2017
For the Period Ending June 30, 2020

PROJECT TITLE: Groundwater Contamination Mapping
PROJECT MANAGER: Hans Neve
AFFILIATION: Minnesota Pollution Control Agency
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: M.L. 2017, Chp. 96, Sec. 2, Subd. 03h
APPROPRIATION AMOUNT: $400,000
AMOUNT SPENT: $400,000
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results

The Minnesota Groundwater Contamination Atlas maps areas of groundwater contamination concern and tells the contamination story in a way that is understandable to the general public and is meaningful for technical users. The Atlas currently includes 92 of the thousands of properties where environmental contamination may exist in Minnesota.

Overall Project Outcome and Results

In Minnesota 75% of the drinking water comes from groundwater, a source that is generally out of sight and out of mind. Minnesota properties that were once home to dry cleaners, metal plating shops, manufacturing plants and other industrial facilities in many cases have contaminated our groundwater from spills and leaks of hazardous chemicals. Frequently the contamination spreads off the property creating an area of groundwater contamination. When there has been contamination often costly treatment systems are needed to make the water suitable for use.

Information about the areas of groundwater contamination were contained in individual MPCA Superfund Program project files. The project was developed to expand access to information about groundwater contamination to improve protection of groundwater resources.

This project developed the Minnesota Groundwater Contamination Atlas. The Atlas maps areas of groundwater contamination concern and tells the contamination story in a way that is understandable to the general public and is meaningful for technical users. The Atlas also makes it easy for the public to download contamination testing results from individual wells. The Atlas establishes a public communication platform that can be expanded beyond the 92 superfund sites that were included in this project.

The project extracted well information from project files and loaded it into a state enterprise database,13,605 wells and loaded 3,700 groundwater contamination test results were loaded into the database. The data was used to map 92 contamination source areas and 60 distinct groundwater contamination areas of concern. For each source areas a contamination site story tells how the contamination happened, what the contaminants are, what cleanup work has been done, what additional cleanup work is planned, where drinking water in the area comes from, who to contact with questions and if there is related contamination in soil, sediments and underground vapor. A project development webpage and stakeholder group were utilized to help shape scope and format of the map contamination story elements of the Atlas.
https://www.pca.state.mn.us/data/minnesota-groundwater-contamination-atlas

Project Results Use and Dissemination

A project webpage was used to provide project development updates and solicit stakeholder feedback as project elements were developed. The webpage invited interested parties to subscribe to the GovDelivery email distribution list for the project. The GovDelivery list currently includes 832 subscribers. Outreach during the project also include presentation at professional conferences and stakeholder meetings. A recorded presentation of the project presentation at that 2019 Minnesota Groundwater Association (MGWA) Fall Conference "No Longer 'out of Sight, Out of Mind- Making Groundwater Science Visible to Citizens and Clients" is available on the MGWA webpage https://www.mgwa.org/conferences/mgwa-2019-fall-conference/

Launch of the Minnesota Groundwater Contamination Atlas was communicated through the project Gov Delivery distribution list as well as MPCA social media platforms. As of August 3rd the Minnesota Groundwater Atlas website has been visited by 1,162 non-MPCA users.

Environment and Natural Resources Trust Fund (ENRTF) M.L. 2017 LCCMR Work Plan Final Report

Date of Submission: August 14, 2020

Final Report

Date of Work Plan Approval: June 7, 2017

Project Completion Date: June 30, 2020

PROJECT TITLE: Groundwater Contamination Mapping

Project Manager: Hans Neve

Organization: Minnesota Pollution Control Agency

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Location: Statewide

Total ENRTF Project Budget:		
	ENRTF Appropriation:	$400,000
	Amount Spent:	$400,000
	Balance:	$0

Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 03h

Appropriation Language:
$400,000 the first year is from the trust fund to the Commissioner of the Pollution Control Agency to develop a Web-based interactive map of groundwater contamination to improve protection of groundwater resources for drinking water. This appropriation is available until June 30, 2020, by which time the project must be completed and final products delivered.

I. PROJECT TITLE: Mapping Groundwater Contamination: accessible data to protect resources

II. PROJECT STATEMENT: Minnesota properties that were once home to dry cleaners, metal plating shops, manufacturing plants and other industrial facilities in many cases have contaminated the groundwater from spills and leaks of hazardous chemicals. Frequently the contamination spreads off the property creating an area of groundwater contamination. The Minnesota Pollution Control Agency (MPCA) proposes to compile data currently kept in individual Superfund Program project files to show these areas of groundwater contamination in an interactive web-based map. The interactive web-based map will fill a data accessibility gap for anyone involved in groundwater use, regulation and conservation in Minnesota.

MPCA programs that address hazardous substance contamination in groundwater are focused on addressing health and environmental risks from individual sources of contamination. Without additional resources, compiling data from individual project files and presenting it in an interactive web-based format has been beyond the program capacity. This is the primary reason the need for easy access to groundwater contamination data has not been met.

When making decisions about the location of new municipal drinking water wells and planning for drinking water treatment, knowing where groundwater contamination areas are located is particularly important. Businesses also need this information as many industries rely on clean water to function, or as they are looking to expand existing or develop new facilities.

Collecting data in one place and generating an interactive map showing areas of contaminated groundwater will help manage and protect the largest source of clean drinking water in the state. This effort will save government agencies, businesses, and Minnesota citizens' time and resources.

III. OVERALL PROJECT STATUS UPDATES:

Project Status as of January 15, 2018:
In the first six months of this project, we worked on three main tasks: hiring key staff, training and creating a process for data entry, and creating a clear communication plan. After hiring the three staff, we've moved into data entry. We are 11% done with loading the groundwater monitoring well locations into EQuIS. Our clear communication plan included creating an information webpage, "friends of groundwater contamination" email list, and an internal process for keeping MPCA staff informed and included. The external webpage documenting our process is available at https://www.pca.state.mn.us/groundwater-contamination-mapping-project.

Project Status as of June 15, 2018:
Since January 2018, we have worked on: harvesting groundwater well and groundwater testing data from superfund project files, hiring additional staff, training, creating a process for data entry, and communication with stakeholders. After hiring two additional student workers, the rate of data harvesting has increased. This pushed the data harvesting part of the project to get back on schedule. We are 72% done with loading the groundwater monitoring well locations into EQuIS. Our project webpage documents our process and presents monthly progress reports. It is available at https://www.pca.state.mn.us/groundwater-contamination-mapping-project.

Project Status as of January 15, 2019:
The project team is focusing on the continued data harvest, map application development, and staffing changes. The team finished loading all monitoring locations for the active Superfund sites (over 12,020 locations) in the centralized database. During this six-month period, the project team transitioned from loading monitoring locations to compiling groundwater sampling data at each location. The project team is also working to develop the map application that will be used to visualize all the groundwater contamination data. The map application

will be developed in three phases: conceptual, draft, and final applications. Between each phase, the project team will be soliciting public comment.

The project team has recently undergone staffing changes as well. Three of the four student workers are moving on and the Hydro 1 team member funded by the trust fund, Michael Ginsbach, was hired by the MPCA as a permanent employee. While he is no longer be funded by the trust fund, he will remain on the project and the MPCA will be utilizing his time as an in-kind contribution. His contributions have been valuable to the project and the MPCA is committed to providing consistency on this important project. The MPCA is working to backfill these team members funded by the trust fund as quickly as possible. Because the project is transitioning to more mapping work and less data harvesting work we evaluating the possibility of hiring more hydrogeologists and fewer student workers.

Amendment Request:
We are requesting a budget change to move dollars from Activity 3 to Activity 1. Activity 1 was to collect and load data into our centralized database. This effort required more time and is more labor intensive than predicted. The project team has created as many efficiencies as possible for this task; however, the effort required the team to complete two data mining efforts. The first data mining effort was to find all the locations that Superfund program has sampled in recent years. The second data mining effort has been to find all the analytical data associated with each location. To finish the first task, we would like to move $43,000 from Activity 3 to Activity 1. Activity 3 goals are to publish the interactive map and increase awareness about groundwater. Due to the nature of Activity 3, MNIT is requiring Activity 3 be led by IT staff members (as an in-kind contribution). The MPCA is comfortable decreasing the budget amount in Activity 3 because much of this work will be implemented by in-kind contributions by existing permanent staff from the MPCA and MNIT.

Amendment Approved by LCCMR **3/26/2019**

Amendment Request:
We are requesting a staffing change for Activity 2. Staffing for the first year and a half of the project was a team of student workers led by one hydrogeologist. This was needed to collect all the data for the sites. Activity 2 is more technical than predicted; the best staffing model for Activity 2 is to have two hydrogeologists and two supporting positions. Two of our four student workers have moved on to other opportunities and one of our student workers has graduated and is no longer eligible to be a student worker. We propose to not replace the two student worker positions and instead hire a second hydrogeologist. We also propose to reclassify our third student worker to a Pollution Control Technician. This will not change the budget amounts or timeline.

Amendment Approved by LCCMR **7/02/2019**

Project Status as of June 15, 2019:
The webpage for our project has been updated to show the current status of the project and to present a near final design for the interactive map. The design includes an interactive map that shows wells and areas of contamination. The map is supported by a “scorecard” that presents additional details about the area of contamination. The design also includes a mechanism to download the raw data in the EQuIS database that was used to make the map and scorecard.

https://www.pca.state.mn.us/groundwater-contamination-mapping-project

We are approaching completion of the work to load data into the EQuIS database. This data harvesting work has taken longer than expected, resulting in a delayed start to the mapping portion of the project. Even though the mapping work is behind the initial project schedule the delay will not impact the final deliverable or overall timeframe to complete the project.

We are experiencing turnover in the staffing of our team. We recently hired two hydrogeologists and two student worker positions. This team of four staff will be the LCCMR funded portion of the team that brings the project to completion.

We are working closely with the team MNIT as assigned to build the platform that will house the interactive map, scorecard and data download. The MNIT team is in the final stage of developing project requirements and will begin focusing on technical design work.

Project Status as of January 15, 2020:

Draft maps are complete for all Superfund sites and are in the process of peer review. Site story format, previously referred to as a "scorecard", is final and data for this portion of the final project is being collected. Basic information is collected for 100% of the sites, while the detailed information is complete for approximately 65% of the sites. External outreach with stakeholders such as MDH, MDA, MGWA, AIPG and local government has been positive. Stakeholders are engaged and eagerly anticipating our final product.

Staffing on the project has stabilized with two project hydrogeologists and one student worker working as a successful team to finish out the project.

MNIT has finalized all project requirements and is working through Iteration 2 with our project team. MNIT has created a functional development version of the final product that enables the team to work towards the final product in a collaborative environment.

Amendment Request:
We are requesting a budget change to move dollars from Activity 2 to Activity 3. As of March 23, 2020 Activity 2 is complete. Draft areas of contamination for active superfund sites have been mapped and peer reviews of the draft maps have been conducted. To be able to finish the remaining tasks in Activity 3 we request a budget change moving the remaining, $33,929 from Activity 2 to Activity 3. Activity 3 goals are to publish the interactive map. Due to the nature of Activity 3, MNIT is requiring that Activity 3 be led by IT staff members (as an in-kind contribution. Our project team has needed to devote more time coordinating with MNIT and the MNIT project process than originally anticipated. This is the reason for the requested Activity 3 budget increase.

Amendment Approved by LCCMR **5/1/2020**

Overall Project Outcomes and Results:

In Minnesota 75% of the drinking water comes from groundwater, a source that is generally out of sight and out of mind. Minnesota properties that were once home to dry cleaners, metal plating shops, manufacturing plants and other industrial facilities in many cases have contaminated our groundwater from spills and leaks of hazardous chemicals. Frequently the contamination spreads off the property creating an area of groundwater contamination. When there has been contamination often costly treatment systems are needed to make the water suitable for use.

Information about the areas of groundwater contamination were contained in individual MPCA Superfund Program project files. The project was developed to expand access to information about groundwater contamination to improve protection of groundwater resources.

This project developed the Minnesota Groundwater Contamination Atlas. The Atlas maps areas of groundwater contamination concern and tells the contamination story in a way that is understandable to the general public and is meaningful for technical users. The Atlas also makes it easy for the public to download contamination

testing results from individual wells. The Atlas establishes a public communication platform that can be expanded beyond the 92 superfund sites that were included in this project.

The project extracted well information from project files and loaded it into a state enterprise database,13,605 wells and loaded 3,700 groundwater contamination test results were loaded into the database. The data was used to map 92 contamination source areas and 60 distinct groundwater contamination areas of concern. For each source areas a contamination site story tells how the contamination happened, what the contaminants are, what cleanup work has been done, what additional cleanup work is planned, where drinking water in the area comes from, who to contact with questions and if there is related contamination in soil, sediments and underground vapor. A project development webpage and stakeholder group were utilized to help shape scope and format of the map contamination story elements of the Atlas.
https://www.pca.state.mn.us/data/minnesota-groundwater-contamination-atlas

IV. PROJECT ACTIVITIES AND OUTCOMES:

ACTIVITY 1: Extract groundwater testing data from individual MPCA files to populate a centralized database

Description: There are 93 active Superfund sites that are part of this project. Currently data is kept in various paper and electronic files. Groundwater contamination at each of the contaminated sites is monitored using a network of monitoring wells. Samples of the groundwater are collected from each well and taken to a lab for analysis. The frequency of sampling and the contamination that the lab will test for varies from project to project.

The State has a standard environmental monitoring database called EQuIS that stores various data including the facility, monitoring locations, characteristics of the underground geology, chemical concentrations, and field notes/observations. The first step in the project is to load laboratory testing results into the EQuIS database. The sampling results are from groundwater testing at the 93 active Superfund sites.

To do this we will hire and train hydrologist and student workers positions to extract data from files and load it into EQuIS.

Summary Budget Information for Activity 1:

ENRTF Budget: $ 176,334
Amount Spent: $ 176,334
Balance: $ 0

Outcome	Completion Date
1. *Hire and train hydrologist and student workers to understand site files and the environmental database.*	November 2017
2. *Groundwater monitoring well locations associated with the 93 active Superfund sites are extracted from files and loaded into the environmental database.*	April 2018
3. *Groundwater testing results from laboratory reports for each monitoring well are extracted from files and loaded into the environmental database.*	July 2019

Activity 1 Status as of January 15, 2018:

We hired two qualified student workers in August 2017. Our hydrologist started in October 2017. So far, the three staff have loaded groundwater monitoring well locations for 11% of the Superfund sites into EQuIS. We created a phased approach to loading location data and then analytical data. To track our progress, there is a brand new fully automated report from the new hydrologist. The report is posted monthly at our webpage. We are developing a quality assurance plan for the analytical data.

The amount spent reflects the most current reporting data available (December 26th, 2017).

Activity 1 Status as of June 15, 2018:
We hired two additional student workers in May 2018. The four student workers and other MPCA staff make up our data harvesting team. They have loaded groundwater monitoring well locations for 72% of the Superfund sites into EQuIS. The progress report is posted monthly at our webpage. We are continuing to develop a quality assurance plan for loading the analytical data.

The amount spent reflects the most current reporting data available (May 29th, 2018).

Activity 1 Status as of January 15, 2019:
We have loaded all the active Superfund site's groundwater monitoring locations into our central database. There now are over 12,020 monitoring locations in the centralized database. The project team is currently compiling the available groundwater sampling data. To efficiently capture the data, we are working with analytical laboratories on this part of our data harvesting process. We currently have analytical data for 7% of Superfund sites loaded in the centralized database and have found recent analytical data for 3,200 more wells that have yet to be loaded.

The extraction of groundwater testing data from individual MPCA files to populate a centralized database has been more challenging and more time intensive than expected.

Activity 1 Status as of June 15, 2019:

We are approaching completion of the process of loading data into the centralized database. We have added additional groundwater monitoring locations into the database and there are now over 13,000 monitoring locations that have been loaded.

The project team is currently working to load groundwater-sampling data collected in the last 5 years into the centralized database. Approximately 3,700 monitoring locations have groundwater sampling data that has been loaded into the database.

To work toward finalization of the data harvest, we are holding review meetings with Superfund project managers to determine if we have a complete dataset for each site. The project manager review process has allowed addition of new data into the centralized database.

Activity 1 Status as of January 15, 2020:
This activity was completed on July 26, 2019.

Final Report Summary:
The project began with our data harvesting team looking for groundwater well data in superfund site project files and loading the well information into the EQuIS database. Once the wells locations were established laboratory testing results that were less than 5 years old were loaded into the EQuIS database. More than 2 years of the project was spent on the unglamorous and often unseen work of data harvesting. Although difficult, this work was essential to establish the electronic dataset that would be used to map areas of groundwater

contamination concern. The data harvest established 13,605 wells in the EQuIS database 4656 of those wells have contamination testing results in the last 5 years in the EQuIS database.

ACTIVITY 2: Map areas of groundwater contamination using data that has been loaded into EQUIS

Description: Using the groundwater data that has been loaded into EQuIS we will map areas of groundwater contamination. Senior-level hydrologists will peer review the mapped areas for consistency and accuracy. These contamination areas will be stored in a GIS database and will be used in Activity 3 to make interactive maps that will be presented on a comprehensive interactive webpage.

Summary Budget Information for Activity 2:

ENRTF Budget: $ 99,404
Amount Spent: $ 99,404
Balance: $ 0

Outcome	Completion Date
1. *Areas of groundwater contamination surrounding 93 Superfund sites are mapped*	April 2019
2. *Groundwater contamination areas are peer reviewed to ensure consistency and accuracy.*	April 2019
3. *Groundwater contamination areas are in a centralized, GIS database.*	June 2019

Activity 2 Status as of January 15, 2018:
We have not formally started this step of the project.

Activity 2 Status as of June 15, 2018:
We have had additional meetings to formulate a plan for a map development team. We've initially scoped a cross-agency team that consists of MPCA staff from this project, Minnesota Department of Health staff from Source Water Protection and the Site Assessment and Consultation Units.

Activity 2 Status as of January 15, 2019:
We have formed a cross-agency team consisting of MPCA, Minnesota Department of Health, MNIT@MPCA, and Minnesota Department of Agriculture staff. The cross-agency team is working to develop the map application in three phases: conceptual, draft, and final. The conceptual phase is nearing completion and the MPCA will be posting the results of each phase on the project webpage for public comment.

Once we gather comments on the conceptual phase, we will be working with MNIT staff to begin the mapping process at each active Superfund site. Working closely with MNIT will ensure the contamination areas will have a centralized location for internal and then external review.

Activity 2 Status as of June 15, 2019:
The cross-agency team discussions and feedback has produced a conceptual groundwater contamination map. This conceptual map is shown online on the updated project website. The conceptual map is near final, and six draft contamination maps have been developed. The goal for the next phase of mapping is to take into account feedback from the June 2019 website update and incorporate into final maps.
Finalizing the mapping portion of the project may also depend on MN.IT processes and capabilities which will be better assessed during website development which is anticipated to occur during the fall or winter of 2019/2020.

A peer-review process has been initiated. This will include MPCA hydrologists familiar with each site reviewing and verifying the defensibility of each groundwater contamination area to be published online. The review

process will be fully implemented as the final map design is applied to remediation sites (for example, 92 Minnesota Superfund sites). The mapping process includes using an agency centralized GIS database which will store and allow management/review of the areas of contamination.

Activity 2 Status as of January 15, 2020:
The project team has developed a procedure for mapping of sites in Remediation programs. This procedure was designed to be replicable in a consistent manner. As part of this process, a mapping SOP was produced and peer reviewed by Remediation division hydrologists.

The project team has produced draft maps for all PLP-listed Superfund sites using data extracted from the EQuIS database. The project team is now in the process of reviewing the draft maps with Superfund site project managers and hydrologists to ensure completeness and accuracy. Following approval of the draft maps by Superfund project managers and hydrologists, they will be packaged into a GIS database and provided to MN.IT staff for upload to the web application.

Final Report Summary:
A cross-agency team consisting of MPCA, Minnesota Department of Health and Minnesota Department of Agriculture staff was formed to scope the map content and format. The cross-agency team initially developed a concept map format that was posted on the project webpage soliciting stakeholder feedback. Incorporating stakeholder feedback a concept map format was developed. The concept format was tested by developing groundwater area of concern maps for a small number of superfund sites. There draft maps were peer reviewed by MPCA hydrologists familiar with each superfund site. This feedback was used to make additional updates to the format. Next a mapping standard operating procedure was developed and used to map groundwater areas of concern for active superfund sites with using data from the EQuIS database. The maps went through additional peer review before final publishing. The project identified 92 contamination source areas and found sufficient data in the last 5 years to map a groundwater contamination area of concern for 60 of these sites.

ACTIVITY 3: Share interactive web-based map
Description: The MPCA will use GIS technology to present the areas of groundwater contamination on an interactive web-based map.

A data portal will be created for sharing the groundwater contamination areas. There are multiple options for the data portal and web-based map. We plan to use Esri's GIS platform called ArcMap and ArcGIS Online. We may also use Tableau's data visualization tools. However, because technology is changing so rapidly our plan will evolve as we prepare to build the data portal and web-based map. MPCA will work closely with MN.IT and will develop the preferred option as the project progresses. All the work products will be sharable in the Minnesota Geospatial Commons. This will make our data GIS-ready for other groundwater resource planning tools.

The project team will work in close coordination with the MPCA Communication group to develop a comprehensive communication plan for this project. This interactive web-based map will increase public awareness of groundwater contamination. Currently, our Superfund program webpage is at https://www.pca.state.mn.us/waste/superfund-program and it is likely that we will embed the new application there.

Summary Budget Information for Activity 3:

ENRTF Budget: $ 124,262
Amount Spent: $ 124,262

Balance: $ 0

Outcome	Completion Date
1. *Interactive web-based map showing areas of groundwater contamination is published.*	May 2020
2. *Users will have better access to MPCA's groundwater contamination results.*	June 2020
3. *Increased public awareness of the groundwater contamination areas in the State.*	June 2020

Activity 3 Status as of January 15, 2018:
Most of these tasks will start after our initial phases are complete.

Activity 3 Status as of June 15, 2018:
The MPCA Business Solutions team requested that three project charters be submitted to MN.IT to support development of the interactive web-based map and to development of systems that will support future updates to the map and database. Charters for the 3 projects below were submitted to MN.IT in March 2018 and were approved. Work has begun on the Location Unique ID project. The other two projects are waiting for staff resources to be available.

MN.IT Projects	Start Date	Percent Complete	End Date
Location Unique ID (LUI) generator project	Mar 2018	1%	Dec 2018
EQuIS submittal portal project	Mar 2018	0%	Mar 2019
MPCA Environmental Cleanup Programs Data Access / LCCMR project web-based interactive map	Mar 2018	0%	Jun 2020

Activity 3 Status as of January 15, 2019:
The LUI generator project is complete and was rolled out on the MPCA's webpage. This webpage enables contractors to work quickly with the MPCA to establish monitoring locations in our centralized database.

As stated in Activity #2 status, we have begun to develop a conceptual map application. The proposed items within the map application are: the interactive map, a scorecard to explain the issues and work done at these Superfund sites, as well as a data download menu. These three proposed elements are conceptually outlined on our groundwater contamination mapping webpage.

Activity 3 Status as of June 15, 2019:
We are beginning to define the data that will be needed to publish the scorecard that provides additional information about each mapped area of contamination. Upcoming work to publish the interactive map will be gathering, refining and creating the information needed to support publishing the scorecard.

We are working closely with the team MNIT as assigned to build the platform that will house the interactive map, scorecard and data download. The MNIT team is in the final stage of developing project requirements and will begin focusing on technical design work.

Activity 3 Status as of January 15, 2020:
The cross-agency team has fully defined the data that we will provide in the site story, originally called the scorecard. We have worked closely with the MPCA Tempo database staff and concluded the site story data will be stored in the MPCA's Tempo database. This will provide two outcomes. First, the updates for the site story

are added to project managers' and hydrologists' workflow, which will provide more timely updates of the information. Second, the database can signal when data will be used as public facing data and trigger a review process on the data.

The project team is continuing to work closely with the MN.IT team assigned to build the platform and web application. As a group, we have finished writing the MN.IT requirements for project development. We have started focus on the technical design work. The MN.IT team is currently producing the web application and has created many functions that will make navigation of the application user friendly. The MNIT team is working on the search functionality of the interactive map, navigation to the site story data from the interactive map, and data download functionality.

Final Report Summary:
The cross-agency team concluded that the contamination map alone would not fulfill the project objective of expanded access to information and increasing public awareness about groundwater contamination to improve protection of groundwater resources for drinking water. To meet the project goal a contamination site story element for each contamination site was added. The site story tells how the contamination happened, what the contaminants are, what cleanup work has been done, what additional cleanup work is planned, where drinking water in the area comes from, who to contact with questions and if there is related contamination in soil, sediments and underground vapor. Development of the site story completed the three elements of the project application 1) mapping of groundwater contamination areas of concern from active superfund sites 2) the contamination story and 3) functionality to download the data that is the basis for the map and the story. The project team worked closely with a team from MNIT and MPCA Business Solutions who developed the online application. Staff from MPCA and MDH communications also participated in the development and publishing of the final product.

The Minnesota Groundwater Contamination Atlas was launched on June 30, 2020.
https://www.pca.state.mn.us/data/minnesota-groundwater-contamination-atlas
The Atlas establishes a standard format and public communication platform that can be expanded to included contaminated sites beyond the 92 superfund sites that were included in this project.

V. DISSEMINATION:
Description:
Our dissemination plan is a significant part of Activity 3. As part of Activity 3, we plan to work closely with MPCA's Communications team to publicize the web-based map and also deliver a comprehensive message about the importance of our groundwater resource. We will also craft metrics to measure our effectiveness in reaching key audiences. This data and interactive web map will be available on the MPCA website at www.pca.state.mn.us.

Status as of January 15, 2018:
We started by creating a "friends of the groundwater contamination project" email list. We also created a GovDelivery email subscription list. The two lists allow us to engage with different people on different levels. The GovDelivery sign up is available on our webpage at https://www.pca.state.mn.us/groundwater-contamination-mapping-project. The webpage provides information about the project, project status, monthly progress reports and an opportunity to subscribe to a GovDelivery subscription list to receive project updates.

Status as of June 15, 2018:
The friends of the groundwater contamination project email list was merged with the GovDelivery list. The GovDelivery list now has 237 members, many of which are city, county and state officials, and environmental contractors. One of our recent communications was a profile on three of the student workers that are doing the

first phase of data harvest. Several presentations were given to various audiences. The webpage, listed above, was regularly updated with monthly progress reports.

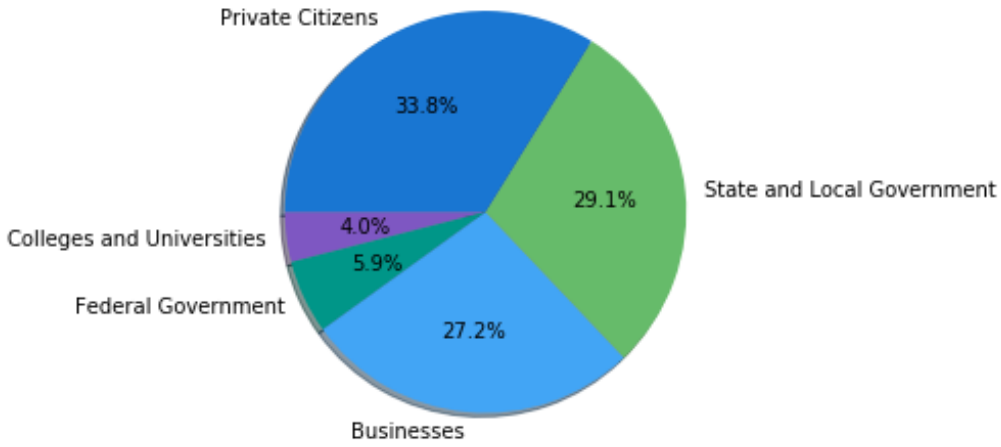
Status as of January 15, 2019:
We made progress on what the final application content may include. We will share the conceptual map application with our GovDelivery list in January 2019. This will give stakeholders the opportunity to comment on the concept.

Status as of June 15, 2019:
We have updated our project website presenting a near final design for the interactive map. We are inviting those following the progress of our project to provide comments on the updated design.

We are in preliminary conversations with the Minnesota Groundwater Association about presenting at the conference this fall.

The list of subscribers to our GovDelivery e-mail distribution list continues to grow. To date over 500 individuals have subscribed to the GovDelivery list. This group represent interest from a variety of sectors including government, industry, citizen, non-profits and educational institutions.

The breakdown of subscribers to the GovDelivery e-mail distribution list for the project:



Status as of January 15, 2020:
The project team has updated our project website, which displays the final designs for the interactive map and the site story layouts. The agency is currently discussing map symbology to determine whether a standard should be set for agency maps moving forward.

We presented an overview of the project to the American Institute of Professional Geologists. We presented a poster and spoke at the Minnesota Groundwater Association (MGWA) Fall Conference “No Longer ‘out of Sight, Out of Mind- Making Groundwater Science Visible to Citizens and Clients”. A recording of the presentation is available on the MGWA webpage for the conference https://www.mgwa.org/conferences/mgwa-2019-fall-conference/

Many guests of the conference engaged in conversation about the project, expressing their interest with the intended outcome.

The list of subscribers to our GovDelivery e-mail distribution list continues to grow. To date around 700 individuals have subscribed to the distribution list including government, industry, citizen, non-profits and educational institutions.

Final Report Summary:
Public communication about the project included developing a project webpage that was used to provide project development updates and solicit stakeholder feedback as project elements were developed. The webpage invited interested parties to subscribe to the GovDelivery email distribution list for the project. The GovDelivery list currently includes 832 subscribers. Outreach during the project also include presentation at professional conferences and stakeholder meetings.

Launch of the Minnesota Groundwater Contamination Atlas was communicated through the project Gov Delivery distribution list as well as MPCA social media platforms.

As of August 3rd the Minnesota Groundwater Atlas website has been visited by 1,162 non-MPCA users.

VI. PROJECT BUDGET SUMMARY:
A. Preliminary ENRTF Budget Overview:
This section represents an overview of the preliminary budget at the start of the project. It will be reconciled with actual expenditures at the time of the final report.

Budget Category	$ Amount	Overview Explanation
Personnel:	$ 400,000	Hydrologist: 1.0 FTE/year, 2.5 FTE total Hydrologist: 1.0 FTE/year, 1 FTE total Student worker 1: 0.25 FTE/year, 0.50 FTE total Student worker 2 (Activity 1); Pollution Control Specialist Technician (Activity 2): 0.25 FTE/year, 0.50 FTE total Student worker 3: 0.25 FTE/year, 0.25 FTE total Student worker 4: 0.25 FTE/year, 0.25 FTE total
TOTAL ENRTF BUDGET:	**$400,000**	

Explanation of Use of Classified Staff:
Staffing for this project is all temporary/unclassified. The only classified staff will be the in-kind contributions, not funded by the ENRTF Appropriation.

Position	Projected FTE	Actual FTE
Hydrologist	2.5	2.1 FTE
Hydrologist	1	1.2 FTE
Student worker/ Pollution Control Technician 1	0.5	0.9 FTE
Student worker 2	0.5	0.3 FTE
Student worker 3	0.25	0.9 FTE
Student worker 4	0.25	1.25 FTE

Project Total	**5 FTE**	**6.6 FTE**

Explanation of Capital Expenditures Greater Than $5,000:
None

Total Number of Full-time Equivalents (FTE) Directly Funded with this ENRTF Appropriation:

At the time of project completion, we expect to have exceeded the initial estimate of 5 FTE. The current projection is that the project total will be closer to 7 FTE in the $400,000 budget.

Total Number of Full-time Equivalents (FTE) Estimated to Be Funded through Contracts with this ENRTF Appropriation: None

B. Other Funds:

Source of Funds	$ Amount Proposed	$ Amount Spent	Use of Other Funds
Non-state	$0	$0	
State	$0	$0	
Environment Fund, in-kind	$240,000	$399,049	Existing Personnel (1 FTE/year for three years). The FTE will be allocated amongst 5 permanent project team members and other additional staff, as needed.
TOTAL OTHER FUNDS:	**$240,000**	**$399,049**	MPCA Environmental Fund only

The in-kind contribution includes only MPCA staff funded through the Environmental Fund. There were other significant in-kind contributions that are not included in the total above. The MNIT project costs to develop the application are over $140,000 and are not included in the total above. Additionally teams from both Minnesota Department of Agriculture and Minnesota Department of Health made significant contributions to the project as well.

VII. PROJECT STRATEGY:
A. Project Partners:

Partners receiving ENRTF funding

- *None*

Partners NOT receiving ENRTF funding

- *Cathy Villas-Horns, Supervisor, Minnesota Department of Agriculture, Data Provider and Beneficiary*
- *Jim Porter, EQuIS Database Administrator, MN.IT@PCA, Database Administrator*
- *Dan Ross, Director, MnGEO, MnGEO Commons Host*
- *Sandeep Burman, MDH Drinking Water Protection Manager*

B. Project Impact and Long-term Strategy:
This project is a stepping stone to increase public awareness about groundwater. For most people groundwater is a resource that is out of sight and out of mind. Allowing areas where the resource has been degraded to be

seen and more fully known will build public knowledge and appreciation to protect and conserve groundwater. The interactive web-based map will be statewide and will encompass all active Superfund sites. Cities, counties, the Metropolitan Council, the Department of Natural Resources, the Minnesota Department of Health, community groups and individual citizens will be able to get this information faster.

Once this system is built, the MPCA will continue to update and publish the data. Conversations with partnering agencies during the duration of the project will help develop the best strategies for long-term maintenance. The MPCA is committed to ongoing data processing and hosting as part of the Agency's overall data and document management strategy.

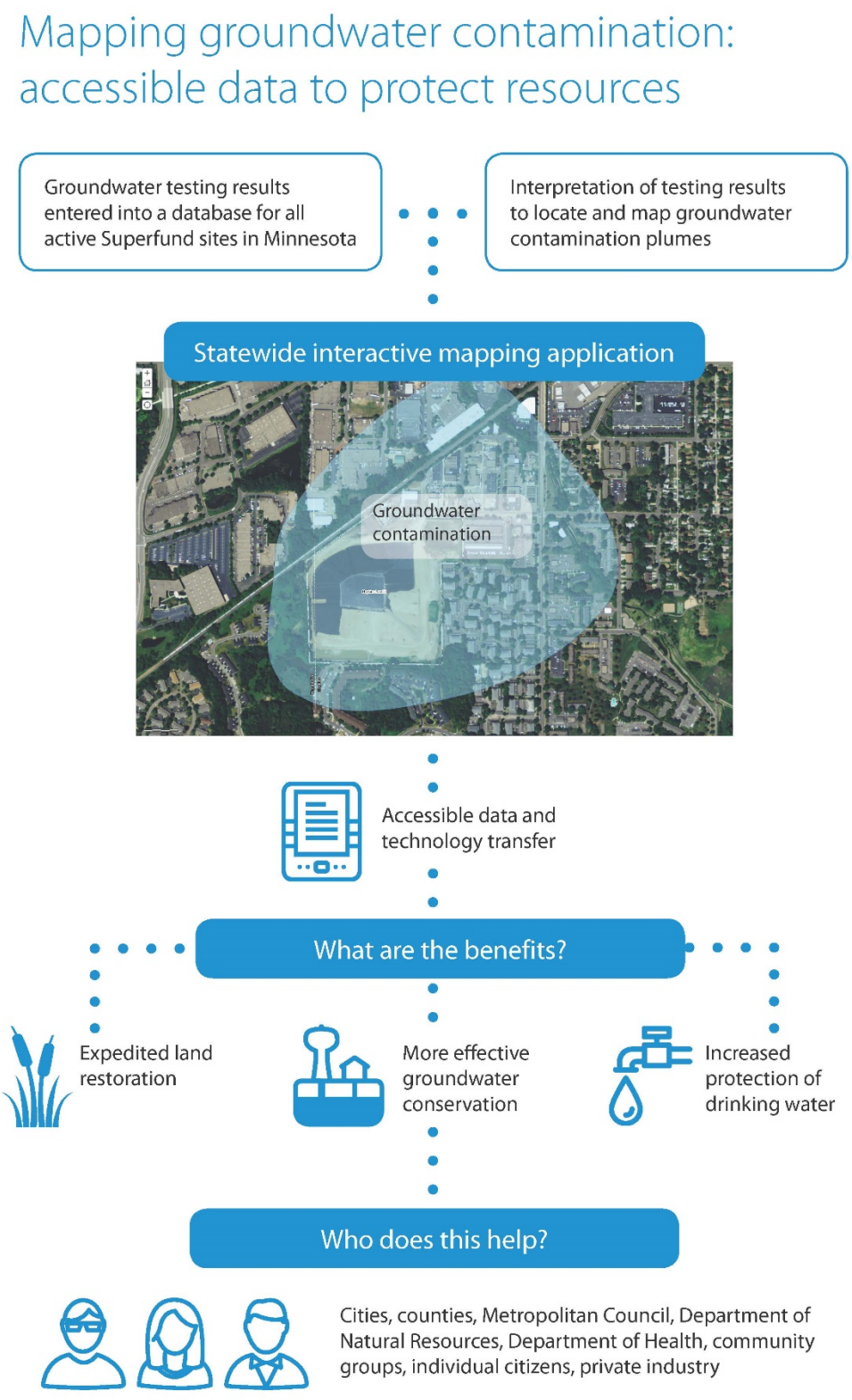
C. Funding History:

Funding Source and Use of Funds	Funding Timeframe	$ Amount
Environment Fund, in kind	2016	$23,000

VIII. REPORTING REQUIREMENTS:

- The project is scheduled for 3 years beginning on 07/01/17 and ending on 06/30/20.
- Periodic project status update reports will be submitted 01/15 and 06/15 of each year.
- A final report and associated products will be submitted between June 30 and August 15, 2020.

IX. VISUAL COMPONENT or MAP(S):



Environment and Natural Resources Trust Fund
M.L. 2017 Final Project Budget

Project Title: Groundwater Contamination Mapping
Legal Citation: M.L. 2017, Chp. 96, Sec. 2, Subd. 03h
Project Manager: *Hans Neve*
Organization: *Minnesota Pollution Control Agency*
M.L. 2017 ENRTF Appropriation: **$** *400,000*
Project Length and Completion Date: *3 Years, June 30, 2020*
Date of Report: *August 14, 2020*

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND BUDGET	Activity 1 Budget 6/30/2020	Amount Spent 6/30/2020	Activity 1 6/30/2020	Activity 2 Amended Budget 6/30/2020	Amount Spent 6/30/2020	Activity 2 Balance 6/30/2020	Activity 3 Amended Budget 6/30/2020	Amount Spent 6/30/2020	Activity 3 Balance 6/30/2020	TOTAL BUDGET	TOTAL BALANCE 6/30/2020
BUDGET ITEM	**Extract groundwater testing data**			**Map areas of groundwater contamination**			**Publish interactive web-based map**				
Personnel (Wages and Benefits)	$176,334	$176,334	$0	$99,404	$99,404	$0	$124,262	$124,262	$0	$400,000	$0
Hydrologist, $80,000 (68% salary 32% benefits), 100% FTE for 16 months											
Hydrologist, $200,000 (68% salary 32% benefits), 100% FTE each year for 3 of years											
Student Workers, $120,000 (92% salary 8% benefits), 66.6% FTE each year											
COLUMN TOTAL	**$176,334**	**$176,334**	**$0**	**$99,404**	**$99,404**	**$0**	**$124,262**	**$124,262**	**$0**	**$0**	**$0**