CASE STUDY

The Jones family runs a mixed livestock and cash crop operation. They recently purchased two additional properties.

Mr. Jones knows that these properties would benefit from a manure application, but they are some distance from their livestock operation. Hauling manure to these farms would not be cost-effective.

One of Mr. Jones's colleagues in the local soil and crop organization has used biosolids in the past, and has been telling Mr. Jones that biosolids might be one way that he could apply nutrients and organic matter to his new farms.

STEP 1 – SET GOALS

Mr. Jones starts by evaluating the two new farms. He wants to get nutrients and organic matter applied to these fields, but he also knows that if the application is not done correctly, any benefit from the applied material may not outweigh the potential harm.

Mr. Jones sits down with the biosolids hauler from his area and the two of them start to develop a game plan to see if biosolids have a place in his operation. The biosolids hauler puts Mr. Jones in contact with a certified NASM plan developer. The three of them will work together to develop a NASM plan for the biosolids application on the Jones farm. Mr. Jones identifies the following goals:

- **timely application** – Mr. Jones does not want the spreading operation to delay his fieldwork. Timely application will be necessary if a spring application is scheduled.
- **agronomic considerations** – Mr. Jones wants to ensure that the crop receives enough nutrients, but he is also sensitive to the risks of over-application. He wants an even and accurate application to his fields.
- **information sharing** – Mr. Jones is adamant that he receive the soil data collected for these fields. He also wants the NASM plan developer to provide him with a completed NASM plan demonstrating how biosolids can fit within his cropping program.

Neighbours' opinion will be crucial to the consideration of regular biosolids use. Jones realizes that informed neighbours will be better than an alarmed community. Many neighbours will be appreciative of being consulted prior to the decision.

STEP 2 – TAKE INVENTORY

The two farms are broken up into six fields. Soil samples are collected from each field to ensure that each field is appropriate for receiving sewage biosolids. The results are shown in the table below.

FIELD	pH	PHOSPHORUS	POTASH
1	6.3	16	150
2	6.8	14	180
3	6.2	8	226
4	6.1	12	201
5	5.9	55	227
6	6.0	64	250

STEP 3 – INPUT AND ANALYZE DATA

Fields 1, 2, 3 and 4 all meet the criteria for biosolids application.

Field 5 meets the criteria for soil phosphorus concentration, but does not meet the minimum pH of 6.0, and therefore is ineligible to receive biosolids until the pH of the field is adjusted to above pH 6.0.

Field 6 exceeds the maximum soil phosphorus level, and is therefore also ineligible to receive an application of biosolids.

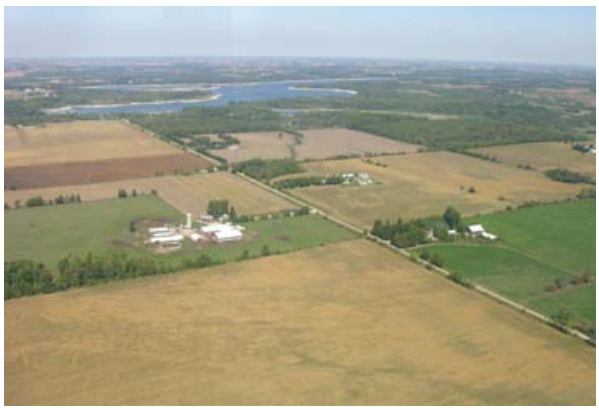
The following chart highlights some potential issues at the Jones farm, and presents alternative strategies that will resolve the problems and improve the nutrient management planning process.

As always, the changes must be practical and fit with the overall management of the farm operation.

POTENTIAL CHANGES FOR NEXT SEASON	CONSIDERATIONS
• consider not using starter fertilizer; apply additional N as carrier in herbicide	• allows increased application (over 1000 gal/ac) based on P_2O_5 • removes N Index red flag from fall application since N over crop removal is reduced
• reduce application rate for corn	• reduces the phosphorus applied to a rate that may still be above, but is closer to, the amount removed by the crop (30–46 kg or 67–103 lb) • removes the red flag for P_2O_5 crop removal balance • removes the red flag for PAN greater than 200 kg/ha ○ what is the impact of eliminating the starter fertilizer or going to a pop-up starter fertilizer for some crops? • how high are the soil test levels? • how will soil test results impact application rates? • how will they impact crop growth? ○ note: side-by-side comparisons are a good option to answer that question specifically for your operation • how much can you save in fertilizer costs?
• change tillage from mouldboard plough to mulch till • change direction from up and down slope to cross slope • measure slope length to show actual 244 m (800 ft) – instead of guessing • eliminate the starter fertilizer	• changes P Index from 36 to 22 in one of the fields • reduces BMP separation distance from 30.5 m (100 ft) to 20 m (66 ft) from surface water

Reducing tillage on candidate fields for biosolids application will reduce the P Index and provide more management options – including higher application rates and shorter separation distances.

The P and N Index restrictions prompted Mr. Jones to consider additional candidate fields for application. Suitable fields were included in the NASM plan.



STEP 4 – DEVELOP OPTIONS

Fields 1 and 2 are both scheduled to be planted to corn in the upcoming spring. The sandy soil texture of these fields might allow an early spring biosolids application. This would allow the crop to make use of more of the nitrogen in the biosolids.

Fields 3 and 4 are scheduled to be planted to soybeans. These fields have a clayey soil type and are therefore not suited to early spring application.

Next year, these fields will probably be growing winter wheat. This would allow for a late summer or early fall application next year after the wheat has been harvested. A cover crop can be established to help retain the nitrogen for the corn crop that will be planted the year after that.

STEP 5 – MAKE DECISIONS

Mr. Jones agrees to use biosolids on his two new farms. Fields 1 and 2 will be targeted for an application this spring. Fields 3 and 4 will be scheduled for an application after next year's winter wheat crop has been harvested.

STEP 6 – TAKE ACTION

The NASM plan developer works with Mr. Jones to develop a NASM plan. The plan balances the nutritional needs of the crop with the nutrients supplied by the biosolids and the supplemental commercial fertilizer applied by Mr. Jones. By making full use of the nitrogen and phosphorus components of the biosolids, Mr. Jones realizes that he is able to drastically reduce the amount of commercial fertilizer he needs to purchase to grow this crop of corn.

His NASM plan developer submits NASM plans for Fields 1, 2, 3 and 4 to the Ontario Ministry of Agriculture, Food and Rural Affairs for Mr. Jones. After review, the four plans receive approval. Biosolids will be applied to Fields 1 and 2 in the spring, and to 3 and 4 next year after wheat harvest.

When springtime comes, the hauler and Mr. Jones schedule the biosolids application for Fields 1 and 2. The application to Field 1 goes as scheduled, but the application to Field 2 is delayed. One of Mr. Jones's goals was timely application. He is not willing to delay his planting operation until the biosolids can be applied to Field 2.

STEP 7 – KEEP RECORDS

Mr. Jones keeps a number of records for all of his field operations, including the biosolids applications. He records the following information:

- application date
- application rate
- current and forecasted weather conditions
- most recent analysis of the biosolids applied to the field
- field conditions
- anything else of pertinence.

STEP 8 – MONITOR

Mr. Jones monitors the biosolids application at many levels, and at many times throughout the year.

Short-term monitoring considerations include:

- checking on the application crew to ensure that the actual application meets the regulatory standards and his own
- observing the crop to make sure there are no nutrient deficiencies
- monitoring the yield and crop quality to ensure these important parameters are maintained.

This fall and winter, Mr. Jones will use the information he collects regarding the biosolids application when evaluating the effectiveness of the program.

Long-term monitoring considerations include:

- ensuring soil test levels are kept within acceptable levels
- ensuring the biosolids hauler maintains proper field operations.

Mr. Jones will use this information to evaluate his continued participation in the program, and to evaluate whether he needs to make any adjustments to his current practices.

STEP 9 – MAKE ADJUSTMENTS TO YOUR NASM PLAN

Due to delays caused by wet weather, the biosolids application on Field 2 at the Jones farm has been postponed for two weeks.

When Mr. Jones informs the hauler that he cannot wait any longer to plant Field 2, they discuss the nutrient impact of this action. Mr. Jones will have to purchase commercial fertilizer to replace the nutrients that would otherwise have come from the biosolids.

The hauler does not want to lose Field 2 as a destination for biosolids, and Mr. Jones does not want to spend the extra money on commercial fertilizer if he does not have to. The two of them decide that inter-row application of biosolids after the crop has been established is an option. Mr. Jones warns the hauler that the tractor operator must be extremely careful not to destroy the corn crop during application. The NASM plan developer makes the necessary changes to the NASM plan to accommodate the inter-row application.

When the corn reaches the 6-leaf stage, Mr. Jones calls the biosolids hauler. The application team comes to Field 2, and through careful operation of the equipment, they are able to apply the biosolids between the rows of corn without causing harm to the crop. Mr. Jones has the tractor operator leave some check strips where no biosolids are applied so that he can evaluate the crop response to the biosolids application.

Mr. Jones records the application rate and timing along with other pertinent information for inclusion in the annual update that is required by the regulations.

STEP 10 – PLAN FOR THE UNEXPECTED

After planning for the use of biosolids on his farms, Mr. Jones and the biosolids hauler discuss potential issues that could arise during or after application, and potential resolutions to these issues. For example, due to his experience applying liquid manure to his own operation, Mr. Jones knows that unintentional spills are a possibility. Since liquid sewage biosolids will be used at his farms, Mr. Jones and the biosolids hauler discuss what will be done in the event of a spill.

During application to Field 1, one of the neighbours is upset by the number of trucks that are using the road. She is concerned that the trucks will be a hazard to the school bus. When she finds out that biosolids are being applied to the site, she becomes more concerned and starts to ask where she can find out more information about this practice. The truck driver gives the neighbour contact information for the biosolids hauler and for Mr. Jones.

Once contacted by the neighbour, Mr. Jones is also concerned about the traffic patterns of the trucks affecting the school bus. He contacts the hauler to discuss possible options. They determine an alternative access to the field that effectively eliminates the traffic congestion issue before the school bus needs to use the road.

The neighbour appreciates the quick action on the traffic issue, but is still concerned about the land application of biosolids in general. The hauler is able to show the neighbour that the application program is being done in accordance with all applicable laws, and Mr. Jones is able – thanks to the NASM plan – to show that the nutrients being supplied by the application are at appropriate levels to be used by the crop.

The hauler also provides the neighbour with some reading material that explains the rules, regulations, potential benefits and potential concerns presented by the land-applied biosolids. The neighbour leaves, perhaps not totally in favour of the program, but well-armed to find out more information to make her own decisions regarding the practice.