

MPCA MMP Spreadsheet User Guide

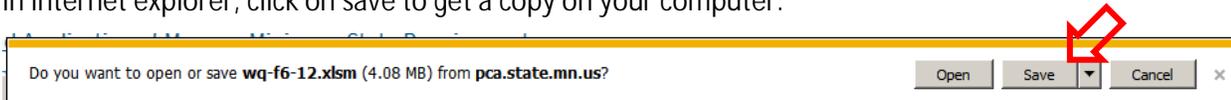
This document describes the most effective way to utilize the MPCA MMP spreadsheet planner.

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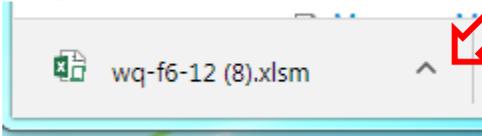
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How to get a copy of the program on your computer

The current version of the MMP spreadsheet can be obtained from the MPCA's website, <https://www.pca.state.mn.us/quick-links/land-application>. In order to use the program you need to save a copy to your computer, it does not work well to simply open the program without saving it first. Here is how it looks in internet explorer, click on save to get a copy on your computer.

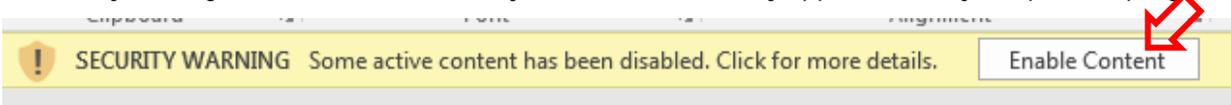


Using the Chrome browser is a little different. Chrome automatically places a copy on your computer in the "downloads" folder. While this does place a copy on your computer, it is not easy to find. It is recommended that you click on the arrow in the downloads toolbar that is displayed and then click "show in folder". This opens the "downloads" folder and you can simply drag the MMP spreadsheet to your desktop so that you can find it easily.



Opening the program

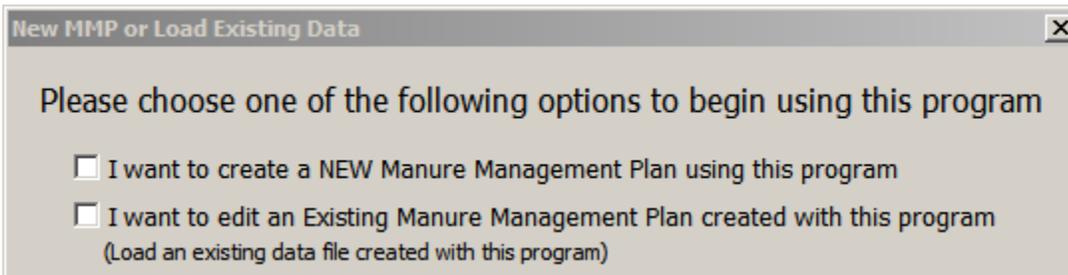
This program is designed to function through the use of macros, which is custom code written specifically for this program and not found in any other excel files. Sometimes hackers use macros like this so Excel does not typically automatically allow this special code to work; so you must tell Excel that you want to enable these macros by clicking "enable content" in the yellow bar that initially appears when you open the program.



Once you click on this button, the program will open.

New or Existing MMP

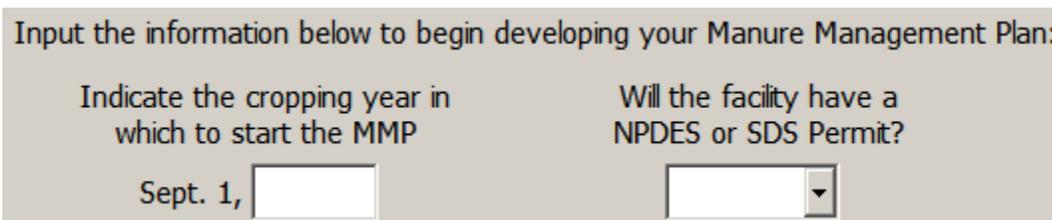
The first thing you will see is a box that asks you if you want to create a new MMP or edit an existing MMP.



If you have never used this program before, then click on the first option. Otherwise, make the appropriate selection. The "X" in the upper right hand corner has been disabled, so you must make a choice to continue.

A. Creating a New MMP

After clicking on the checkbox for creating a new MMP, you will need to complete the next box that appears.

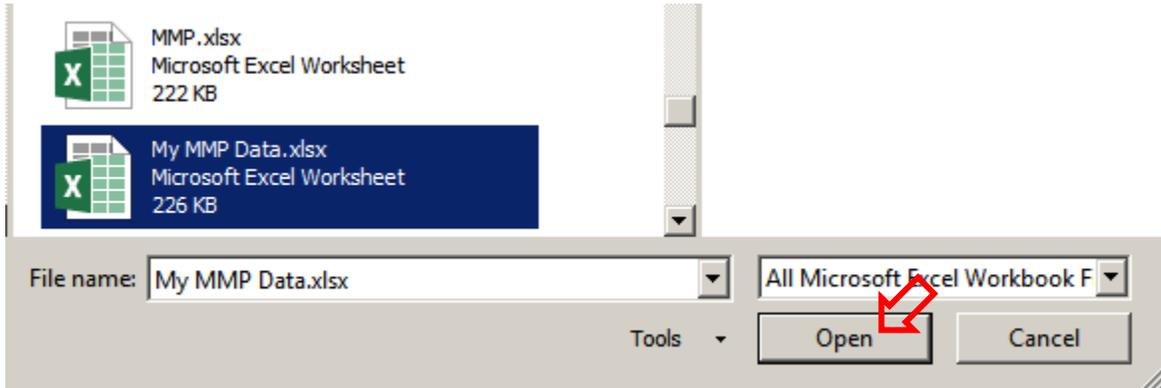


Enter the crop year in which to start the MMP. Crop years run from September 1 to August 31 the following year. For example the crop year for crops that are grown in 2019 actually starts on September 1, 2018 and end August 31, 2019. You must also indicate if the facility will have a NPDES or SDS permit.

After entering this information and clicking OK, the instructions will appear. You can read through these for additional information. You can scroll to the bottom and click “close instructions” or simply use the “X” in the upper right hand corner.

B. Editing an Existing MMP (Loading data)

After clicking on the checkbox for editing an existing MMP, you get an informational box reminding you to complete the animal mortality portion of the MMP if you are a facility that has a NPDES or SDS permit. Click “OK” to continue the process and the program will open a window for you to navigate to your existing data set.



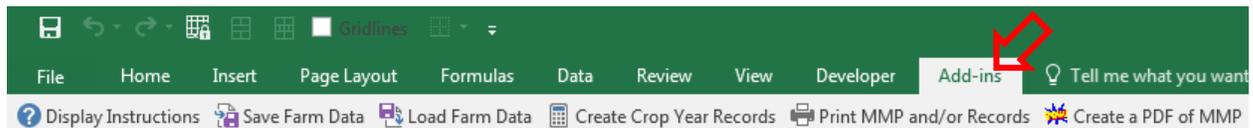
After locating it, click “open” to continue and the program will load this data into the program.

Important features of the program

This is not your typical Microsoft excel workbook. If you had data to load into the program you will know most of this already but for those that are starting from scratch here are some important features of the program now that you are ready to start creating your MMP.

A. Add-ins menu

If you have not noticed yet a new tab was added to your ribbon titled “Add-ins”.



Clicking on it will reveal a number of choices that were specially designed for this workbook.

Display Instructions Clicking on this will display the instructions again, if you need it.

Save Farm Data **Load Farm Data** These are the most important features within the program. Their use is covered in section C. “Saving and Loading Data”.

Create Crop Year Records This feature is critical to using the program effectively. Its use is covered in section B. “Planning and Record Keeping”.

Print MMP and/or Records This button can be used to facilitate printing of the MMP and/or records for submission. As every computer and printer is different, this button may not give you the results you desire so be sure to check the printout it generates to make sure it is satisfactory. Individual sheets can be printed as you would print any other worksheet: navigate to the worksheet you want to print then select “File” from the ribbon and then “Print.”



This button can be used to generate a PDF of your MMP to allow you to easily email it to your CFO or the MPCA. Once you click this button you will be given a window to chose the file name for the pdf as well as where to save the pdf once generated.



Nutrient App Summary

This button will create a PDF of a worksheet that summarizes all nutrient applications (manure and fertilizer) for each field within the planner.

Planned Nutrient Application Summary Sheet

Data is not editable and is simply a summary of the planned nutrient applications per field.

Crop Year: Sep

<i>Manure Source Summary</i>									
Source 1: _____					Source 5: _____				
Source 2: _____					Source 6: _____				
Source 3: _____					Source 7: _____				
Source 4: _____					Source 8: _____				

Field Information		Manure Application			Starter Fertilizer		Supplemental Fertilizer #1	
ID	Acres	ID	Rate	Acres	Product	Rate	Product	Rate

B. Planning and Record Keeping

The MMP spreadsheet is designed to help you create a plan for the current crop year as well as crop years to come with minimal data entry required for future MMPs. The intent of this program is to create a plan for the upcoming crop year and then create records to show what actually happened. You should not come back to the program after doing the land application event and then complete your plan; this is when you should be creating/editing your records. In other words, the plan is a prediction of what you intend to do and the records are what actually happened. This is also the only way to change crop years without having to again enter all the information into the program (ie. facility, manure source, and land base information).

Here is the best way to use the program for planning and record keeping for multiple crop years.

1. Create a plan for the current crop year by filling out all the worksheets.
2. Once you have completed your plan for nutrient applications go to the add-ins tab on the ribbon and click **Create Crop Year Records**
3. The program will ask you if you are certain you want to do this. This action cannot be un-done; but this does not mean you cannot change the information on the records form to reflect the actual applications. In fact creating the records after you are done planning and then editing the records form is the intended functionality of the MMP planner spreadsheet. You should always first create a plan that you intend to follow, create the records, and then edit the records to reflect what actually happened.
4. The program will then create the records form for the crop year designated in the plan. The form will be added to the tabs at the bottom of the screen and will be the worksheet currently visible on your screen.



5. Go ahead and make any necessary changes to the records form and indicate the dates of application. Any changes you make here (except the manure source test results) will be applied to the plan for the next crop year. The program has automatically made any necessary changes to assist you in planning for the next crop year.
6. To complete the plan for the next crop year, make any necessary change to the existing information with the program; but, be sure to visit the Manure Source Info page to make any updates to manure tests and the Field Info page to make any updates needed there including addition or subtraction of fields from your land base.

- Navigate to the Crop Info page and you will see that information from the records form is now in this form, including any changes you have made, or will make, to the records form for the previous crop year. Simply enter the crop to be grown this crop year and then visit the Nutrient Application page to indicate the planned applications.
- This completes the plan and you are now set to begin the cycle of creating records again to advance to planning for the next crop year.

The program is capable of keeping records for 6 crop years at which time the oldest one will be deleted and replaced with the newest one. This coincides with the length of time that you are required to keep land application records.

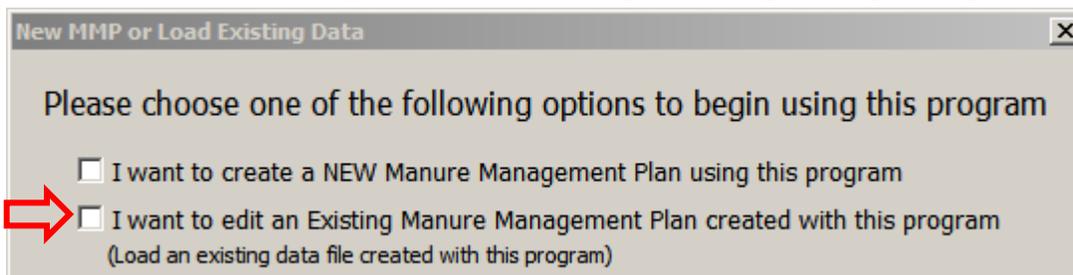
C. Saving and Loading Data

The MMP spreadsheet was designed so that you would not be forced to start over each time updates were made to the MMP spreadsheet or when nutrient recommendations or applicable regulations change. To accomplish this you should not be saving your MMP in the manner which you would typically save an Excel workbook (ie. clicking the save icon or through the File menu on the ribbon). In fact, if you try to save this way you will be given a warning box laying out the pitfalls of saving in this manner.

In a nutshell, just as you use the Microsoft Excel software to view many different spreadsheet files by “opening” them, the MMP spreadsheet is designed to view your farms data. For instance, you do not need to obtain a new copy of the Excel program in order to open each and every spreadsheet you have. Likewise, the MMP spreadsheet within the Excel program saves and loads your farms data without the need to obtain a new copy of the MMP spreadsheet each and every time. In other words, think of the MPCA MMP spreadsheet as a “viewer” for your farms data.

Here is the correct way to save your work.

- At the point you desire to save your work simply go to the add-ins tab on the ribbon and click . It is recommended  Save Farm Data to save your work after entering the Manure Source Info and Field Info, as this is the most intensive data entry within the program.
- This will bring up a dialogue box for you to name the file and select where to save the data. Here is what is happening. You are saving any information you entered into the program in a very small and condensed file (<500 KB) separate from the MMP spreadsheet program which is a very large and expansive file (4.5 MB). The very small and condensed file is referred to as the “DATA FILE”.
- Prior to exiting the program (at any stage) simply click on  Save Farm Data to make sure your work is saved.
- When you want to again work on your MMP or records open the MMP Planner Spreadsheet program you downloaded from the MPCAs website (good time to check for a new version if it has been a while). When you open the program you will see no data in the Manure Source Info page, DO NOT BE ALARMED, this is normal! You should see an option to choose to edit your existing MMP by loading data into the program.



- Click this option and then navigate to the “data file” you saved. This will then load all the data into the program for viewing and further editing. It is also possible to load data from the add-ins tab in the ribbon by clicking.  Load Farm Data
- Once you are done viewing or editing your farm’s data, again go to the add-ins tab on the ribbon and click. Again, you will get the dialogue  Save Farm Data box to name the file and select where to save the data. You can safely name it the same as before even though it will warn you that you will over-write an existing

file. You can go ahead and overwrite the previous file unless you want to save the recent changes separately for some reason. This cycle can be repeated any number of times.

Data files from previous versions will always be compatible with new versions of the program; however, newly created data files may not open correctly with old versions of the program.

D. What **NOT** to do (cut, copy, paste or adding/deleting rows/columns)

The use of copy and paste creates the majority of headaches for users of this program. You will notice that you cannot grab the corner of a cell and use the typical drag down or to the right to copy the contents. The MMP spreadsheet has many instances of code that works only when you physically type something in a cell or make a selection from a drop down menu. If that does not happen certain code does not work which in turn affects other parts of the worksheet, which can result in errors or, in the worst case, a crash of the program. Prior versions of Microsoft Excel allowed these commands to be disabled, the newer version of Microsoft Excel make this much harder to accomplish without access to each and every computer using this program. So again, do not use cut and paste!

Similarly, the code and formulas that make this program work depend on certain information being located in very particular locations within the program. If you do such things as insert or delete a row/column it will **always** result in errors within the program. You will notice that you do not see the typical row and column headings on each worksheet. This is to prevent the possibility of inserting or deleting a row/column accidentally. Just leave the layout of the program alone!

The program is “protected” for your own well-being. Don’t unprotect it to make changes to it. You won’t like the consequences!

E. Which cells are editable

Areas highlighted with light gray (red arrow) are automatically calculated or contain info from other parts of the program and are locked from editing. Areas highlighted with light gray diagonal line (blue arrow) are automatically calculated or contain info from other parts of the program but can be edited. Areas without highlighting (green arrow) are always editable. If a small triangle appears when you click on an editable cell (just above the green arrow), it means that there is a dropdown menu for you to choose from. Simply click the small triangle and choose the applicable entry for the cell.

Manure Source (1-12)	Method of Application and Incorporation NPDES/SDS permitted sites cannot apply liquid manure in the winter (unless emergency)	Acres Receiving Manure (reduce to split the field)	Manure Application Rate (gals/tons per acre)	
			Calculated Max Rate based on Nitrogen	Planned Rate max used if blank
?		?	?	?

F. Help text boxes

Should you need help understanding what type of information needs to be entered in a particular cell, you can click the small gray boxes with the blue question mark to reveal help text (yellow arrow). Additionally any orange colored text within the program is there to help guide you through the process of completing a MMP. This text will not be a part of the printed copy of the MMP.

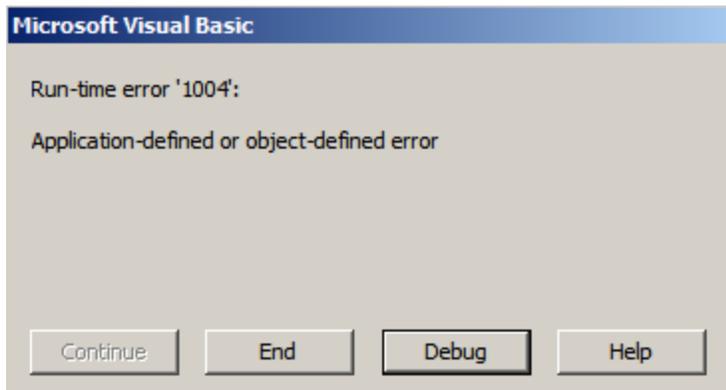
Annual Generation - Existing facilities should use actual	
Total Manure Produced per Year (Estimated)	?
Total Manure Produced per Year (Actual)	?
Annual N Produced	?
Annual P ₂ O ₅ Produced	?
Annual K ₂ O Produced	?

To Prevent Errors - It is best to complete the worksheets in the order they appear on the tabs at the bottom of the screen.

Average
N
P ₂ O ₅
K ₂ O

G. Program errors

Hopefully this will not happen, but, in the event the program has an issue with the data you are entering, you will see an error message pop up that looks something like this:



At first, you should try to click on “End”, which will take you back to the worksheet and the cell you were working on. If you see an issue with what you had entered, fix it and the program may be able to continue without further issue. Sometimes, however, the error message will keep appearing. If that happens first you should try to save your data, exit the program, reopen the program and reload the data. This can actually fix the issue, especially if you saw an error in the information you were entering. If this still does not work you should then click on “Debug”. This will take you to a screen that probably looks totally foreign but is useful for the program developer to correct the error you are experiencing. Take a screen shot of the debug screen and email it to george.schwint@state.mn.us along with the data file you are working with and a short description of what you were/are trying to do. In nearly every case, the data you had saved can be rescued with the offending data removed.

H. Order of data entry

In general, it is best to complete the different parts of the MMP in the order that they appear on the bottom of your screen when you open the program. Obviously, you need to enter in your facility information and your land base information before you can develop a plan for your facility. The following sections are presented in the recommended order of completion.

Manure Source Info page

Complete the initial info at the top of the page and be sure to indicate if the facility will have a NPDES or SDS permit. There are special worksheets within the program that only apply to facilities with this type of permit coverage. This page is where you identify the characteristics of your manure sources. You can group similar manure sources provided the management and nutrient tests are similar. The program can handle up to 12 manure sources. Initially there are 4 manure sources displayed. The program will ask you if you need more manure sources once you start entering the animal type for manure source 4 and likewise for manure source 8.

It is best to enter all the information for one manure source before moving to the next source. In other words, work downward on this worksheet.

Up to two animal types can be entered per manure source. For example, if an earthen basin collects manure from mature dairy cows as well as heifers, you can indicate that in the Livestock Information section.

The type of manure storage must be completed as this signals to the program if the manure is liquid or solid, which also determines the type of units to use.

If you select book value in the “Basis for N, P, & K Values Below” from the drop down in that cell, the program will automatically fill in the applicable book values. Only facilities without actual manure test results should use book values.

Make sure that enter the total nitrogen, phosphate, and potassium as reported by the manure testing laboratory. Some labs will also provide you with estimated first year availability, which you should not record here as the program does this calculation for you. The graphic below shows which numbers to use in the program.

Manure Nutrients	Units	As Received	lbs/1000 gal	lbs/Ton
Moisture, %	%	92.75		
Dry Matter	%	7.25		
Nitrogen (TKN)	%	0.79	65.78	15.78
Ammonium N	%	0.74	61.65	14.79
Organic Nitrogen	%	0.05	4.13	0.99
%P2O5	%	0.35	29.53	7.09
%K2O	%	0.51	42.92	10.30
Calcium (Ca)	%	0.19	15.79	3.79
Magnesium (Mg)	%	0.12	9.95	2.39
Sodium	%	0.16	13.26	3.18
Sulfur (S)	%	0.14	11.85	2.84
Copper	ppm	50.50	0.42	0.10
Iron	ppm	90.20	0.75	0.18
Manganese	ppm	15.50	0.13	0.03
Zinc	ppm	69.20	0.58	0.14

~~Estimated 1st Year Available Nutrients~~

	Injected or Incorporated		Surface Applied	
	as Liquid (lbs/1000 gal)	as Solid (lbs/ton)	as Liquid (lbs/1000 gal)	as Solid (lbs/ton)
Nitrogen (TKN)	49	12	23	6
%P2O5	24	6	24	6
%K2O	39	9	39	9

The program will also give an estimated manure production volume that can be used if there is no actual data for the manure source. These are just estimates, primarily from Midwest Plan Service, so actual production can vary based on the specifics of the operation. If you input an actual value, the program will use your actual value rather than the estimated value.

If you forget to fill in a critical piece of information, as soon as you leave the Manure source info page the program will require you to enter the missing information.

Field Info page

This is where you input your land base available for land application of manure. It is recommended that you list your entire land base even though it may not get manure in the current crop year. This way it is available in following years without having to revisit this page and add it. The program can handle up to 100 fields. As you enter a field ID in the last row the program will display more rows for entry of more fields. If you have more than 100 fields you can either group those that have the same management, crop rotations, and similar soil tests or start another data file with the rest of the fields.

Each field must have a unique ID. There is no required information in the field ID, just that it is unique and matches the aerial photograph/map that must be included with a complete MMP.

Indicate the types of sensitive features contained within or near the field by double-clicking to insert check marks.

For any facility or 300 or more animal units you must test for soil phosphorus at least every four years. For convenience outdated soils tests within existing data sets are highlighted in red text. Use a filed average when a gridded soil sampling program is employed.

If the field is irrigated with groundwater, indicate "Yes" in the irrigation column.

Indicate the anticipated manure application timing. This is used to determine if winter application restrictions are applicable to the fields. In the event they are, you need to complete the information in the winter application columns. Use the shortest distance to water features and the largest field slope where manure is applied.

You can double click the word clear at the end of a row to remove all entries from that particular row. This is particularly useful when a field becomes no longer part of your land base (ie. no longer renting that field). This is the best way to remove the field from your plan.

The entries you make on this form are used to populate other cells on upcoming worksheets. It is recommended that you save after completing this page.

Methodology - Field Info page (only visible if the facility has a NPDES or SDS permit)

If you do not have a NPDES or SDS permit you will not see this page and you can move on to the next section of this guide. If it is visible, it must be completed.

This page is very important to complete thoroughly if you want to avoid delays in making changes to your MMP. Nearly every change to this page will require you to apply for a permit modification to authorize the change. This includes a 30 day public comment period. So you would be looking at waiting at least 30 days before making any change to this page of your MMP. This includes when you need to add a field to your MMP.

This page is pre-populated with the list of fields from the Field Info worksheet. There is an area at the bottom of this worksheet to add fields to this page but it is advised that you add them to the Field Info worksheet instead.

To complete this page simply double click the type of crops that could potentially be grown on the fields. Keep in mind that a change to the crops would take at least 30 days to authorize so make to indicate any possibility.

Similarly double click to insert checkmarks for manure application timing and method of application, again indicating all anticipated options. If you indicate winter as a potential application timing, you will need to indicate the results of the Minnesota Phosphorus Index and attach the output from that model. The Phosphorus Index can be found here: <https://www.swac.umn.edu/extension-outreach/phosphorusloss>.

If you have any amount of liquid manure at your facility, you must identify a potential field that could be used for emergency application during the winter. This must be done even if you do not regularly plan to apply manure in the winter. You must have at least one field identified before you can advance from this worksheet.

You can double click the word clear at the end of a row to remove all entries from that particular row. Everything in that row will be removed except the Field ID as that is carried forward the Field Info worksheet. Most likely not all that useful but available nonetheless.

Methodology - Nutrients page (only visible if the facility has a NPDES or SDS permit)

If you do not have a NPDES or SDS permit you will not see this page and you can move on to the next section of this guide. If it is visible, it must be completed.

There is no data entry required for this part of the MMP for a NPDES or SDS permitted site. Although there is no data entry, it is a required part of the MMP and must be followed by the facility. This page outlines the methods used by the program to calculate nutrient recommendations and manage phosphorus levels, which obviously you are going to use since you are using the spreadsheet. This page also recites the land application restrictions contained within the NPDES or SDS permit, which you are also required to follow. In summary, this page simply puts into words what the spreadsheet program is doing for you and what you are required to do via your permit.

Sensitive Features (required)

There is no data entry required for this part of a MMP. Although there is no data entry, it is a required part of the MMP and must be followed by the facility. This page outlines the approved management techniques available for the various sensitive features listed. You can chose any of those that are listed. For instance on one field you could employ Option A for one tile intake and Option C for a different tile intake. Alternatives to those listed can be approved on a case-by-case basis with the MPCA.

Sensitive Features (optional)

There is no data entry required for this part of a MMP. Although there is no data entry, it is a required part of the MMP. This page outlines management techniques available for the various sensitive features listed. You can chose any of those that are listed or list your own. Even though no specific practices are required, Minnesota Rules do require management techniques be listed in the MMP and utilized to provide protection for these sensitive features.

Winter Application (only visible if the facility has a NPDES or SDS permit)

If you do not have a NPDES or SDS permit, you will not see this page and you can move on to the next section of this guide. If it is visible, it must be completed. There is limited data entry required on this page. If the words "NOT APPLICABLE TO THIS OPERATION" appear in a section, then you do not need to complete this section as you either do not have liquid manure or do not plan to apply solid manure in the winter. If you plan to apply or potentially plan to apply solid manure in the winter, this page summarizes the restrictions applicable to such applications. You must comply with these restrictions. Additionally, you must indicate why winter application of solid manure is necessary. There is space for five reasons.

If you have liquid manure at your facility, you are required to comply with this page. Even though winter application of liquid manure is prohibited, this page handles emergency situations when land application of liquid manure in the winter may be needed. This page summarizes the restrictions that are applicable as well as the need to call the Duty Officer and the MPCA with 24 hours of the emergency application. You need to indicate, via check mark, which management techniques will be used to prevent or minimize the need to land apply in the winter time. Land application of liquid manure in the winter should only be done as a last resort.

High Soil P Mgmt (only visible if the facility does not have a NPDES or SDS permit)

If you have a NPDES or SDS permit, you will not see this page and you can move on to the next section of this guide. For NPDES and SDS permits, the same information within this worksheet is contained in the Methodology – Nutrients page. If it is visible, it must be completed.

There is no data entry required for this part of a MMP. Although there is no data entry, it is a required part of the MMP and must be followed by the facility. This page outlines the approved management techniques available for management of phosphorus on fields that receive manure applications. You can choose either option A or B for each of the levels indicated. Again, even though no data entry is required, you are required to comply with this page.

6 Yr P Management

You must complete this worksheet when you have soil test phosphorus levels above 21 Bray or 16 Olsen. When soil test are above these levels, it is very likely that you must manage soil phosphorus so as to avoid building soil P levels over a 6 year period. If it is visible, it must be completed.

If you do not plan to apply manure within 300 feet of waters then you can check the box at the very top of the page and then continue on with your MMP without completing the rest of this page. However, this option is not available when your soil test results are over 150 Bray or 120 Olsen. At these soil test levels you must manage your soil test P over a six year period even if no water features are nearby.

This worksheet does not require a field-by-field plan for managing soil phosphorus buildup but rather identification of different crop scenarios that you could employ on those fields to manage the phosphorus levels effectively. Obviously, for each scenario you need to identify the crops and P applications within the six-year period. You start by selecting a crop for year 1 from the drop down and identifying a yield goal. Then you identify the manure application planned by picking a manure source number from the drop down list and the rate which you anticipate applying manure. As you click on the cell to pick a manure source, a popup window will appear to remind you which source corresponds to which number (1-12).

As you click on the cell to enter a manure application rate, an additional form (see below) will appear where you should enter the application rate you plan to use.

Scenario 1	
Crop (Year 1)	Corn Silage
Yield	27 ton
Manure Application Source (1-12) & Rate	1 gals
2 nd Manure Application	
Fertilizer P (total)	0 lbs
Crop (Year 2)	Corn Silage
Yield	27 ton
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	0 lbs
Crop (Year 3)	Corn Silage
Yield	27 ton

Manure Application

Indicate the application rate and click "Insert Rate into Worksheet"

Source: 1 Application Rate: gals

The Nitrogen and Phosphorus info below is for your information only. It has no affect on the worksheet or its calculations.

<p>NITROGEN</p> <p>Select Application Method: <input type="text"/></p> <p>Available N: <input type="text"/> lbs</p>	<p>PHOSPHORUS</p> <p>Available P2O5: <input type="text"/> lbs</p> <p>P2O5 Removed: <input type="text"/> lbs</p>
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Once you start entering an application rate, this form will display the P2O5 available from the manure application and the P2O5 removed by the crop. It will also display the N available should you enter an application method. This additional form has no effect on any other part of the program; it is simply to help guide you in selecting a manure application rate should you not have a good idea as to what rate to use.

On the main worksheet, there is a spot for a second manure application to this crop in the event you apply two sources of manure to the same crop. Then you need to input the commercial fertilizer you plan to apply to this crop (including starter). When you click on this cell, you will be presented with a handy window (see below) to assist with fertilizer entry.

Fertilizer Applications

Complete the following for your commercial fertilizer applications for this crop in the rotation.

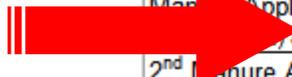
<p>Starter</p> <p>Select Product Below:</p> <div style="border: 1px solid gray; padding: 2px;"> <ul style="list-style-type: none"> UAN (28% N) UAN (32% N) Liquid 10-34-0 Liquid 9-18-9 Liquid 7-21-7 Liquid Amm. Thiosulfate (12-0-0-26) Urea (46% N) Anhydrous Ammonia (82% N) </div> <p style="text-align: center; font-size: small;">Click to remove this application</p>	<p>Supplemental #1</p> <p>Select Product Below:</p> <div style="border: 1px solid gray; padding: 2px; height: 20px;"></div> <p>Rate of Product Application: <input type="text"/></p> <p style="text-align: center; font-size: small;">Nutrients Available in lb/acre</p> <p>N: <input type="text"/> P2O5: <input type="text"/> K2O: <input type="text"/></p> <p style="text-align: center; font-size: small;">Click to remove this application</p>
--	--

Click on the dropdown list to select the common type of fertilizer (or use "Custom" for special blends) and then input the rate of application. The program will automatically calculate the P2O5 available from the fertilizer. There is space for identification of starter fertilizer and up to three supplemental fertilizer applications. Clicking continue at the bottom of the window will place the appropriate value into the worksheet.

Then you continue to enter the crop in Year 2 along with the nutrient applications for that crop in the same manner as Year 1. You continue this process for each following year until you get to the point at which you start repeating the rotation from Year 1. Once your rotation starts repeating, you can simply select "Repeat from Year 1" in the crop selection drop down and the program will automatically fill in the remaining years for that crop scenario starting from Year 1. An example is provided on the next page.

In the example shown below, crop scenario 1 is a Corn - Soybean rotation with manure and starter fertilizer applied to the corn crop. The left most image below shows how to enter the information for the first two crop years. Then for the third year, you select "Repeat from Year 1" for the crop in Crop (Year 3). The program will then automatically complete the rotation for years 3-6, as shown on the right most image below.

Scenario 1	
Crop (Year 1)	Corn
Yield	200 bu
Manure Application Source (1-12) & Rate	1 3000 gals
2 nd Manure Application	
Fertilizer P (total)	19.8 lbs
Crop (Year 2)	Soybeans
Yield	50 bu
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	lbs
Crop (Year 3)	Repeat from Year 1
Yield	Corn
Manure Application Source (1-12) & Rate	Soybeans
2 nd Manure Application	Alfalfa
Fertilizer P (total)	Barley
Crop (Year 4)	Barley w/ Straw
Yield	Birdsfoot Trefoil
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	
Crop (Year 5)	
Yield	
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	
Crop (Year 6)	
Yield	
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	



Scenario 1	
Crop (Year 1)	Corn
Yield	200 bu
Manure Application Source (1-12) & Rate	1 3000 gals
2 nd Manure Application	
Fertilizer P (total)	19.8 lbs
Crop (Year 2)	Soybeans
Yield	50 bu
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	lbs
Crop (Year 3)	Corn
Yield	200 bu
Manure Application Source (1-12) & Rate	1 3000 gals
2 nd Manure Application	
Fertilizer P (total)	19.8 lbs
Crop (Year 4)	Soybeans
Yield	50 bu
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	lbs
Crop (Year 5)	Corn
Yield	200 bu
Manure Application Source (1-12) & Rate	1 3000 gals
2 nd Manure Application	
Fertilizer P (total)	19.8 lbs
Crop (Year 6)	Soybeans
Yield	50 bu
Manure Application Source (1-12) & Rate	
2 nd Manure Application	
Fertilizer P (total)	lbs

At the bottom of the worksheet, the program displays the P applied and removed over 6 years. If more P is applied than removed, the program tells you to modify the rotation. To the right are the results of the example crop scenario. As you can see, this scenario will build soil P so it must be modified.

Results	
P Applied over 6 Yrs	377.4 lbs
P Removed over 6 Yrs	333 lbs
Will Rotation Build Soil Phosphorus Levels?	Yes - Modify the Rotation

In the example situation, a change to the type of starter fertilizer to remove P₂O₅ from the blend resulted in a nutrient application plan that would not build soil phosphorus for the corn – soybean rotation over the six-year period. In some situations, a manure application may need to be removed in order to prevent soil P buildup. You can input eight different scenarios of crops and nutrient applications to identify multiple options for management of high soil phosphorus. The program will not let you move on until you identify at least one scenario that will not build soil P over 6 years.

Irrigated Fields

This page is required for any irrigated field to account for nitrogen credits from nitrates within the irrigation water. If it is visible, it must be completed. The worksheet is divided into two parts, the left side is required and the right side is optional.

To complete the right side of the worksheet, simply enter the results of the most recent irrigation water test results and the amount of water typically applied. If you do not have a nitrate test result, leave this cell blank and the program will assume a default value of 15 ppm. Likewise, if you do not know the typical depth of water applied, leave this cell blank and the program will assume a default value of 7 acre-inches. Using the default values, a credit of 24 lbs of N per acre is utilized.

The optional side of the worksheet allows you to use the University of Minnesota recommendations for corn crops grown on irrigated sandy soils, which are different than the standard recommendations. In order to verify the field is indeed eligible to utilize the alternative recommendations, you need to select the predominate soil type of the field as well as the timing of manure application. You will notice that only soil types that end with the word "sand" are listed, as these are the only soil types that are eligible to use the alternative recommendations. You will also see that fertilizer application timing is limited to application at planting or during the growing season. The applicable alternative nitrogen recommendation, without accounting for any applicable nitrogen credits, is displayed in the far right column on the page.

When completing the next two worksheets there are a couple of features on these worksheets that tie directly to the irrigated fields page. You must inform the program on the Crop Info page that you want to use the alternative recommendations. On the Nutrient Application page, you will be limited to no more than 180 lbs of nitrogen from manure application meaning that the remainder of the nitrogen must come from commercial sources.

In summary, using the alternative nitrogen recommendation includes complying with the following:

- Only utilized on fields with the predominate soil type that ends with the word "sand"
- Commercial fertilizer application only allowed at planting or during the growing season
- No more than 180 lbs of plant available nitrogen comes from manure application
- For NPDES or SDS permitted sites, fall manure app is delayed until soil temps are < 50°F

Crop Info

This page is a critical component of any MMP. This is where you will identify the crops grown and the program will calculate for you the appropriate nitrogen recommendation after taking into account any applicable credits. At the top of this page is the crop year, for which you are planning. This is taken from the entry you made when starting to develop your MMP or is taken from the data file you loaded. This cannot be changed at this point. If you made a mistake on the crop year, email your data file to george.schwint@state.mn.us along with the change you desire to the crop year. If you are working with a data file you can advance the crop year by creating records, this is covered in more detail elsewhere in this document.

If you are working with existing data that contains records of previous crops and manure applications, much of this worksheet will be completed for you, as the program will automatically pull forward any applicable data from previous year's records. When data is pulled forward, the cell has a light gray background to let you know that you should not change it. If you see a mistake, you should **NOT** make changes on this worksheet; rather make any changes required to the previous year's records form within the planner. Changes to the records forms will be reflected on this worksheet once you return to it from the applicable records form. Much of the explanation that follows focuses on those that do not have records within the program.

You will notice a little note alerting you to a potential time saving measure by clicking on the button "Use Rotation Builder".

Cropping Year: September 1, 2018 to August 31, 2019

Field Information	Use Rotation Builder Crop Information				Last Year's Manure Test N
Field ID	Crop Grown to Utilize the Nutrients Applied 2019 Crop	Expected Yield (per acre) crop receiving nutrients	Crop Most Recently Harvested 2018 Crop	Crop Grown 2 Years Ago 2017 Crop	Last Year's Manure Test N
Example	Corn	180 bu	Corn	Alfalfa	25
Baxter 6 NE					
Baxter 6 W 1/2					
Maxwell 12 NE					
Hamlin 11 SW					
Riverside 2 SW 1/4					

Potential Time Saver
You can save time entering the crop info if you click the "Use Rotation Builder" button above.

The rotation builder saves time by indicating a common crop rotation (eg. corn following soybeans) and then picking which fields employ this rotation. This is most useful when you are just starting to develop a MMP and do not have any crop history stored within records in the program.

Here is what the rotation builder looks like:

Crop Rotation Entry

To shorten the data entry process you can use this form to identify common crop

Step 1: Enter a Crop Rotation Below

Crop Information			
Crop Grown to Utilize the Nutrients Applied 2019 Crop	Expected Yield (per acre) crop receiving nutrients	Crop Most Recently Harvested 2018 Crop	Crop Grown 2 Years Ago 2017 Crop
Corn	200 bu	Soybeans	Corn

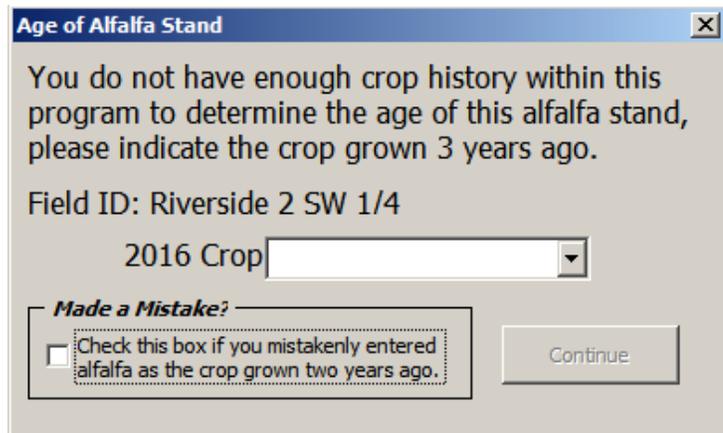
Step 2: Indicate ALL Fields With this Crop Rotation

Baxter 6 NE Baxter 6 W 1/2
 Hamlin 11 SW Riverside 2 SW 1/4

As you can see in this example, a corn soybean rotation is used for 3 of the 4 fields displayed. You would then click continue at the bottom of the window or click save and enter another rotation if you have another common rotation to enter. This data will then be automatically entered into the program instead of you having to enter it for each field. You can do this any many times as you need to in order to make data entry easier.

Whenever a field is assigned a crop rotation, it is removed from the list of fields displayed. If you do not want to use the rotation builder then you simply would identify the crops by selecting a choice from the drop down menus on the worksheet.

Should you have alfalfa in your crop rotation, the program may ask you for the crop grown 3 years ago. This is needed to determine the age of the alfalfa stand since that will affect the amount of nitrogen available from this alfalfa crop. All nutrient recommendations have been adapted to use age of alfalfa stand versus the previous method of plants per sq ft to determine the appropriate credit. The adaptation of recommendations to alfalfa age can be viewed within Table A of the planner.



On this worksheet, you will also need to enter any manure applications to the field that occurred last year. There is nitrogen available to this year's crop from manure that was applied last year that needs to be accounted for. Simply enter the manure N test result, animal type of manure, and the rate of application. The program will take care of the calculations to determine the appropriate credit. If records exist in the program, this data will be automatically pulled forward.

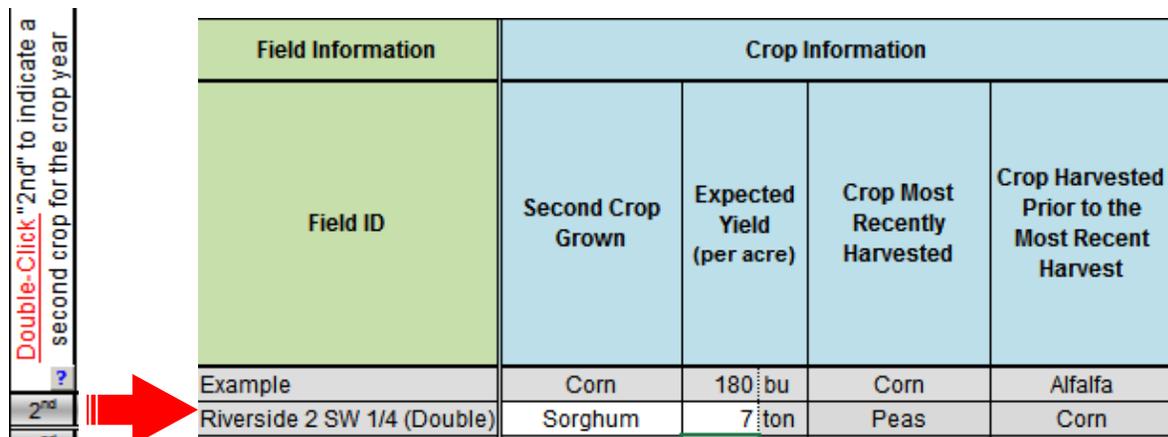
The program displays the University of Minnesota nitrogen recommendation as well as the credits applicable that need to be subtracted from the nitrogen recommendation. You can see below the different types of credits and how they are subtracted from the "N Recommendation" to obtain the "N Needs". If you want more information on how these credits are calculated, you can click on the blue question mark help text boxes on the form. If the N Credit from Irrigation Water is highlighted in yellow, this simply means it is an estimated value. You will also see a category titled "N Removal". This will display the amount of nitrogen a legume crop will remove. Although it does fix its own nitrogen, it will use nitrogen that is applied to it, hence the N removal value displayed.

Nutrient Recommendations and Credits						Irrigated Sands Alternate N Needs		displayed if applicable	
N (lb/ac)						P ₂ O ₅ (lb/ac)			
N Recommendation after 2018 crop credits	Legume-N Credit from the 2017 Crop	N Credit from Manure Applied to 2018 Crop	N Credit from Irrigation Water	N Needs after all credits	N Removal after all credits	P ₂ O ₅ Needs (based on soil test data)	P ₂ O ₅ Removal (based on crop uptake)	N Needs for Corn on Irrigated Sands after all credits	Use Irrigated Sands N Needs instead of typical N Needs
180	60	62	---	58	---	0	63	---	
140	0	---	---	140	---	96	70	---	
180	0	24	---	156	---	43	70	---	
180	0	---	27	153	---	34	70	206	Yes
---	0	---	---	---	255	0	60	---	
180	100	---	---	80	---	52	70	---	

In the example, you will also see the P2O5 needs, which is based on soil test data, and the P2O5 removal, which is based on crop utilization. Typically, manure applications based on nitrogen provide more than enough phosphorus, so much so, that over time it may be necessary to develop a plan for some fields to meet the P2O5 removal of the crop grown and supplement with commercial nitrogen. You can use the information displayed here to assist you in developing a phosphorus based rate for those fields that require extensive phosphorus management.

Finally, in the example above, you will see the nitrogen recommendation for corn production on irrigated sandy soils. As you can see, only one field actually has a recommendation displayed, as this is the only field eligible to use this alternate N recommendation based on previous entries within the planner. As the final step to utilize this alternate recommendation, you must tell the program that you do in deed plan to apply nutrients to meet this alternate recommendation. To do this you must respond "Yes" in the cell to the right of the irrigated sands recommendation displayed. As shown in the example, the program will then use 206 lbs of N as the recommendation versus the 153 lbs of N that would have otherwise been recommended.

The program can accommodate instances where two crops are grown within the same crop year. To identify a second crop simply double click "2nd" at the end of the row. The program will then add another field to the very bottom of the crop info worksheet. It will have the same Field ID but will be followed by "(Double)" to indicate this is the second crop for this field.



Double-Click "2nd" to indicate a second crop for the crop year

Field Information	Crop Information			
Field ID	Second Crop Grown	Expected Yield (per acre)	Crop Most Recently Harvested	Crop Harvested Prior to the Most Recent Harvest
Example	Corn	180 bu	Corn	Alfalfa
Riverside 2 SW 1/4 (Double)	Sorghum	7 ton	Peas	Corn

You then select the second crop grown and indicate the yield. The program will take care of the rest of the information and calculations for you. This will also appear on the nutrient application worksheet in order to allow nutrient applications to both crops.

IMPORTANT DOUBLE CROP NOTES: Upon creation of the double crop field you will be initially taken to the Nutrient Application worksheet, this is just to make you aware that a field has also been added on this worksheet. You can return to the Crop Info worksheet to complete the entry on this worksheet before moving on with your planning. In order to remove the doubled cropped field from the plan you must double click "delete" at the end of the row. If you do not delete the field in this manner, you may have trouble when loading the data back into the program. You do not need to delete the field in this manner if you use the create crop year records feature to advance the plan to the next crop year as the program will automatically do it for you.

Nutrient Application

Now that you have done all the necessary data entry, it is time to actually plan nutrient applications. This worksheet will allow you to identify manure and commercial fertilizer applications.

The very top of the worksheet provides a summary of the available manure sources. This is summarized from the Manure Source Info worksheet and consists of a description of the source and the nutrient content in the format of (N-P-K). Also, a running total of manure remaining for land application can be found within the additions menu or at the bottom of the second page of this worksheet. As manure application is planned, the program automatically removes, from the drop down menu on the worksheet, any manure source where the total volume planned for application exceeds the volume available.

The left side of this worksheet is information carried forward from previous entries in the program. If need be, you can adjust the field acres to account for any reduction from the observance of setbacks. The nutrients needed to meet the yield goal represents the amount of nutrients that can be supplied by manure or commercial fertilizer application after accounting for any previous crop or manure application credits. As you can see, even though the same crop is being grown on all three fields, the amount of nitrogen the corn crop needs varies due to different credits from previous crops or manure applications.

Field Information Summary		Crops Grown Summary		Nutrients Needed to Meet Yield Goal (lb/acre) after credits for nutrients from previous crops and manure applications		
Field ID	Acres After Setbacks	Crop Grown to Utilize the Nutrients Applied	Crop Most Recently Harvested	Nitrogen Needs	Nitrogen (Removal)	Phosphorus (Needs)
		2019 Crop	2018 Crop			
Baxter 6 NE	79	Corn	Soybeans	140	--	96
Baxter 6 W 1/2	280	Corn	Corn	156	--	43
Maxwell 12 NE	148	Corn	Corn	206	--	34

The next section on the worksheet is where you plan your manure applications. You first enter the manure source (1-12) and then select the method of application and incorporation. The program will then auto enter the "Acres Receiving Manure" column as well as the rate (maximum) that would supply the necessary nitrogen to the crop (red arrow). It is suggested that you simply use the rate provided as a guide to assist you in determining the rate at which you plan to apply. For instance, it may be difficult to apply at exactly 4,457 gal/acre so you may want to plan for 4,500 gal/acre. If you do not enter a number in the "planned rate" column the program will assume you want to apply at the "calculated max rate". You can also split a field into two pieces to apply manure from two different sources. This is useful if there is not enough manure from one source to cover the acreage and you want to use a second source to apply to the remaining acres. This is referred to as "splitting a field". To split a field, you simply reduce the number displayed in the "Acres Receiving Manure" column (green arrow). The program then asks you if you want to make this acreage available for application from a second manure source. If you respond "Yes", another field will be added to the very bottom of the worksheet. It will have the same field ID but will be followed by "(Split)". You would then follow the same process to identify the manure source, method of application, and application rate for the remaining acreage. It should be noted that the fertilizer application is assumed to the same as the field from which this acreage was split.

Manure Application Information (Nutrients for the 2019 Crop) Application Typically 9/1/2018 to 8/31/2019				
Manure Source (1-12)	Method of Application and Incorporation NPDES/SDS permitted sites cannot apply liquid manure in the winter (unless emergency)	Acres Receiving Manure (reduce to split the field)	Manure Application Rate (gals/tons per acre)	
			Calculated Max Rate <i>based on Nitrogen</i>	Planned Rate <i>max used if blank</i>
1	Knife Injection	20	4,000	
1	Knife Injection	40	4,457	4500
1	Knife Injection	40	5,143	5000
			--	
			--	

IMPORTANT SPLIT FIELD NOTE: In order to remove the split field from the plan you must double click "delete" at the end of the row. If you do not delete the field in this manner, you may have trouble when loading the data back into the program. You do not need to delete the field in this manner if you use the create crop year records feature to advance the plan to the next crop year as the program will automatically do it for you.

The last section on this worksheet provides you with the amount of nutrients available from the manure application as well as an area to input any commercial fertilizer applications. The "N from Manure" column gives you the contribution from manure application. The "Excess Available N" column informs you of excess nutrient application or if more N is needed. In the example, you can see "0" in the excess available N column indicating that the nutrient needs are completely met by the identified manure application. The "2" in the second row indicates that the identified manure application provides 2 lbs more than what the crop needs. The program does allow slight over application of nitrogen to accommodate the inexactitude of the manure application process. The "-48" in the third row indicates that the manure application did not supply enough nutrients for the crop. You can apply up to another 48 lbs of N to this crop.

Nitrogen (lb N/ac)				Phosphorus (lb P ₂ O ₅ /ac)			
N from Manure (Available this year)	Total Fertilizer Application (lbs/acre)		Excess Available N (negative for deficiency)	P from Manure (Available this year)	Total Fertilizer Application (lbs/acre)		P in Excess of Removal (negative for deficiency)
	Starter	Supplemental			Starter	Supplemental	
140	Click	Here	0	74	Or	Here	4
158	Click	Here	2	83	Or	Here	13
158	Click	Here	-48	83	Or	Here	13

The commercial fertilizer application initially says "Click Here Or Here". You should click in one of those boxes regardless of your intent to use commercial fertilizer. Clicking on the cells will bring up the fertilizer application window (see below).

Click on the dropdown list to select the common type of fertilizer (or use "Custom" for special blends) and then input the rate of application. The program will automatically calculate the N, P2O5, and K2O provided by the fertilizer in lbs/acre. There is space for identification of starter fertilizer and up to three supplemental fertilizer applications. Should you not apply commercial fertilizer simply leave this form blank and the program will put zero into the worksheet for you. At the bottom of this window, you will see some auto fill options to ease in data entry.

At the end of each row is a cell that contains the word "Dual". Double-clicking this cell will allow you to apply two sources of manure to the same crop on the same acreage, which is referred to as dual application. For example, liquid manure application in the fall and then some solid manure application in the spring for the same corn crop is a dual application. In order to plan for a dual application you must have indicated the commercial fertilizer application and the excess available N must be a negative number (meaning that additional N can be applied). Once you double click "Dual", the program will add a field to the very bottom of the worksheet. It will have the same field ID but will have "(Dual)" at the end to indicate it is a dual application. The N needs for the dual field will reflect the remaining amount of N that can be applied (ie. the amount indicated in the "Excess Available N" column in the associated field at the top of the worksheet). You would then indicated the planned second manure application by indicating a manure source, method of application, and application rate. It should be noted that the fertilizer application is identified along with the first manure application.

IMPORTANT DUAL APPLICATION NOTE: In order to remove the dual application from the plan you must double click "delete" at the end of the row. If you do not delete the field in this manner, you may have trouble when

loading the data back into the program. You do not need to delete the field in this manner if you use the create crop year records feature to advance the plan to the next crop year as the program will automatically do it for you.

If you have a planned double crop situation (see Crop Info worksheet explanation of double crops), you will need to scroll to the bottom of the Nutrient Application worksheet to assign nutrient application to the second crop grown on the applicable field. The program limits the total number of double crop, dual, or split fields to 31. Once the limit is reached, you will not be able to perform these actions anymore.

At you significantly exceed the recommended N at any point during the nutrient application planning process, the program will warn you via the over-application window. The window indicates which field is the offender and summarizes the crops as well as the currently planned nutrient applications. The feedlot rules do allow for some deviation (up to 20%) from University recommendations the reasons indicated on the window. If you believe this applies to your situation, check the box stating that you plan to apply at the identified rates (see below) and click continue at the bottom of the window.

Deviation less than 20%

Minn. R. ch. 7020 allows nitrogen application, from organic sources, above the U of MN recommendations when nutrient management history, soil conditions, or cool weather warrant additional nitrogen. Please check the box below if you believe these conditions exist.

I plan to apply at these rates as this field meets the conditions identified above.

If these conditions do not exist (box not checked) you must adjust the application methods/rates below:

The application will be allowed by the program but will be highlighted in yellow to indicate your determination that conditions warrant application at rates that provide significantly more nitrogen than recommended.

In the event that you do not believe the conditions are applicable to the field indicated, you can edit the planned applications from within the window (see info to follow).

In the event that your planned applications exceed the recommendations by more than 20% you will be forced to modify the planned applications before you can continue (see below).

Deviation more than 20%

Nitrogen application at this rate is only allowed when nitrogen deficiency is visible or measured in the growing crop. You are not allowed to "plan" for such a nitrogen deficiency; therefore you must change the nutrient applications for this field.

You must adjust the application methods/rates below:

Manure Source (1-12)	Method of Application and Incorporation	Manure Application Rate (gals/tons per acre)		N from Manure (Available this year)	Fertilizer Application (lbs/acre)		Excess Available N (negative for deficiency)
		Calculated Max Rate <i>based on Nitrogen</i>	Planned Rate <i>max used if blank</i>		Starter	Supplemental	
1	Knife Injection	3834	6000	210	5.8	0	75.8

Click to Remove Nutrient Applications Continue

At the bottom of the window, you can change the manure or fertilizer applications to apply fewer nutrients. Clicking the fertilizer application columns will display the fertilizer application window (see earlier examples) to

assist you with that entry. When a compliant rate is entered the “Continue” button at the bottom of the window will be activated (text will turn black instead of gray) and you can click it to proceed. This will change the planned application for the identified field accordingly.

When you are done planning your manure application and you still have manure left to land apply, you can indicate that you wish to transfer ownership of that manure to a third party for land application. To accomplish this, simply click on the check box at the top of page one or bottom of page two and the necessary forms for a plan for transferred manure will become visible.

Finally, once you have advanced to this point, and are satisfied with your plan, you can click on “Create Crop Year Records” in the add-ins menu. This will create a records form with the information you have just entered for this crop year and set-up the worksheets for developing a plan for the next crop year. No need to worry about deviations from the plan as those changes can be captured/recorded on the records form that was just created and all changes made to the records form will be carried forward for the next crop year plan. There is a more detailed explanation of the plan vs records concepts within this program earlier in this document (part 4.B).

Transferred Ownership

This worksheet is used to create a plan for any manure that is transferred to a third party for land application. The requirements for this type of plan are limited and mostly satisfied within the body of the MMP you have been working on for your cropland or cropland that you control. To make sure you actually transfer manure ownership, you need to answer the first two questions. If you answer “No” to both of the questions, you are transferring ownership and should complete the form that has not become visible. The form is relatively short and data entry is needed for item c) of the first section and item a) of the second section. The rest of the information is contained within the body of the non-transferred MMP.

You will also have noticed the appearance of two more worksheets (Attachment A and B). These are part of the transferred ownership MMP. Attachment A should be provided to the manure recipient, as it will guide them to proper application of the manure. When you transfer ownership of manure, you must obtain the location of the actual application as well as the rate at which the recipient applied the manure. Attachment B is a record keeping form that you must use to record the transfer of the manure as well as the location of the land application of manure. The MPCA does have triplicate copies of this form that can be used in place of this one within this program.

MMP Notes

This worksheet is used to make note of anything that could not be accommodated by the program or any other notes you wish to record. The very first cell can be used to make note of something that applies to all fields in your MMP and the others can be used to record notes on a field-by-field basis. No entry is required on this form to complete a MMP, it is simply provided for your convenience.

Table A - F

These tables contain the information used by the program to perform the calculations. There is no data entry required not can you change the data on these tables to affect the calculations within the program. These tables are informational only.

Revisions

This final worksheet in the program simply tracks updates that have been made to the program over the years. It is simply informational.