

Decision Support Tool User Guide

This document is intended to provide the user with guidance in applying the ACRP Project 02-71 Decision Support Tool, version 3.0, that accompanies ACRP Research Report 14, 2nd edition. The tool is designed to be used in conjunction with ACRP Research Report 14, which provides details on specific best management practices (BMPs) to supplement the information provided in the tool.

INTRODUCTION

Purpose of the Decision Support Tool

The Decision Support Tool was developed to help a wide range of airport users identify candidate practices and technologies for controlling the discharge of aircraft deicers into the environment that may potentially be feasible at their facility. The tool does not specifically address airfield pavement deicing because the control options are generally limited to selecting products that don't contain urea and ensuring that the products are handled properly and used efficiently.

The tool provides recommendations in terms of potential applicability for the user's unique conditions and considerations (e.g., types of deicing events and operations, airfield characteristics, drainage, nature of receiving waters, regulatory requirements and budget). The recommendations are intended to lay the groundwork for subsequent engineering feasibility analysis and design that consider a broader variety of site-specific factors in much greater detail than provided by the tool.

Throughout this guidance and in the tool, BMP is used to describe any potential deicer management activity that falls under the categories of source reduction, collection and containment, treatment/recovery/disposal and storage. For example, a deicing pad for deicer collection and an aerated gravel bed for treatment are both considered BMPs for the purposes of the tool. Other ACRP documents may use descriptors such as "control measure", "technology", and "process" to describe these deicer management activities.

The tool can be applied for a variety of purposes, including:

- Exploring possible solutions to managing deicing runoff.
- Gaining a better understanding of the factors that affect the feasibility of different deicing runoff management BMPs at an airport.
- Facilitating discussions with airport management, airlines, regulators, or interested third parties regarding deicing BMPs that may or may not be suitable under a particular set of circumstances.
- Assessing the basic applicability of an airport's current deicing runoff management system.
- Identifying additional potentially applicable BMPs not currently implemented in an existing deicing runoff management system.
- Supporting preparation of requests for proposals for deicer management services by focusing services on solutions identified by the tool output.
- Facilitating targeted use of other ACRP guidance documents based on potential applicability to user's situation.
- Understanding the limiting factors that are preventing additional BMPs from being utilized.
- Assessing possible future deicing runoff management systems in consideration of current systems.
- Identifying potentially applicable BMPs under future operating conditions or future permit requirements.

Capabilities and Limitations

In applying the tool, it's important to understand both the capabilities and limitations of the tool.

Capabilities

- The evaluation is analogous to the process that an expert practitioner would take when first approaching a deicing runoff management project at an unfamiliar airport.
- The tool provides a means of screening out deicer management processes that can clearly be eliminated from consideration because they are not compatible with user-entered information from their airport (e.g., certain treatment technologies may be eliminated if they are not compatible with available space or height restrictions).
- Within the tool, deicer management processes that pass the screening analysis are linked with other compatible processes that pass the screening analysis (e.g., use of deicing pads may be linked with the ability to recycle aircraft deicing fluid).
- The tool is applied to a single drainage area. This could involve the entire airport, or a subset of drainage basins where deicing operations are currently conducted or are planned in the future. The inputs entered should only reflect the operations and conditions within the area being evaluated. If several basins are to be investigated, separate runs of the tool would be conducted for each basin with basin-specific data. It may be necessary for the user to estimate basin-specific inputs from airport-wide information.
- Scenarios can be saved as uniquely named tool files for future reference or documentation purposes.

Limitations

- The generalized assumptions imbedded in the tool may not be applicable to a particular facility.
- Analyses that involve site-specific and fine-scale evaluations are beyond the scope of the tool. Examples include storm event-scale estimates of runoff volumes and deicer concentrations; storage volume estimates that require time-series analysis of runoff collection and treatment rates; identifying site-specific gravity and pumping conveyance needs between unit processes; and sizing of storage and treatment facilities also require relatively fine-scale time-series analyses.
- Cost estimation is not provided in the tool because site-specific analyses are required for sizing and costing of facilities and infrastructure. The user is directed to the BMP Fact Sheets in ACRP Research Report 14, 2nd edition for guidance on costs.
- The tool is not intended to define the components or specifications of a deicing runoff management system to a degree that performance can be guaranteed.
- The tool excludes or includes various components by comparing user inputs to technical limitations of each component and typical implementation conditions. In some unique circumstances, an excluded component could be applicable at a given airport. Conversely, included components could potentially be infeasible due to site specific conditions not considered in the tool.
- The tool is not intended to be all-encompassing or used as a final word in any major decisions; rather, the results of the tool's analysis provide a basis for further investigation by the user into the BMPs suggested.

INSTALLATION

The tool is delivered in three files: the Tool itself in an MS Excel spreadsheet file and two PDF files containing ACRP Report 14 files that are linked to in the tool. Installation requires placing all three of these files in the same folder. MS Excel must also be installed to access the tool.

Two messages may come up when the Tool is first opened: "Enable Editing?" and "Enable Content?" The user must respond affirmatively to both of these to use the Tool.

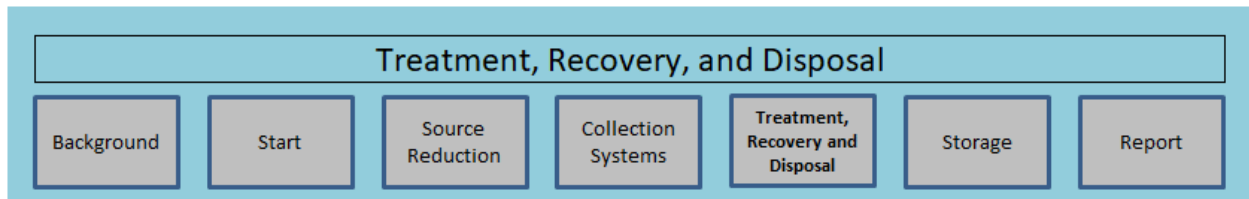
OVERVIEW OF THE DECISION SUPPORT TOOL

The tool is constructed as an MS Excel application that, through a series of guided questions and embedded decision logic, presents the user with a set of recommendations for source reduction BMPs and ranked combinations of BMPs for collection and containment, treatment/recovery/disposal, and storage of deicing runoff at their airport. As noted, the results of the tool's analyses provide a basis for further investigation into the alternatives suggested, with priority on the highest ranked combinations.

The analysis is driven by user inputs that are used to screen out clearly inapplicable BMPs and define objectives against which potentially viable configurations of BMPs can be evaluated. An internal database contains BMP characterizations that provide the basis for initial exclusion or inclusion in the analyses, and subsequent assembly of combinations of BMPs. The characterizations are based on the information in the ACRP Research Report 14, 2nd edition BMP factsheets. All combinations that pass exclusionary criteria are evaluated in terms of scoring and weighting factors such as pollution reduction potential, implementability, siting constraints, expandability and adaptability, staffing and contractor support requirements, and operation and maintenance complexity. Appendix A presents these scoring and weighting factors. A report is generated for each run that documents the conditions input by the user and a listing of potentially applicable BMP combinations ranked according to their score. The user can apply this information along with site-specific knowledge to further eliminate combinations that may not be feasible or desirable. The resulting list of BMP combinations can then be used as a starting point for further analysis of potentially desirable system configurations.

The exclusionary parameters used by the tool were selected to achieve a straightforward comparison of information entered by the user and available threshold criteria. The user may ultimately find that further screening of potentially applicable processes occurs in subsequent studies when the nuances of individual situations can be more effectively considered.

The tool is structured into seven separate pages: a background page, an initial start page, the four major BMP topic pages mentioned previously, and finally the report. Some brief background and relevant assumptions for each page are also presented where applicable. Navigation between pages in the tool is done through buttons in a blue banner at the top of each page. The button for the current page appears bolded in the banner.



User input fields in the tool are shown as white. User input takes different forms in the tool depending on the nature of the required information. The most common input format is a yes/no pair of radio buttons for a question that requires such an answer. Some fields ask for numeric input (e.g., gallons of a fluid, acres of space, etc.), often restricted to reasonable values. Some questions require the user to check a box for all the answers that apply. Lastly, some questions will ask the user to select a single answer from a set of responses in a group. As answers are selected to questions, further dependent questions are revealed. Once all questions related to a specific topic are answered, guidance appears in the column to the right of the question related to that topic. Most topics will also include a “reset” button that clears any given guidance and user input, returning a topic to its initial default state.

Aside from the navigation buttons, user input fields, reset buttons, and some report-specific buttons that will be covered later, the tool is locked to user input to prevent unintended changes.

The table below summarizes the key pieces of information that the user will need to run the tool. It may be necessary to coordinate with other entities or stakeholders to gather some of this information, and potential sources of information are noted in the table. Appendix A contains a blank form to facilitate gathering of the key pieces of information that the user will need to run the Decision Support Tool.

Key pieces of information that the user will need to run the Decision Support Tool.

Information Required	Possible Sources
Weather	
Average number of deicing days (including defrosting days) at airport	Operations, Airline station chiefs, FBOs
Average number of frost deicing days at airport	Airline station chiefs, FBOs
Average number of days with snow > 1 inch (or liquid equivalent > 0.1 inch)	Operations, Airline station chiefs, FBOs, National Weather Service
Aircraft operations, deicer use and deicing operations in the basin under analysis	
Peak hourly departure rate (commercial and corporate)	Operations, FAA tower
Openness of airlines to consider centralized deicing	Airline station chiefs, FBOs
Area potentially available for deicing pads (acres)	Operations, Airport Planning
Existing gate constraints causing operational issues	Operations, Airline station chiefs
Acceptability of additional vehicular traffic in deicing areas	Operations, Airline station chiefs, FBOs
Operational concerns with source reduction and collection BMPs	Airline station chiefs, FBOs
Type of glycol in ADF ¹ used	Airline station chiefs, FBOs
Types of ADF used (e.g., Type I, Type IV)	Airline station chiefs, FBOs
Average gallons of each Type of ADF used annually (as applied or undiluted fluid [neat])	Airline station chiefs, FBOs
Average Type I ADF mixture applied (% ADF-concentrate:water)	Airline station chiefs, FBOs
Percent of all aircraft deicing trucks equipped with Forced Air/Fluid technology	Airline station chiefs, FBOs
Percent of all aircraft deicing operations conducted using Blend to Temperature technologies	Airline station chiefs, FBOs
Use by aircraft operators of: proactive anti-icing, physical removal of snow, hangared parking, hot water deicing, enclosed bucket deicing, enhanced weather forecasting, holdover time determinations system, and reduced aircraft operations	Airline station chiefs, FBOs
Current deicing runoff collection practices being employed in the basin under analysis	
Predominant current collection practice in study area	Airport Environmental Department, Airfield Maintenance
Capture efficiency of the current collection practice	Airport Environmental Department
Percentage of airport-wide ADF usage applied in the collection area	Airline station chiefs, FBOs, Airport Environmental Department
Current storage practices for collected deicing runoff	Airport Environmental Department, Airfield Maintenance
Current or potential future collection area characteristics	
Understanding of drainage system in deicing areas	Airport Engineering
Physical condition of storm sewers serving deicing areas	Airfield Maintenance, Airport Engineering
Planned airfield improvements that include current aircraft deicing areas or where a central deicing facility might be constructed	Airport Planning
Environmental requirements in the basin under analysis	
Most restrictive surface water numeric discharge limit	NPDES Stormwater discharge permit
Treatment/Recovery/Disposal	
Availability of sanitary sewer service at the airport	Airport Facilities Department
Organizational desire to pursue glycol recycling	Airport Management
Openness to consider transporting collected runoff off-site for glycol recovery.	Airport Environmental Department, Airport Operations
Openness to considering on-site treatment or glycol recovery.	Airport Environmental Department, Airport Planning
Acreage, height restrictions, and wildlife concerns for locations identified as potential storage, treatment, or recovery infrastructure.	Airport Environmental Department, Airport Planning, Airport Safety

¹ ADF = Aircraft Deicing Fluid

USING THE TOOL

Guidance on using the tool is organized by page.

Background Page

This is a simple informational page that provides a concise background and summary of the tool.

Start Page

This page gathers general information on the airport and run-specific information to document the scenario being evaluated. The page is subdivided into three topic categories, as follows.

Run-Specific Information

This block asks for information about the specific tool run, such as the user's name, a scenario name (e.g., current conditions, 20% growth, new terminal) and simple description, and date. The airport name is selected from a pull down list of locations where weather data are available, organized by state. If the airport being evaluated is not on the list, "NOT LISTED" should be selected from the bottom of the list, and the tool will ask for a manual input of the airport name. A second pull down list will also appear asking for the nearest listed airport. The information in this block is used in the analysis and included in the run report documentation.

Weather Information

This block asks for weather information as it relates to deicing events at the airport in question. The user is required to estimate the average number of deicing events (including defrosting events) each season. If the user indicates that weather data are available, the tool requests inputs for average number of frost deicing events and events with snow > 1 inch (or liquid equivalent > 0.1 inch). If no such data are available, the tool uses default values. An average winter temperature for the airport is auto-filled from a weather database populated from the National Climatic Data Center (NCDC) in the tool. This value can be overridden by the user, if desired.

Terminology:

Deicing event: A day when ADF is applied to aircraft

Defrosting event: A deicing day when low volumes of ADF are applied to remove frost/hoar frost from aircraft.

Deicer Use

This block guides the user through a set of questions to gather information on the types and volumes of aircraft deicers used at the airport. The average Type I fluid mixture is also requested. This defaults to a 50:50 mixture if the user cannot provide an input.

Source Reduction Page

This page collects information and provides guidance on aircraft deicing source reduction technologies and practices that may be implemented at the airport. If desired, this page can be completed independent of the other pages in the tool.

Assumptions

This block lists assumptions to help the user understand the results of the analyses.

Forced Air / Fluid

This block requests information on the current use of this technology and estimates potential benefits based on the inputs and weather.

Blend to Temperature

This block requests information on the current use of this technology and operational conditions. The estimate of potential benefit is based on these inputs and the average minimum temperature from the Start page.

Additional Source Reduction Technologies

Simple questions about the current use of additional source reduction technologies are asked and qualitative guidance is presented in the run report.

Collection Systems Page

This page collects information and presents guidance on various types of collection systems that might be implemented at an airport.

Assumptions

This block lists assumptions to help the user understand the results of the analyses.

General Question

This question determines if institutional priorities should add extra weight to higher performance collection technologies.

BMPs Currently in Use

This block requests information on the existing collection system, its performance and extent of use. In the event more than one collection technology is being used in the area under evaluation, then predominant technology should be selected. Guidance is provided on improving operation or implementation, or investigating other collection alternatives.

Glycol Capture Efficiency is calculated as:

$(\text{Gallons collected} \div \text{Gallons applied}) * 100$

Note: Gallons as 100% glycol

Centralized Deicing Facilities

This block evaluates the basic feasibility of a central deicing facility in consideration of maximum hourly throughput capacity required, availability of suitable space on the airfield, gate congestion, and air carrier acceptability.

Apron Collection Systems

This block evaluates the basic feasibility of an apron collection system approach based on aircraft deicing being conducted at a location with suitable drainage conditions in consideration of maximum hourly throughput capacity required, availability of suitable space on the airfield, gate congestion, and air carrier acceptability.

Glycol Collection Vehicles

This block evaluates the basic feasibility of glycol collection vehicles based on collection requirements, apron congestion, storm inlet features, and staffing requirements.

Block and Pump Systems

This block evaluates the basic feasibility of a block and pump approach based on aircraft deicing being conducted at a location with suitable drainage conditions and infrastructure features.

Airfield Drainage Planning/Design/Retrofit

This block requests information that pertains to incorporating a deicing alternatives feasibility analysis into future planning efforts.

Deicer-laden Snow Management

This block evaluates the potential desirability of isolating plowed snow containing aircraft deicers.

Treatment/Recovery/Disposal Page

This page collects information and provides guidance on the deicer treatment, recovery, and disposal BMPs that may be implemented at the airport. It includes a set of general questions at the beginning of the page, the answers to which affect the evaluation of the treatment, disposal, and recovery BMPs. Some of the BMP blocks rely on information collected from the user on the Start Page, and some require the user to click an “evaluate” button before presenting final guidance.

General Questions

These questions provide input that sets constraints and weights on various aspects of the analyses.

The question regarding wildlife attractants is used to eliminate BMPs that involve open water, including ponds as a storage BMP. This question should be answered “no” if an airport would consider open water features with measures to mitigate wildlife attraction, such as netting or “bird balls.”

The response to the question regarding the most restrictive discharge limit is used in evaluating the individual onsite treatment technology BMPs in terms of their ability to produce treated effluent at or below the entered limit. If an airport has limits on its discharges that are expressed in pounds or kilograms, or other non-concentration-based restrictions, the value entered should be the user’s best estimate of the concentration at which deicing runoff needs to be collected to meet requirements related to deicers in stormwater discharges. If

the concentration at which runoff would need to be collected has not been determined, select the concentration range that reflects the range typically measured in discharges during deicing events.

Publicly Owned Treatment Works

This block collects input and provides guidance on the applicability of discharging collected deicing runoff to a municipal wastewater treatment system.

Glycol Recovery

This block collects input and provides guidance on the potential use of glycol recycling as a means for disposal of collected high concentration deicing runoff. The evaluation of this BMP is triggered manually by the “evaluate” button.

Passive Facultative Treatment, Aerated Lagoon, Activated Sludge, Aerated Gravel Beds, Moving Bed Bio-Reactor, Anaerobic Fluidized Bed Reactor

These blocks use previously provided user input from the Start page, the Collection Systems page, and general questions from this page to evaluate the potential applicability of these treatment BMPs and provide guidance on their potential implementation. The evaluation of these BMPs is triggered manually by the “evaluate remaining topics” button situated above the PFT topic. “Evaluate remaining topics” immediately produces a message for each treatment BMP indicating that it is either potentially applicable or, alternatively, inapplicable if the answers to previous questions eliminate the BMP from further consideration.

Storage Page

This page presents guidance on the methods of storage of collected deicer that may be implemented at the airport. It includes an optional calculator for estimating space requirements for each storage option based on a user input volume.

Storage Area Calculator

This optional calculator is included to provide a high-level evaluation of space requirements for siting different types of storage. The user is asked to supply an estimate for the volume of storage required from which the tool performs basic storage dimension calculations based on default dimensional assumptions. Sizing of storage, and subsequent selection of the most appropriate storage BMP is highly dependent on deicing activity, precipitation, local hydrology, the conveyance network, and treatment or disposal capacity. Sizing of storage for the purposes of design should always be done with a site-specific analysis that considers these factors. This calculator is only intended to provide a general sense of storage needs for the purposes of comparing storage BMP alternatives.

BMPs Currently in Use

This block gathers information on storage BMPs already in use and the airport’s willingness to continue to use and/or expand the use of each BMP. The responses are used to assign weights applied in the scoring of the storage BMPs.

Portable Tanks

This block evaluates the potential applicability of portable tanks (also called frac tanks) for storage based on user provided information on estimated storage requirements (if known) and space availability (footprint). It should be noted that portable tanks are typically employed as an interim practice until permanent storage can be provided.

Modular Tanks

This block evaluates the potential applicability of modular tanks for storage based on user provided information on estimated storage requirements (if known) and space availability (footprint). It should be noted that modular tanks are typically employed as an interim practice until permanent storage can be provided.

Ponds

This block evaluates the potential applicability of pond storage using user provided information on wildlife attractant concerns, space availability (footprint), and site suitability (depth to groundwater or bedrock and elevation relative to the deicing runoff collection point) for construction of a pond.

Above Ground Permanent Tanks

This block evaluates the potential applicability of above ground storage tanks based on user provided information regarding space availability (footprint) and suitability (bedrock and elevation relative to the deicing runoff collection point).

Below Ground Permanent Tanks

This block evaluates the potential applicability of underground storage tanks based on user provided information regarding space availability (footprint) and site suitability (depth to groundwater or bedrock and elevation relative to the deicing runoff collection location and discharge to the treatment/recovery/disposal location).

Report Page

The report page summarizes the analyses and guidance in a format suitable for printing. There is no user input on this page.

Run-Specific Information

This block contains identifying information provided by the user on the Start page. The purpose is to allow enough detail to provide useful documentation of the run.

Action buttons

Three action buttons are provided:

Run Report – Compiles the evaluations from the other pages, scores and ranks the potentially applicable BMP configurations, and generates the content for the report. The user may revisit and revise parts of the tool, but the “Run Report” button must be clicked again when coming back to the report for any changes to be reflected.

Print All – Sends the report to your designated printer.

Save As ... – Allows the user to save the run as a uniquely named file for future use or reference. It is recommended that the run name correspond to the Scenario Name, if possible.

Source Reduction Summary

This block presents recommendations for considering and further investigation of source reduction approaches that are potentially applicable. Estimated potential reductions in glycol usage are included.

Additional Source Reduction technologies to consider

This block presents recommendations for considering and further investigation of additional source reduction approaches that may provide increment benefits that are not quantifiable.

Existing Collection Systems BMPs

This block provides recommendations for further investigation of the existing collection BMP or a potentially better collection BMP.

Additional Strategies to Consider

This block presents recommendations for strategies not mentioned elsewhere in the report that could provide incremental or future benefits.

BMP Combinations Table

This block presents all the potentially applicable combinations of Collection System, Treatment/Recovery/Disposal, and Storage BMPs into a ranked list based on final score. The user can sort the list by score or each of the BMP categories to explore the results. For example, the user may wish to see the different treatment BMPs that are potentially applicable in conjunction with a specific recommended collection BMP, which treatment BMP was associated with the highest score, and the difference in scores among the top ranked treatment BMPs.

Interpretation of the results should be carried out with the following understandings:

- The tool results will typically provide a series of potential BMP combinations. This mirrors what is often seen in practice where multiple combinations of BMPs can meet the airport’s objectives.
- Tool results are intended to provide direction and focus, not the definitive preferred alternative.

- The results are based on average performance of the BMPs with consideration of generalized local conditions. Actual performance will likely vary based on site-specific factors.
- Ranking of a combination of BMPs is relative to other combinations, and relatively small differences in scoring should not be interpreted as being necessarily significant in terms of further investigation. Users are advised to look for large breaks in the ranked scores in determining which of the possible combinations should be explored in more detail in site-specific studies.
- Local insights and priorities should take precedence over numerical ranking of BMP combinations in moving forward with further evaluations based on tool output.

LIST OF ACRONYMS AND TERMINOLOGY

AAF	Aircraft anti-icing fluid
ADF	Aircraft deicing fluid
AFBR	Anaerobic fluidized bed reactor
AGB	Aerated gravel bed
BMP	Best Management Practice
CDF	Centralized deicing facility (often called “pads”)
GRV	Glycol recovery vehicle
MBBR	Moving bed bioreactor
Neat	Undiluted concentrate (e.g., Type I ADF concentrate)
PFT	Passive facultative treatment
POTW	Publicly owned treatment works
Type I	Synonymous with ADF
Type IV	Most popular form of AAF

Note: See ACRP Research Report 14, 2nd edition for detailed descriptions of BMPs and other terminologies.

APPENDIX A: Decision Support Tool Worksheet

This worksheet is intended to be used in conjunction with the Decision Support Tool to facilitate gathering and organizing information about your airport for input to the tool. This information will be used in the tool to identify deicing best management practice (BMPs) and technologies that have potential applicability at your airport. The sections are organized by topic and directions are provided.

A. Glycol Use		
<i>A.1 Please fill out the following information regarding the type and amount of glycol use at your airport.</i>		
1) What type of aircraft deicing fluid (ADF) is in use at your airport?		
<input type="radio"/> Propylene glycol	<input type="radio"/> Ethylene Glycol	
2) How many annual gallons, on average, are used for each type of fluid as either applied (mixed) or as undiluted (neat)?		
Type I _____	<input type="radio"/> Undiluted (neat) <input type="radio"/> As applied (mixed)	Average mixture applied for Type I? _____ <i>(e.g. 55:45 mixture is 55% ADF concentrate and 45% water)</i>
Type II _____	<input type="radio"/> Undiluted (neat) <input type="radio"/> As applied (mixed)	
Type IV _____	<input type="radio"/> Undiluted (neat) <input type="radio"/> As applied (mixed)	

B. Weather	
<i>B.1 Please fill out the following weather information as it pertains to your airport.</i>	
On average, how many deicing days (including defrosting days) occur per deicing season?	
On average, how many frost deicing days occur per deicing season?	
On average, how many days per deicing season include less than 1 inch of snow (or liquid equivalent of less than 0.1 inch)?	
What is the average deicing season temperature (in Fahrenheit)?	

C. Operations			
<i>C.1 The level of activity in an area during deicing conditions may impact the type of best management practices that are potentially applicable. Please provide the following information on congestion and apron areas at your airport during deicing conditions.</i>			
What are the relative congestion levels in the following areas? <i>(lower congestion levels would indicate additional traffic could be accommodated)</i>			
Area	Low	Medium	High
Ramps around terminal area	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External gates and jetways	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<i>C.2 Please provide the following information on aircraft operations during deicing conditions.</i>			
What is the peak hourly departure rate during deicing conditions? (air carrier and other commercial aviation)			
Is an area available to install a stationary blend to temperature system which would be convenient to air carrier operations?	Yes / No		
Does most aircraft deicing occur in an area where stormwater drainage could be isolated to a dedicated drainage system under deicing conditions?	Yes / No		

D. Siting Requirements and Available Space		
<i>D.1 Please provide information on how many acres are potentially available and suitable for the following types of deicing facilities. Additional detailed information is provided for each type.</i>		
Facility	Acres Available	Criteria to Consider
Deicing Pad	_____	<i>A deicing pad provides a designated area for aircraft deicing. Pads are subject to runway safety separation requirements and should be located to allow aircraft access to the runway and taxiway environment.</i>
Runoff Storage	_____	<i>Onsite temporary storage is often needed for collected deicing runoff. See the storage calculator in the tool to estimate required area if you have an estimate of required storage volume.</i>
<i>D.2 Please complete the following section on potential siting concerns.</i>		
Are potential storage areas downgradient of the deicing runoff collection points?		Yes / No
Is construction of a pump station possible to assist in the transport of deicing runoff to potential storage areas?		Yes / No
What is the depth to groundwater in potential deicing runoff storage areas?		
What is the depth to bedrock in potential deicing runoff storage areas?		

E. Deicing Practices and Facilities		
<i>E.1 Please mark all aircraft deicing and runoff collection and storage practices currently in use at your airport.</i>		
Aircraft Deicing Practices	Deicing Runoff Collection Systems	Deicing Runoff Storage Systems
<input type="checkbox"/> Proactive anti-icing	<input type="checkbox"/> Centralized Deicing Facilities	<input type="checkbox"/> Portable Tanks
<input type="checkbox"/> Physical snow removal	<input type="checkbox"/> Apron Collection Systems	<input type="checkbox"/> Modular Tanks
<input type="checkbox"/> Hangared parking	<input type="checkbox"/> Glycol Collection Vehicles	<input type="checkbox"/> Ponds
<input type="checkbox"/> Hot water deicing	<input type="checkbox"/> Block and Pump Systems	<input type="checkbox"/> Above Ground Tanks
<input type="checkbox"/> Enclosed bucket deicing	<input type="checkbox"/> Reduced aircraft operations	<input type="checkbox"/> Below Ground Tanks
<input type="checkbox"/> Enhanced weather forecasting		
<input type="checkbox"/> Holdover time system		
<i>E.2 Please provide the requested information regarding specific deicing practices at your airport, if applicable.</i>		
What is the total average efficiency of the current collection practice(s)?		%
What percent of all aircraft deicing trucks are equipped with forced air technology?		%
What percent of all aircraft deicing trucks are equipped with blend to temperature technology?		%
What percentage of aircraft deicing take place within the confines of an isolated drainage area? (i.e. stormwater drainage from the deicing area does not mix with stormwater not containing deicers)		%
What is the most restrictive discharge limit at the most restrictive surface discharge outfall? Specify if this is expressed as BOD, COD, Propylene Glycol or Ethylene Glycol. If there are no concentration limits, estimate the concentration at which the airport's deicing runoff management objectives would be met. If the concentration at which runoff would need to be collected has not been determined, what is a typical concentration measured in discharges during deicing events.		(mg/L) <input type="radio"/> BOD <input type="radio"/> COD <input type="radio"/> PG <input type="radio"/> EG
<i>E.3 Please complete this section regarding future deicing practices and preferences.</i>		
Are air carriers open to using a blend to temperature central station?		Yes / No
Is collection of aircraft deicing runoff at higher concentrations and/or smaller volumes desirable to support recycling, reduce storage, or other reasons?		Yes / No
Should glycol recycling be given extra weight in the ranking of applicable treatment, recovery, and disposal technologies based on organization objectives to promote recycling?		Yes / No
Is the airport willing to consider transporting collected runoff off-site for glycol recovery?		Yes / No
Would the airport consider an on-site treatment system for deicer-laden stormwater?		Yes / No

APPENDIX B: Decision Support Tool Scoring

This appendix documents the basis for Best Management Practice (BMP) scoring by the Decision Support Tool.

BMP SCORING CRITERIA

The following table shows the five criteria used to score each BMP. Each criterion has five possible scores based on a screening metric that reflects the magnitude of constraints. A higher rating reflects more positively and indicates greater ease of implementation and/or operation. These criteria are consistent with guidance in Report 14.

BMP Scoring Criteria		
Score	Screening Metric	Considerations to Establish Rating
Implementation Time		
1	> 3 years	Quantify time to execute Planning & Study, Permitting, Design, Procurement, Construction, Commissioning
2	2 - 3 years	
3	1 - 2 years	
4	3 - 12 months	
5	< 3 months	
Siting Constraints		
1	> 6 constraints	Example Constraint parameters: Height (> 10ft), Footprint (>1 acre), Hazardous Wildlife Attractant (y/n), Electrical Service (y/n), Connect to Airport Controls/Communication (y/n), Typically Located in Airfield (y/n), Requires Construction > 3 ft below surface (y/n), Typically located in tenant operated areas (y/n), Requires connection to offsite infrastructure (y/n), Impacts to design surfaces (Part 77, RSA, ROFA, etc.)
2	5-6 constraints	
3	3-4 constraints	
4	1-2 constraints	
5	No constraints	
Expandability and Adaptability		
1	> 9 constraints	Example constraints: Inflexible shape, inflexible unit size, requires new building to expand/adapt, requires new support system to expand/adapt, requires more than one connection point to existing system to expand/adapt, not typically modular, can only expand in one direction, expansion impacts to existing infrastructure/tenants.
2	7-9 constraints	
3	4-6 constraints	
4	1-3 constraints	
5	No constraints	
Staffing & Contract Operational Support		
1	3 or more new FTE	For processes requiring contracted operational support instead of employees, considering 1 FTE = \$100,000 in annual contracted operational support. Consider operations, maintenance, technical support, and management when evaluating FTEs.
2	2 new FTE	
3	1 new FTE	
4	Part-time employee	
5	No new employees	
Operations and Maintenance Complexity		
1	> 10 parameters	Parameter = an individual item that must be monitored, analyzed, controlled, adjusted, or maintained on a daily basis by the operations and maintenance staff. For example, monitoring and adjusting flow rate into a system = 1 parameter.
2	5-10 parameters	
3	2-5 parameters	
4	1 parameter	
5	0 parameters	

Notes: FTE: Full Time Employee

INDIVIDUAL BMP RATINGS

The scoring criteria discussed above are applied to each of the BMPs within the Decision Support Tool, except Source Reduction BMPs, which are evaluated solely on the estimated potential for reduction in ADF usage. Each of the BMPs are shown separately in tables below. The Collection System BMPs have additional weighting that is applied to the sums based on user preferences expressed in responses to certain General Questions.

Treatment/Recovery/Disposal Ratings								
Criteria	POTW	Glycol Recovery	PFT	Aerated Lagoon	Activated Sludge	AGB	MBBR	AFBR
Implementation Time	4	1	2	4	2	3	2	2
Siting Constraints	5	3	2	4	4	3	4	3
Expandability and Adaptability	5	2	4	4	3	5	2	2
Staffing & Contract Operational Support	5	1	4	4	2	3	2	2
Operations and Maintenance Complexity	4	3	5	3	2	3	2	2
Sum	23	10	17	19	13	17	12	11

Notes: POTW: Publicly Owned Treatment Works

PFT: Passive Facultative Treatment

AGB: Aerated Gravel Bed Filter

MBB: Moving Bed Bio-Reactor

AFBR: Anaerobic Fluidized Bed Reactor

Collection Systems Ratings						
Criteria	Centralized Deicing Facilities	Apron Collection Systems	Glycol Collection Vehicles	Block-and-pump Systems	Airfield Drainage Planning/ Design/ Retrofit	Deicer-laden Snow Management
Implementation Time	2	4	4	4	1	4
Siting Constraints	2	4	4	3	1	4
Expandability and Adaptability	3	3	5	4	3	5
Staffing & Contract Operational Support	4	4	2	2	1	5
Operations and Maintenance Complexity	1	3	2	2	1	3
Sum	12	18	17	15	7	21
<i>Recycling is Desired</i>	1.1	0.9	1.2	0.8	1.2	1
<i>Collection Efficiency is Important</i>	1.2	1.1	0.9	1	1.2	0.5
Weighted Sum	15.84	17.82	18.36	12	10.08	10.5

Storage Rating					
Criteria	Portable Tanks	Modular Tanks	Ponds	Above Ground Permanent Tanks	Below Ground Permanent Tanks
Implementation Time	5	4	3	3	3
Siting Constraints	4	4	3	3	3
Expandability and Adaptability	4	4	3	3	3
Staffing & Contract Operational Support	4	4	3	4	4
Operations and Maintenance Complexity	4	4	3	4	4
Sum	21	20	15	17	17

REFERENCE COLLECTION PERFORMANCE

This final section shows reference performance values for selected collection BMPs. The reference values are used in the tool as triggers for recommendations to investigate possible opportunities to enhance BMP operations.

Reference Performance Values*		
Collection Technology	Fact Sheet	Reference Value
Centralized Deicing Facilities	21	60%
Apron Collection Systems	22	50%
Glycol Collection Vehicles	23	40%
Block-and-pump systems	24	30%

*Performance is calculated as (Glycol collected/Glycol applied)*100

Because BMP performance is heavily affected by a variety of site-specific factors, observed performance below the reference value doesn't necessarily indicate a problem, but rather suggests that there may be opportunities for optimization.