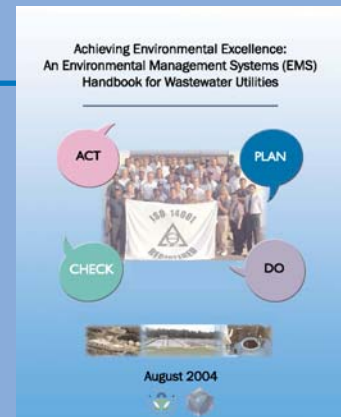


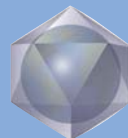
# Environmental Management System (EMS) Handbook for Wastewater Utilities



## EMS Aspects Identification and Prioritization Workbook



May 2006



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## Foreward

Water and wastewater utility managers are facing a number of challenges today as they address a wide array of issues ranging from increased public expectations for service levels, improved environmental performance and compliance, sustainable infrastructure expectations/needs, changing work force demographics, and more stringent regulatory standards. To help address these challenges on an ongoing basis, a number of utilities are developing and successfully implementing an environmental management system (EMS) for their operations. Based on this success, a step-by-step EMS Handbook for Wastewater Utilities (<http://www.peercenter.net/sector/wastewater/>) was developed in August 2004 and was written in conjunction with knowledgeable wastewater EMS practitioners. The Handbook includes EMS sample documents and practical ideas and lessons learned from wastewater treatment facilities that have developed an EMS.

The identification and prioritization of significant environmental aspects and impacts is one of the most important and challenging parts of implementing an EMS. Conducting a sound aspect/impact analysis is critical to implementing a viable EMS, as significant environmental aspects become the primary focal points for the EMS, and all subsequent EMS tasks are designed to control, reduce or eliminate your wastewater utility's environmental impact.

This *EMS Aspects Identification and Prioritization Workbook* was produced to compliment the Handbook described above and guide users through this difficult step in the EMS process. The Workbook was funded through a cooperative agreement between the Office of Wastewater Management (OWM) at the U. S. Environmental Protection Agency (EPA) and the Global Environment and Technology Foundation (GETF). In order to reflect the real life EMS experiences of wastewater organizations, EPA and GETF again asked a small group of utilities and other professionals to serve on a Steering Committee for this project. Their advice and insights were critical to making this project a success.

Throughout this Workbook, you will see step-by-step lessons and exercises, along with the experiences from several wastewater organizations, to make it easier for you to successfully complete your EMS aspects/impacts review.

In conclusion, we appreciate the opportunity to help produce this Workbook and further share our experiences with colleagues. It fills an important need for our industry and will hopefully encourage an increasing number of utilities to develop their own EMS and realize the benefits we have witnessed. Remember, this Workbook relies on much of the material included in the Handbook and you should use both as tools to help implement an EMS at your wastewater utility.

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## You'll find the following icon symbols in each section:



**Keys to Success** indicates key takeaways to successful EMS implementation, as identified by EMS wastewater practitioners.



**Notes** highlight a point or concept important to EMS implementation.



**Reminders** are key points to keep in mind as you implement your EMS.



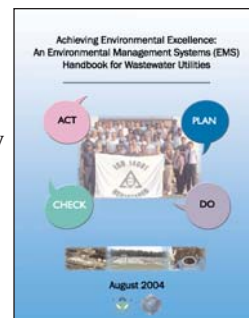
**Stop Signs/Review** identify key concepts to review in the Handbook before completing each of the steps and lessons in the Workbook.

# EMS Aspects Workbook

## To the User

This *EMS Aspects Workbook* was created to accompany *An Environmental Management System (EMS) Handbook for Wastewater Utilities (Handbook)*, August 2004

(<http://www.peercenter.net/sector/wastewater>). Similar to a chemistry lab workbook that accompanies and builds on the chemistry text, the *EMS Workbook* lessons and activities are designed specifically to help wastewater and other public and private organizations conduct an environmental aspect and impact analysis at their facilities.



Each lesson in the *Workbook* corresponds to the steps presented in Section 3: Environmental Aspects and Impacts (pages 61-74) of the *Handbook*. Each lesson will define the Objective of the lesson, provide a brief Background of the concept, have the user complete Lesson Exercises where applicable, and finally review the Key Takeaways specific to each lesson.

Note that after each of the lessons, the *Workbook* directs the user to additional applicable blank EMS aspect/impact forms and templates (found in Appendix B) for your EMS Wastewater Teams to practice with and/or to use as tools as you conduct your aspects/impacts review and develop and implement your wastewater EMS.

The *Workbook* utilizes proven techniques collected from training and working with numerous public organizations that have successfully implemented EMSs at their organizations. However, there are alternative methods to conducting aspects/impacts analysis and implementing an EMS than those highlighted in this *Workbook* and readers should review those methods to see which ones fit best for their organizations. For more information, review Appendix C: Additional Sources of Information in the *Handbook*.



### Review

Review Section 3: Environmental Aspects and Impacts in the *Handbook* (pages 61-74) as you complete this *Workbook*. Specific steps and page numbers in the *Handbook* will be highlighted for review in each lesson.

### Note

Clarifying EMS jargon is important for consistency if your facility is following the ISO 14001 Standard or National Biosolids Partnership (NBP) guide.

### Lesson 1) Clarify EMS Jargon with Your Team

**Objective:** To obtain a working knowledge of environmental management system (EMS) terms and their meanings, particularly as related to defining your wastewater organization's environmental aspects and impacts.

**Background:** It's important that you have a clear understanding of EMS terms and their meanings, from defining the wastewater operations where you will implement your EMS (your fenceline), to who should be involved (employees and stakeholders), to the impact of your products, services (e.g., treated wastewater) and activities (e.g., primary treatment operations)—your environmental “footprint.” This lesson and its exercises will particularly focus on helping you and your team understand differences between activities, aspects, and impacts.



## Review

Refer to Section 3, Step 1 (pages 62-63) in the *Wastewater EMS Handbook* as you complete the lesson exercises, for more information about EMS jargon and for further review of this concept.

First let's review the definitions:

**Operation/Activity:** Something that an organization does, usually intentionally.

**Aspect:** An element of an organization's activities, products or services that can interact with the environment.

**Impact:** Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organization's activities, products or services.

### Lesson 1 Exercises:

Now try these quizzes with your EMS Team.

#### A. Indicate which of the following terms is an operation/activity, aspect, or impact.

- |  |     |
|--|-----|
| 1. Air pollution                           | 1.  |
| 2. Burning diesel fuel                     | 2.  |
| 3. Digester Operations                     | 3.  |
| 4. Operating/Maintaining Backup Generators | 4.  |
| 5. (Electrical) energy consumption         | 5.  |
| 6. Water consumption                       | 6.  |
| 7. Herbicide Application                   | 7.  |
| 8. Burning bio-diesel fuel                 | 8.  |
| 9. Spilled Solvent                         | 9.  |
| 10. Recycling Program                      | 10. |
| 11. Cleaning Spills                        | 11. |
| 12. Degradation of water quality           | 12. |
| 13. Generation of solid waste              | 13. |
| 14. Designing construction specifications  | 14. |
| 15. Restoring natural resources            | 15. |
| 16. Air emissions                          | 16. |
| 17. Steam cleaning                         | 17. |
| 18. Depletion of landfill space            | 18. |
| 19. Purchasing supplies                    | 19. |
| 20. Contamination of ground water          | 20. |

## Remember



Environmental Aspects are elements of your utility's activities or products or services that can interact with the environment. For example, the air emissions are the aspects of the burning of fuels (the activity).

Environmental impacts are the changes to the environment, positive or negative, resulting from your organization's operations and activities. For example, the degradation of air quality is the impact from the burning of fuels.

Put another way:  
**Aspects = Causes**  
**Impacts = Effects**

**B. Indicate which of the following wastewater terms is an operation/activity, aspect, or impact.**

- |   |     |
|---|-----|
| 1. Odors                                | 1.  |
| 2. Receiving and Transporting Chemicals | 2.  |
| 3. Biodiesel Fuel Use                   | 3.  |
| 4. Reduction in Landfill Space          | 4.  |
| 5. Maintaining Operations Buildings     | 5.  |
| 6. Solid Waste Generation               | 6.  |
| 7. Biosolids (Beneficial Product +)     | 7.  |
| 8. Reduction in Natural Resources       | 8.  |
| 9. Biodegradable Chemical Use (+)       | 9.  |
| 10. Chlorine Disinfection               | 10. |

## Remember



As you can see, some aspects may actually have a positive impact. Other examples

include using a (biodegradable) chemical in place of a hazardous chemical in a preventative maintenance activity and using low flow toilets and motion lighting in your facility operations and administrative buildings to conserve water and energy.

**C. Indicate which of the terms below are operations/activities and then designate their corresponding aspects and impacts.**

In the example, the corresponding terms used in the table are crossed-out for you to follow as an example.

Now it's your turn! Complete the rest of the table (remaining 3 rows) using the terms that are not crossed-out.

*Note:* Biosolids Application as an Operation/Activity will be used more than once.

<del>Biosolids Land Application</del>	Reduction in Landfill Space	Odors
<del>Receiving and Transporting Chemicals</del>	<del>Degradation of Air, Land or Water</del>	
Nuisance	<del>Spills and Leaks</del>	Sludge Reuse
<del>Air, Soil and Groundwater Contamination</del>	Solid Waste Generation (e.g., Rags, Supplies)	Beneficial Product +
Aerobic Digestion	<del>Odor, Dust, Runoff</del>	Maintaining Operations Buildings

Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)
Biosolids Land Application	Odor, Dust, Runoff	Degradation of Air, Land or Water and Public Complaints
Receiving and Transporting Chemicals	Spills and Leaks	Air, Soil and Groundwater Contamination



## Key Takeaways



While a majority of employees at a wastewater treatment facility have an understanding of how they could potentially impact their own health and safety, how their work could impact their natural surroundings (i.e., the environment) introduces new terms/meanings that need to be understood in order to implement and maintain an EMS. If your employees are still having trouble with these terms, practice with some examples from your own environmental “footprint” at home. For example, consider the **operation/activity** of **running your air conditioner** in the summer. The **aspect** would be **energy use** and the **impact** would be the **depletion of natural resources**—not to mention the impact on your utility bill!

## Note



The questions in Appendix B (Lesson 2: Confirming Your EMS Fenceline) will give your wastewater facility additional questions to consider and answer before proceeding with the selection of your EMS fenceline.

## Lesson 2) Confirm Your EMS “Fenceline”

**Objective:** To review which operations and supporting activities that will be the focus of your EMS (i.e., your “fenceline”), and to confirm management understanding of the human and financial resources involved.

**Background:** An EMS can be applied to any operation or organization within your wastewater facility (e.g., a department, division, operation or your entire facility). Before you begin your aspect and impact review consider these questions:

- Have you identified the specific organizational and environmental objectives that you want the EMS to deliver?
- Do you have clear management approval for EMS development?
- Have you estimated the level of resource commitment you need from staff and who will be involved in EMS implementation? (Remember, EMS implementation is going to compete for employee time and with other responsibilities, and this may need to be managed. This is especially true at the beginning in scheduling EMS Core Team responsibilities.)
- Which managers in the fenceline need to approve EMS development to ensure that appropriate human and financial resources are allocated?
- Have you met with these key staff managers throughout the organization to discuss the proposed EMS implementation schedule?



## Review

Refer to Section 3, Step 2 (page 63) of the *Handbook* for more information about choosing your EMS wastewater fenceline and for further review.

## Practical Experience

Often a memorandum or letter from senior management is useful to confirm understanding of management's commitment to proceed with EMS development and to state the specific business rationale, drivers, and expected benefits for development of the EMS.

See Appendix D for an example from a wastewater treatment facility.

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It may be tempting at first to include all of your operations and facilities within your EMS scope. However, it is usually unrealistic for most organizations to manage such a scope initially considering the human and financial resources involved. Consider starting with a smaller section of your organization and adding more departments and facilities as your EMS experience and expertise grows. This will help you develop a solid understanding of the EMS process and a group of internal experts that can act as mentors as your EMS grows.

## Example Fencelines from Wastewater Facilities that have Implemented EMSs

Wastewater Treatment Facility-Purchasing Department

Wastewater Treatment Plant-Engineering and Construction

Wastewater Treatment Plant

Wastewater Treatment Facility and Biosolids Operation

Wastewater Division

Entire Wastewater Operation

Wastewater O&M Division

Figure 1 below presents a simple, typical wastewater facility-level diagram as an example of wastewater treatment as the operational fenceline.

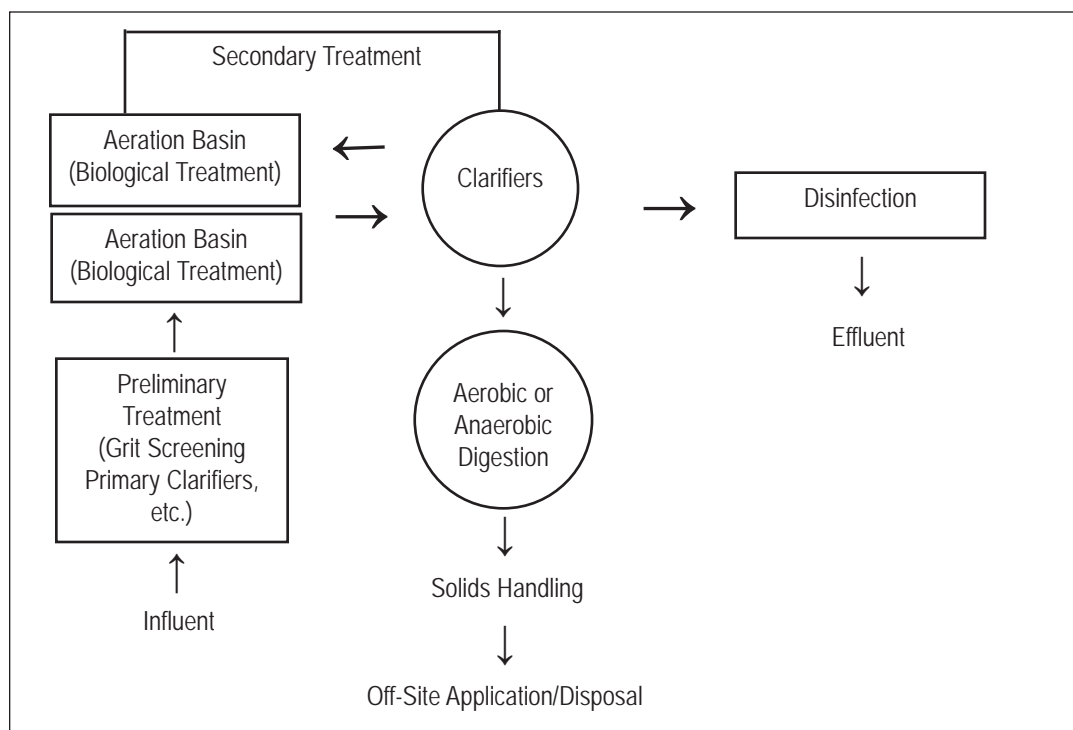


Figure 1: Wastewater Treatment Plant #1

Now let's say that your organization selected secondary treatment (biological treatment/aeration basins and clarification) as its EMS fenceline.

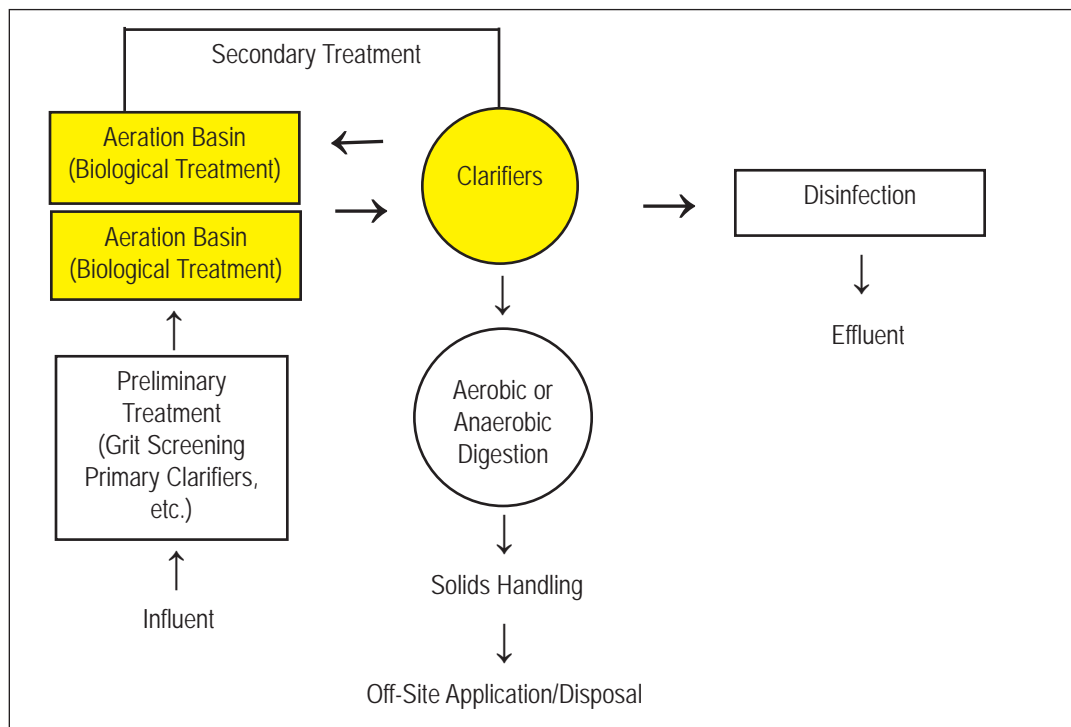


Figure 2: Wastewater Treatment Plant #2

*Note that Aeration Basin and Clarifiers have been highlighted or selected.*



The diagram in Figure 2 is an example of the EMS Fenceline (i.e., Aeration Basins and Clarifiers) that we will be using throughout this *Workbook*.

Now that you’ve mastered the exercises on EMS jargon and documented your EMS scope, it’s time to determine how your fenceline will impact the environment (your environmental “footprint”).

To accomplish this, sticking with a systematic process, organizations commonly utilize input/process/output diagrams to help them understand and visualize the processes as well as how materials are used, re-used and disposed of within each operation or activity.

## Key Takeaways



The advice of other wastewater facilities that have implemented an EMS is: “Think big, but start small!” In addition, build internal EMS expertise and understanding, then expand the fenceline based on resources and receptiveness.

## Lesson 3) Identifying Operations in Your EMS Fenceline: Constructing Input/Process/Output Diagrams

**Objective:** To identify the operations within your EMS fenceline (operations include activities, products, and services) and how they impact the environment.

**Background:** To understand your environmental aspects and impacts, it helps to understand the inputs/processes/outputs-starting with the resources, wastes and products-that are a part of the operations and activities associated with your wastewater EMS Fenceline.



## Review

Refer to Section 3, Step 3 (pages 64-65) of the *Handbook* for more information about constructing input/process/output diagrams and for further review.

A sample format for an input/process/output diagram is presented below.

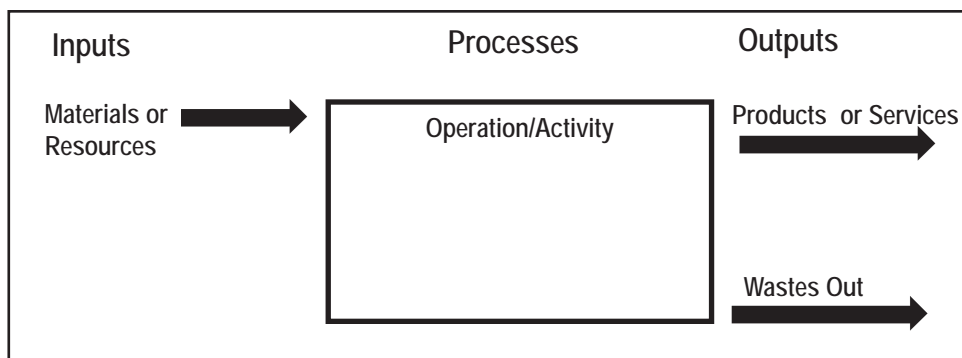


Figure 3: Basic Input/Process/Output Diagram

## Remember



One way to visualize the environmental “footprint” of your operations and activities is to construct

input/process/output diagrams. These diagrams will help you identify what materials and resources you use (inputs), where they are used (the process or operation/activity), and how they are turned into a product or service or become wastes (output).

See Figure 3 at the bottom of this page.

## Note



Some organizations also capture by-products (e.g., recyclables) as part of their outputs when completing their input/process/output diagrams. See page 65 of the *Handbook* for more information.

## Remember



Involve a group of cross-functional line staff in this input/process/output process review.

Participation from all levels and departments is a fundamental key to success during EMS implementation. These are the employees who have the hands on knowledge and experiences of the activities you are going to evaluate and who are the closest to the actual operations on a daily basis.

## Practical Experience

At the Kent County, Delaware Wastewater facility, employees in each main activity (e.g., clarifiers) were asked to generate a list of activities they performed each day as they did their jobs. This list became the input for Kent County Wastewater's input/process/output diagrams.

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Before you complete your input/process/output diagrams, let's first review the following terms:

**Materials or Resources** - Inputs into a facilities' operations/activities that are used or expended and that can be drawn on when needed (e.g., energy, equipment, chemicals, water, employee labor).

**Processes** - Operations/activities that bring about a result in the making or treatment of a product (i.e., treated wastewater) through specific steps. Examples for a wastewater facility would include preliminary treatment, clarifier operations or disinfection.

**Waste** - Outputs of operations/activities that are used, consumed, spent, or expended (e.g., waste oils/lubricants, trash, air emissions).

**Products or Services** - A direct result (output) produced by operations/activities (e.g., treated wastewater, in manufacturing—a widget).

At this point you are probably thinking, “okay we can do this, let’s sit down and drum up a list, we pretty much know how aeration basins and clarifiers can impact on the environment.” Although your team could probably brainstorm a pretty good list, the process of first developing visual input/process/output diagrams focuses your efforts to ensure that you cover all the bases and that nothing slips through the cracks. It’s a systematic and replicable process that will provide consistency to your aspect/impact review.

In addition, by developing input/process/output diagrams, your team will be able to focus not only on impacts, but also the activities and the operations that create them. This is the key to effective management and operational control of an activity.

A great way to determine the inputs and outputs (i.e., resources, wastes and products) of a particular operation/activity (i.e., process) is to brainstorm with your wastewater staff that work in the area you are reviewing. For example, take a look back at the Wastewater Treatment Plant Diagram #2 (Figure #2). Let’s focus on the aeration basin as the main operation/activity and generate a list of operations/activities.

Some of the operations/activities (i.e., processes) you identified may include the following:

- Air Diffusion
- Inspecting/Controlling Bio-Organisms
- Preventative Maintenance
- Monitoring (Oxygen, Odor, Diffusers, Flow)
- Skimming Floatables

For the purposes of Lesson 3, we’ll focus on the air diffusion operation/activity and carry that example forward through the *Workbook*. Then your Team will practice this method for clarifier operations.

Using a blank input/process/output diagram that you’ll find in Appendix B, work through the following questions regarding the air diffusion operation/activity with your team to

determine the resources, wastes and products for the aeration basin operations/activities listed above.

**What are the materials and resources (inputs) that are important to the air diffusion process?**

- George calls out, “Air from the blowers is an input.”
- Amy remarks, “Energy is required to run the air diffusion operations.”
- Steve notes “Sometimes back-up power is required,” and he mentions that emergency generators should be on the diagram.
- Joe then thinks about what’s needed for the emergency generators to operate and suggests that we include fuel as well.

Reviewing the diagram below, your team has filled in the inputs—resources—for air diffusion (highlighted).

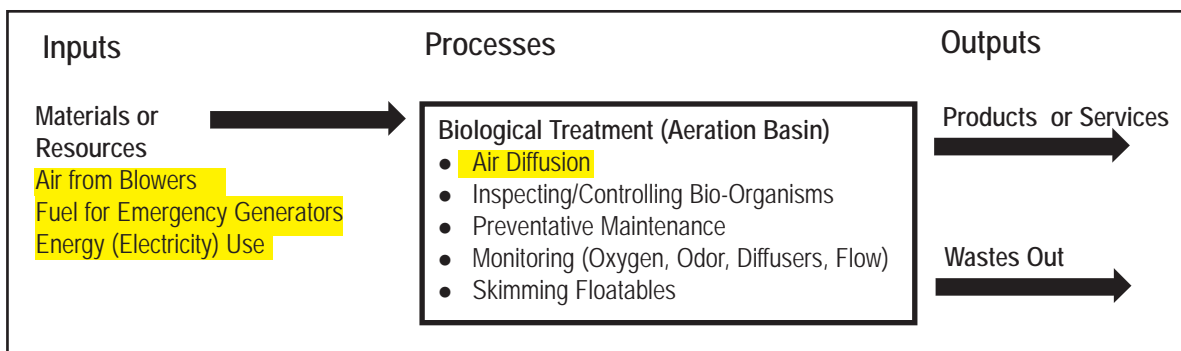


Figure 4: Wastewater Aeration Basins Input/Process/Output Diagram

Next, it’s time to determine the **outputs**, or the wastes and products, of the air diffusion process. Brainstorm with your team...

**What are the *outputs* that come from the air diffusion *process*?**

- Amy notes that odors are usually produced from the air diffusion process.
- Steve chimes in “VOCs are also produced while the diffusers are operating.”
- Joe thinks about the emergency generators and mentions that VOCs can also be produced while the generators are operating. He adds that he is required to wear hearing protection when he tests or operates the back-up generators, and that noise should be added as well.
- One of the clarifier operator staff, sitting in on the discussion mentions that she gets the treated wastewater from the aeration basins and she wonders if this should be part of the diagram even though it is an environmental improvement.

Reviewing the diagram below, your team now has filled in the outputs for air diffusion (highlighted), including a positive environmental output-treated wastewater.

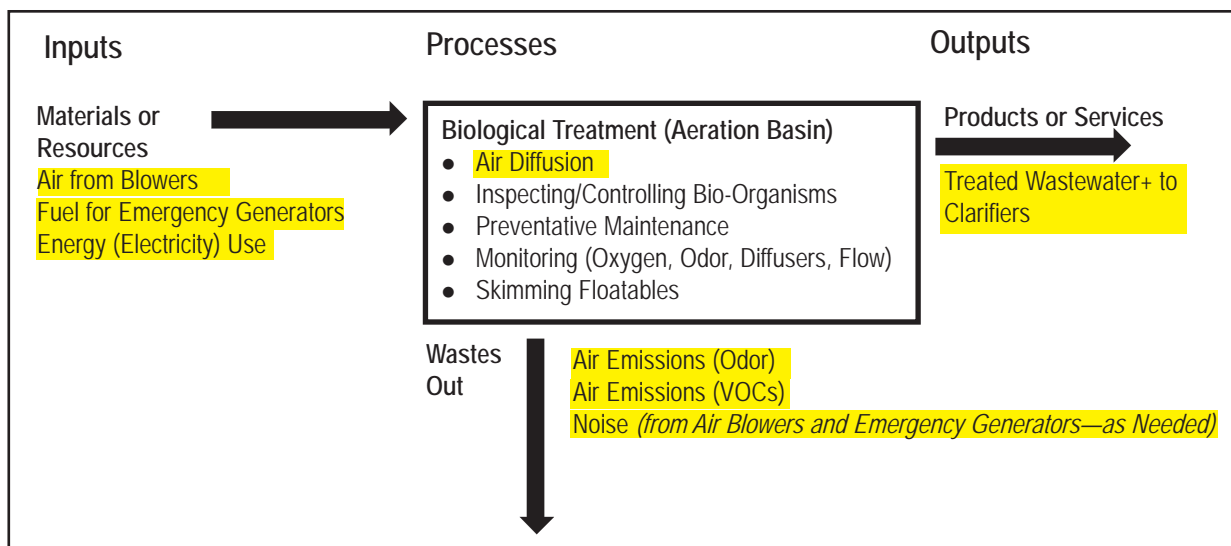


Figure 5: Wastewater Aeration Basins Input/Process/Output Diagram

Now it's your turn! Complete the rest of the aeration basin input/process/output diagram using the blank diagram located in Appendix B.

How did you do? Check out a complete example aeration basin input/process/output in the Lesson 3 Answer Key in Appendix A.

### Lesson 3 Exercises:

#### Remember



Aspects are causes of changes to the environment, and impacts are the effects they produce.

Reviewing the completed aeration basin input/process/output diagram in Lesson 3 of Appendix A, complete a list of the typical input/process/output diagram for a wastewater **clarification** operation.

How did you do? Check out a completed input/process/output diagram for a typical wastewater clarifier in the Lesson 3 Answer Key in Appendix A. Keep in mind, all facilities are different, so your wastewater input/process/output diagram may not match ours.

Appendix B contains a blank input/process/output diagram that you can copy and use for the additional operations/activities at your wastewater facility as you complete the aspects/impacts analysis.

Now that your team has determined the inputs and outputs of the air diffusion process and has identified your core operational fenceline activities and created diagrams to “visualize” your processes, it's time to create your list of environmental aspects and impacts.

#### Remember



Complete an input/process/output diagram review for all your air diffusion operations/activities (e.g., inspecting and Controlling Bio-Organisms, Preventative Maintenance) and subsequent fenceline processes (e.g., Primary Treatment, Disinfection).

### Key Takeaways



Creating input/process/output diagrams is a good, systematic and replicable way to identify and visualize the products, activities, and services in each operation/activity, as well as how materials are used, disposed of and turned into products within your wastewater EMS fenceline.

## Lesson 4) Develop a List of Your Environmental Aspects and Impacts

**Objective:** To use input/process/output diagrams of wastewater operations and activities to create manageable lists of environmental aspects and impacts.

**Background:** The most common approach to developing a list of your wastewater environmental aspects and impacts is to develop a matrix from each of the input/process/output diagrams and to input and collect the relevant information about environmental aspects and impacts in a manageable and organized manner.



### Review

Refer to Section 3, Step 4 (pages 66-67) of the *Handbook* for more information about developing lists or matrices of environmental aspects and impacts and for further review.

Now that we have input/process/output diagrams to help us visualize and account for all the activities in our wastewater fenceline, we can begin to:

1. Analyze how aspects of these activities interact with or cause a change to the environment, and
2. Evaluate what positive or negative environmental effects or impacts will result.

Get back together with your wastewater team with your air diffusion input/process/output diagram in hand. It's time to develop a list or matrix of your wastewater environmental aspects and impacts. You may start with a matrix that looks like this:

Aeration Basin Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)
Air Diffusion		

Now, work with your team to input the various aspects associated with the air diffusion operation/activity. In defining aspects remember to focus on the environmental interactions that create releases into the environment: air emissions, releases to water, solid waste management, contamination of land, use of raw materials and use of natural resources.

Remember, aspects are how these processes interact with the environment and are the causes of potential environmental impacts.

Don't forget to include your positive aspects and impacts! Take a look at your pollution prevention plans, reuse and recycling initiatives, etc. already in place at your wastewater facility. Build momentum from how you are currently minimizing and preventing pollution.

## Remember



You could develop a list of aspects and impacts without the input/process/output diagrams.

However, it is recommended by public utilities who have implemented EMSs that you first visualize (through input/process/output diagrams) and then brainstorm aspect/impact lists with your cross-functional teams to obtain a complete understanding of the environmental impacts of your operations.

## Note



When you identify your wastewater aspects and their impacts, consider:

- 1) Regulated Aspects (e.g., Air Emissions, Water Discharges);
- 2) Non-Regulated Aspects (e.g., Electrical/Energy Use, Land Use);
- 3) Emergency Situations/Conditions (e.g., Spills, Leaks); and,
- 4) Positive Impacts on the Environment (e.g., Recycling Paper, Re-Use of Water, Using Biogas as an Energy Source).

## Remember



Involve personnel from the shop floor in identifying your inputs/processes/outputs and your aspects/impacts. They have the operational knowledge and it is a good way to ensure buy-in to your EMS.

Entering the aspects from the air diffusion example in Lesson 3, our example matrix would look like this:

Aeration Basin Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)
Air Diffusion	Air Emissions (VOCs) Air Emissions (Odor) Noise Energy Use Fuel Use	

Next, let's add the potential environmental impacts of each aspect to our matrix.

For each aspect identified in your matrix above ask your EMS team:

- Does this Aspect **cause** any positive or negative changes to air quality, water quality, or soil quality?
- Does this Aspect **cause** any positive or adverse changes to the consumption or depletion of natural resources?
- Does this Aspect **cause** any Nuisance issues?
- Does this Aspect **cause** any Stakeholder issues?
- Does this Aspect **cause** Human Health concerns?

If the answer to any of these questions is “yes”, you have a good start at identifying the environmental impacts associated with your aspects.

Keep in mind that you can have several impacts per aspect. However, for simplicity, we've identified only one impact per aspect in our example below.

Entering the impacts for each aspect for air diffusion, our example matrix for would look like this:

Aeration Basin Operation/Activity	Aspects (Cause of Impact)	Effects (Potential Impacts)
Air Diffusion	Air Emissions (VOCs)	Degradation of Air
	Air Emissions (Odor)	Nuisance
	Noise	Nuisance
	Energy Use	Depletion of Natural Resources
	Fuel Use	Depletion of a Natural Resource
		Treated Wastewater +

## Remember



Keep in mind as you brainstorm and generate your aspect/impact list that you are not expected to manage environmental issues outside your influence or control. For example, while your organization probably has control over how much electricity it buys from a supplier, it likely may or may not control or influence the way in which that electricity is generated. Therefore, your focus as you develop your list should be on the environmental aspects of your operations and activities within the fenceline that you can define and control.



Note potential health & safety impact (Noise and Air Emissions) for the emergency generator activity in the Aeration Basin Table above. Although the *Handbook* and this *Workbook* focus on the implementation of an environmental management system, analyzing employee health and safety impacts during the environmental review is a good way to get buy-in from staff. Keep in mind that anything that affects employees or their families will be of interest and more easily understood.

Now it's your turn! Complete an aspect/impact aeration basin matrix using the aeration basin input/process/diagram you completed in Exercise 3, the list of aeration basin operations/activities and the blank matrix located in Appendix B.

How did you do? Check out a complete aeration basin aspect/impact matrix in the Lesson 4 Answer Key in Appendix A.

### Lesson 4 Exercises:

Now it's your turn! Referring back to the wastewater plant diagram #2 (Figure #2), take the clarifier operation/activity and complete the following 5 activities per the example your team completed for the aeration basin. You'll find the blank forms you need in Appendix B.

1. Develop a list of clarifier operations/activities.
2. Brainstorm and identify the resources, equipment and materials (inputs) and wastes and products (outputs).
3. Create a clarifier input/process/output diagram.
4. Brainstorm and identify clarifier aspects and their associated impacts.
5. Create an aspect/impact list or matrix of your wastewater facilities clarifier operation/activity.

Remember you will complete these same steps for all operations within your fenceline at your wastewater treatment facility.

How did you do? Check out a complete clarifier aspect/impact analysis in the Lesson 4 Answer Key in Appendix A.



### Key Takeaways

**"Don't get too far down in the weeds"**

Wastewater facilities and other public organizations have reported getting caught up in too much detail and generating very large lists of environmental aspects and impacts. For example, you do not need to list and capture the use and generation of rags and other general trash (solid waste) from every area that uses and generates solid waste. Remember, this is an iterative process—a process that stresses the importance of continuous improvement. Make your lists manageable and if you do not catch every aspect/impact at the first go around, it's okay. You will most likely catch it during the next cycle as your EMS is refined and matures.

### Note



As a public organization, you may want to consider

involving external stakeholders (neighbors, local community groups, etc.) in identifying potential environmental aspects and impacts that affect the local community (e.g., effluent and odor issues). Some organizations utilize public advisory groups or designate a public member that reviews a final aspects/impacts list.

### Practical Experience

The Gastonia, North Carolina Public Works and Utilities Department found that it is easy to get bogged down in the details of your operations and activities while determining their environmental aspects/impacts—slowing down or stopping the progress of your EMS implementation. Gastonia's experience... Don't be afraid to say "good enough for now, let's move on. An EMS is about continual improvement."

For more information contact:  
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Department  
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## Remember



Remember the Keep It Simple and Smart (KISS) rule! Experience has shown that a simple system for prioritizing environmental aspects and impacts has generated the same results as a more complex one, but in a shorter period of time and with happier EMS team members.

In addition to staying out of the weeds, keep in mind that there are daily (continuous) activities that generate aspects and impacts that may need to be “rolled-up” from multiple operations/activities so that their impacts are captured. For example, while energy use may not be an issue from activity to activity, if you examine the overall use of energy, you may decide that it requires further focus as a high priority issue under your EMS.

Now that you’ve developed your lists of activities and their environmental aspects and impacts, it’s time to prioritize or rank the activities that could have the greatest impact to the environment.

## Lesson 5) Prioritize Your Environmental Aspects and Impacts

**Objective:** To rank (prioritize) your wastewater environmental aspects and impacts.

**Background:** At this point you have a good list of operations/activities and their associated environmental aspects and impacts. An EMS is structured so that you can narrow the list down, through a ranking technique, to a group of the most “significant” to your wastewater facility. These significant aspects and impacts will be the focus of your EMS from here on.



## Review

Refer to Section 3, Step 5 (pages 67-71) of the *Handbook* for more information about prioritizing environmental aspects and impacts and for further review.

## Note



Many public organizations have also weighted their criteria to capture issues such as how often an impact happens, the likelihood of an impact happening, etc. Example weighted criteria include frequency, probability of occurrence, volume and toxicity.

To determine your most significant aspects, first determine what criteria are most important to your wastewater facility to evaluate the significance of your impacts. Is it Regulation? Energy use? Public Image? Worker Health and Safety? Water Pollution?

Here are a number of criteria that have been used by wastewater facilities and other public organizations in the ranking process:

- Changes to Air, Water and Land
- Impact to Natural Resources
- Regulated
- Cost
- Nuisance
- Stakeholder Impact
- Human Health Impacts

For the purposes of an example in this lesson, we will follow the Keep It Simple and Smart (KISS) rule and select just a few criteria that you can use to practice ranking your wastewater aspects to determine which are the most significant. Let’s select changes to air, water and land; impact to natural resources; stakeholder impact and cost.

Most organizations choose about 5 to 7 significance criteria when they conduct their aspects/impacts analysis. Remember to keep it simple and smart, the KISS rule. There is no need to develop complex formulas or scientific analyses in this process. Choose criteria that are most important to your strategic goals and to the issues that are of most concern to your wastewater organization.

Referring back to the aeration basin example and adding in columns for our criteria, our table would look like this:

Aeration Basin Operation/Activity	Aspects (Causes of Impacts)	Effects (Potential Impacts)	Changes to Air, Water, Land	Impact to Natural Resource	Stakeholder Impact	Cost
Air Diffusion	Air Emissions (Odor, VOCs), VOCs Noise, Energy and Fuel Use	Degradation of Air, Nuisance, Depletion of a Natural Resource  Treated Wastewater +				
Inspecting/Controlling Bio-Organisms	Energy (Electricity) Use	Depletion of a Natural Resource and Degradation of Air				
Preventative Maintenance	Solid Waste Generation	Use of Landfill Space				
Monitoring (Oxygen, Odor, Diffusers, Flow)	Energy Use & Supply/Paper Use	Depletion of Natural Resources				
Skimming Floatables	Solid Waste Generation	Use of Landfill Space				
Emergency Generator Operations	Noise, Air Emissions and Fuel Use	Nuisance, Health & Safety, Degradation of Air and Air Emissions and Depletion of a Natural Resource				

Now, it's time to develop a scoring system to go with our criteria. Once again, the KISS rule applies. Make sure that the scoring system you use is understood by all that will participate on your cross-functional evaluation teams.

Note "Stakeholder Impact" and "Cost" in our criteria.

Many public organizations consider their stakeholders (e.g., regulators, the local community, elected local officials) important in determining what is environmentally significant at their facilities.

Since we choose cost as one of our criteria, we need to come up with a means to evaluate the significance for cost. For the purposes of this Lesson, we will evaluate the significance criteria of **cost** as follows:

1 = a one time, relatively low cost, 3 = an occasional outlay of dollars and/or medium cost, 5 = ongoing outlay of dollars or high cost.

## Practical Experiences

The Rivanna Water & Sewer Authority in Charlottesville, Virginia formed a working group (Moores Creek EMS Steering Committee), with representation from local citizen and community organizations, to provide input on the Authority's significant environmental aspects, to provide leadership and insight on environmental issues, and to assist with EMS public outreach.

For more information contact:  
Anne Bedarf  
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(434) 977-2970  
[abedarf@rivanna.org](mailto:abedarf@rivanna.org)

Remember to clearly define the significance criteria for your team.

Examples of significant aspect/impact scoring systems used by wastewater treatment facilities and other public organizations include the following with low, medium, high, etc. designating the level of (potential) environmental impact.

- 1 = Low, 3 = Medium, 5 = High
- 1 = Low, 3 = Medium, 5 = High, and multiplying each aspect/impact by a weighted frequency or likelihood factor (e.g., multiply by 1 if the impact almost never happens such as a leak or spill ... to multiplying by 5 if the impact is a daily occurrence such as the generation of trash/solid waste)

Again, for the purposes of this lesson, we are going to follow the KISS rule and chose our scoring system as:

- ☒ 1 = Low, 3 = Medium, 5 = High, with no weighting factors.

OK—let's go! Get with your team and let's apply the 4 criteria and scoring system to each of the listed activities and environmental aspects and impacts to achieve a total numerical prioritization (or rank) for each. Keep in mind that this analysis is usually completed as a team with the team reaching a consensus on score.

Let's complete the aeration basin example by adding another column to find a total significance score. For example, for inspecting and controlling organisms, we ranked our significance as 1, 5, 5, 5 to get a total score of 16 because:

- Inspecting and controlling organisms is a controlled process with little or low change to air, water or land (i.e., surrounding environment)
- Inspecting and controlling organisms is an energy (electricity) intensive process and therefore we gave it a 5 for impact to natural resources
- And so on for each of the criteria as provided on the next page

Then, it's simply a matter of sorting each of the aeration basin activities from highest to lowest score.

## Remember



This is a subjective analysis! Just make sure that when you finish your scoring, you do a reality check ("gut check") with staff that work in clarifier operations to verify that your operations and activities rank out in a manner that makes sense for their level of environmental impact.

<b>Aeration Basin Operation/Activity</b>	<b>Aspects (Causes of Impacts)</b>	<b>Effects (Potential Impacts)</b>	<b>Changes to Air, Water, Land</b>	<b>Impact to Natural Resource</b>	<b>Stakeholder Impact</b>	<b>Cost</b>	<b>Total Score</b>
Inspecting/Controlling Bio-Organisms	Energy (Electricity) Use	Depletion of a Natural Resource and Degradation of Air	1	5	5	5	16
Air Diffusion	Air Emissions (Odor, VOCs), VOCs Noise, Energy and Fuel Use	Degradation of Air, Nuisance, Depletion of a Natural Resource  Treated Wastewater +	1	5	3	5	14
Preventative Maintenance	Solid Waste Generation	Use of Landfill Space	3	3	1	3	10
Monitoring (Oxygen, Odor, Diffusers, Flow)	Energy Use & Supply/Paper Use	Depletion of Natural Resources	1	3	1	3	8
Skimming Floatables	Solid Waste Generation	Use of Landfill Space	1	1	1	1	4
Emergency Generator Operations	Noise, Air Emissions and Fuel Use	Nuisance, Health & Safety, Degradation of Air and Air Emissions and Depletion of a Natural Resource	1	1	1	1	4

So, the total scores range from 4 to 16 in this example. What does this score mean? It means that while all of the environmental impacts are important, some of the impacts have a higher priority of environmental concern than others.

Also consider the total number of operations/activities when you determine how many will become significant in your EMS. For example, if you have 30 operations/activities that you have scored, maybe only the top 5 become significant. Do what makes sense and is reasonable at your facility.

Once you've determined all your aspects and their associated impact scores for the operations/activities within your defined fence line, you will need to establish a threshold for significance. For example, if we establish 14 as a threshold, then anything with a score of 14 or above would be considered significant.

Make sure that everyone realizes that everything your team determines to be significant (14 and above in our example) will require operational controls in place to minimize or prevent environmental impact (i.e., to show management and control). Refer to the "Next Steps" at the end of the Workbook for more information.

## Remember



Conduct a reality check with your EMS Core Team and comments from

senior management to reflect the drivers and goals that you have for the EMS.

Also keep in mind that each organization has the flexibility, based on its business, technical, legal, operational, and stakeholder concerns and requirements, to set what it considers a significant threshold value.

### Lesson 5 Exercises:

Now it's your turn! To reinforce what we just learned, let's look at our clarifier example. Refer back to operations/activities and the aspect/impact matrix you developed for clarifier operations.

Clarifier Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)
Monitoring (Flow Balancing, Wastewater Quality, Odor)	Energy Use Supply/Paper Use	Depletion of Natural Resources
Solids and Sludge Control	Wastewater Solids Generation/Disposal	Biosolids Product +
Clarifier (Tank) Cleaning	Energy Use Air Emissions	Depletion of Natural Resources Degradation of Air
RAS and WAS Pumping	Energy/Water Use	Depletion of Natural Resources
Preventative Maintenance	Solid Waste Generation	Depletion of Landfill Space
Wastewater Clarification	Treated Wastewater	Treated Wastewater +

## Note



For real life examples of an aspect/impact analysis completed by a wastewater facility, including examples where weighting factors were used to determine significance, see Appendix A of the *EMS Wastewater Handbook*.

As a team, select 3 criteria from the following list for working through the following exercise, using the aspects/impacts matrix for the clarifier operation.

- Changes to Air, Water and Land
- Impact to Natural Resources
- Regulated
- Cost
- Nuisance
- Stakeholder Impact
- Human Health Impacts

In addition, select the scoring system you would like to utilize.

Go at it! Using the table below, score and sort each of the activities and their aspects/impacts for the wastewater clarifier operation.



Clarifier Operation/ Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)	Your criteria 1	Your criteria 2	Your criteria 3	TotalScore
Monitoring (Flow Balancing, Wastewater Quality, Odor)	Energy Use Supply/Paper Use	Depletion of Natural Resources				
Solids and Sludge Control	Wastewater Solids Generation/Disposal	Biosolids Product +				
Clarifier (Tank) Cleaning	Energy Use Air Emissions	Depletion of Natural Resources Degradation of Air				
RAS and WAS Pumping	Energy/Water Use	Depletion of Natural Resources				
Preventative Maintenance	Solid Waste Generation	Use of Landfill Space				
Wastewater Clarification	Treated Wastewater	Treated Wastewater +				

How did your clarifier activities score and rank?

When completing the significance review at your wastewater facility, evaluate your aspects/impacts considering how they score within a particular operation AND how they score across your fenceline. For example, you may consider that the RAS and WAS Pumping activities use a lot of energy. However, consider the energy used for RAS and WAS pumping as compared to biosolids drying. That operation/activity (i.e., biosolids drying) will become your benchmark (5) to score energy impact of all other activities in your wastewater operations analysis.

Appendix B contains a blank significant operations/activities and aspects/impacts scoring table that you can copy and use for the additional operations/activities at your wastewater facility as you complete the aspects/impacts analysis.

When you're satisfied that your process for identifying and ranking your environmental aspects/impacts meets with your wastewater organization's needs, it's time to document the process in a system procedure and verify that it conforms to EMS requirements.

## Key Takeaways



- Your wastewater facility has the flexibility to determine the criteria and the method for determining significance, based on your organizational priorities, strategic goals, and priority environmental issues and/or constraints. Consider the approach that best fits your organization and remember to consider technical, business and stakeholder issues as part of your analysis.
- Create cross-functional teams for your review. Include frontline employees from the applicable areas and the environmental department on the team(s) that conduct the aspects analysis.
- Remember, you need to manage (e.g., have operational procedures, records, training, emergency response plans) for whatever your team determines to be a significant aspect.

## Remember



The goal of a well written procedure is to ensure that anyone can pick it up, read it and understand what needs to be accomplished or has been accomplished for this activity.

Think about having someone who has not been part of the procedures development review it for clarity.

## Lessons 6 & 7) Develop a System Procedure for Identifying Your Environmental Aspects/Impacts AND Check Your Environmental Aspect Identification Procedure for EMS Conformance

**Objective:** To learn how to develop and evaluate an ISO 14001 conforming environmental aspect systems procedure.

**Background:** An EMS system procedure clearly defines what you did and will continue to do and it provides a clear guide for ensuring that your EMS is carried out according to your well thought out plans.



## Review

Refer back to Section 3: EMS Documents and Records (pages 109 to 116) of the *Handbook* for more information on controlling procedures and other EMS documents.

A procedure generally tells, at a minimum, who will do what, when they will do it, and where the information can be found. EMS procedures also may include a purpose and a scope. Procedures:

- Define the purpose (why the procedure is needed);
- The scope (what fenceline [operations/areas] and staff the procedure applies);
- Roles & responsibilities (who needs to complete the tasks); and,
- The tasks that need to be completed and when they should be completed (e.g., annually, when changes occur in operations or in legal requirements).

### Lesson 6 & 7 Exercises:

Now let's walk through our checklist (below), based on the ISO 14001 Standard requirements, for an example procedure to verify if it meets the minimum procedural requirements as well as what should be included in an *environmental aspect procedure* as defined above and in the *Handbook* Section 3, page 71. Walking through this checklist will provide your team with a clear picture of what your aspects procedure should cover.

This can be thought of as a “desktop” review.

Note: The aspects system procedure (#1) provided in Appendix C was reviewed to complete the checklist below.

**1) Defines the purpose (why the procedure is needed).**

Yes ☒ No ☐ Reference/Explanation: Section 1.0 (Purpose) describes the reason for this procedure - “to identify the environmental aspects of its activities, products, and services” and “to determine those activities and services that can have significant impacts and the environment.”

**2) Defines the scope (what core fenceline [operations/areas] and staff the procedure applies).**

Yes ☐ No ☒ Reference/Explanation: It is not clear what operations/areas (fenceline) the procedure applies to/covers.

**3) Explains roles & responsibilities (who needs to complete the tasks).**

Yes ☒ No ☐ Reference/Explanation: Section 2.0 (Responsibility and Authority) explains the responsibilities for the EMS Coordinator and the EMS Team for the aspects procedure. In addition, throughout Section 3.0, roles and responsibilities for conducting the aspects analysis are defined.

**4) Identifies the tasks that need to be completed.**

Yes ☒ No ☐ Reference/Explanation: Section 3.0 (Requirements and Procedures) defines the tasks to be completed for the City's aspects analysis.

**5) Contains a good, sound aspect/impact analysis methodology?**

Yes ☒ No ☐ Reference/Explanation: Although it can be subjective to state any analysis is “good and sound,” Section 3.0 outlines the City's tasks to complete the aspects analysis.

**6) Includes a list of significant environmental aspects and impacts (or reference to a list)?**

Yes ☒ No ☐ Reference/Explanation: Section 4.0 (Related Documents and Data) references the City's Environmental Aspects List (PO2-R2).

**7) Defines a method to review the aspect/impact list at least annually and take into account changes to operations and activities?**

Yes ☒ No ☐ Reference/Explanation: Section 3.9 (Updating Aspects and Impacts) explains the process (“At least once per year” and “new or modified activity” for reviewing the City's environmental aspects.

## Note



In addition to the general procedural requirements

noted above, an environmental aspects procedure should address, at a minimum, the following:

- ✓ Does it contain good, sound aspect/impact analysis methodology?
- ✓ Does it include a list of significant environmental aspects and impacts (or reference to a list)?
- ✓ Is the aspect/impact list reviewed at least annually?
- ✓ Does the procedure take into account changes to operations and activities?

Now it's your turn! Review the aspects system procedure #2 in Appendix C, and using what you just learned, complete the procedure checklist below. Verify that the procedure:

**1) Defines the purpose (why the procedure is needed).**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

\_\_\_\_\_

**2) Defines the scope (what core fenceline [operations/areas] and staff the procedure applies).**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

\_\_\_\_\_

**3) Explains roles & responsibilities (who needs to complete the tasks).**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

\_\_\_\_\_

**4) Identifies the tasks that need to be completed.**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

\_\_\_\_\_

**5) Contains a good, sound aspect/impact analysis methodology?**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

\_\_\_\_\_

**6) Includes a list of significant environmental aspects and impacts (or reference to a list)?**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

\_\_\_\_\_

**7) Defines a method to review the aspect/impact list at least annually and take into account changes to operations and activities?**

Yes ☐ No ☐ Reference/Explanation: \_\_\_\_\_

How did you do? Review the completed checklist for procedure in the Lesson 6&7 Answer Key in Appendix A.

Although you will want to use your facilities' standard procedure format, a blank template procedure form has been provided in Appendix B.

Now, get with your Team and draft an aspects system procedure for your wastewater facility.



## Key Takeaways

Your wastewater aspects system procedure should document what you actually do (i.e., "do what you say and say what you do").

## Lesson 8) Review and Revise Your Environmental Aspects/Impacts

### Note



It is not necessary or required that objectives and targets be established for every significant aspect. However, remember that the purpose of an EMS is continuous improvement. Setting goals is a good motivator for performance.

**Objective:** To build a periodic review and update into your aspects analysis.

**Background:** Once you have your aspect list in place, determined the significant environmental issues at your wastewater facility and written a procedure to document that it follows the process you implemented, you need to keep the information up-to-date. Using the written procedure you've developed, review your aspect list at least once a year and complete an aspect/impact review when you have any new or changed operations or services that come on-line.

For example, if your wastewater facility is changing from chlorine disinfection to ultra-violet, your cross-functional team (made up of environmental, engineering, disinfection operations, etc.) should review ultra-violet operations/activities as described in the *Handbook* and in this *Workbook* and update your aspects list and significance ranking accordingly.



### Review

Refer to Section 3, Step 8 (page 72) and Appendix A (page 185) of the *Handbook* for information on reviewing and revising your wastewater aspects and impacts and for further review.

### Key Takeaways



Your wastewater operations/activities and their associated environmental aspects/impacts will require an annual review in order to verify your activities and aspects/impacts have not changed in environmental impact or importance and to verify the significance of any changes to operations and activities.



## Next Steps

Congratulations! You've just completed an aspects/impacts and significance review of your wastewater facility, one of the main steps in an environmental management system. So what's next?

Remember, every environmental aspect you determine to be significant (above the threshold you established) will require you to verify current controls (e.g., procedures, work instructions, training) or to implement new or additional controls to manage your significant environmental issues. In addition, it's time to set some goals for improving your organization's environmental footprint. Setting objectives and targets presents an opportunity to identify where you want to be in the next year or two regarding your significant aspects. For more information, review Section 3: Objectives & Targets and Environmental Management Programs (pages 75-89) and Operational Control (pages 117-121) in the *Handbook*.

The diagram below also represents your wastewater facilities' next steps. Note that whether you chose to set objectives and targets or manage your significant environmental issues, you must establish operational controls for ALL activities/operations that you determined to be the most significant within your EMS fenceline.

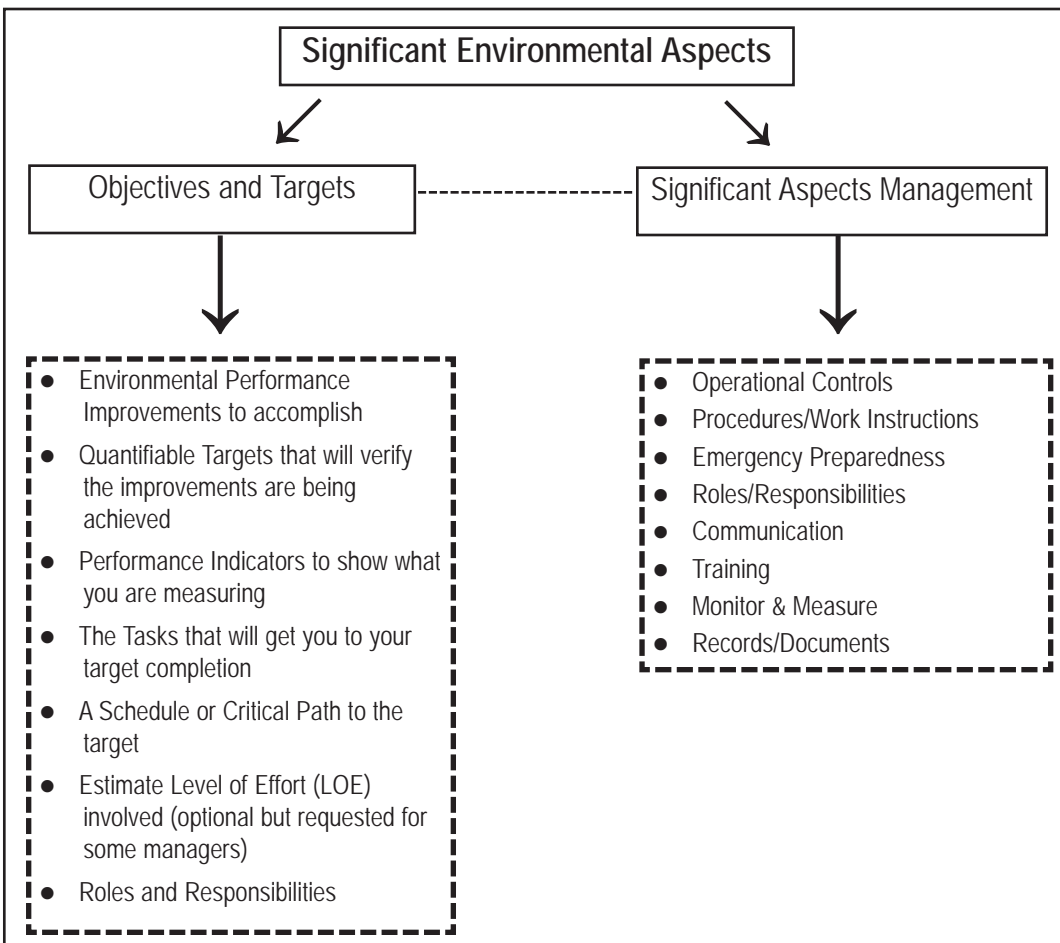


Figure 6: Significant Environmental Aspects: What's next?

## Key Takeaways



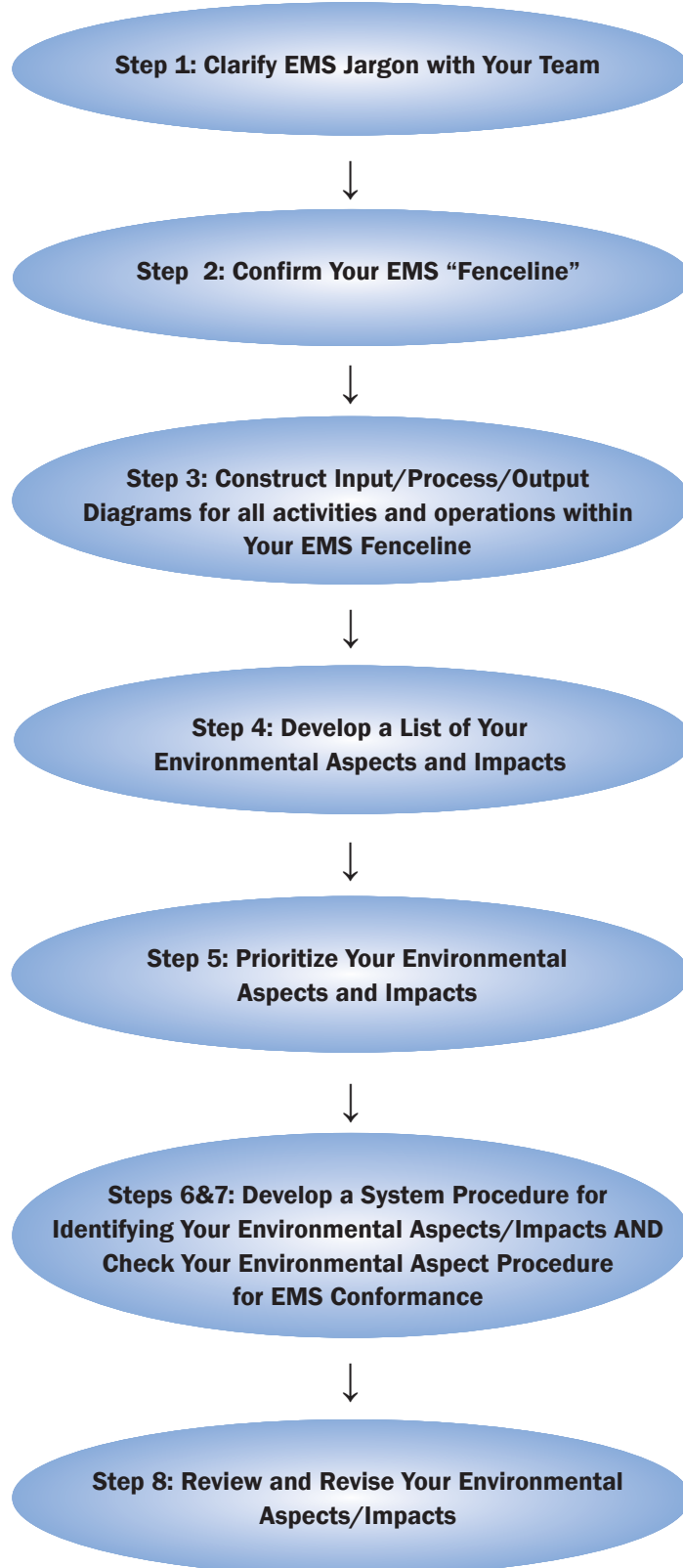
As you focus efforts on ensuring sound management of each significant

aspect/impact, your wastewater utility will also need to consider which ones will become targets for improvement. When considering the objectives and targets to set, you will need to:

- Obtain clear management approval and commitment
- Establish resources (personnel and dollars)
- Set performance goals for your targets that are achievable
- Establish performance indicators to effectively measure your targets
- Estimate timelines and roles and responsibilities
- Identify specific organizational and environmental objectives that you want your targets to deliver

See Appendix B for a handy cut-out of this step-by-step process.

## **Your Step-by-Step Guide to Identify and Prioritize Your Environmental Aspects**



# Appendix A

## Answer Key for Lessons 1, 3, 4, 6 & 7

**Lesson 1:**  
**Clarifying EMS Jargon—**  
**Exercises A, B & C**

**Lesson 3:**  
**Completed Aeration Basin and**  
**Clarifier Input/ Process/Output**  
**Diagrams**

**Lesson 4:**  
**Aeration Basin Aspect/Impact Table;**  
**List of Clarifier Operations/ Activities;**  
**and Clarifier Aspect/Impact Table**

**Lesson 6&7:**  
**Aspects System Procedure #2**

## Lesson 1 Exercises Answer Key

**A. Indicate which of the following terms is an operation/activity, aspect, or impact.**

	Answers
1) Air pollution	1) <u>Impact</u>
2) Burning diesel fuel	2) <u>Aspect – Driving a truck is the Activity</u>
3) Digester Operations	3) <u>Operation/Activity</u>
4) Operating/Maintaining Backup Generators	4) <u>Operation/Activity</u>
5) (Electrical) energy consumption	5) <u>Aspect</u>
6) Water consumption	6) <u>Aspect</u>
7) Herbicide Application	7) <u>Operation/Activity</u>
8) Burning bio-diesel fuel	8) <u>Aspect</u>
9) Spilled Solvent	9) <u>Aspect or None – Potential spill is an aspect; contamination of workers is an Impact</u>
10) Recycling Program	10) <u>Operation/Activity</u>
11) Cleaning Spills	11) <u>Operation/Activity</u>
12) Degradation of water quality	12) <u>Impact</u>
13) Generation of solid waste	13) <u>Aspect</u>
14) Designing construction specifications	14) <u>Operation/Activity</u>
15) Restoring natural resources	15) <u>(Positive) Impact</u>
16) Air emissions	16) <u>Impact</u>
17) Steam cleaning	17) <u>Operation/Activity</u>
18) Depletion of landfill space	18) <u>Impact</u>
19) Purchasing supplies	19) <u>Operation/Activity</u>
20) Contamination of ground water	20) <u>Impact</u>

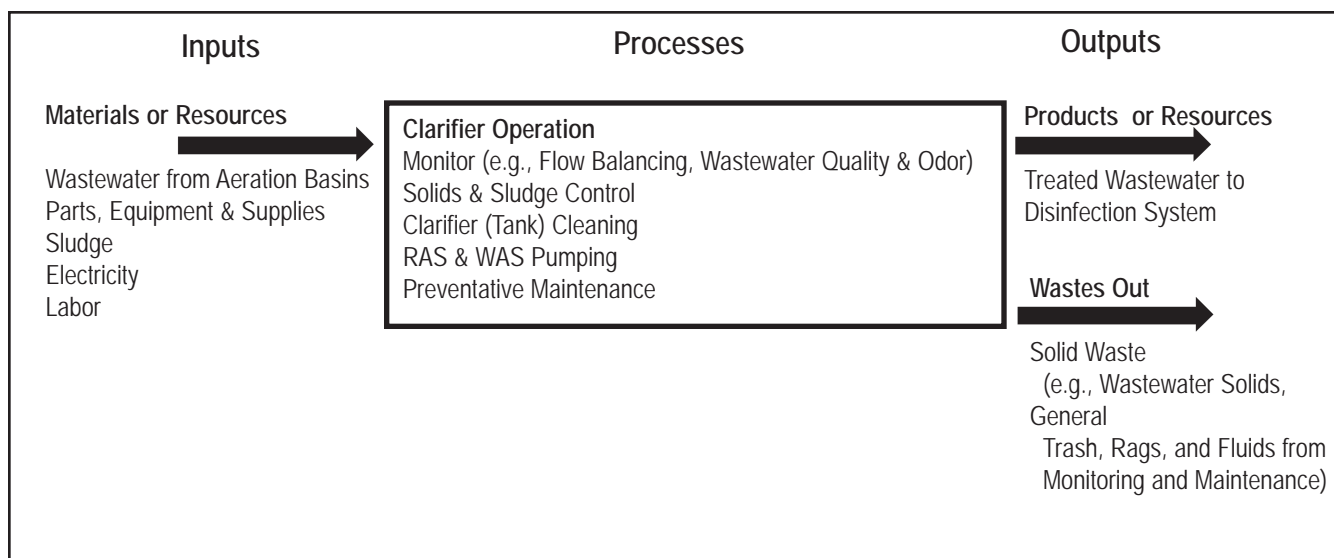
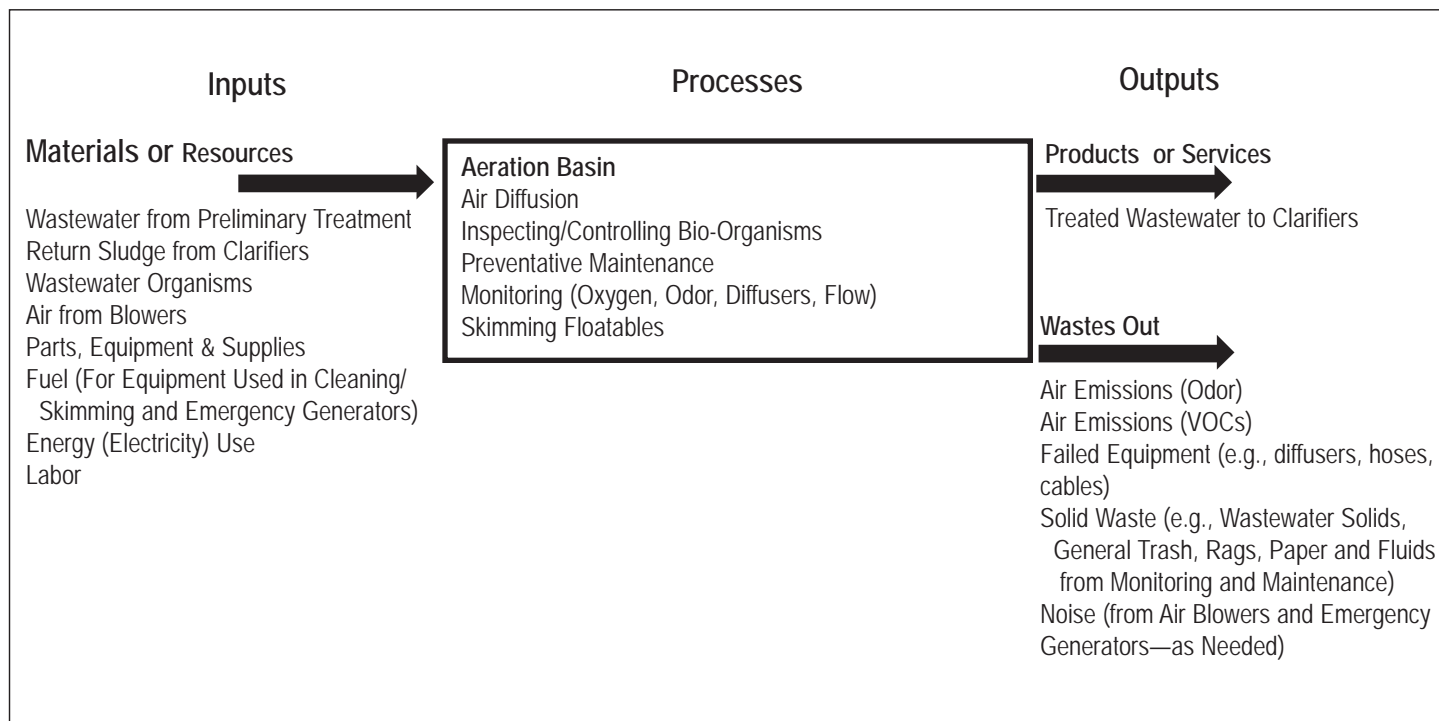
**B. Indicate which of the following wastewater specific terms is an operation/activity, aspect, or impact.**

	Answers
1) Odors	1) <u>Aspect</u>
2) Receiving and Transporting Chemicals	2) <u>Operation/Activity</u>
3) Biodiesel Fuel Use	3) <u>Aspect</u>
4) Reduction in Landfill Space	4) <u>Impact</u>
5) Maintaining Operations Buildings	5) <u>Operation/Activity</u>
6) Solid Waste Generation	6) <u>Aspect</u>
7) Biosolids (Beneficial Product +)	7) <u>(Positive) Impact</u>
8) Reduction in Natural Resources	8) <u>Impact</u>
9) Biodegradable Chemical Use (+)	9) <u>(Positive) Aspect</u>
10) Chlorine Disinfection	10) <u>Operation/Activity</u>

**C. Indicate which of the terms below are operations/activities and then designate their corresponding aspects and impacts.**

<b>Operation/Activity</b>	<b>Aspects (Causes of Impact)</b>	<b>Effects (Potential Impacts)</b>
Biosolids Land Application	Odor, Dust, Runoff	Degradation of Air, Land or Water and Public Complaints
Receiving and Transporting Chemicals	Spills and Leaks	Air, Soil and Groundwater Contamination
Maintaining Operations Buildings	Solid Waste Generation (e.g., Rags, Supplies)	Reduction in Landfill Space
Aerobic Digestion	Odors	Nuisance
Biosolids Land Application	Sludge Reuse	Beneficial Product +

## Lesson 3 Exercises Answer Key





## Lesson 4 Exercises Answer Key

Aeration Basin peration/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)
Air Diffusion	Air Emissions (VOCs)	Degradation of Air
	Air Emissions (Odor)	Nuisance
	Noise	Nuisance
	Energy Use	Depletion of Natural Resources
	Fuel Use	Depletion of a Natural Resource
		Treated Wastewater +
Inspecting and Controlling Bio-Organisms	Energy (Electricity) Use	Depletion of a Natural Resource
		Degradation of Air
Preventative Maintenance	Solid Waste Generation	Use of Landfill Space
Monitoring (Oxygen, Odor, Diffusers, Flow)	Energy (Electricity) Use	Depletion of a Natural Resource
	Supply/Paper Use	Depletion of Natural Resources
Skimming Floatables	Solid Waste Generation	Use of Landfill Space
Emergency Generator Operations	Noise	Nuisance and Health & Safety
	Air Emissions	Degradation of Air
	Fuel Use	Air Emissions and Depletion of a Natural Resource

*Note: Aeration Basin Operations (Air Diffusion Treatment) can also be thought of as a Positive Impact and designated with a “+”*

## List of Clarifier Operations/Activities

- Monitor (e.g., Flow Balancing, Wastewater Quality and Odor)
- Solids and Sludge Control
- Clarifier (Tank) Cleaning
- RAS and WAS Pumping
- Preventative Maintenance

## Lesson 4 Exercises Answer Key, continued

Clarifier Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)
Monitoring (Flow Balancing, Wastewater Quality, Odor)	Energy Use	Depletion of Natural Resources
	Supply/Paper Use	Depletion of Natural Resources
Solids and Sludge Control	Wastewater Solids Generation/Disposal	Biosolids Product +
Clarifier (Tank) Cleaning	Energy Use	Depletion of Natural Resources
	Air Emissions	Degradation of Air
RAS and WAS Pumping	Energy Use	Depletion of Natural Resources
	Water Use	Depletion of Natural Resources
Preventative Maintenance	Solid Waste Generation	Depletion of Landfill Space
Wastewater Clarification	Treated Wastewater	Treated Wastewater +

## Lesson 6 & 7 Exercises Answer Key

Answers for the aspects system procedure #2 (in Appendix C)

Does the procedure:

1) *Define the purpose (why the procedure is needed).*

Yes ☐ No ☒

Reference/Explanation: The procedure does not describe the purpose of the aspects procedure. E.g., "The purpose of this procedure is to identify the significant environmental aspects of ABC activities in order to set objectives and targets for the ABC EMS.

2) *Define the scope (what core fenceline [operations/areas] and staff the procedure applies).*

Yes ☒ No ☐

Reference/Explanation: Section 1.0 (Scope) defines that the procedure applies to all ABC activities, including from internal and external (supplier) sources that ABC can control.

3) *Explain roles & responsibilities (who needs to complete the tasks).*

Yes ☐ No ☒

Reference/Explanation: There are no clear explanation of roles and responsibilities in the procedure (e.g., who is doing what by when, etc.).

4) *Identify the tasks that need to be completed.*

Yes ☒ No ☐

Reference/Explanation: Section 3.0 (Approach) outlines the approach that ABC will use to determine and rank the environmental significance of their activities.

5) *Contain a good, sound aspect/impact analysis methodology?*

Yes ☒ No ☐

Reference/Explanation: Although it can be subjective to state any analysis is "good and sound," Section 3.0 (Approach) outlines ABC's tasks to complete the aspects analysis.

6) *Include a list of significant environmental aspects and impacts (or reference to a list)?*

Yes ☒ No ☐

Reference/Explanation: Section 4.1 under 4.0 Documents/Records references a "table listing all of ABC's activities, products and services; their associated environmental aspects; and their associated potential environmental impacts."

7) *Is the aspect/impact list reviewed at least annually and take into account changes to operations and activities?*

Yes ☒ No ☐

Reference/Explanation: Section 3.8 outlines that ABC will complete a review as outlined in Section 3.0 as "a new activity, product or service is initiated at ABC." In addition, the last paragraph of Section 3.0 states that the procedure will be applied no less than once per year.



# Appendix B

Conforming Your EMS Fenceline

List of Operations/Activities

Input/Process/Output Diagram

Operations/Activities and Aspects/Impacts Matrix

Significant Operations/Activities and Aspects/Impacts Table

Template Procedure Form

Step-by-Step Guide to Identify and Prioritize Your Environmental Aspects

## Lesson 2: Confirming your EMS Fenceline

Where will your EMS provide the most bang for your buck (i.e., the "low-hanging fruit")? What organizational benefits and environmental performance improvements do you expect the EMS provide?

---

---

Where in the organization are there opportunities to leverage things that are going well and best practices?

---

---

What areas in your organization give you the most heartburn at the moment? How will the EMS help improve management confidence in these areas?

---

---

Where do you use the most natural resources? Energy? Hazardous materials?

---

---

Which areas have the most support and/or interest? Receptive management? Line supervisors? Employees?

---

---

Have you estimated the Level of Effort that will be required from employees in the identified fenceline areas?

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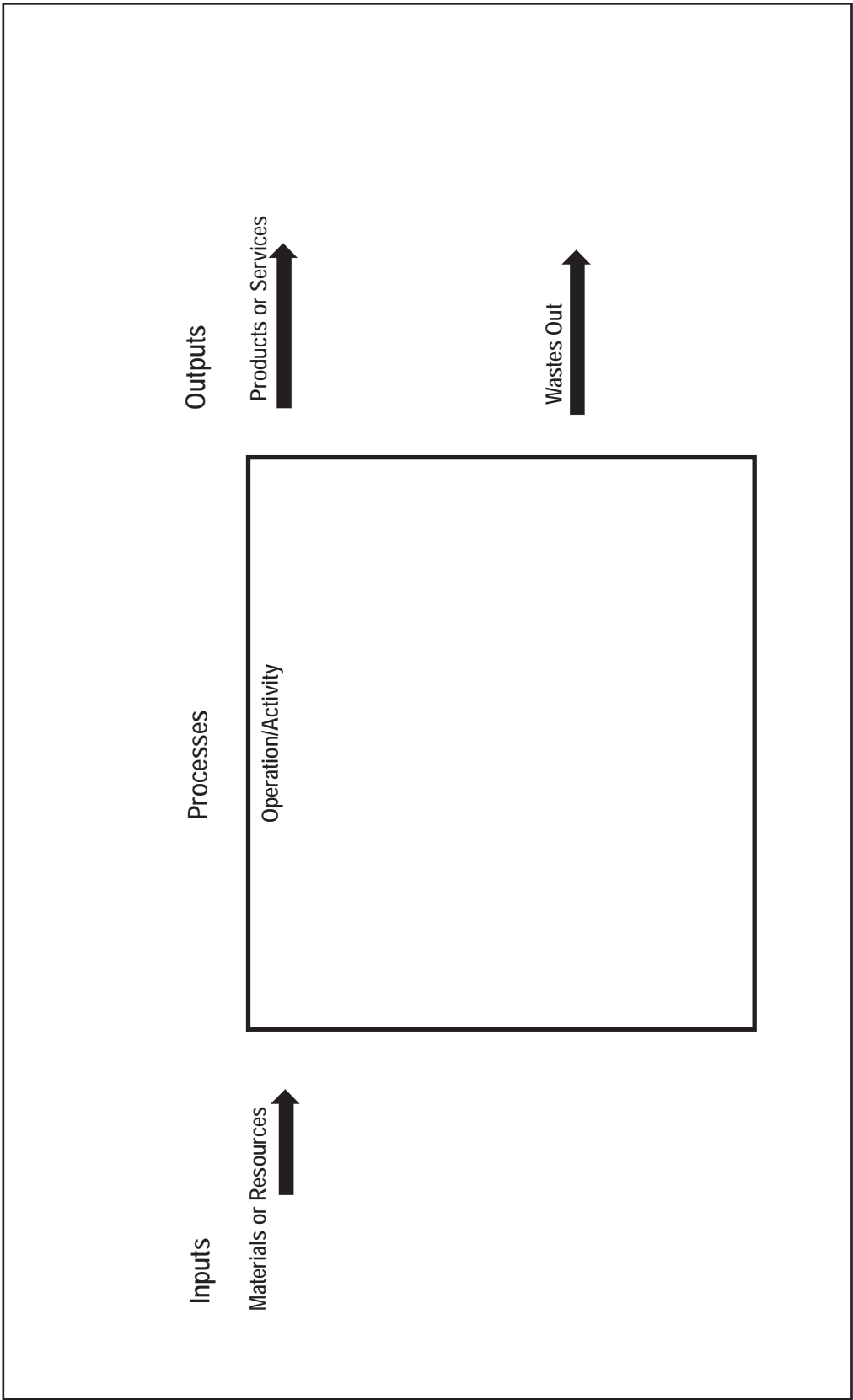
---

Have you discussed human and financial resource needs with appropriate levels of management in your fenceline areas?

---

---

Input/Process/Output Diagram





## List of Operations/Activities


## Significant Operations/Activities and Aspects/Impacts Table

Wastewater Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)				Total Score

Wastewater Operation/Activity	Aspects (Causes of Impact)	Effects (Potential Impacts)				Total Score

## **Template Procedure Form**

### **Identifying Significant Environmental Aspects System Procedure**

#### **1.0 Purpose**

#### **2.0 Scope**

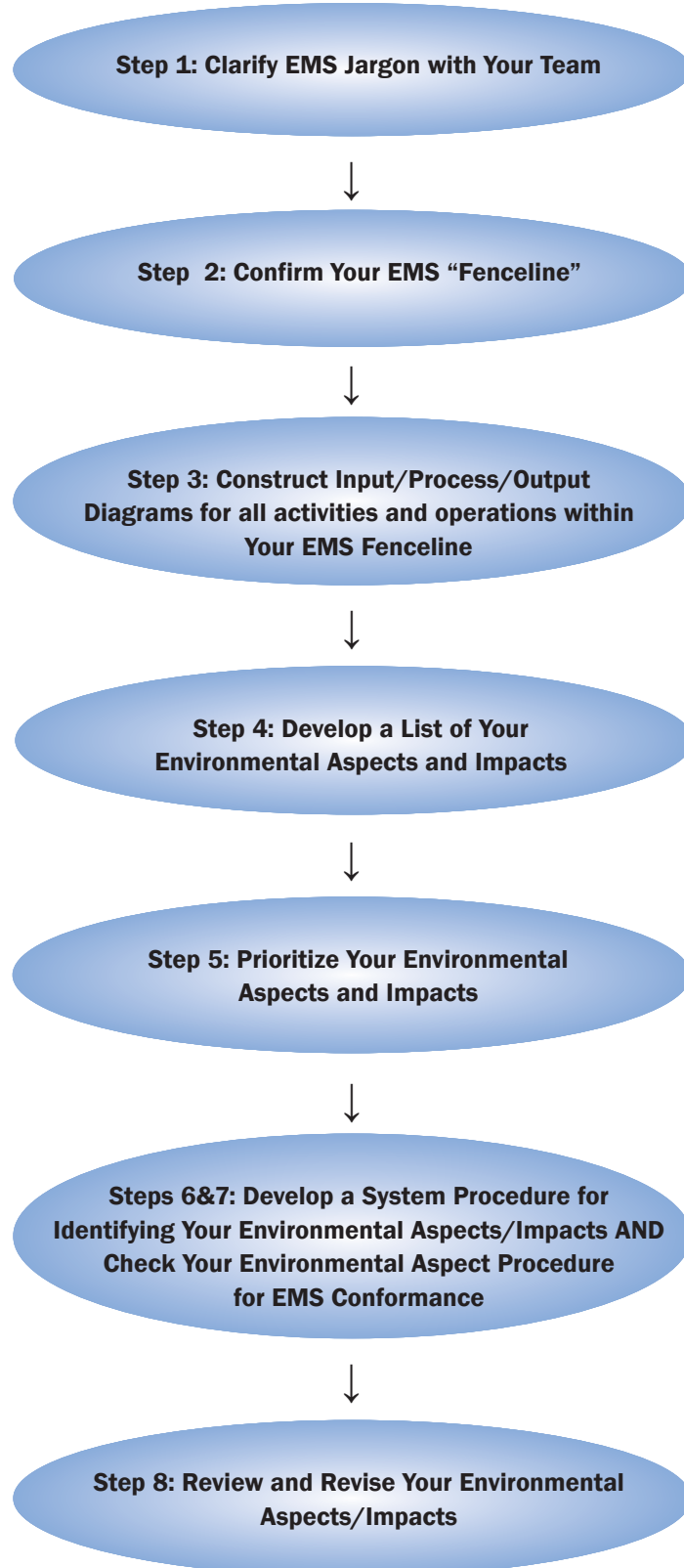
#### **3.0 Roles & Responsibilities**

#### **4.0 Approach**

#### **5.0 Documents/Records**

**Your Step-by-Step Guide to Identify and Prioritize Your Environmental Aspects**

Cut out this for a Step-by-Step Aspects Guide handy reference





# Appendix C

## EMS Aspects Procedures 1 & 2

## Environmental Management System Significant Aspects Procedure #1

### 1.0 Purpose

The purpose of this procedure is to describe a consistent method by which the City identifies the environmental aspects of its activities and services. The primary purpose of this procedure is to determine those activities and services that can have significant impacts on the environment, and to ensure that these activities and impacts are considered in setting environmental objectives.

### 2.0 Responsibility and Authority

The EMS Coordinator, or designee, and the EMS Team are responsible for developing, undertaking, and implementing the procedure of identifying the environmental aspects and impacts of the activities and services of the City Departments and Divisions (referred to as fencelines) are included in the EMS. The results of this identification process will be summarized in an organizational matrix of activities and services with their related environmental aspects and impacts. This procedure is described in greater detail in Section 5.0 “Requirements and Procedures.”

The EMS Coordinator, or designee, and the EMS Team are responsible for establishing the significance criteria to be used in rating the identified aspects and impacts and for ranking them with respect to the significance criteria.

The EMS Coordinator, or designee, and the EMS Team are responsible for performing an annual review of and, if necessary, updating the aspects/impacts matrix and the associated significance ranking.

### 3.0 Requirements and Procedures

The procedure by which the City identifies the environmental aspects and impacts of its activities and services will be conducted for each fenceline (i.e., site or operational boundary) as it joins the City’s EMS program. For each application, the procedure will consist of the following steps, also presented in P02-R2, Aspects/Impacts Identification and Assessment Diagram:

#### 3.1 Identifying Key Operations

The EMS Coordinator and the EMS Team will hold a series of meetings in which a compendium of the major operations undertaken within the subject fenceline will be compiled. This summary listing will be referred to as “key operations” and is subsequently broken down into smaller, more specific activities related to that key operation. This overall organizational diagram serves as the basis for the remaining steps in the procedure.

#### 3.2 Input/Output Diagrams

The EMS Coordinator and the EMS Team then address each key operation individually by creating Input/Output Diagrams that detail all the resources that are used, all the waste and by-products that are produced, and all the services that are provided in the course of performing each key operation. These diagrams will assist in the following steps by providing a clear overview of the operations and

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activities being further examined. See P02-R3 for an Input/Output Diagram Template.

### 3.3 Activities

The EMS Coordinator and the EMS Team will then compile a listing of all the activities that together comprise a particular key operation. Every activity, large and small, is listed in a table designed for the purpose. See P02-R4 for an Activities, Aspects, Impacts, Significance Criteria Template. In some cases, certain activities may have several different components, but are always specific to the key operation the team is addressing.

### 3.4 Environmental Aspects and Impacts

After the list of activities is fully compiled for a particular key operation, the EMS Coordinator and the EMS Team address each activity individually. For each activity, the environmental aspect(s) is listed. Some activities have multiple corresponding aspects, and some have only one. The resulting environmental impact(s) are then listed in correspondence with the appropriate aspects.

In conducting this step, it is important to remember that the aspect is the element of the activity or service that interacts with the environment while the impact describes the change to the environment (Note: an impact can be either a positive or a negative change). Potential impacts to be considered include:

- changes to air, soil, and water quality;
- human exposure to chemical or harmful agents;
- changes to natural habitat;
- nuisances;
- depletion of resources.

### 3.5 Regulatory Status

After each aspect in the table, a notation (Yes or No) is made as to whether or not the aspect is regulated under existing legal requirements.

### 3.6 Significance Criteria

The EMS Coordinator and the EMS Team select the significance criteria. This step in the procedure is conducted only once as the same significance criteria are to be applied to each Key Operation within the subject fenceline and eventually to each fenceline within the City as they are incorporated into the EMS. A list of fourteen different significance criteria divided into environmental/sustainability-related and business-related categories was reviewed and voted on by the EMS Coordinator and the EMS Team. From this vote the list of significance criteria was reduced to seven areas of concern. See P02-R5 for a listing of selected significance criteria.

### 3.7 Environmental Aspect Significance Ranking

In order to identify which environmental aspects and their associated impacts are to be considered significant, the EMS Coordinator and the EMS Team review

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each aspect of every activity in relation to the selected significance criteria. A rating on a scale from zero to five (with zero representing no impact and five representing a major impact) will be assigned to each significance criteria as it relates to each aspect. The Core Team will assign this rating to each aspect using their best professional judgment, knowledge of the activities they are evaluating, and with the input of additional knowledgeable staff, as needed.

### 3.8 Determining Significance

Once the ranking of aspects is completed, the significance scores are totaled. A threshold value is selected, at or above which the associated aspects are to be considered of high significance in light of its regulated status and the City's environmental policy as well as improvable within technical, financial, and organizational constraints. The list of significant aspects resulting from this procedure will be maintained as P02-R-XX (Dept. Abbreviation).

### 3.9 Updating Aspects and Impacts

At least once per year, the EMS Coordinator and the Core Team will evaluate new or modified activities and their associated aspects and impacts. Depending on the complexity of the activity, an Input/Output Diagram may be generated. The subsequent steps, including the identification of environmental aspects and impacts related to the new or modified activity and the significance rating will be conducted. If a significant aspect is identified, it will be added to the overall listing generated from Step 5.7, Determining Significance. The Team will also consider the significance criteria used in the rating exercise and evaluate any need to alter them.

### 4.0 Related Documents and Data

P02-R1 ISO 14001 Standard Excerpt 4.3.1

P02-R2 Environmental Aspects List

P02-R3 Aspects/Impacts Identification and Assessment Diagram

P02-R4 Input/Output Diagram Template

P02-R5 Activity, Aspect, Impact, Significance Criteria Table Template

P02-R6 Significance Criteria

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## Identifying Significant Environmental Aspects Procedure #2

### 1.0 Scope

This procedure is applied to all activities, products and services that are internal to and under the control of ABC. It is applied equally to those aspects at ABC that originate from external sources.

### 2.0 Definitions

**Environmental aspect:** Element of an activity, process or service that can interact with the environment. The environmental aspect of an activity is that part of it that creates a possibility for an environmental impact. As such, it is equivalent to the concept of a "hazard" in safety, which is also defined as the mere possibility of a negative event.

**Significant environmental aspect:** An environmental aspect that has or can have a significant environmental or business impact, i.e., one that can potentially cause a significant environmental or operational impact.

**Environmental impact:** Any change to the environment, whether adverse or beneficial, wholly or partially resulting from the facility's activities, products or services. A potential negative environmental impact is equivalent to the concept of "risk" in safety, which assigns a probability and consequence to the possible negative event that may result from a "hazard".

### 3.0 Approach

The approach enumerated below reflects the method developed in Module 1, Significant Aspects, Objectives and Targets of US EPA's Environmental Management System Implementation Training Course. That training module is incorporated here by reference and represents a further elaboration of the approach used by ABC to identify its significant environmental aspects. The approach below is a very condensed version of the contents of the training module.

3.1 Create a baseline list of ABC activities, products, and services that have the possibility of interacting with the environment, (e.g., possess environmental aspects) together with their environmental aspects.

3.2 Using the baseline list, aggregate all activities, products and services by environmental aspect.

3.3 For each of these aspects, state the potential environmental impact by highlighting the probability and consequence of the aspect's occurrence.

3.4 Ascertain the regulatory or other requirements that may pertain to a given aspect when considered together with each activity, product or service it is associated with and note each combination that has a regulatory or other requirement. Those aspects that are so highlighted are designated as significant aspects. Document the regulatory and other requirements that apply to each aspect.

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3.5 Establish significance criteria for potential impacts by establishing levels for probability and consequence that fall into low, medium and high levels.

3.6 Compare the potential environmental impacts against the significance criteria to determine which aspects should be designated as significant. Where a potential environmental impact meets or surpasses the minimum criteria for designating as "significant", then its associated aspect is considered significant.

3.7 Create a final list of all significant aspects that have been so designated either because they have regulatory or other requirements that make them so or because they meet or surpass the significance criteria established for the ABC.

3.8 Whenever a new activity, product or service is initiated at ABC, the requirements of this procedure will be applied to it to ascertain if any new significant environmental aspects have been introduced.

3.9 This procedure is also applied to activities, products and services at ABC that originate from external sources (e.g., suppliers). Significant environmental aspects on ABC premises that originate from such sources shall be managed like all other significant environmental aspects. ABC may take steps to notify those external parties over which it has some influence to mitigate any aspects that may reasonably be mitigated at the source. Where no such influence exists or where mitigation at the source is infeasible, ABC will address such aspects within its own EMS.

This procedure will be applied as necessary to ensure the EMS addresses all significant aspects but not less than once per year to maintain the list's relevance.

#### **4.0 Documents/Records**

4.1 A table listing all of ABC's activities, products and services; their associated environmental aspects; and their associated potential environmental impacts. The table is split into significant and non-significant impacts and grouped by aspect. Aspects with regulatory or other legal requirements are noted as such.

4.2 Documentation of the method used to ascertain which environmental aspects are significant.

4.3 Documentation of any legal and other requirements for significant environmental aspects.

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# Appendix D

## Senior Management Commitment and Roles Defined

# Appendix D

## Senior Management Commitment and Roles Defined

December 19, 2005

Re: Authority for EHS-MS activities

Under the authority delegated to me on January 14, 2003 by the Kent County Levy Court, I am delegating the following Environmental Health and Safety Management System (EHS-MS) as follows.

The Environmental Program Manager shall:

- Develop all procedures associated with the EHS-MS;
- Lead the Core Team;
- Participate in the appropriate biosolids value chain activities;
- Conduct internal audits and compliance assessments under the EHS-MS; and
- Report on the performance of the EHS-MS to all interested parties.

The Core Team shall be composed of all department managers with EHS-MS responsibility. The Core Team shall have the following responsibilities:

- Approve all EHS-MS documents;
- Ensure that the EHS-MS is implemented, maintained and continually improved within the plant;
- Conduct periodic management reviews;
- Determine the direction of the EHS-MS;
- Determine the resources necessary to operate, maintain and continually improve the EHS-MS; and
- Conduct all management of change processes.

Hans Medlarz, P.E.  
Public Works Director  
Kent County, DE