000	$9,280,000

Filtering the project list by choosing a code

Click on a dollar amount to filter the project list by code and year.



Code	2021	2022	2023	2024	Total
Unassigned	$227,560,632	$173,241,513	$147,713,405	$117,530,112	$666,045,662
	$96,607,643	$32,135,492	$156,000		$128,899,135
AC-NHPP	$349,931,850	$156,466,400	$115,557,700	$18,442,300	$640,398,250
BUILD			$25,000,000		$25,000,000
CHBP	$191,170				$191,170
DEMO	$1,578,000				$1,578,000

Project Development

Lettings List

Reports

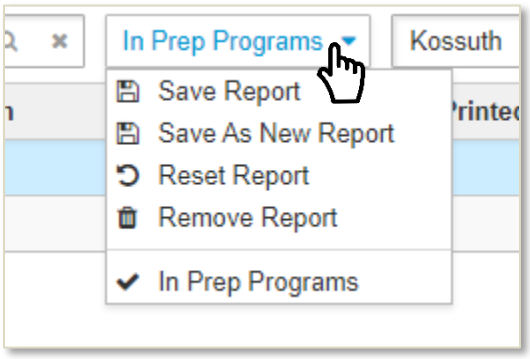
Reports allow you to save multiple layouts of the list.

Saving a report

7. Choose the columns, sort, and filters for the list
8. Click the reports dropdown
9. Click “Save As New Report” to save a new report, or “Save Report” to update your current report with the new changes

Removing a report

5. Click the reports dropdown
6. Click “Remove Report”
    a. This will remove the currently selected report

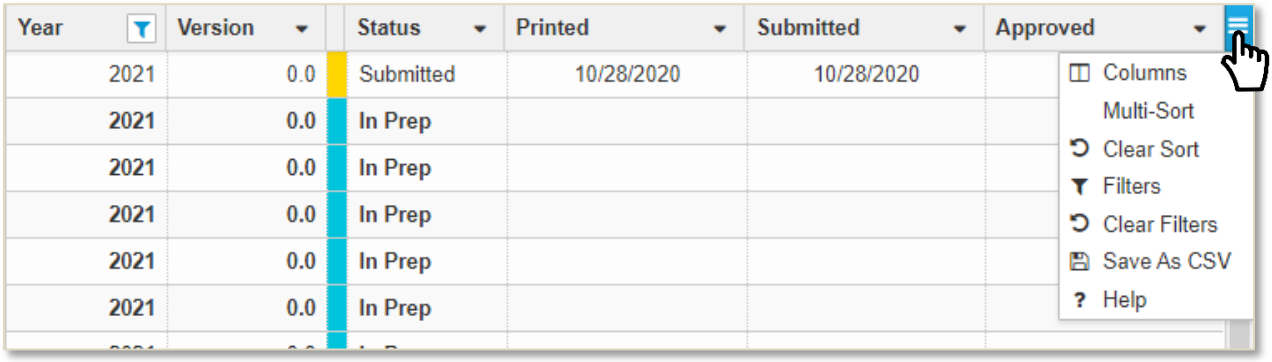


Search

Use the search bar near the project list to find all items that contain the search term.

List Menu

The menu is used to change the columns, sort, and filters for the list. There is also an option to print a CSV and view help content for the list.



Project list

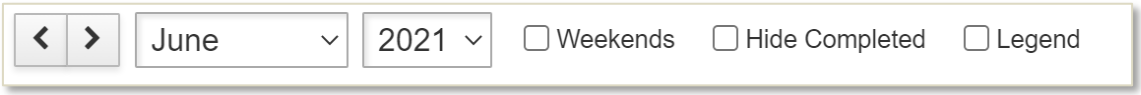
The project list shows all projects, with optional columns showing schedule item status. These have icons showing if they are behind schedule, completed, or not applicable. **The icons will be colored if the schedule items can be updated by the current user.**

Map

The map shows all project locations within development. The map and project list work together to determine which projects are shown. Filtering on either the map or list will filter the other to the same set of projects. Each location on the map can be selected to open the corresponding project.

Calendar

The calendar shows projects by when their schedule items are due. Each project has a color icon representing which item is due for that day. Hovering over the project will show an expanded view of each item due.



Controls

Month – the month and year can be changed by the dropdown menus. The arrow buttons can be used to change the month one at a time

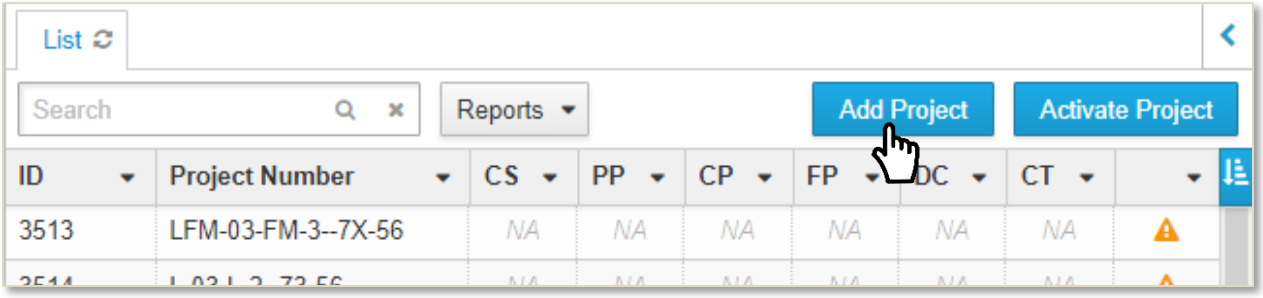
Weekends – toggling the "Weekends" checkbox will show or hide the weekends on the calendar

Hide completed – turning on the "Hide Completed" checkbox will hide all schedule items that have been completed. This may also hide entire projects from a day, if they have no items finished

Legend – the legend can be shown or hidden using the checkbox. When the legend is shown, it gives the option to toggle each schedule item, individually, on the calendar

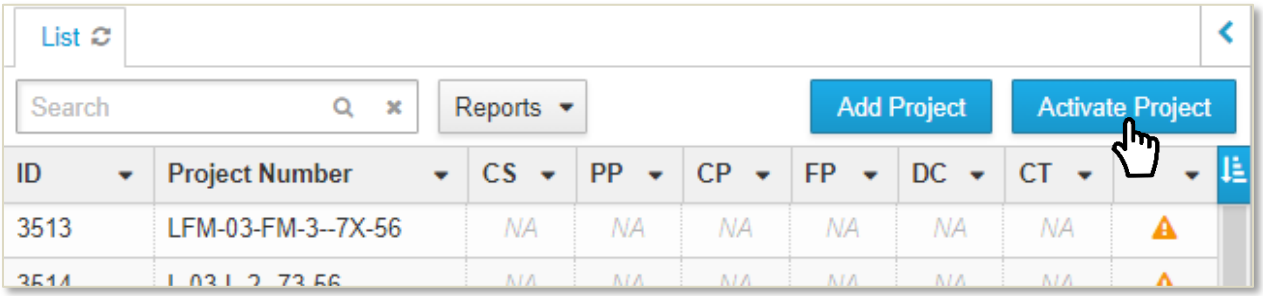
Adding a project

1. Click on "Add Project"

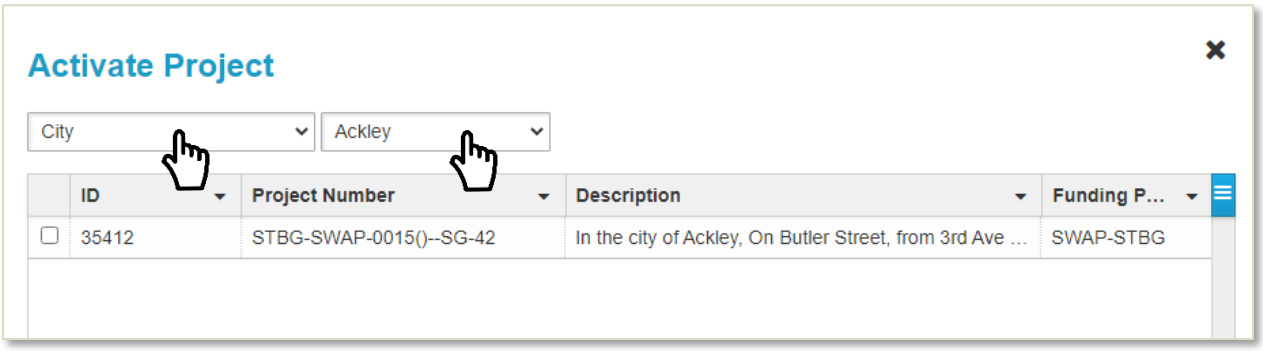


Activating a project

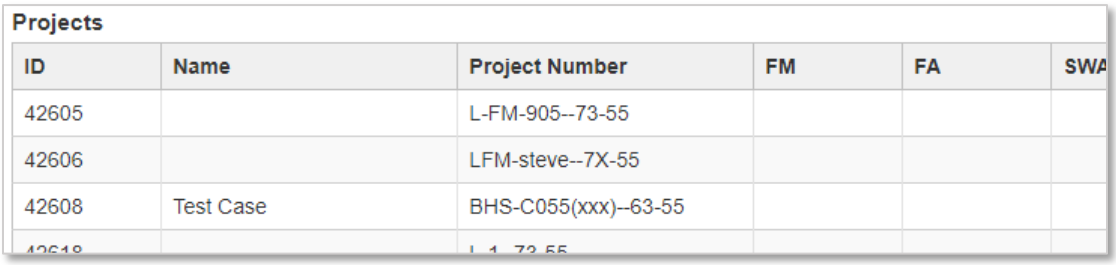
1. Click on “Activate Project”



2. Choose a sponsor and sponsor type



3. Choose a project from the list



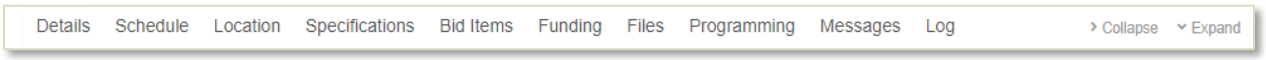
4. Fill out the project form and click “Submit”

Opening a project

Click a project from the list or map to open it. It will open in a tab, or if it has already been opened, the correct tab will activate.

Viewing a project

All project information will be shown, separated into different sections. These sections can be collapsed and expanded, as well as scrolled to by using the navigation bar.



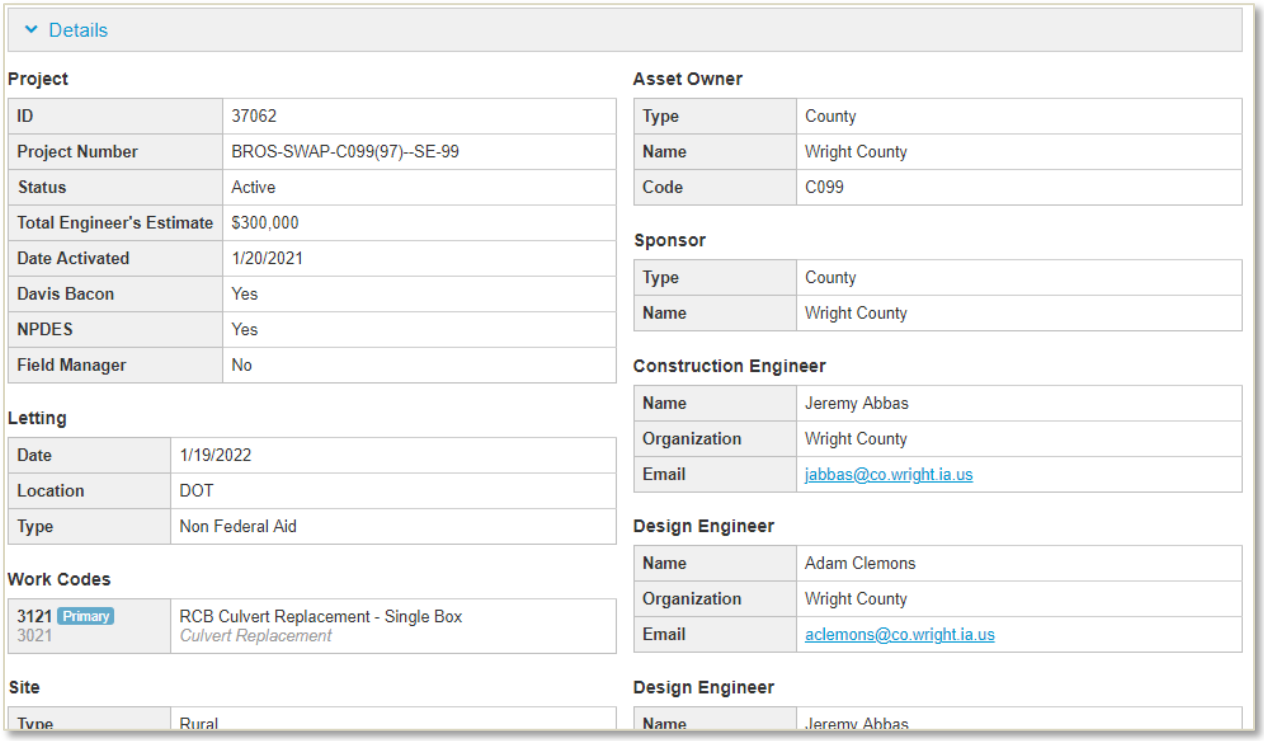
Problems

A project may have content the system decides could be a problem. There are two categories of problems: Errors and Warnings.

> **Errors**: These must be fixed before the project or program can be submitted
> **Warnings:** These are just notices that something may be wrong.

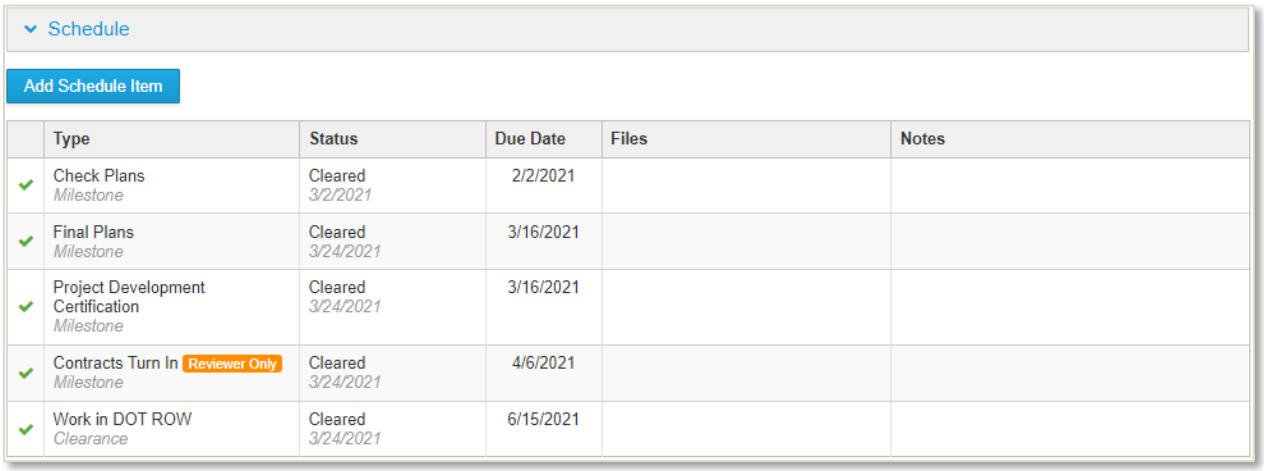
Details

The basic information of a project is shown in the details.



Schedule

The schedule shows milestones and clearances set for the project. Each item can have files and notes associated with it, along with its status, due date, and type. **Only reviewers can remove schedule items.**

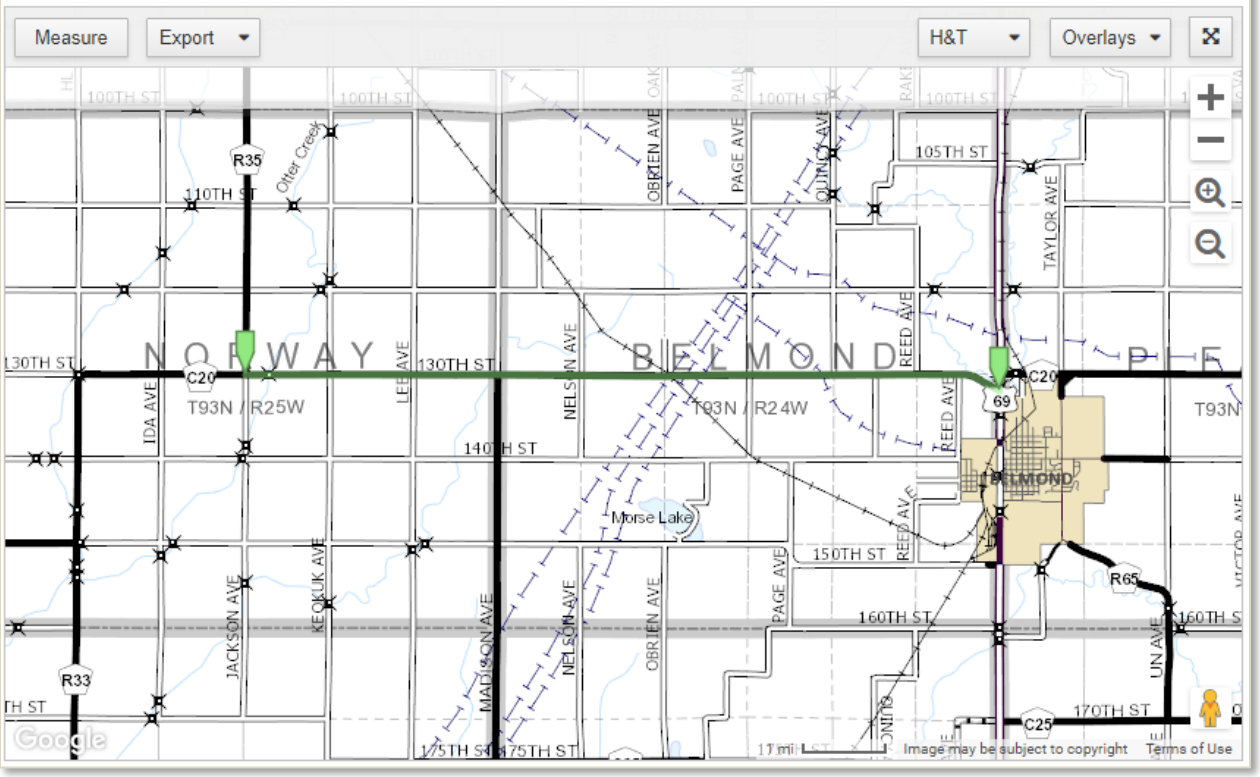


Location

The location shows the written description of the project's location. A map will be included if it is available.

Location

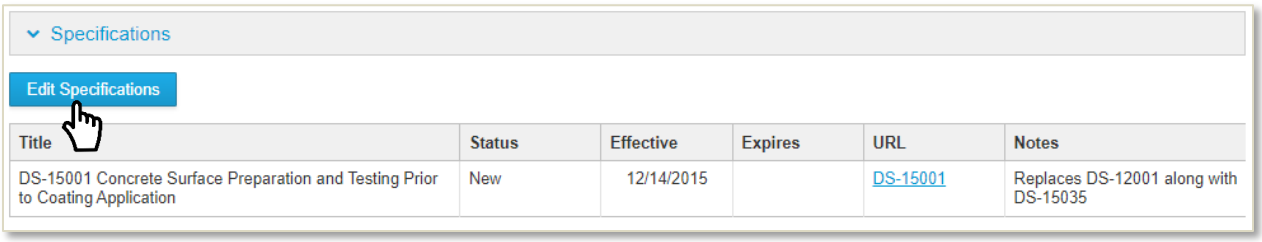
On NELSON AVE, Over IOWA RIVER, from R35 9 miles to U.S. Hwy 69 S21 T93 R24



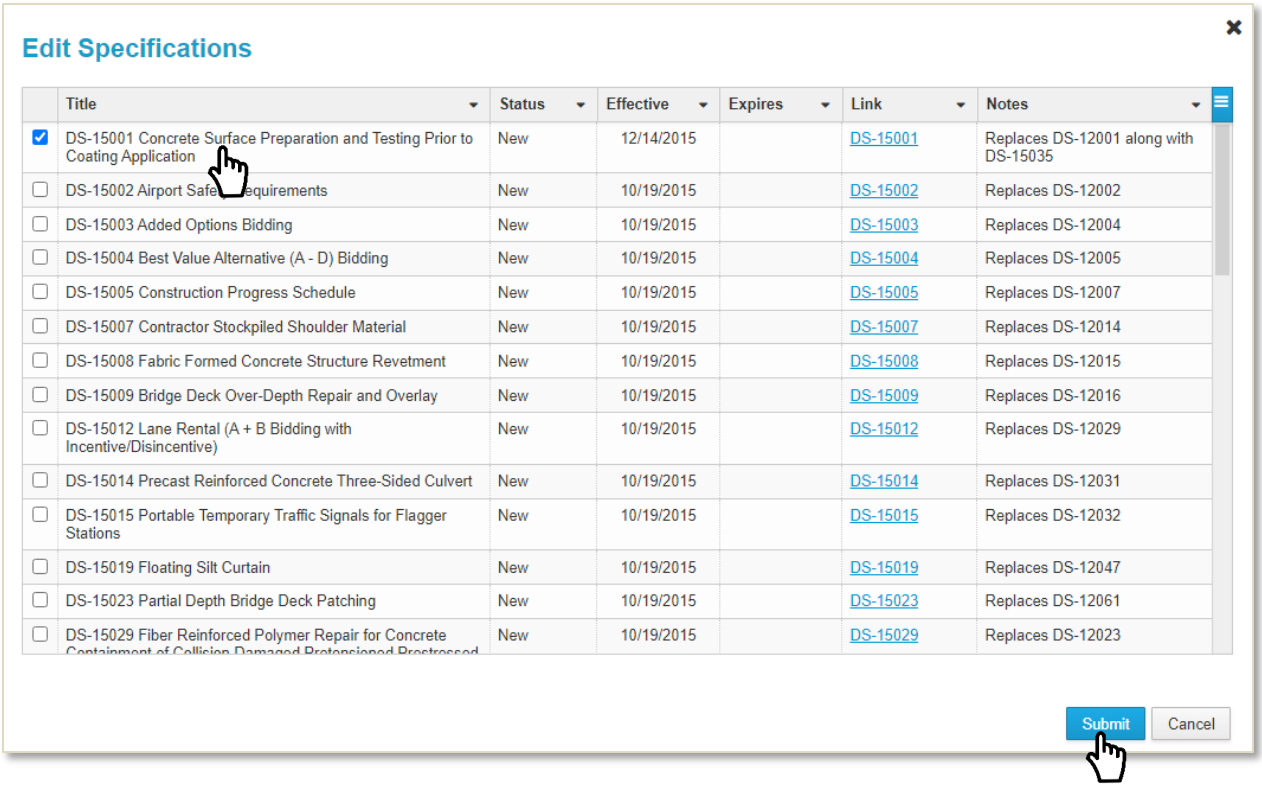
Specifications

Adding/Editing specifications

1. Click “Edit Specifications”



2. Choose specifications and click “Submit”



Bid Items

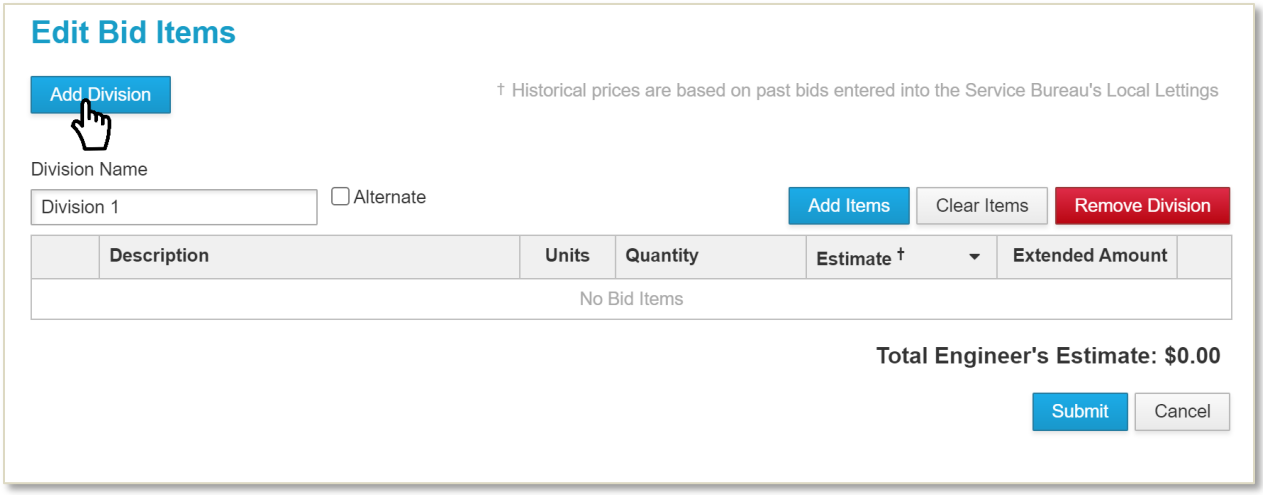
Editing Bid Items

1. Click “Edit Bid Items”

Creating a division

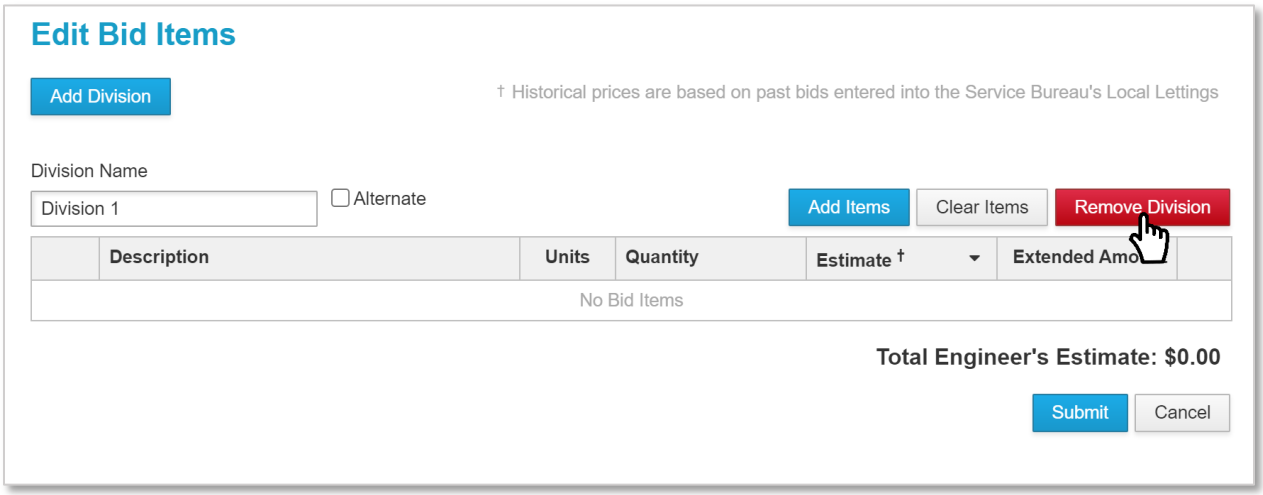
Each division has its own controls to add and remove bid items. There is also an option to name each division.

1. Click “Create Division”



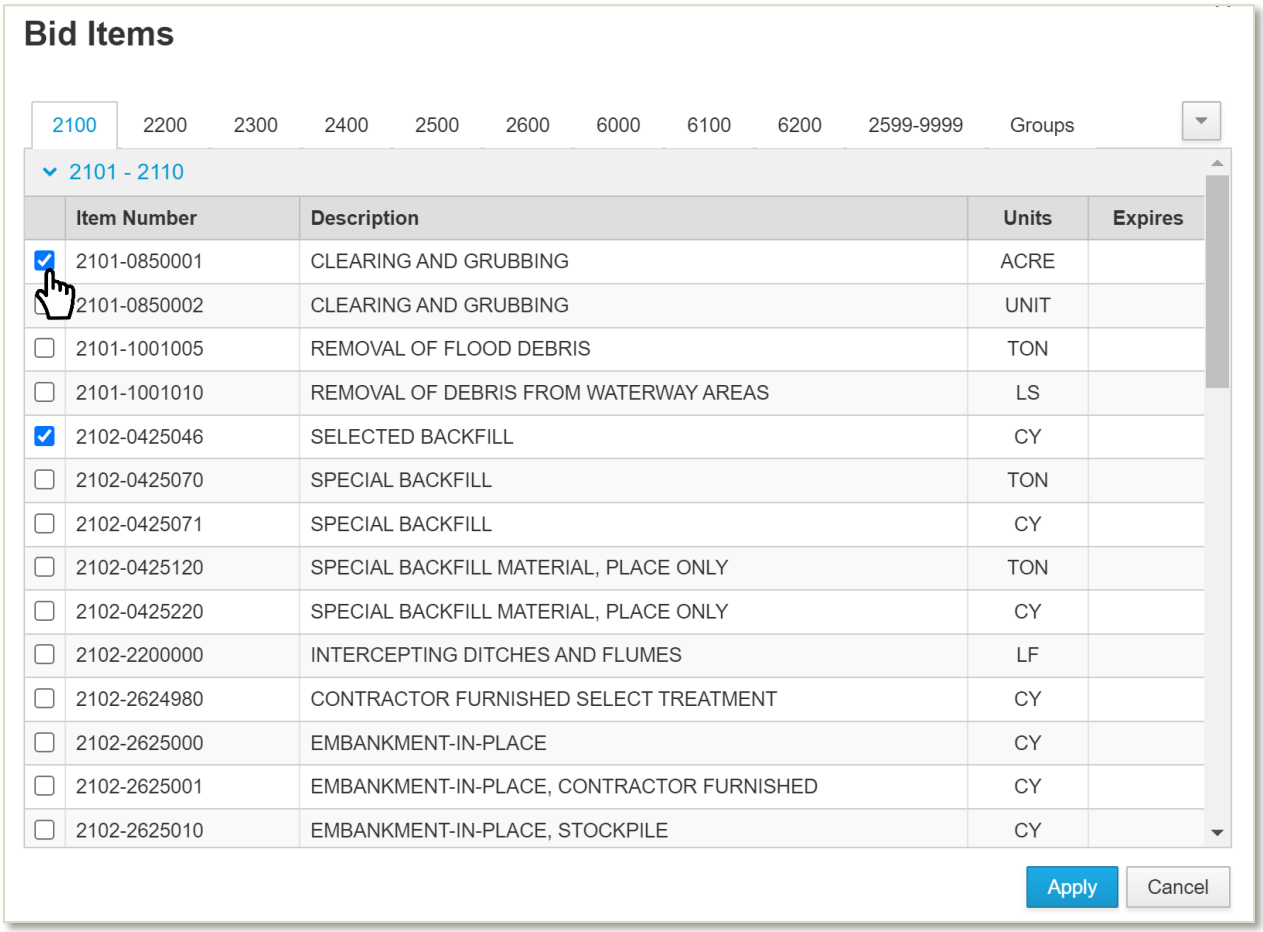
Removing a division

1. Click “Remove Division”

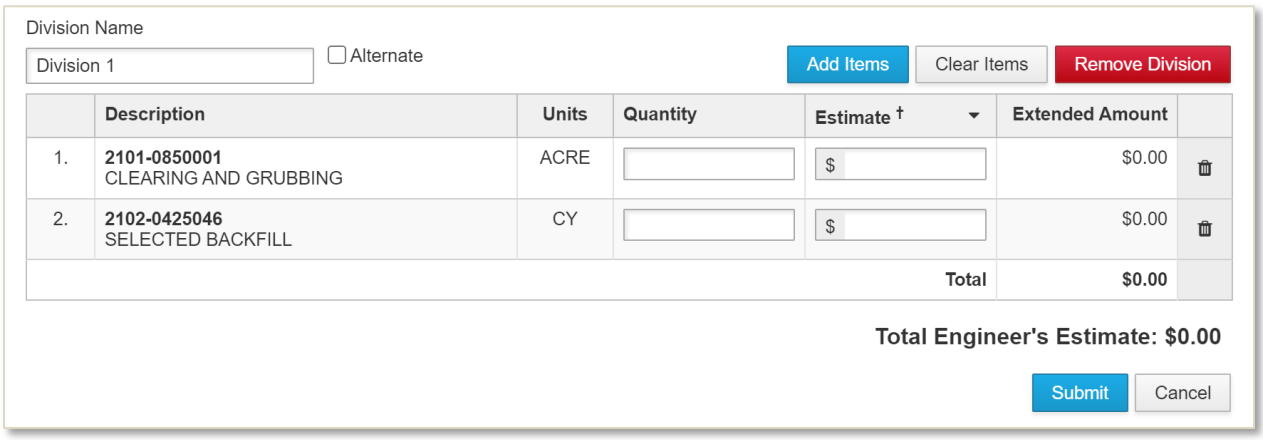


Adding bid items

1. Click “Add Items” for the division being worked on
2. Find bid items using the series group tabs, or search for an item in the search tab
3. Choose each item
4. Click “Apply”



5. Fill in optional quantities and estimates
6. Click “Submit”



Funding

Funding

Source	2021
CHBP (FA)	$220,000
SWAP-HBP (SWAP)	$180,000
Total	**$400,000**

Files

Files can be uploaded by clicking “Upload File”, or they can be dragged into the files area.

Files

Upload File

Supports drag and drop uploads

Name	By	Uploaded	Size	Type
No Files				

Programming

Each program the project has been in is listed under programs. Each of these can be opened for viewing.

Programming

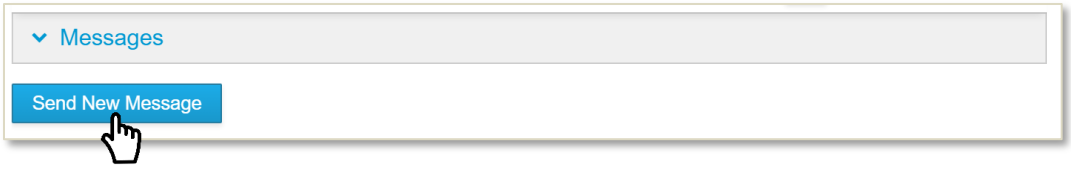
Program	Version	Project Number	Funding
2004 CFYP	0.0	L-B902401--73-55	$60,000
2004 CFYP	1.0	L-B902401--73-55	$60,000
2004 CFYP	2.0	L-B902401--73-55	$60,000
2005 CFYP	0.0	L-B902401--73-55	$60,000
2005 CFYP	0.1	L-B902401--73-55	$60,000
2005 CFYP	0.2	L-B902401--73-55	$60,000
2005 CFYP	0.3	L-B902401--73-55	$60,000
2006 CFYP	0.0	L-B902401--73-55	$60,000
2006 CFYP	1.0	L-B902401--73-55	$60,000
2007 CFYP	0.0	L-B902401--73-55	$60,000
2007 CFYP	0.1	L-B902401--73-55	$60,000
2007 CFYP	0.2	L-B902401--73-55	$60,000

Messages

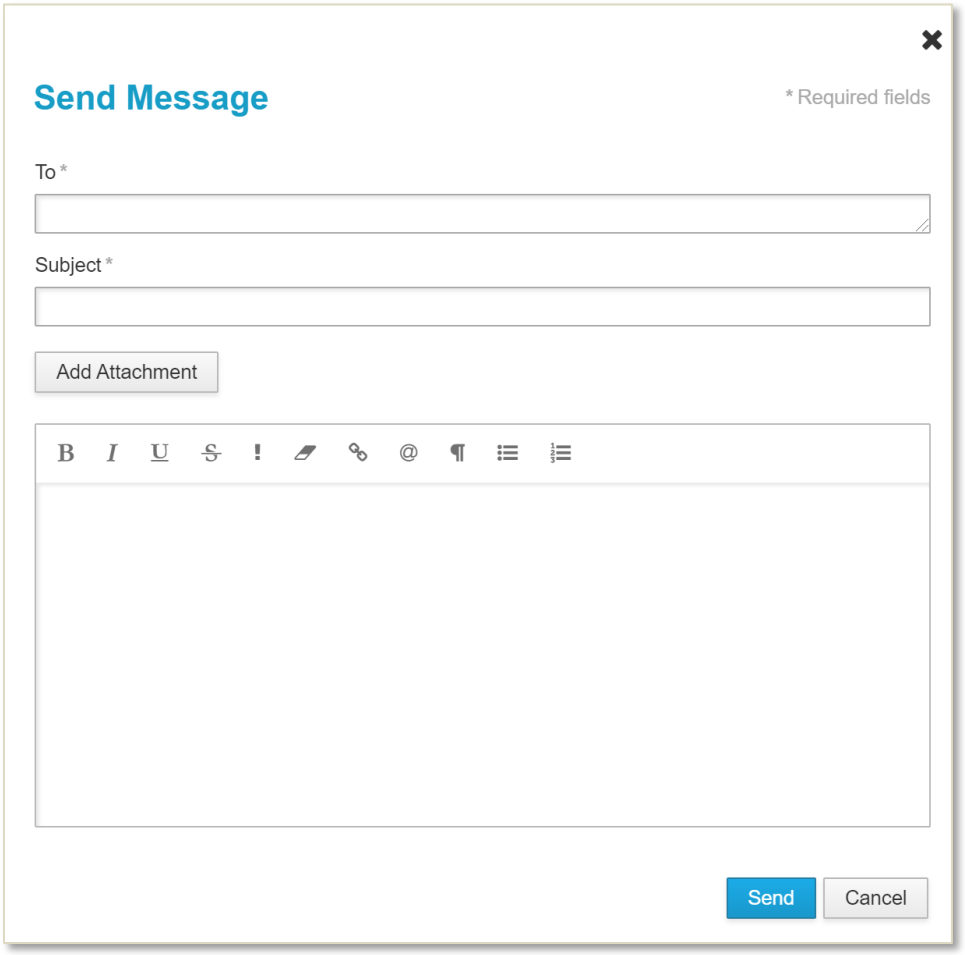
Messages will be sent in an email. They will be displayed in the messages section.

Sending a new message

1. Click on “Send New Message”

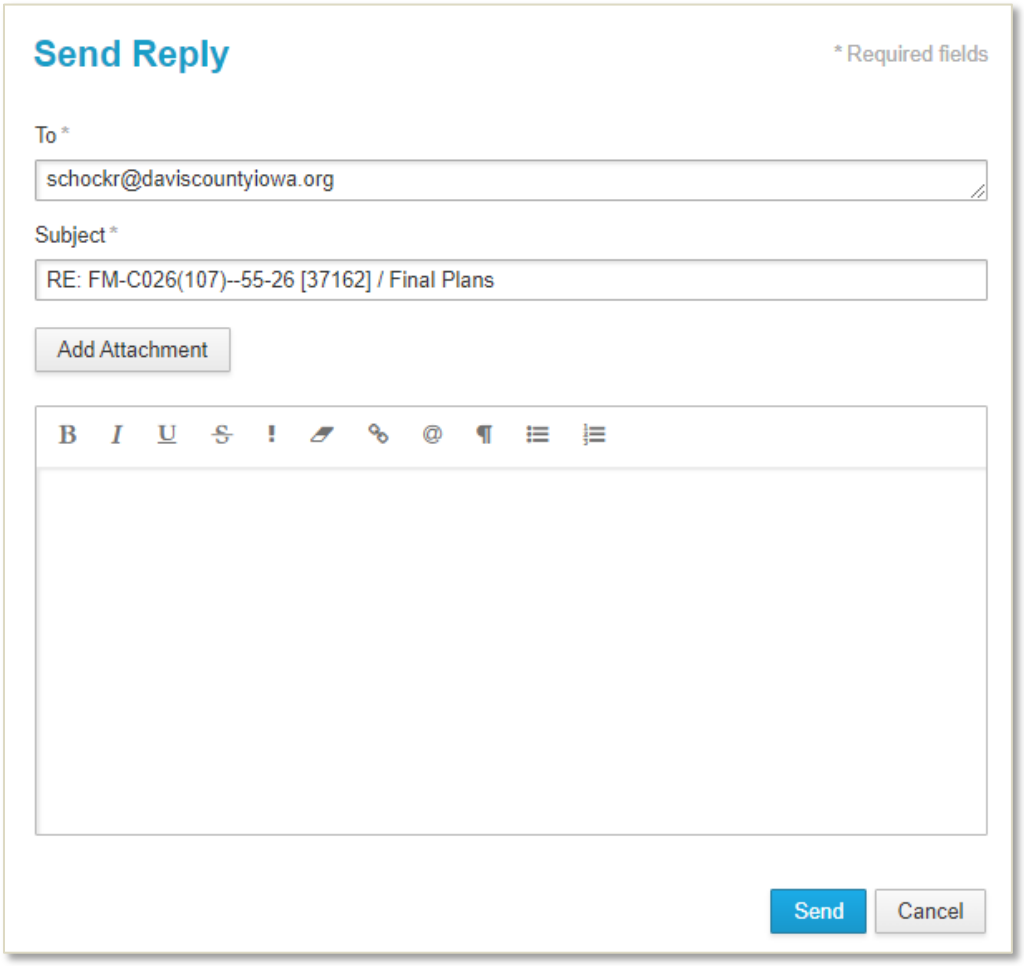


2. Fill out form



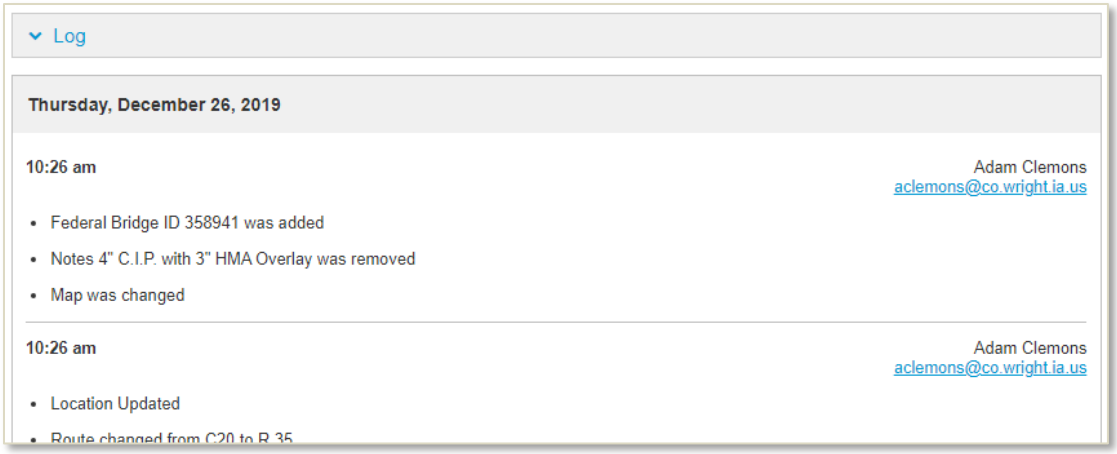
Replying to a message

1. Click “reply” next to the message
2. Fill out the form
    a. “To” and the subject will be automatically filled in



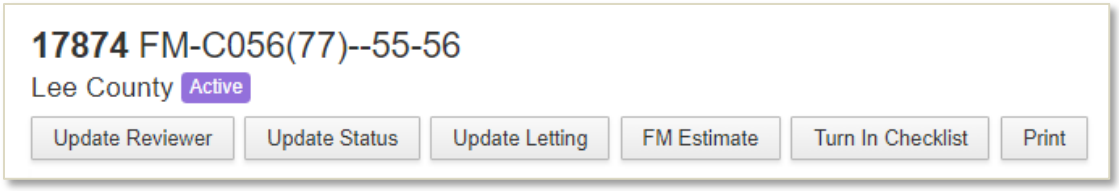
Log

The log shows all changes that were made throughout the project’s life.

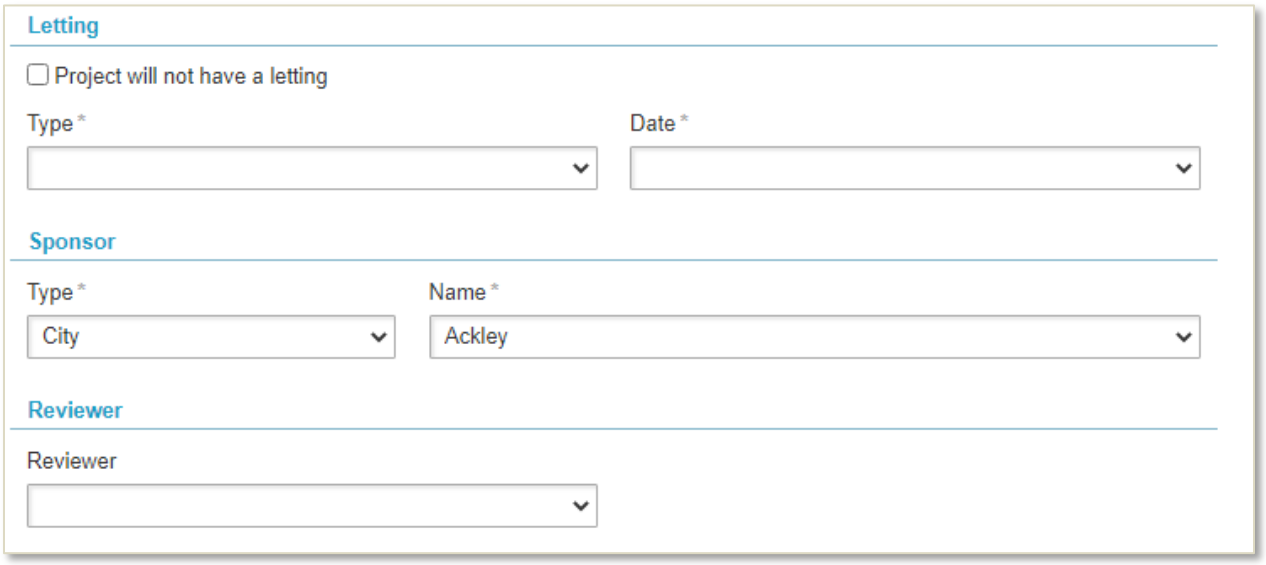


Editing a project

Some of the project’s attributes can be changed using the buttons located at the top of a project’s details. Each button will open a form to fill out. **Each button will only appear if that attribute can be updated.**

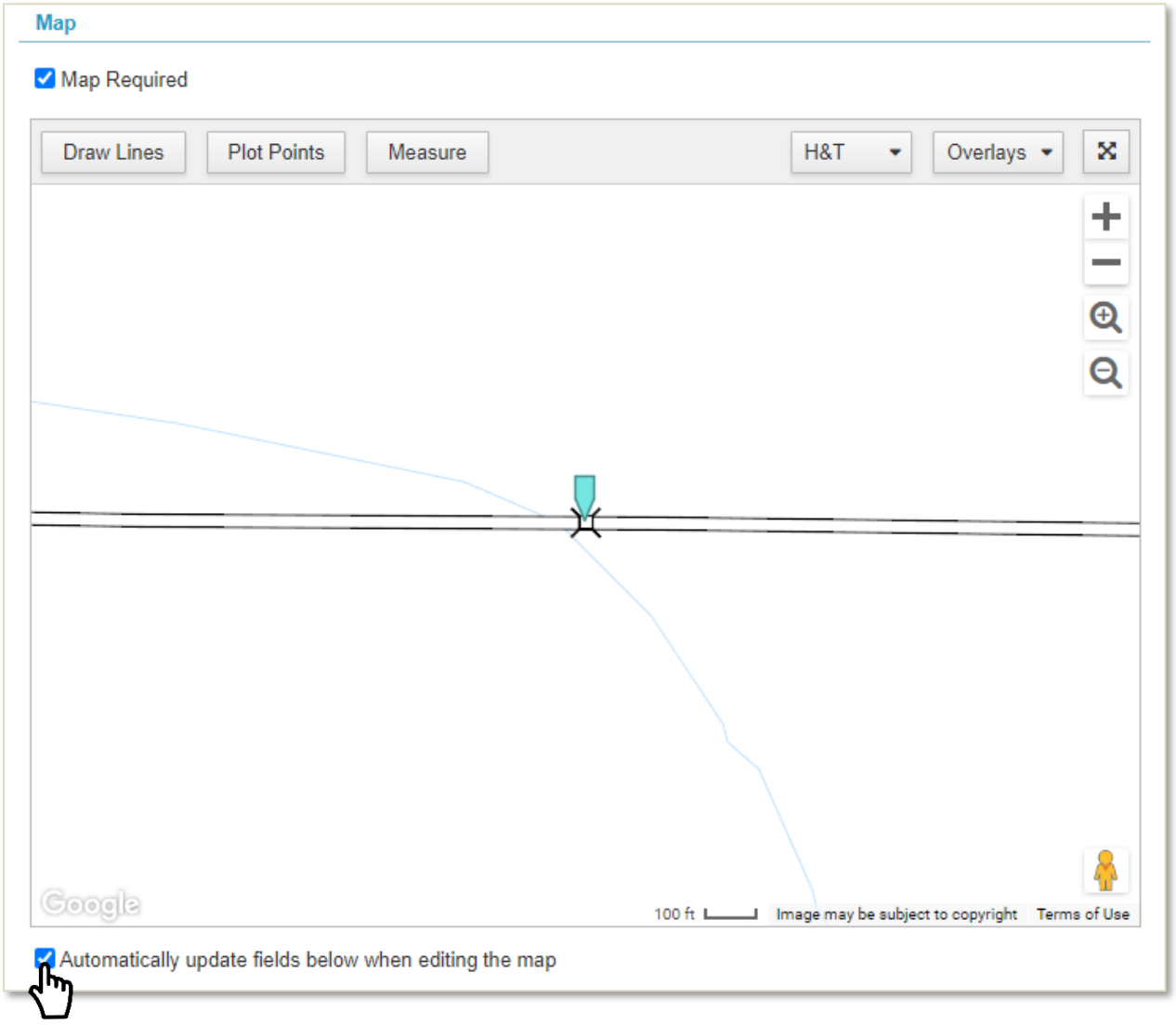


Project letting information will need to be filled in, and based on what type, the reviewer options will change. The sponsor type and sponsor will also need to be filled out.



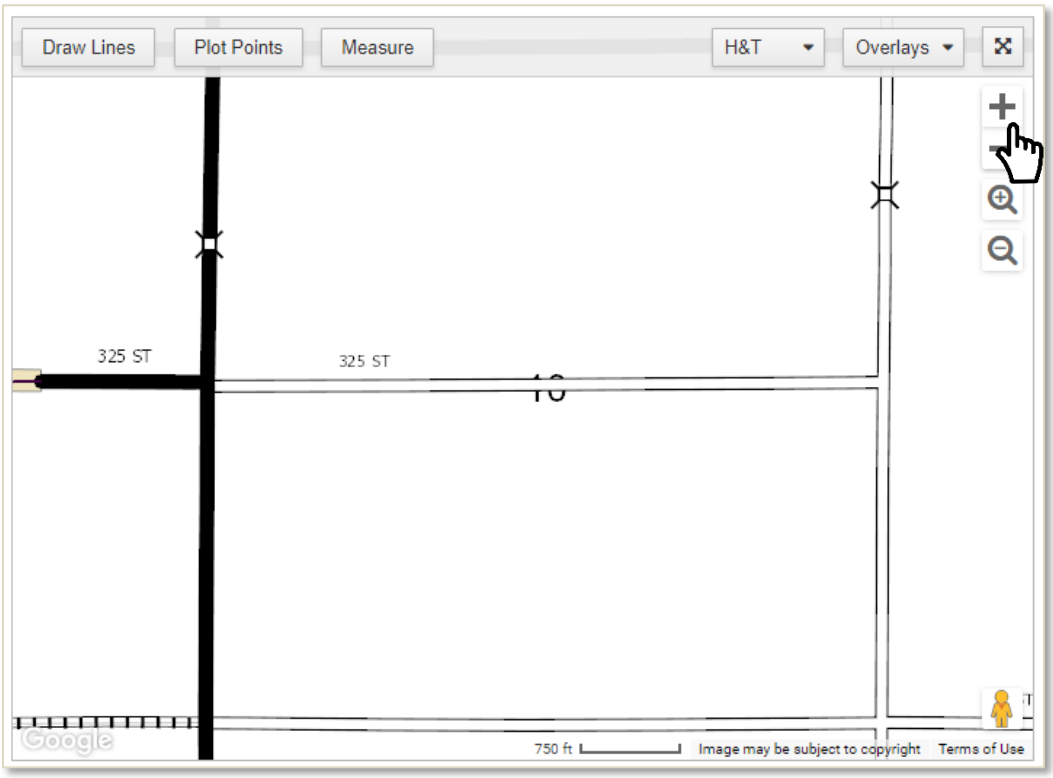
Drawing on the map

Plotting points or lines on the map will update the location fields based on the system data. This can be stopped by unchecking the box labeled “Automatically update fields below when editing the map”.

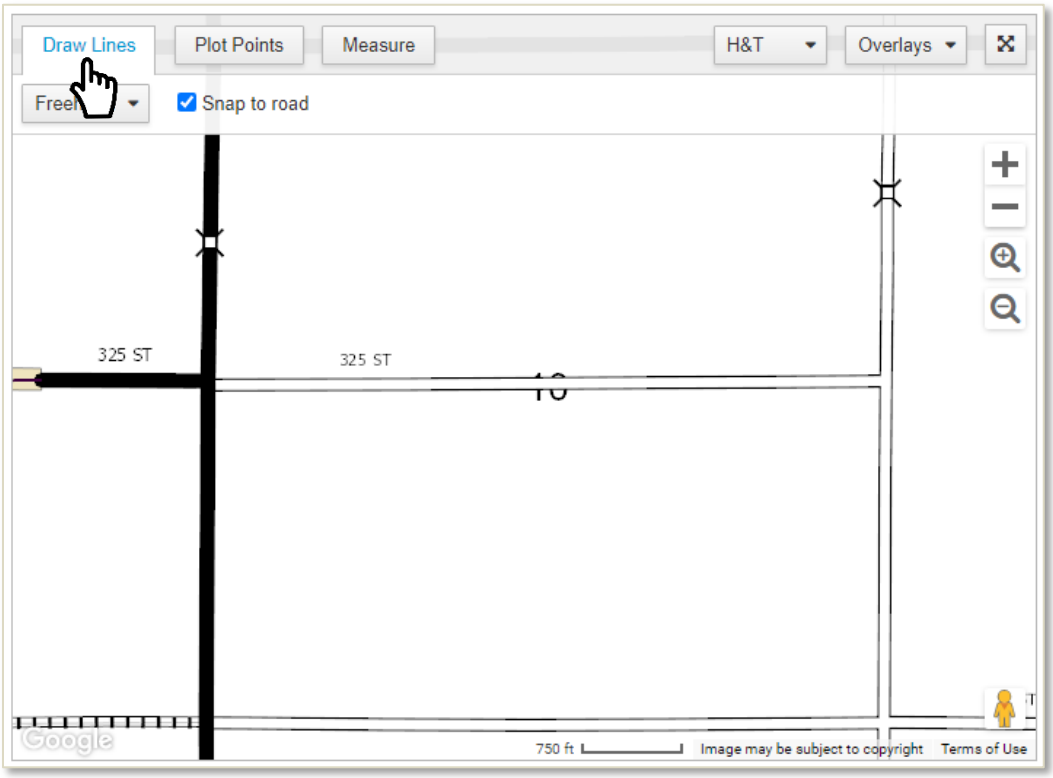


Lines

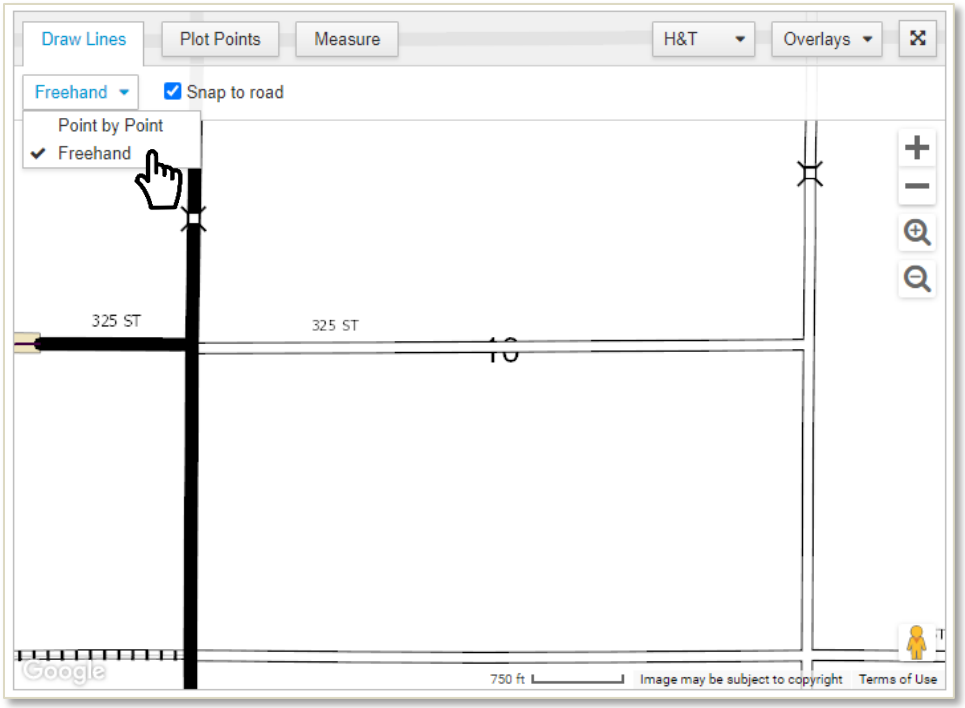
1. Zoom in to the correct location



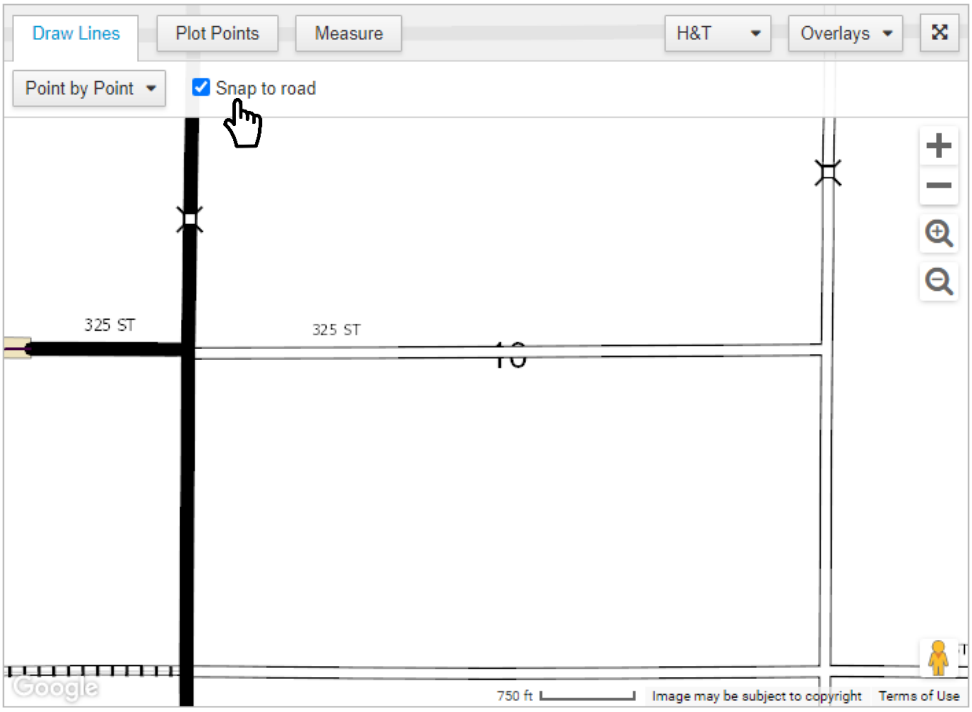
2. Click “Draw Lines”



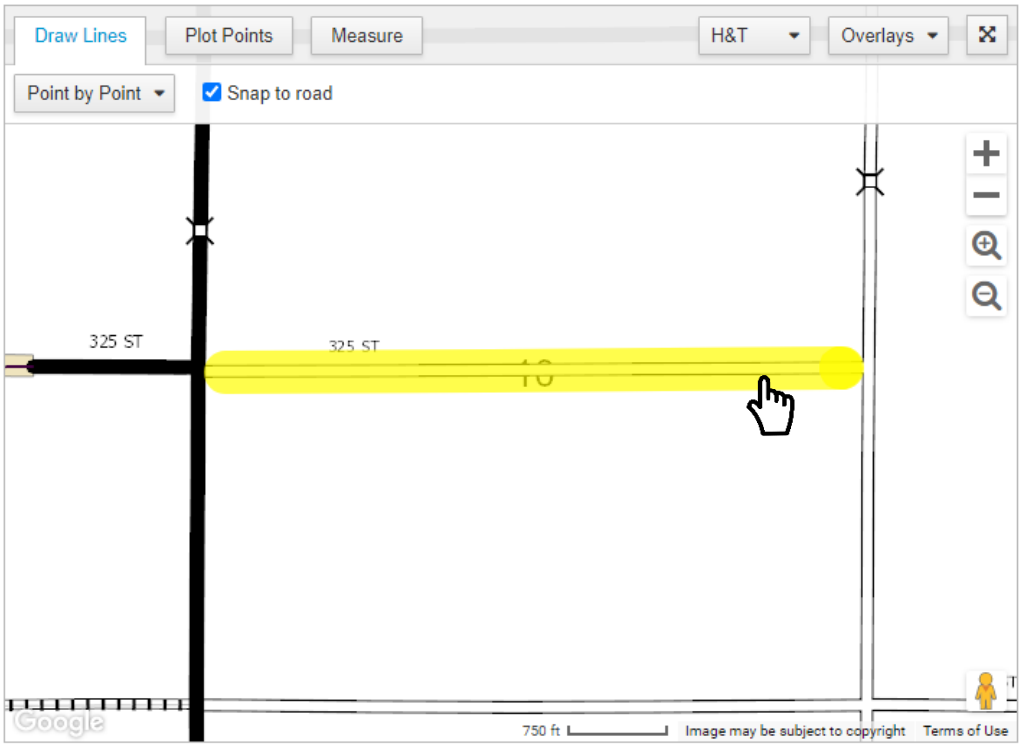
3. Choose drawing mode
    a. Freehand means click and drag your line
    b. Point by Point means click points along your route



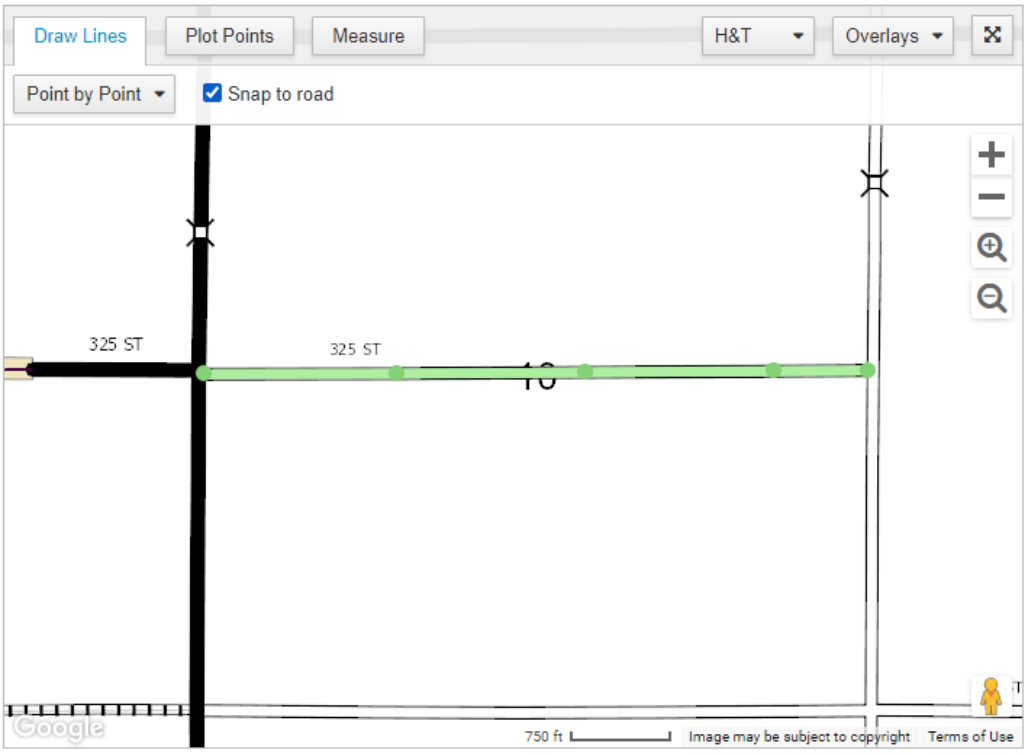
4. Toggle “Snap to road”
    a. If on, the system will make sure your line is on a road
    b. If off, the system will leave your line wherever you draw it



5. Draw the line

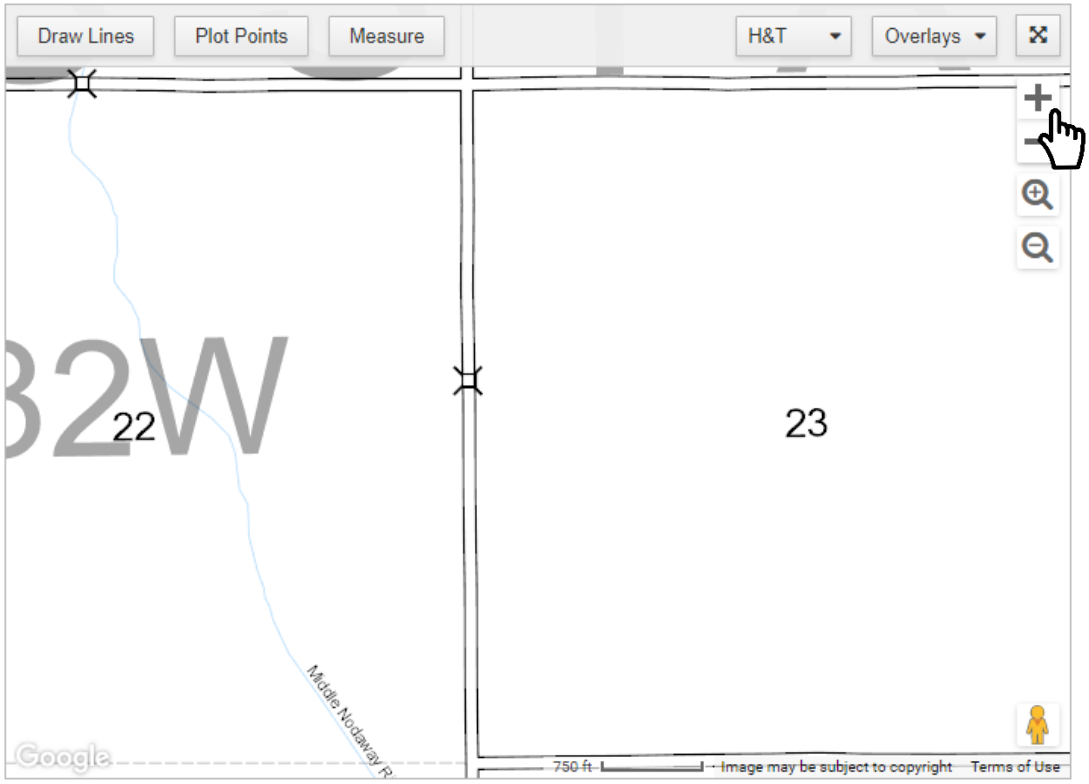


6. Double click to stop drawing

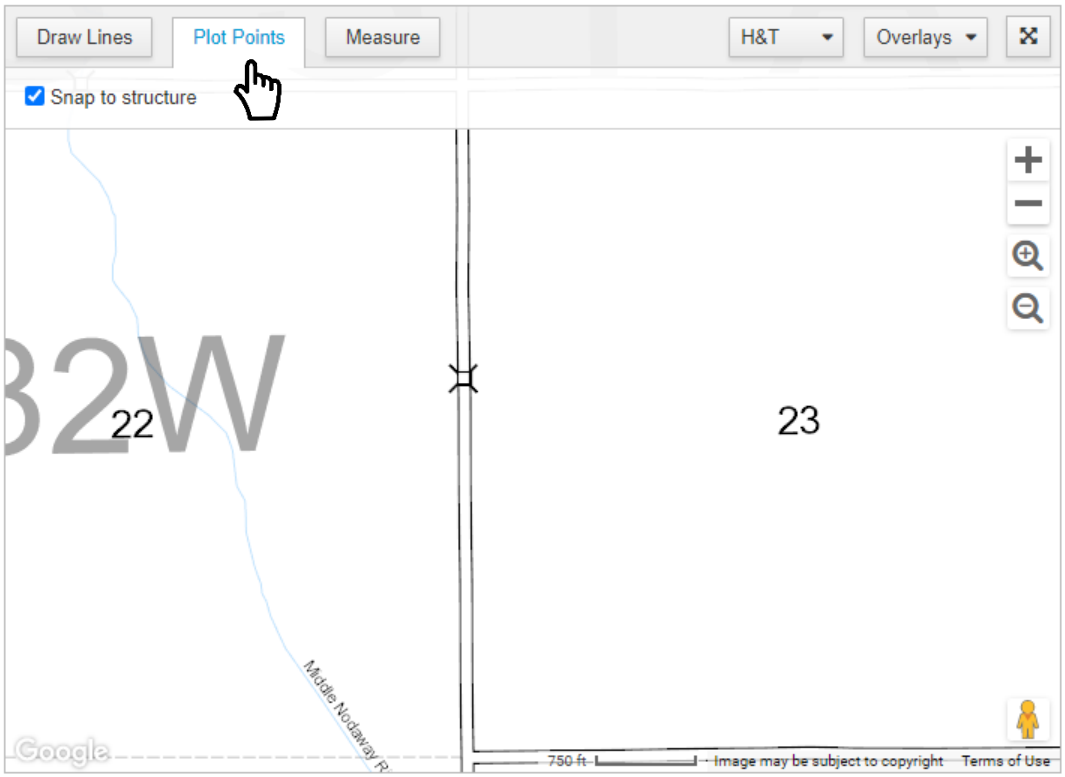


Points

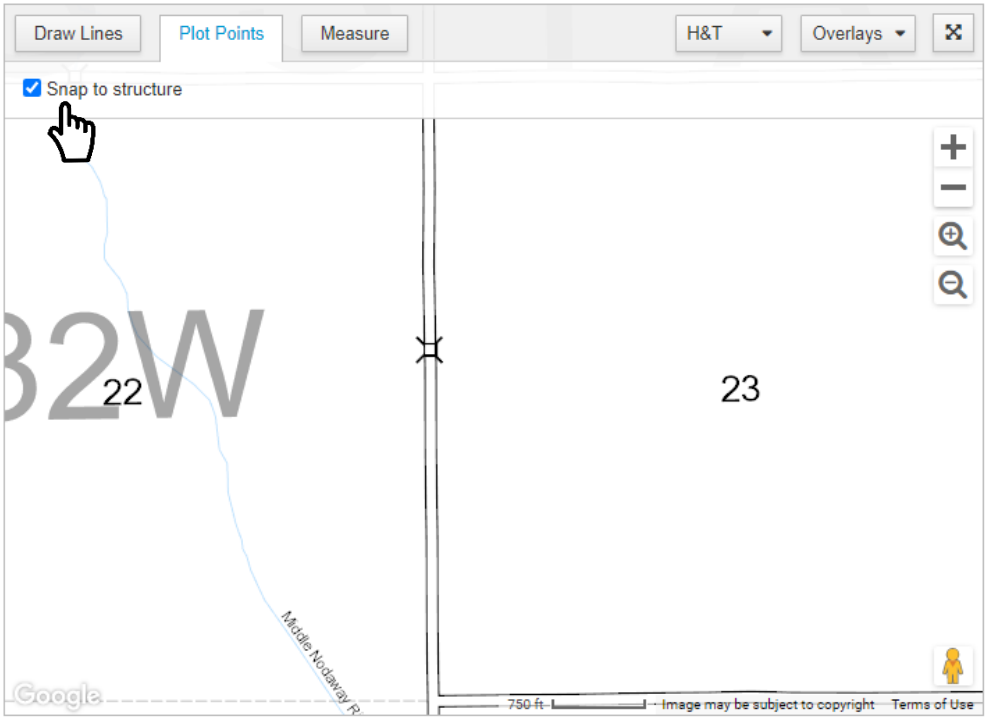
1. Zoom in to the correct location



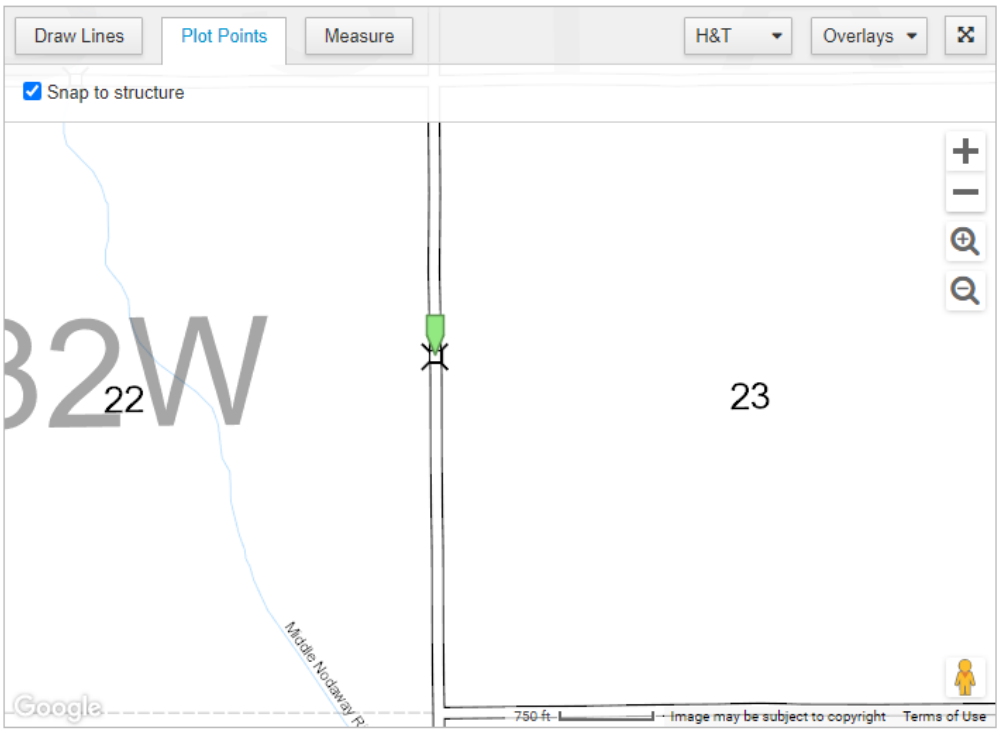
2. Click “Plot Points”



3. Toggle “Snap to structure”
    a. If on, the system will move the point to the nearest structure
    b. If off, the system will leave your point where you plot it

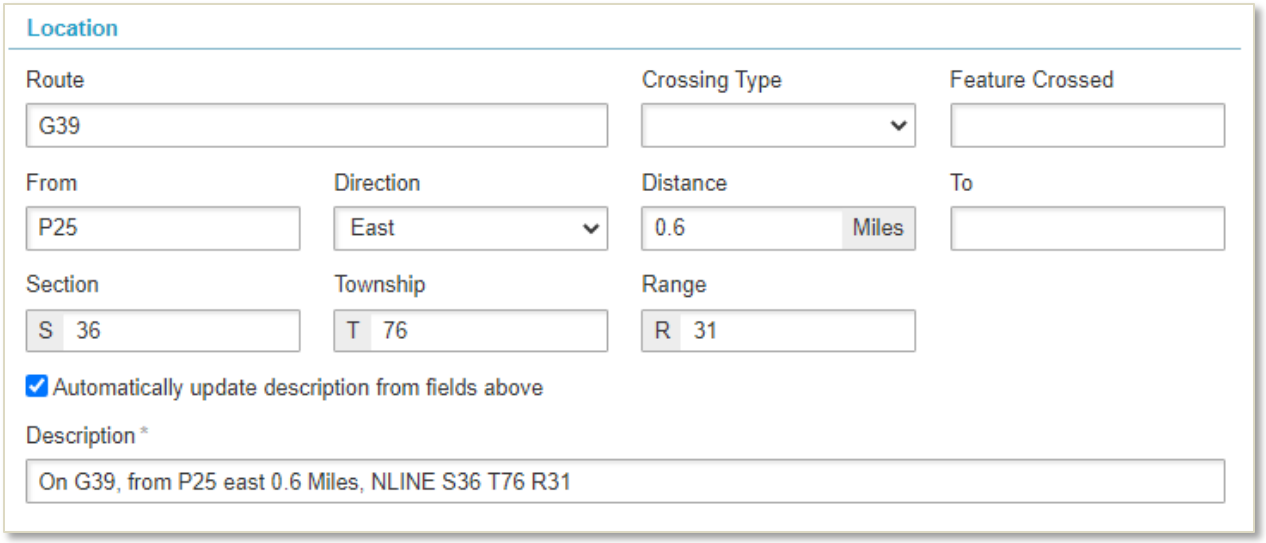


4. Plot the point



Location Description

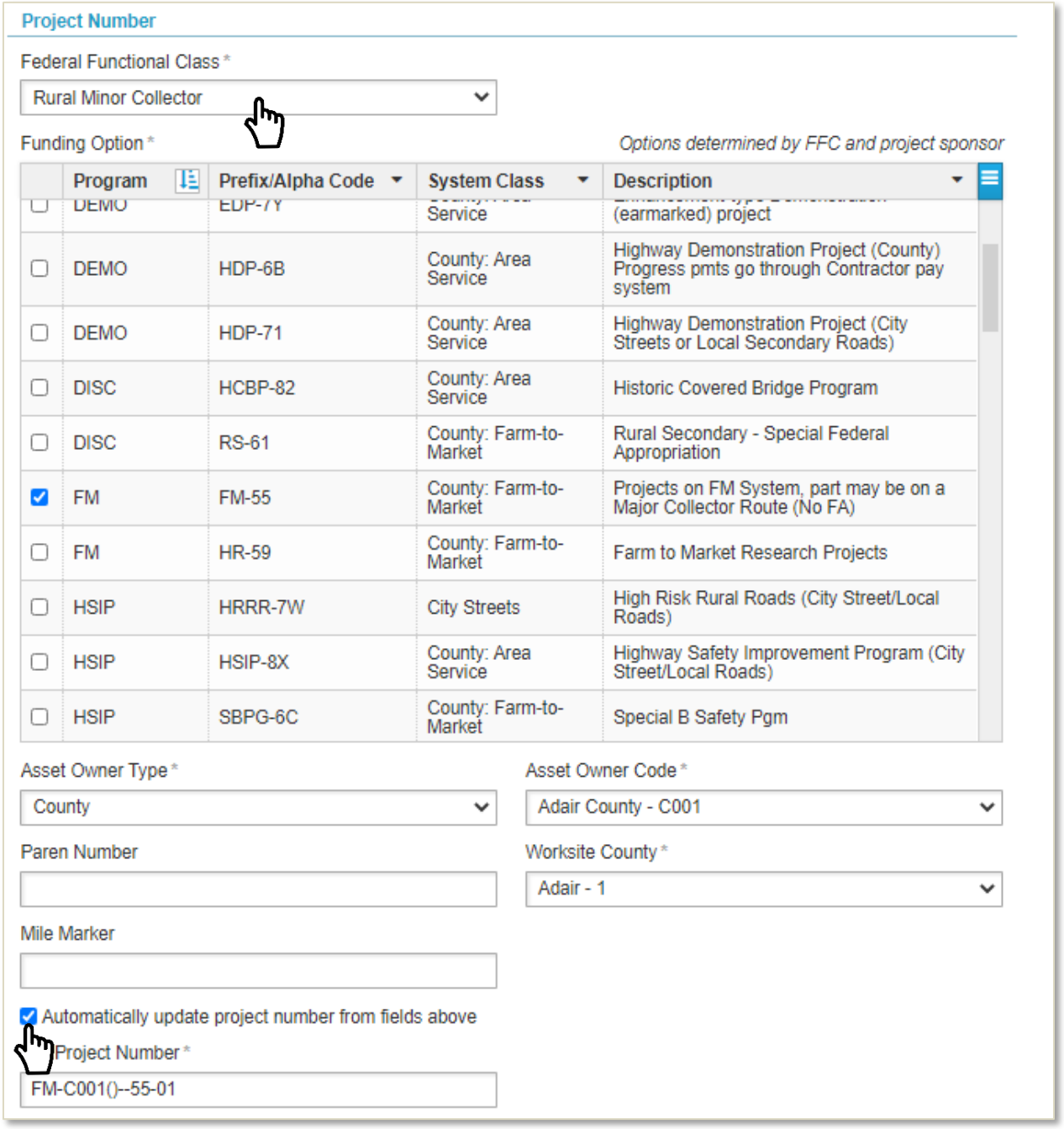
The location description uses a builder to help format the value correctly. This can be turned on or off using the checkbox marked “Automatically update description from fields above”. The builder uses the fields grouped under location to fill in the description.


Location
Route
G39
Crossing Type
Feature Crossed
From
P25
Direction
East
Distance
0.6
Miles
To
Section
S 36
Township
T 76
Range
R 31
Automatically update description from fields above
Description *
On G39, from P25 east 0.6 Miles, NLINE S36 T76 R31

Project Number

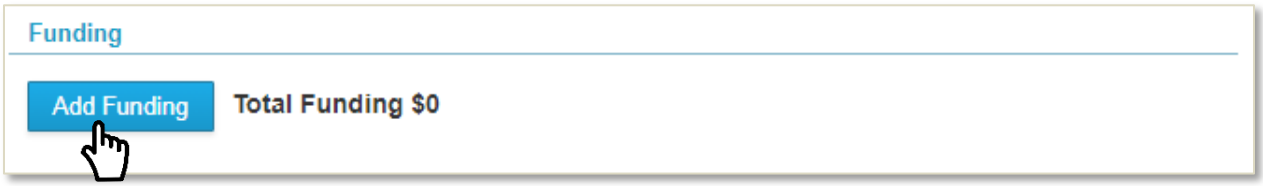
The project number uses a builder to help format the value correctly. This can be turned on or off using the checkbox marked “Automatically update project number from fields above”. The builder uses the fields grouped under project number to fill in the description.

Changing the federal functional class will also change the funding program options.

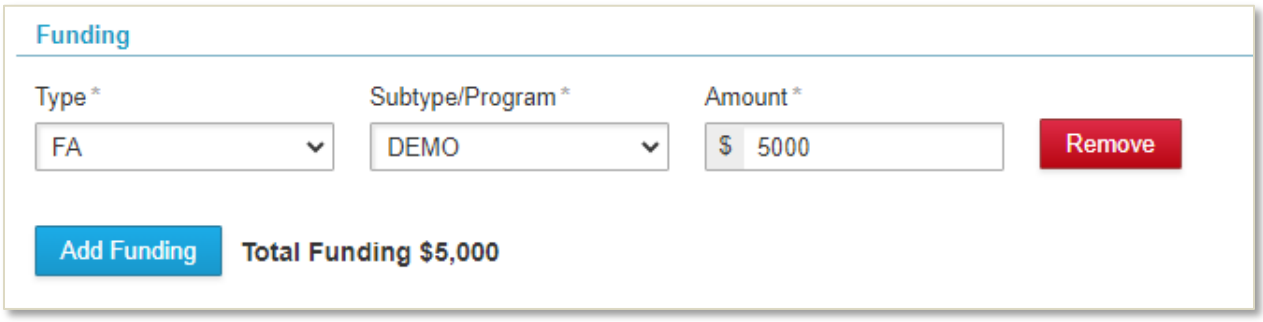


Funding

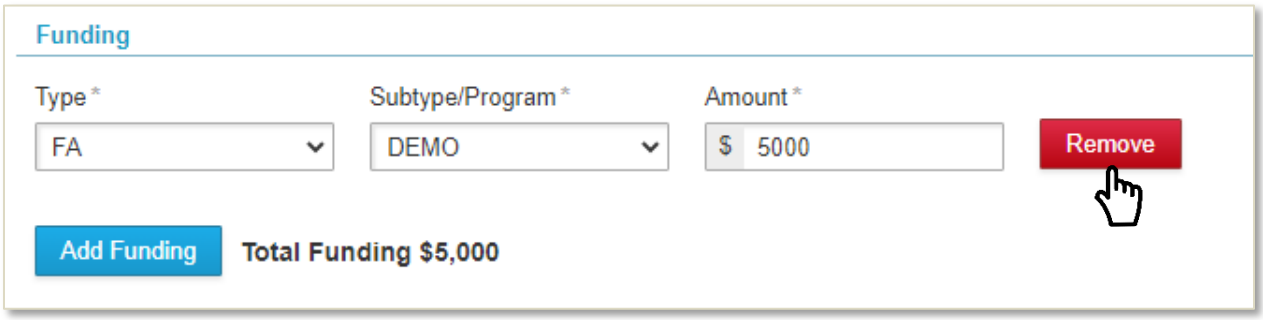
1. Click “Add Funding” to add a line of funding



2. Fill in the year, type, subtype, and amount.



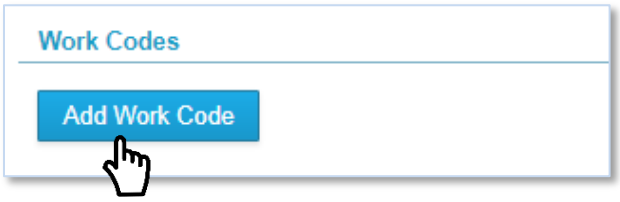
3. Remove a line of funding if needed by clicking “Remove”



Work Codes

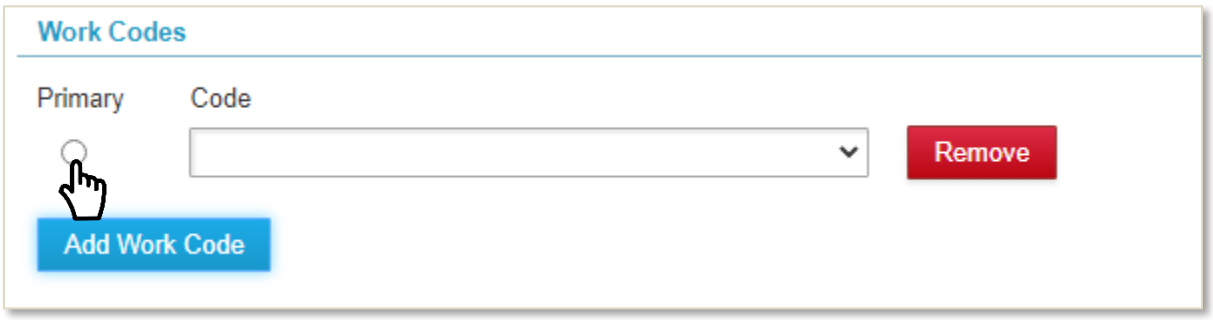
Adding a work code

1. Click “Add Work Code”

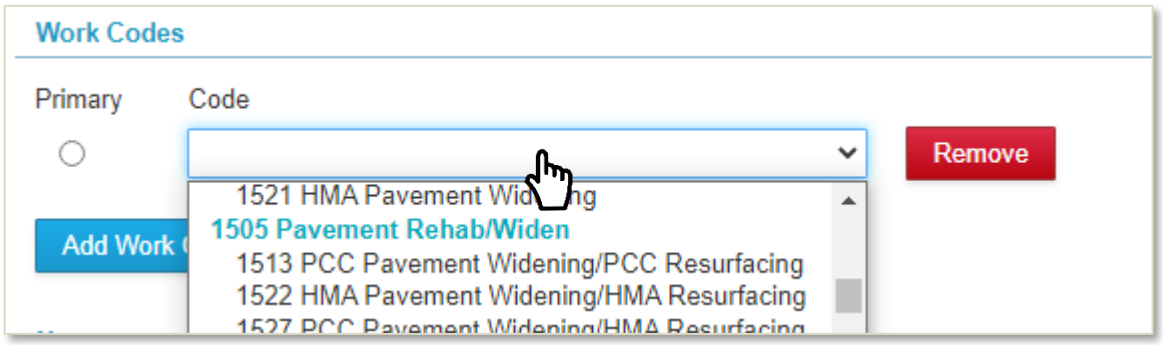


Choosing a work code

1. Choose “Primary” if this is the primary work code

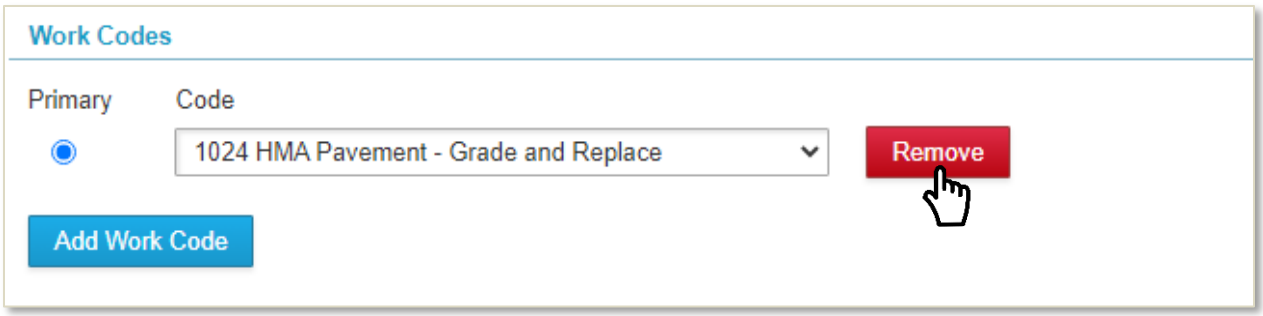


2. Select the code



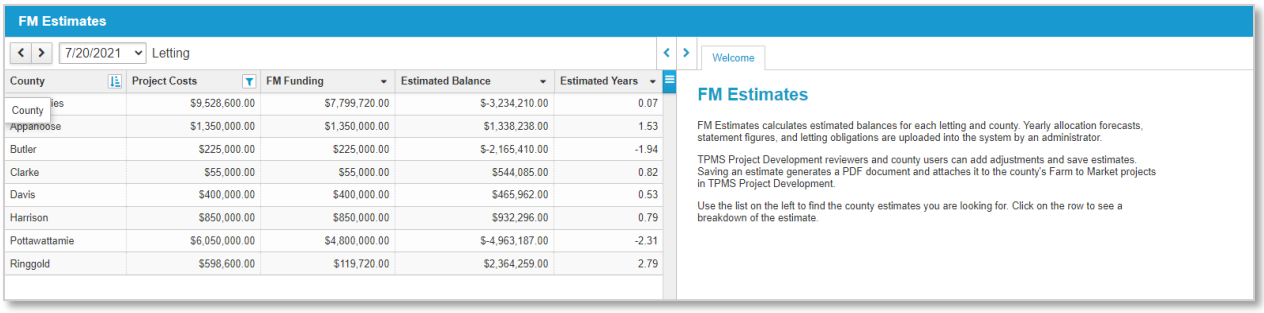
Removing a work code

1. Click “Remove”



FM Estimates

FM Estimates is divided into two main sections. On the left is a list of counties, per letting date. Click on a county in the list to view a breakdown of that estimate.



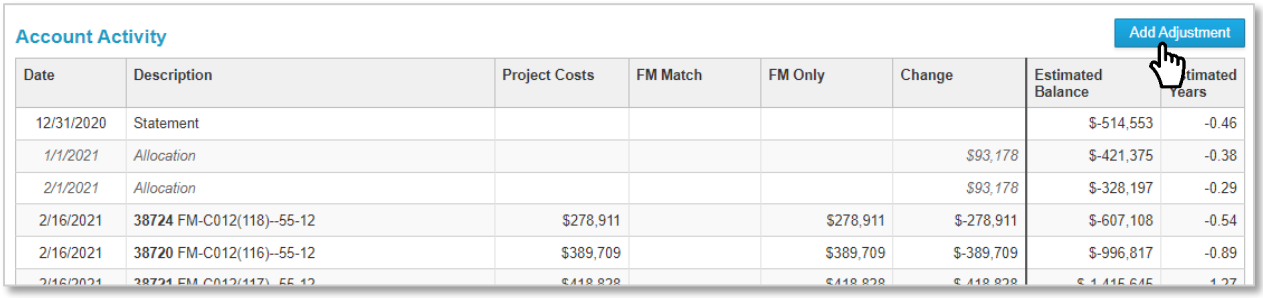
Saving an estimate for a letting

1. Click "Save Estimate"

2. Fill out optional notes and click submit

Adding adjustments

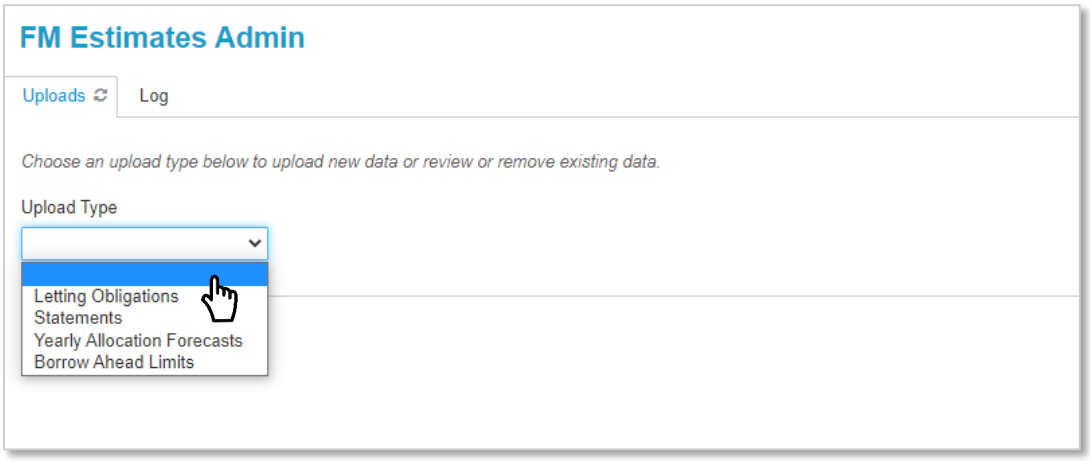
1. Click "Add Adjustment"



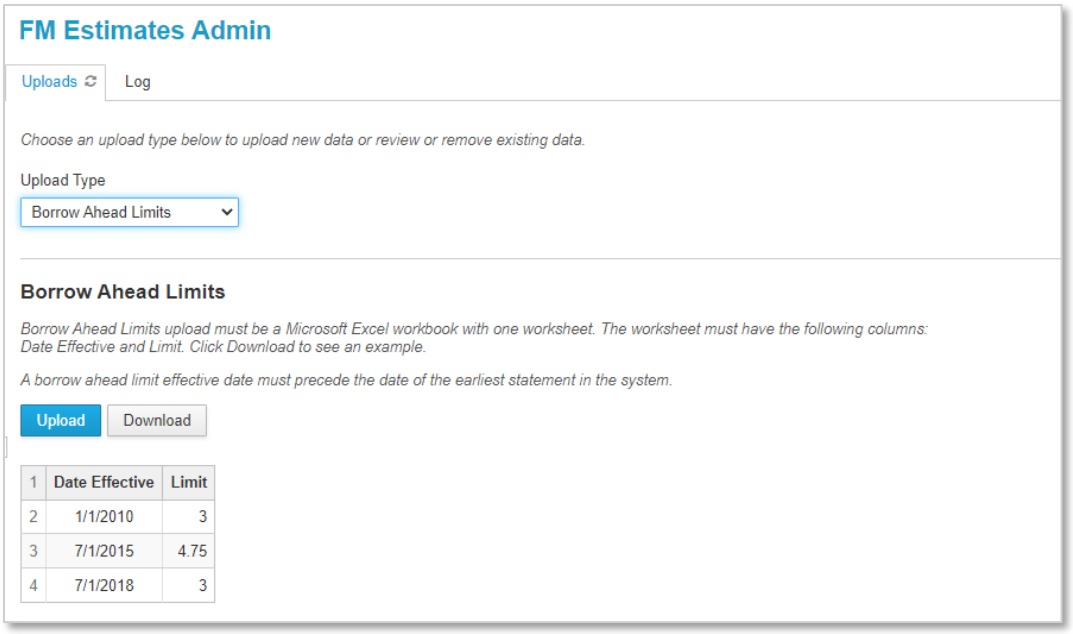
2. Fill out form and click submit

Uploading data (Administrator only)

1. Choose the upload type



   a. If choosing Borrow Ahead Limits, upload an excel file, or download an example



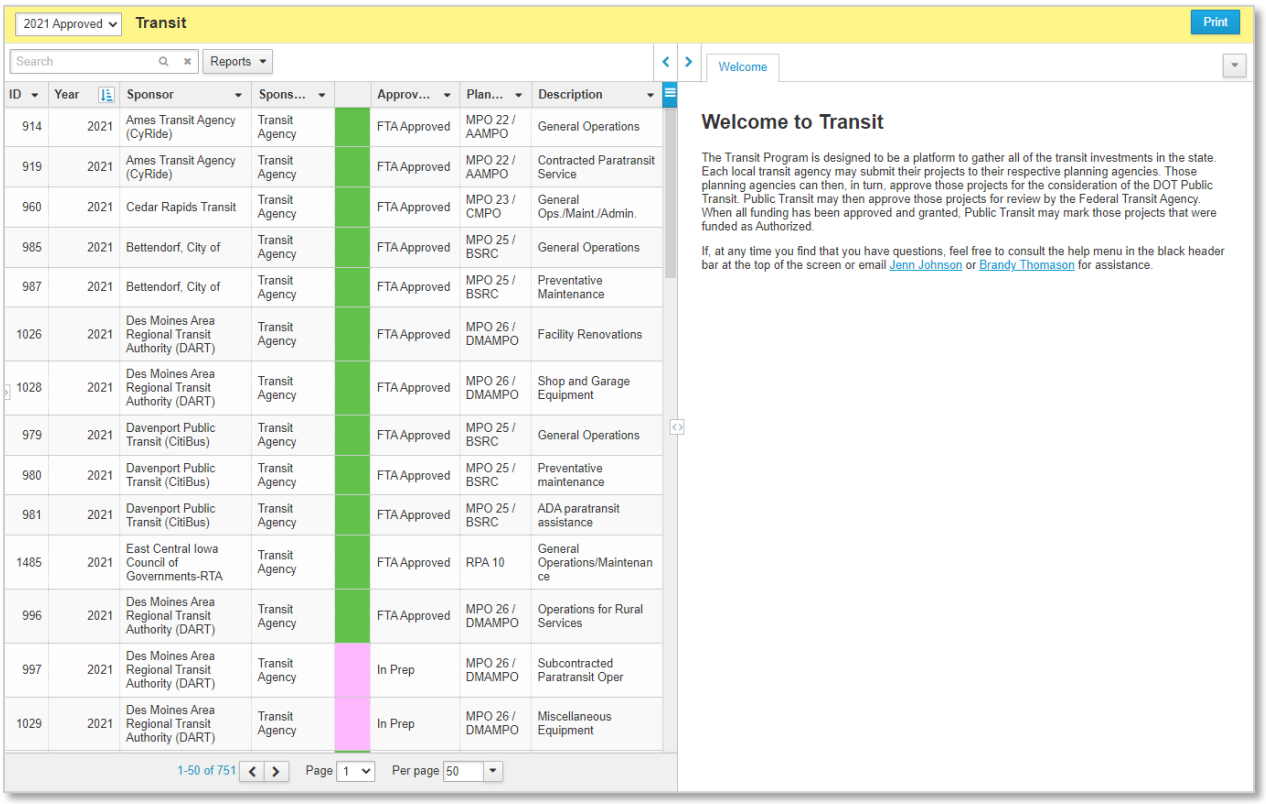
Transit

Opening a transit program

Use the program list to open a program. Once a program is selected, it will open in a tab on the right side of the screen.

Viewing a program

Programs are divided into two main sections, with a title bar at the top. The title bar contains the program year and version. This is also where the button to print the official transit is located. The left side contains the project list, while the right side contains tabs for each project that has been opened.



ID	Year	Sponsor	Spons...		Approv...	Plan...	Description
914	2021	Ames Transit Agency (CyRide)	Transit Agency		FTA Approved	MPO 22 / AAMPO	General Operations
919	2021	Ames Transit Agency (CyRide)	Transit Agency		FTA Approved	MPO 22 / AAMPO	Contracted Paratransit Service
960	2021	Cedar Rapids Transit	Transit Agency		FTA Approved	MPO 23 / CMPO	General Ops./Maint./Admin.
985	2021	Bettendorf, City of	Transit Agency		FTA Approved	MPO 25 / BSRC	General Operations
987	2021	Bettendorf, City of	Transit Agency		FTA Approved	MPO 25 / BSRC	Preventative Maintenance
1026	2021	Des Moines Area Regional Transit Authority (DART)	Transit Agency		FTA Approved	MPO 26 / DMAMPO	Facility Renovations
1028	2021	Des Moines Area Regional Transit Authority (DART)	Transit Agency		FTA Approved	MPO 26 / DMAMPO	Shop and Garage Equipment
979	2021	Davenport Public Transit (CitiBus)	Transit Agency		FTA Approved	MPO 25 / BSRC	General Operations
980	2021	Davenport Public Transit (CitiBus)	Transit Agency		FTA Approved	MPO 25 / BSRC	Preventative maintenance
981	2021	Davenport Public Transit (CitiBus)	Transit Agency		FTA Approved	MPO 25 / BSRC	ADA paratransit assistance
1485	2021	East Central Iowa Council of Governments-RTA	Transit Agency		FTA Approved	RPA 10	General Operations/Maintenance
996	2021	Des Moines Area Regional Transit Authority (DART)	Transit Agency		FTA Approved	MPO 26 / DMAMPO	Operations for Rural Services
997	2021	Des Moines Area Regional Transit Authority (DART)	Transit Agency		In Prep	MPO 26 / DMAMPO	Subcontracted Paratransit Oper
1029	2021	Des Moines Area Regional Transit Authority (DART)	Transit Agency		In Prep	MPO 26 / DMAMPO	Miscellaneous Equipment

Project list

Reports

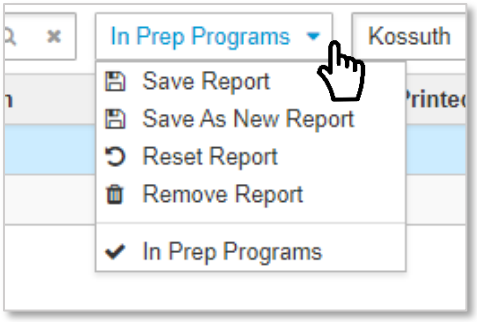
Reports allow you to save multiple layouts of the list.

Saving a report

10. Choose the columns, sort, and filters for the list
11. Click the reports dropdown
12. Click “Save As New Report” to save a new report, or “Save Report” to update your current report with the new changes

Removing a report

5. Click the reports dropdown
6. Click “Remove Report”
    a. This will remove the currently selected report

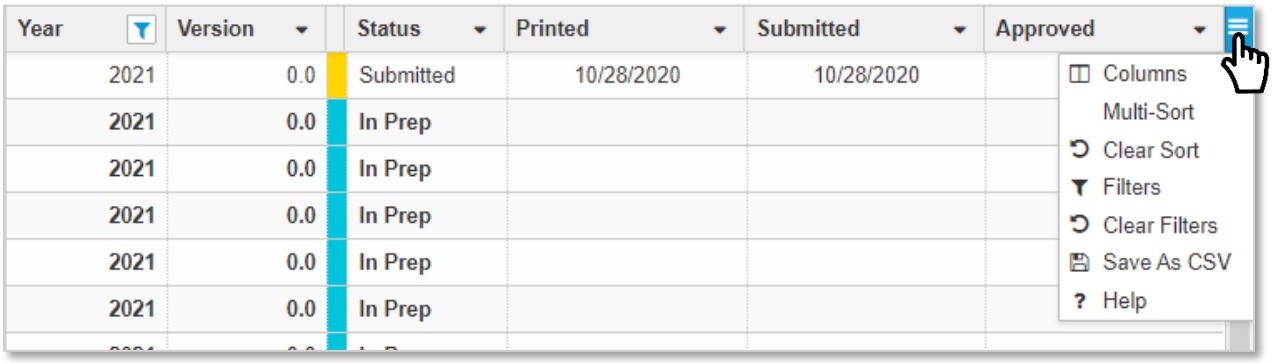


Search

Use the search bar near the project list to find all items that contain the search term.

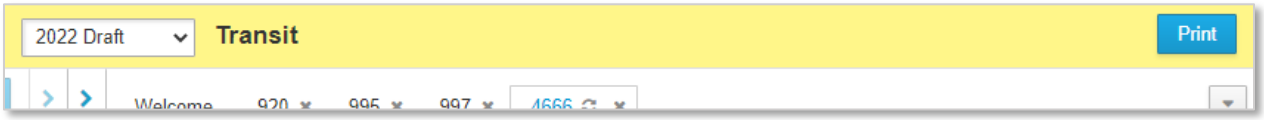
List Menu

The menu is used to change the columns, sort, and filters for the list. There is also an option to print a CSV and view help content for the list.



Printing a program

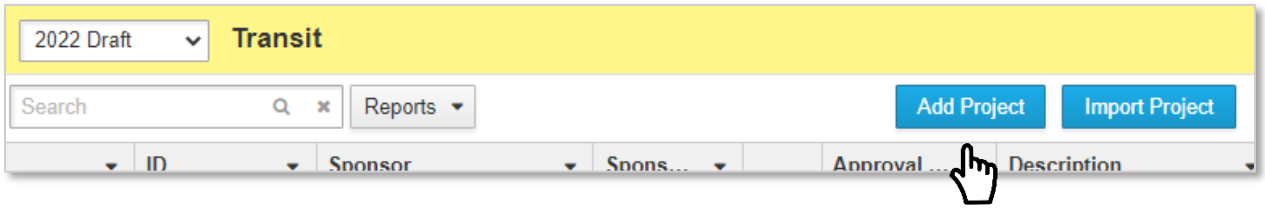
Click on the "Print" button located in the title bar on the right side. This will open a new window where the program will be loaded. **This could take a few minutes.**



Adding a project

Adding a project will add a new project to the program.

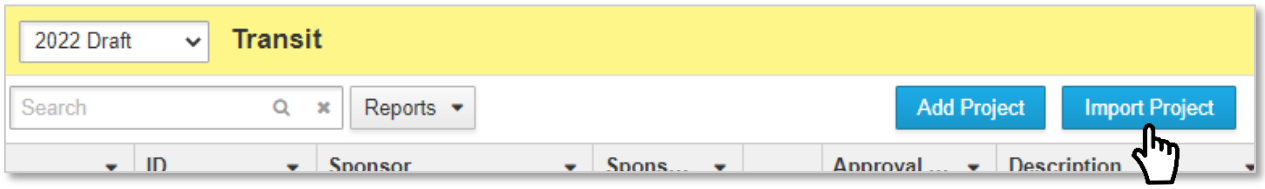
1. Click on "Add Project"



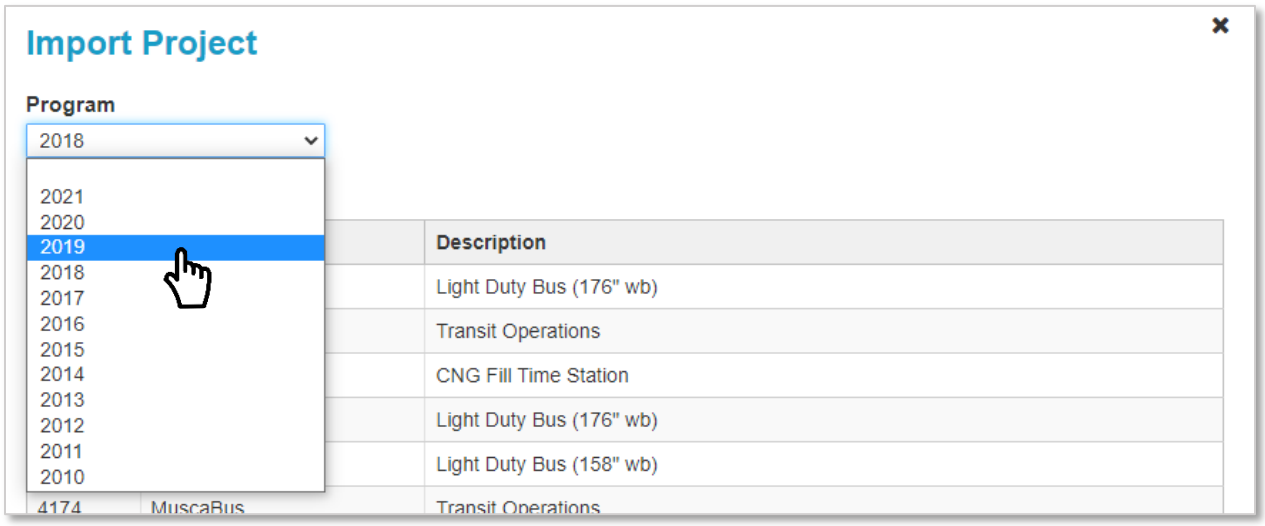
Importing a project

Importing will add a project that has been in a previous program to the current program.

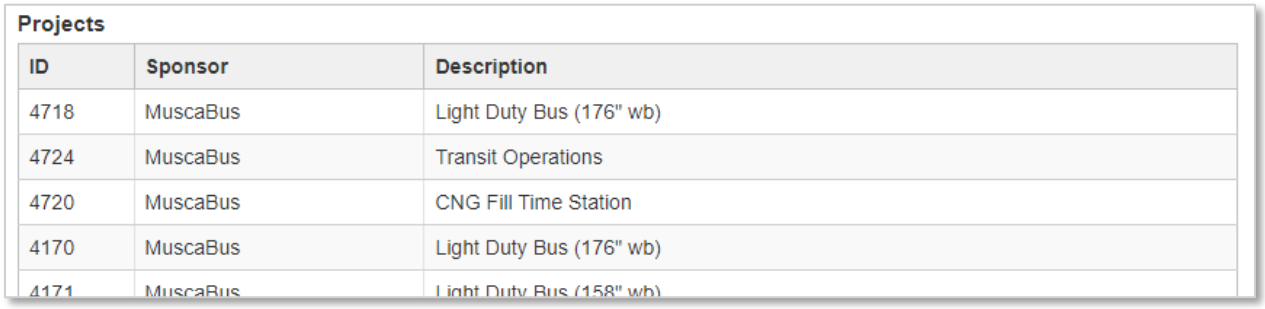
1. Click on “Import Project”



2. Choose a program



3. Choose a project from the list



4. Fill out the project form and click “Submit”

Opening a project

Click a project from the list or map to open it. It will open in a tab, or if it has already been opened, the correct tab will activate.

Viewing a project

All project information will be shown, separated into different sections. These sections can be collapsed and expanded, as well as scrolled to by using the navigation bar.

Details

The basic information of a project is shown in the details.

Details

Project

Approval Level	In Prep
ID	4666
Version	Original
Type	Replacement
Description	Heavy Duty Bus (40-42 ft.)

Inventory Vehicle

Local ID	
VIN	1VHAH3H2526502012
Description	2002 Orion V
Date Acquired	6/23/2003
Year	2002
Active	Yes

Contacts

Planning Agency	MPO 22 / AAMPO
Sponsor	Ames Transit Agency (CyRide)

Funding

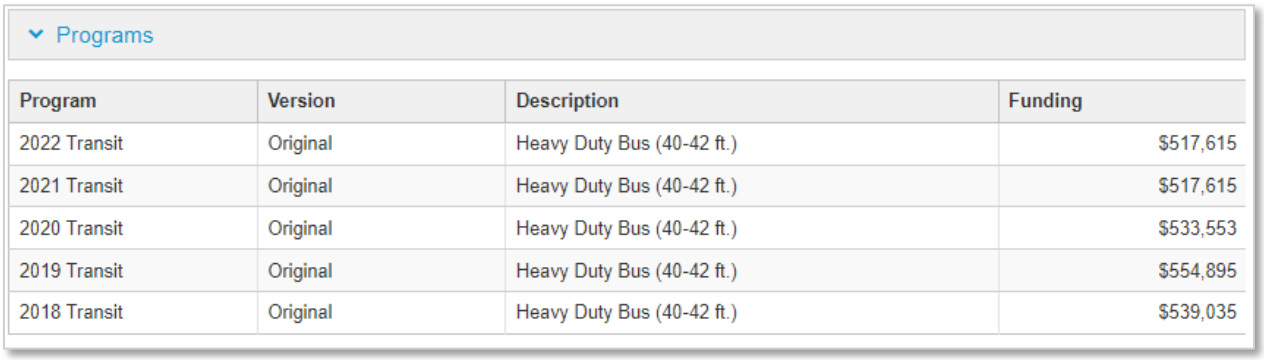
Funding is broken down by source and year.

Funding

Source	2021
CHBP (FA)	$220,000
SWAP-HBP (SWAP)	$180,000
Total	**$400,000**

Programs

Each program the project has been in is listed under programs. Each of these can be opened for viewing.

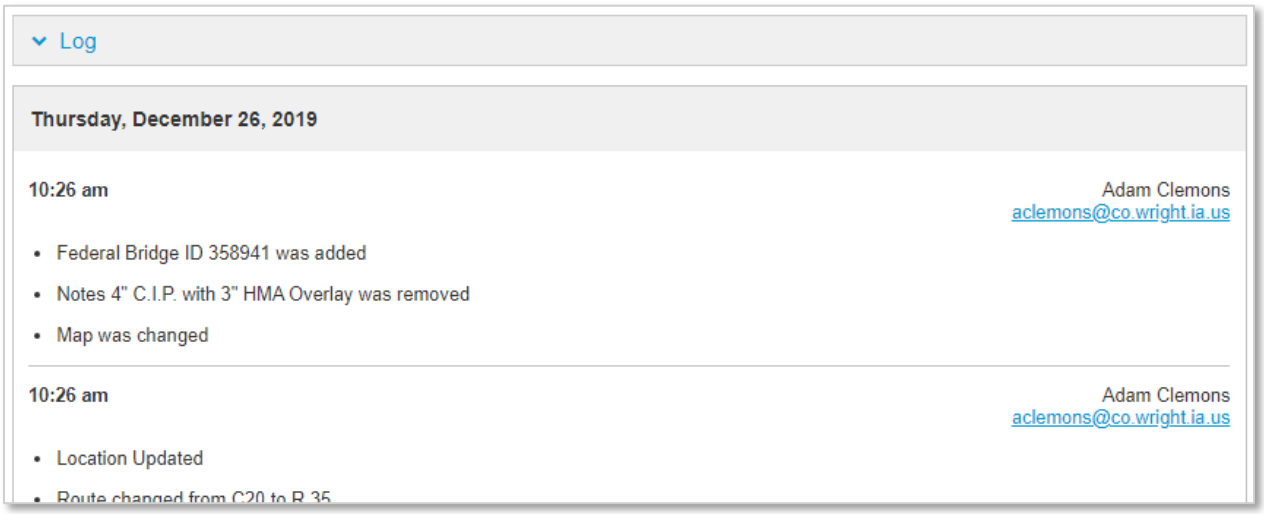


Programs

Program	Version	Description	Funding
2022 Transit	Original	Heavy Duty Bus (40-42 ft.)	$517,615
2021 Transit	Original	Heavy Duty Bus (40-42 ft.)	$517,615
2020 Transit	Original	Heavy Duty Bus (40-42 ft.)	$533,553
2019 Transit	Original	Heavy Duty Bus (40-42 ft.)	$554,895
2018 Transit	Original	Heavy Duty Bus (40-42 ft.)	$539,035

Log

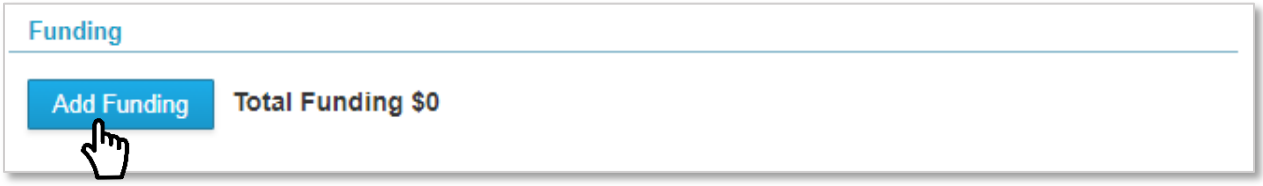
The log shows all changes that were made throughout the project's life.



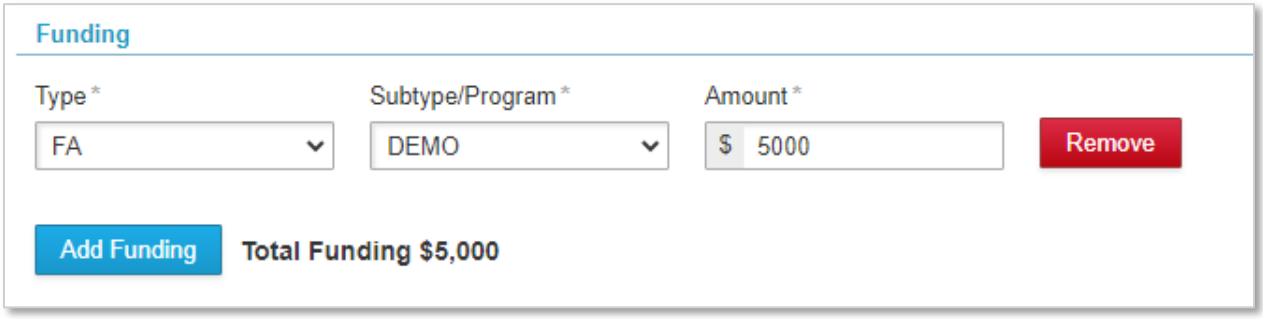
Editing a project

Funding

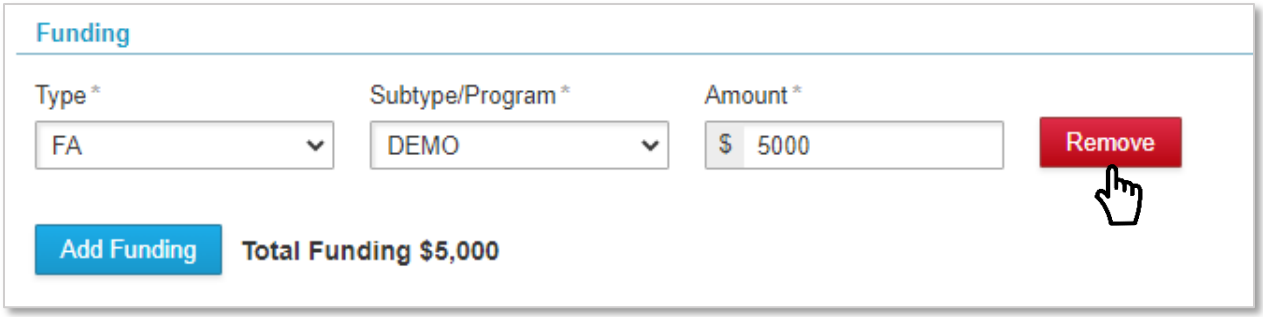
1. Click "Add Funding" to add a line of funding



2. Fill in the year, type, subtype, an n md amount.



3. Remove a line of funding if needed by clicking "Remove"


Funding
Type *
FA
Subtype/Program *
DEMO
Amount *
$ 5000
Remove
Add Funding
Total Funding $5,000

Chapter 4 – Conclusions and Recommendations

TPMS 2020 – Implementation Plan

TPMS 2020 was deployed to begin running on July 7, 2021. It was migrated to the production environment on July 5-6, 2021, after approximately 3.5 years of application development, including 6 months of testing, debugging, and critiquing integrations. There has been ongoing virtual and in-person training sessions, instructional videos, and help documentation published to the ICEASB website. Training will continue to be refined and offered to experienced and novice users alike. The ICEA Service Bureau will host TPMS 2020 on premise, store redundant backups, and provide ongoing user support.

The Service Bureau's system architecture will offer Software as a Service (SaaS) type access, and will allow users no-fee usage, upgrades, and support. Organizations that use this service are the custodians of and will manage their own data. TPMS 2020 is simply the means or framework into which user owned and updated data is placed. Since data owners have the ability to commit, modified, and retrieved data, they alone are the arbiters of what is to be considered official information for their organization. Considering users have sole rights to be the authority of their own data, all public information requests will be referred to the individual project sponsor as the custodian of the data.

Application with Respect to Research Objectives

TPMS 2020 is designed to provide efficient and effective workflow for transportation projects to be submitted and reviewed and ultimately let through the Iowa DOT Contracts and Specifications Bureau. The following list of general business processes are facilitated by the new TPMS 2020 application.

Programming and Budgeting

- County Engineers prepare Five Year Construction Programs and Budgets for review by DOT Local Systems Bureau.
- Local Systems Bureau staff review and approve CFYP and Budgets for each county

STIP Programming

- County, City, and other local agencies submit projects to their MPOs and RPAs for inclusion in the Regional TIP.
- Regional Planning Agency compiles and submits projects to be included in the TIPs, once the TIP has completed the regional planning process.
- The DOT Program Management Bureau combines the regional TIPs to develop the official STIP and prepares projects for FHWA approval.

Development – TPDev

- Project sponsors and designers develop projects and document clearances and milestones.
- Authorizing agencies review and approve each required stage of development.
- All project update data is exchanged with Masterworks PPMS system in real-time through APIs.
- Logs of all project modifications record a documented paper trail.

- Notifications within the application allow communication between project stakeholders.
- Projects completing all required design elements become available to Contracts and Specifications Bureau for inclusion in upcoming lettings.

Farm to Market Balances

- FM funding projections are calculated and tracked to determine funding availability and fiscal constraint.
- Projections start with known quarterly statement balances, estimated monthly allocations, and allowable adjustments to determine compliance with borrow ahead rules for future project lettings.

Transit

- Regional Transit Agencies and Transportation Authorities identify Transit projects and acquisitions to be included in the Transit application. The Iowa DOT's Public Transit Bureau provides technical assistance to urban and regional transit systems and administers federal and state transit grants. Transit projects are compiled in the TPMS Transit application to produce a Transit Report for review and acceptance by the Federal Transit Agency.
- The Federal Transit Administration authorizes the Transit Report.

Objectives Satisfied by Feature-Rich Environment

The features described below have been built in to TPMS 2020 to enhance the user experience, provide data transparency, and satisfy some of the predefined objectives of this research.

Responsive

All TPMS modules have been designed to be used on a variety of devises. Responsive screen frames adjust to allow viewing on various sized screens and different devises. For small screens, the default settings show the most pertinent information. Users can expand, contract, or resize the panels on any given device to fit the screen and view desired information.

Custom Resizing

Since the majority of system use will likely be on a desktop devise, it was thought to allow full access to program and project information through a selection menu, customizable by the user. The tri-panels layout allows maximum data viewing, but each panel can be collapsed or expanded as desired. Project details are viewed in expandable/collapsible bars allowing quick access and isolation of data.

Selection Menu

A selection menu allows sorting and filtering of desired data in order to isolate and display information. The menu allows users to select as many available data columns as they would desire to display. Selected data can also be exported to CSV file format by accessing "save as CSV" in the selection menu.

Reports Feature

Once a user has customized a screen layout and desire to come back to that particular data set and screen layout sometime in the future, they are able to save this view just like it is currently displayed by saving and naming it as a report. The user is allowed as many custom reports as they would like to save for future reference.

Preferences

If a user exits the application, whether due to an interruption or a desired stopping point, the system remembers the screen layout where they last were. The built in preferences feature returns them to that last screen view.

Economical and Efficient Use of Highway Funding

TPMS 2020's broad and diverse user base reaches across the State to all counties, cities, and state highway agencies and associated consulting service providers. Few web-based application purport to connect such widespread resources into a central clearinghouse to provide collaborative effort for the purpose of organizing and facilitating highway construction project development and letting preparation. This virtual venue allows project stakeholders the information transparency and joint user workspace to accomplish their individual business objectives in an effectiveness and efficient manner, with the ultimate goal to expedite project delivery to letting, while maintaining adherence to quality and development requirements.

More economical use of project planning, development time, and manpower conserves resources, brings projects to letting earlier, and equates to more funds being available for physical concrete and steel in actual highway projects. Early and efficient delivery of bid ready projects helps fulfil objectives consistent with the FHWA's, "Every Day Counts" initiatives. TPMS 2020 has been modernized to create logical workflows to assist diverse organizations, furnish a more complete on screen project data display, and provide a more intuitive structure to navigate standardized business processes. As processes change, the updated technology in this modernized application will provide more flexibility in adjusting to future needs.

Real-Time Rapid Data Exchange

The new TPMS 2020 application offer improved data transmission to the Iowa DOT Program and Project Management System, PPMS. The previous nightly file exchange format between Legacy TPMS and PSS has been replaced with current data exchange technology offered through Application Programming Interfaces, API's. This technology is a software intermediary that allows two applications to talk to each other over the internet. These are common-place in most web-based application used today and provide rapid, real-time data transfer whenever project information is updated. The advantage over our previous file transfer is more reliable and readily available project information exchange. Instead of submitting project or reviewer changes in TPMS and waiting for the nightly data exchange to update access to data, an API can be scheduled to run automatically on a set time interval, providing the updated changes for immediate consumption by interested parties to act on. Communicating updates in minutes vs hours or

days, should prove to save valuable downtime and timely address project issues more efficiently on both sides of the work flow effort, bring projects to approval status more rapidly.

Future Application Enhancements

The initial version of TPMS 2020 will continue to be evaluated, debugged, and enhanced as additional user input recognize limitations or valued features. Future warranted software changes are expected to be minor in scope and assumable require minimal SB staff development time. In the event that major modifications are required, a scheduled version upgrade, including advanced planning, scheduling, and staff time allocation, may be necessary.

A few potential future enhancements may include:

- Mobile version of TPMS (County specific)
- Pod Version to integrate with the Operations Management System
- SB Public Web-site interface to present project information for public, consultant, and contractor access
- Linkable URL that Counties may offer as access to project information on their County website or GIS system
- Batch move projects to different year of programming
- Activity grid allowing sorting or querying across sponsors or project types
- Tied/Shared/Bundled project types
- Address book type look-up for message queries
- Local Systems field staff to be able to process project agreements
- Enhanced email address “home service” to draw from current addresses and prompting or auto-complete of message emails

All user questions, comments, and suggestions are encouraged and will be addressed by SB staff. It is our intent that the new TPMS 2020 application be useful and a valued programming and project management tool for many years to come.

Appendix A – Forensic file analysis results – performed March 2018 by Brandy Thomason

Subject	Results
Program/Budget Overview	Show overview of Current and Draft Programs (1 file) Will be able to revise Current Program (5 files) Will prevent revision during period of public comment Will show version number of Current program Will show version number of Current budget Will allow dual county engineers to switch counties (1 file)
CFYP	Show list of projects, divided into years (6 files) Will be able to add and remove projects Will be able to edit a project (7 files) Will prevent editing of projects within project list based on program status and type When a program is beyond ready, all projects will be locked When a program is of type Resolution, only accomplishment year projects will be edited Allow users to order projects in a custom way for the purpose of printing (1 file) Show a history of actions (1 file) Allow the creation and revisions of a budget (1 file) Provide a mechanism to calculate local construction costs Show an aggregate map of projects (3 files) Show a list of past programs and budgets Show a project listing for a past program (3 files) Allow amendments and revisions to the program (2 files) Will update open programs and budgets when an annual report is approved (1 file) Will annually create new CFYP year (1 file) Will allow counties to initiate their CFYP (1 file) Will show a list of programs and Budgets (1 file) Will send out reminders to those that have long standing amendments that have not been submitted (1 file) View and Edit Project Programming (8 files) Edit Project maps (16 files) Show Mile point information from map drawings (4 files) Choose a project number option (5 files) Calculate paving points (4 files) View Mile point information (3 files) Create properly formatted location description (3 files)
Budget	Create versions of a CFYP Budget
CYFP/Budget Prep-Review-Approve process	Provide a way to locally review and submit (81 files)
DOT review/approve panel	Review submitted programs and budgets (36 files)

STIP/SWAP	Show list of projects (20 files) Show a log of project activities (3 files) Filter list by year (7 files) Filter list by funding program type Appropriate organizations can approve projects (15 files) Sort by one or more columns (3 files) Filter list by District, DP, PA, County, Program, Sponsor Type, and / or Sponsor (7 files) Filter list by a predefined set of canned filters (4 files) Create PDF Report (5 files) Provide a CFYP view of projects (5 files) Provide a Planning Agency project count report by Approval level (6 files) Create or Import projects (6 files) Show an aggregate map of projects (7 files) Create Financial Code summary by Planning Agency, Fund Code and year (13 files) Persist state of filters for users (3 files) Provide mechanism to set STIP Id's (8 files) Change a project sponsor from one organization to another (10 files) Provide a key of Organization acronyms (5 files) Approve a group of projects (4 files) show a pdf report of a project (4 files) Create excel output that could be used for ArcGIS purposes (4 files) Create dataset that can be consumed by an ArcGIS Service (4 files) Import DOT records for creation of DRAFT STIP Yearly (5 files) Create a report detailing the dollar amounts yet to be let between now and the end of the fiscal year (1 file) Will annually create new STIP year and expire current year (2 files) Will import revisions and amendments made during period of public review (1 file) Create PDF report of a single project (1 file)
Data exchange/import scripts	Missing some data?
Development admin	Will generate a report of weekly activity (1 file) Will zip and archive projects on a scheduled basis (1 file) Will generate a report of projects with improper project numbers on a scheduled basis (1 file) Send out reminders to stake holders of projects falling behind schedule (1 file) Provide a mechanism to change, add, or remove people from an organization (2 files) Be able to identify who you are (3 files) Will display system notifications (1 file) ???? Will generate a report of FM projects (1 file) ????
Development Project List	Show list of projects (5 files) Identify those that have railroad work (1 file) Activate a project from Programming (7 files) Will be able to download a csv list of projects (1 file) Will display Qualifying Bridge List information about structure (1 file) Have a way to log out (1 file) Provide a mechanism to re-activate a canceled project (1 file)

Project activation / setup	Create a project (1 file) Create new phase of a project in development only (1 file) Will be able to update basic attributes of a project (18 files) Copy project number into programming when necessary (2 files) Will be able to update the project number (1 file) Will choose the project number sponsor, if different from the project sponsor (1 file) ????
Single Project View	Show a detailed view of a project Update the status of project mile stones (62 files) Show a log of project Emails (1 file) View a list of project contacts (2 files) View a log of project activities (1 file) Will show a list files related to the project (5 files) Will display Qualifying Bridge List information about structure (1 file) Display help (26 files) Identify when a project description is different than programming (1 file) Be able to close a project (2 files) Will be able to send emails regarding milestones (6 files) Will show a list of contacts for a project (1 file) Will show a view of the project in Programming (3 files) ??? Will show the PSS status of the project (1 file) Provide an FM worksheet to track FM account and expenditures (3 files) Provide a project Turn-In Checklist (2 files) Will show list of Special Provisions and Developmental Specs for any project (1 file)
Project status scripts	Missing some data?
PSS data exchange scripts	Will generate a transport file (4 files) Communicate with the DOT about project information (5 files)
Transit Program	Will show a list of projects (3 files) Will provide filters (4 files) Will create new projects (3 files) Will show a detailed view of a project (2 files) Will show help content (2 files) Will generate a pdf program report (3 files) Will generate an excel program report (3 files) Will provide Grant management (2 files) Will allow users to create grants Grants will have a name Grants will have a fund source Grants will have an amount to be distributed Will create new Draft program and auto import projects into it every year (1 file) Will notify appropriate parties of submittals and approvals each morning, from the previous day (1 file)

Transit Project Mgmt	Will allow admin users to move the projects of a given sponsors back one year (3 files) Will allow batch approval of projects (3 files) Will manage Transit Contracts (41 files) Will generate an excel fund totals report (2 files) Will import a new fleet of vehicles from a DOT source every year (1 file)

Appendix B – User comments tally

TPMS Modernization items

SWD & DRW notes

Date	Contact	Section	Remarks
20-Mar-18	Shawn	STIP	STIP - color intensity could be eased
20-Mar-18	Shawn	STIP-new	Some sort of financial consolidation and analysis report to help with FM, SWAP and FA cash flow projections
20-Mar-18	Shawn	STIP-new	DOT OPM would like to be able to insert DOT project PNs (from PSS) into STIP to assist with job identification
20-Mar-18	Shawn	STIP-chg	OPM would like a simpler way to defund projects. Current zeroed out version processing is cumbersome
20-Mar-18	Shawn	STIP-chg	Existing Map: you have to click 'X' to close it and return to text/numeric view. This leaves users uneasy because they are not certain that their maps edits have actually been saved. Can we improve the psychology of how map data is saved and confirmed?
20-Mar-18	Shawn	STIP	STIP - Print version does not need to be in color.
20-Mar-18	Eric C	CFYP-Bdgt	Nichole and Eric prefer to have V0.0 Pgm and V0 budget mandatorily submitted together
			Change up Prep/review sequence: DOT review before presentation to BOS?
23-Mar-18	Muscatine CRD	CFYP	Requested that the existing thee lines per project layout not be changed if not necessary
			Requested to be able to see all single project view data in a single screen or panel.
26-Mar-18	M. Chambers	STIP/SWAP	Was favorable to keeping current project display format
		STIP/SWAP	Inquired if STIP/SWAP screen could be shifted left, in today's wider screens, and remain in view even when a single project is being inspected
		STIP/SWAP	Suggested that perhaps then the single project data could appear to the right, possibly in a tabbed format
4-12-2018	District 4 Vince	Activation of Projects	Don't Activate project from programming- it is a more logical process to activate in development
	Vince	TP Dev	Airports need to add as check off/on
	Group	Dev Project List Screen	Notifications are important - a different way to display would be ok, but current is good.

	Group	TP Dev	Need to add Hold button & comment about why & stop sending letting change notices.
	Group	General	In general - Don't throw the baby out with the bathwater… Small changes are better than mass changes
	Group		Sorting capability is important to keep due to access to other county plan sets of similar nature to gain sq ft costs or use plan sets as a guide.
	Group		Restrict access for uploading plans to other counties. Electronic feed from DOT to TPMS to populate letting dates.
	Group	TP Dev	Two step process to approve and say it is approved. It is not a big deal, but Alternate Dev. Status layout would better, slicker, try it! Go with the drag and drop!
	Group	TP Dev	Add a print icon to the pull down bars.
	Group	General	Emails – Like new layout - more like normal email format. Nice to have the files list to pick from so consultant can notify county it has been submitted
	Group	Project Close-out	Some have problem with definition of cancel, maybe call it de-activate Add Hold project would be good. Option for completed projects, Active pool/ Dead pool
	Eric	Programming	Is there a way to handle paving points better. Eric is able to see a read only view on the programming side, would like to keep this the same.
	Group	Programming	Generally like the Single line with totals for each year. Expand each year w/ description or collapse. Need Print option.
	Group	Budget	Generally like the Single line with totals for each year. Expand each year w/ description or collapse.
4-18-2018	J Albright	TP Dev	Requested that an option to mark projects as 'tied' (for letting) be added
4-18-2018	J Albright		Requested that project cancellation be improved. Close-out options to include 1) Let/Completed 2)On-Hold 3) De-Activate
4-18-2018	J Albright		Wants study and non-letting projects to be listed w/o letting date
4-18-2018	J Albright		System fails to notify District to assign a paren number if the sponsor enters a paren number when they activate the project for development. JA suggests that perhaps we should not allow sponsors to enter them.
4-18-2018	J Albright	TP Dev emails	Suggested that all members of a consulting firm's staff should be available in both contacts and in the email pick list
4-18-2018	C Van Buskirk		CVB: In the email listing screen, offer check boxes that users can mark to indicate which emails are to be printed
4-18-2018	C Van Buskirk		CVB: how can we get an email that originated and terminated outside of TPMS to be included in the transcript?
4-18-2018	Brad Ketels	Files	The panel that lists the file names to too narrow: cannot read the full file names.

4-18-2018	Ryan Schock	Access	Can a direct 'TPMS Dev' link be added into the ICEASB website?
4-20-2018	Rob F	Activation	Checks program listing first, then activates
4-20-2018	Doug Heeren	Activation	DOT believes activation from programming would be a problem with small towns and special recipient sponsors
4-20-2018	Rob	Files	Recommends use of paper clip icon for attaching files to emails
4-20-2018	Dist 6	Programming	Group favored keeping current multi-row/column layout to display projects in CFYP and STIP/SWAP
4-20-2018		Files	Group desires use of automatic file naming convention to keep things ordered and clear. May also want brief description of contents
4-20-2018	Rob	CFYP & STIP/SWAP	When setting up a new program element, can there be attachments?
4-20-2018	Doug H	TP Dev set up	Offer ability for sponsor to request Dist or OSP make changes to milestones and/or clearance items. DocXpress can come back off
4-20-2018		TP Dev late warnings	They still ruffle feathers. Maybe need to base them on dates that sponsors/agents are supposed to have things turned in by
4-20-2018	Group	TP Dev emails	Group would support attachment icons that handle both attaching existing files as well as uploading and attaching new ones
4-20-2018	Group	TP dev Files	They would like to see the list maximized so they don't have to scroll so much to locate a particular file.
4-20-2018	Group	TPMS startup	Draft concept for new TPMS startup dashboard didn't provoke much reaction. They were OK with it but not excited by it.
4-20-2018	Group	CFYP & Budget	They would like to have us generate CFYP & Budget word files with more detail: They'd like CFYP or Bdgt + FY + version + Date in the file names
4-20-2018		FA and SWAP projects	Can there be a way for sponsors to checkmark which items will be reimbursed: PE, CE, ROW, UTIL, RR, Construction?
4-20-2018	Nichole Brown	Single project edit – CFYP	Can we change things so that, when they use the 'Extract data' command in the map, items not determined by extraction remain blank – as a visual key that indicates that they must still take action. NB feels this would reduce errors caused by people not noticing that a field is set wrong
4-20-2018	Rob F	Mapping	Would like to see map become scalable with mouse scroll button
4-20-2018	Nicole Brown	General	Asked 'How can a county show what's actually going to get done in any given year?' She chafes at the DOT direction to only program for year of letting. Because of contract and late start delays, there are projects from last year that are just getting ready to start and some of the jobs to be let in current year won't get built until next. Wants to know if there would be a way to show a realistic summary of work anticipated to be done so that the board and public can be better and more accurately informed.

4-20-2018	District 1 OLS/OPM County Eng	CFYP	Counties want to be able to sort project list in various ways, add notes to projects, and filter the CFYP for various reasons.
	Sponsors and Districts	TP Dev	Flexibility to tie projects together up to and including Turn-in checklist.
			Users don't like filters auto applying when they're changed. Users don't want to archive projects… want a mechanism to upload some kind of archive into a project.
	Districts		Have ROW and Utility milestones to default to off in all but FA projects. Will need clearance items for Threatened and Endangered Species.
			Ability to request Hydraulic and Structural Review. Request to have HMA Inspection at turn-in time and email the Office of Materials.
	Group		Don't need TPMS numbers on project files, but want to see dates on files.
			Choice of work type needs to match better; maybe work type should have a blank option.
	DOT OLS		Wish they could drag maps around. Want to review a project map and have that review persist until something about the location has changed.
			Want map underlying attributes to validate project information. It would check if road is gravel and work type is paving then paving points should be required.
			Initial program and budget versions must be submitted together. Date of Board approval and book and page information could be separated. Would like TPMS to represent work by year of obligation (one year of funding only). But Counties would like to show project costs in year they would be spent. Obligation vs. cash accounting basis.
			For DocExpress, have the system notify DOT as project gets close to final plans stage.
			At close-out; cancel project is scary – change to De-Activate.
	Gregg District Local Sys		Likes the checkmark files to be transmitted to upload screen. Like the new outlook look of email transcripts.
5/2/2018	Deb Arp OSP grp	STIP/SWAP view	Would like to be able to see all years' programming for a single project at once. See a project programming history. Like seeing stacked data.
		Rounding	Discussed pros and cons of going to exact $1. Didn't seem to have a lot of support or opposition. Users wish to see funding rounded to the nearest dollar in some cases and to the nearest thousand in others.
		STIP/SWAP	Drop District Planners out of process
		STIP/SWAP page	Not everyone uses every single left hand column to filter with. Could the columns be collapsed or a different filter process be set up. If there was more room in screen, they'd like to see TPMS#, STIP# in standalone columns

		Cancellation	They suggest sending a notice to RPA/MPO and perhaps other reviewers when a project is cancelled
		Filtering	Would like to filter STIP/SWAP by work type. Possibly have a project without a letting date identified or a TBD date.
		NEPA reminder	When Concept and/or Prelim Plans are cleared, system sends out notice advising that no work on ROW, CE, Util or RR should proceed until NEPA clearance is obtained. Need to rethink how this will work in SWAP era
		Doc express	It's clear that we'll have to work with InfoTech so as to be able to inject certain development stage files into DocExpress when a project gets let
		Mapping	Frustration was expressed with the challenge of drawing a linear project through a town or across a corp line
		TP Dev	Drag n drop idea is not the complete answer as it only works when the file is visible on the desktop. They will also need to be able to navigate to a folder and select a file for upload
		TP Dev	Users want late notices to key off of the date a milestone was submitted, want to remove files at any time, and feel the NEPA notices can be stopped. Users don't use the Email feature in Development at all.
		General	Districts and OSP want to be notified of changes submitted in programming.
5/2/2018	Randy	Transit	Grant Management of contracts is not used and preferred to be done through spreadsheets
	Randy		Transit management wants to be able to update the cost from year to year and see programmed transit numbers.
	Randy		First screens are all that are being used, the remaining can be eliminated.
5/3/2018	D3 Mark H Brian C	CFYP and STIP/SWAP interfaces	Favored keeping existing 'block' style format for display of programming Favorable to 'bar' based presentation of single project. "If it ain't broke, don't fix it"
	D3	Development	Keep project list page mostly as is Favorable to 'bar' based presentation of project status
	D3	Development	Liked Notifications from the system and clearance deadline is approaching. Both are using email transcripts.
	D3	Project close-out	Some counties are indicating "Let" and then selecting "Cancel" which then disables PSS to continue to monitor the project through financial close-out.
	Brian C	Development	PSS is notifying DOT that letting date is changing, so can there be an over-write to keep letting date the same without pushing to the next letting date.
	D3	Programming	Make map information and Route type class selection match to create Project number.
5/4/2018	D2 group	STIP/SWAP	Group wanted us to be clear on business rules regarding RPA/MPO reviews. Do the PA's look at everything or just the STBG. And to what degree do they need to conduct regional fiscal constraint?
	Mary Kelly	Pgm vs AR	Expressed concern that projects listed in CFYP don't show up in Annual Report local construction section. Need to check with office mgr for more details

	Group	Versioning	Group doesn't see the V0.0 and V0 structure for programs and budgets as particularly valuable. Would be open to a different schema
	Budget	Data resource idea	Could users pull out multi-year budget listings to enable them to analyze revenue and expenditure changes over time. Would be similar to AR analysis but would pull up data from current and past budgets instead - comparing prospective money instead of final money
	MK	Milestones in TP Dev	Continue to show due dates
	MK	Activation of Projects	Felt that activation of projects in TP-Dev was the appropriate location.
	MK	Expand / collapse	Felt that it's redundant to have both an Expand and Contract button in each FY of the CFYP. Suggests just a single toggle on/off button.
	Group	Mapping	They prefer to give the Board a map of the program rather than the document itself. But our map generation tools don't work very well so they use GIS or paper maps instead. We need to ramp up mapping to at least allow users to drag labels off the project site while keeping a leader line back to the project point or line
	Kossuth	Mapping	Extracts data to make up their CFYP map but seemed concerned that the extract may not 100% reflect what is in the program. Need to double check this.
	Kossuth	CFYP	Could we allow picking / resetting letting date in the program – with the project then 'jumping' into whichever FY matches?
	Winnebago	CFYP/Bdgt/ TIP/DEV	Could we offer a user feedback/ feature enhancement request button in the app panels?
		Doc Express	Need list of officially defined drawers in that app
		TP DEV	Rather than Submitted, perhaps use 'Ready for review' for newly uploaded files
		Close out	If project is to be let at DOT, don't allow LPA to cancel after project turn in. Also, if a project is 'on hold' need to show this prominently in all views
		Mapping	Can there be one color per year for the program map?

Appendix C – Instructions to prepare the FY 2022 County Secondary Road Budget and Construction Program

As prepared and provided by Nicole Stinn, Local Systems Bureau, Iowa Department of Transportation, Feb 2021. URL link: https://iowadot.gov/local_systems/publications/county_bp_instructions.pdf