

APPENDIX A. INFORMATION SOURCES

This appendix provides the solid waste management planner with a listing of the references used to prepare the *Handbook for Integrated Solid Waste Management Planning* and other information sources which may be of interest.

For easy use, the references have been organized in three ways as follows:

- First, the references used in the preparation of this handbook are listed alphabetically by author.
- Second, additional references that can be used to supplement the information provided in the handbook are listed alphabetically by title.
- Third, the additional references have been organized into a matrix which identifies what subject matter each reference addresses. There are 17 subject categories as follows:
 - collection and transport
 - combustion
 - comparisons of SWM methods
 - composting
 - health and environmental effects
 - integrated SWM
 - land disposal
 - market considerations
 - public and political input
 - recycling
 - siting requirements
 - solid waste generation
 - SWM planning
 - SWM system implementation
 - solid waste transfer
 - source/waste reduction
 - special wastes.

A list of relevant professional journals is also provided.

Handbook References

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Wet Bag Composting Demonstration Project. Greenwich & Fairfield, Connecticut. National Audubon Society. A joint project coordinated by the National Audubon Society, Procter & Gamble, and International Process Systems. Spring 1993.

Note: To order U.S. EPA publications please contact one of the following three U.S. EPA organizations. Please be sure to provide the complete name and EPA identification number of the desired document.

Public Information Center (PIC) U.S. EPA Public Information Center (3404) 401 M Street, SW Washington, DC 20460 phone: 202/260-7751 fax: 202/260-6257	Primary point of contact between EPA and the public. Distributes a variety of general-interest materials.
RCRA Docket Information Center (RIC) U.S. EPA RCRA Docket Information Center (5305) 401 M Street, SW Washington, DC 20460 phone: 202/260/9327	Provides public access to all regulatory materials on solid waste and distributes technical and non-technical information on solid waste.
RCRA/Superfund OUST Hotline 1725 Jefferson Davis Highway Arlington, VA 22202 phone: 808/424-9346 fax: 703/486-3333	Answers questions related to solid waste, or underground storage tanks. Can be used to find and order EPA publications.

Relevant Professional Journals

BioCycle. The JG Press, Inc. 419 State Avenue, Emmaus, PA 18049.
(215)967-4135.

C&D Debris Recycling. A Maclean Hunter Publication. 29 North Wacker Dr.,
Chicago, IL 60606. (312)726-2820.

MSW Management. Published by Forester Communications.
216 East Gutierrez, Santa Barbara, CA 93101. (805)899-3355.

Public Works. P.O. Box 688, Ridgewood, NJ 07451. (201)445-5800.

Recycling Today. GIE Inc. 4012 Bridge Ave., Cleveland, OH 44113-3320.
(216)961-4130.

Resource Recycling. Published by Resource Recycling, Inc., P.O. Box 10540
Portland, OR 97210-0540. (503)227-1319.

Solid Waste Technologies. HCI Publications. 410 Archibald Street,
Kansas City, MO 64111-3046. (816)931-1311.

Waste Age. 4301 Connecticut Avenue NW, Washington, DC 20008.
(202)244-4700.

World Wastes. Argus Business publication. P.O. Box 41369,
Nashville, TN 37204-1094. (615)377-3322.

INFORMATION SOURCES

Reference	Collection & Transportation	Combustion	Comparison of SWM Methods	Composting	Health & Environmental Effects	Integrated SWM	Land Disposal	Market Considerations	Public & Political Input	Recycling	Siting Requirements	Solid Waste Generation	SWM Planning	SWM System Implementation	Solid Waste Transfer	Source/Waste Reduction	Special Wastes
Accounting for the Full Cost of Garbage, Recycling, and Yard Waste	✓		✓	✓				✓		✓			✓				
Are Solid Waste Stocks Hazardous to Your Portfolio!					✓								✓				
Backyard Composting: Your Complete Guide to Recycling Yard Clippings			✓	✓									✓				
Bibliography of MSW Management Alternatives	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
BioCycle Guide to Collecting, Processing, and Marketing Recyclables	✓						✓	✓		✓							
BioCycle Guide to Maximum Recycling	✓									✓						✓	✓
Business Guide to Reducing Solid Waste											✓					✓	
Buy Recycled Training Manual								✓		✓							
Catalog of Hazardous and Solid Waste Publications	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

INFORMATION SOURCES

Reference	Collection & Transportation	Combustion	Comparison of SWM Methods	Composting	Health & Environmental Effects	Integrated SWM	Land Disposal	Market Considerations	Public & Political Input	Recycling	Siting Requirements	Solid Waste Generation	SWM Planning	SWM System Implementation	Solid Waste Transfer	Source/Waste Reduction	Special Wastes
Characterization of Municipal Solid Waste in the U.S. 1995 Update.	✓			✓		✓				✓						✓	
Collection Costs for Residential Commingled Recyclables			✓							✓							
Community Issues in Facility Siting the Case of MSW Composting								✓			✓						
Compost Facility Operating Guide				✓													
Composting Potential in MSW Management				✓													
Consumers' Handbook for Reducing Solid Waste												✓				✓	
Cost Analysis of Municipal Yard Trimmings Composting				✓													
Decision Makers Guide to Solid Waste Management, Volume 1	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓
Decision Makers Guide to Solid Waste Management, Volume 2	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓

INFORMATION SOURCES

Reference	Collection & Transportation	Combustion	Comparison of SWM Methods	Composting	Health & Environmental Effects	Integrated SWM	Land Disposal	Market Considerations	Public & Political Input	Recycling	Siting Requirements	Solid Waste Generation	SWM Planning	SWM System Implementation	Solid Waste Transfer	Source/Waste Reduction	Special Wastes
Developing a Comprehensive Federal Office Recycling Program	✓							✓		✓				✓			
Economic Benefits of Recycling			✓					✓		✓				✓			
Financing Models for Environmental Protection- Helping Communities Meet their Environmental Goals			✓										✓				
Guide to Buying Recycled Products							✓										
Handbook of SWM		✓								✓						✓	
Household Hazardous Waste Management									✓				✓			✓	
How to Set up a Local Program to Recycle Used Oil									✓				✓			✓	
Impact of Postconsumer Recycling Initiatives on Industrial Energy Demand-Opportunities & Threats for Natural Gas					✓												
Landfill Course, The																	

INFORMATION SOURCES

Reference	Collection & Transportation	Combustion	Comparison of SWM Methods	Composting	Health & Environmental Effects	Integrated SWM	Land Disposal	Market Considerations	Public & Political Input	Recycling	Siting Requirements	Solid Waste Generation	SWM Planning	SWM System Implementation	Solid Waste Transfer	Source/Waste Reduction	Special Wastes
Landfill Design Course Material							✓										
Making Less Garbage: A Planning guide for Communities												✓				✓	
Market for Compost				✓				✓									
McGraw-Hill Recycling Handbook	✓					✓				✓							✓
MSW Management Options Volume 1 Implementation	✓												✓				
MSW Management Options Volume 2 Landfills																	
MSW Management Options Volume 3 Transfer Stations																	
MSW Management Options Volume 4 Waste-To-Energy																	
National Directory of Solid Waste Curricula/Education, 1994		✓															

INFORMATION SOURCES

Reference	Collection & Transportation	Combustion	Comparison of SWM Methods	Composting	Health & Environmental Effects	Integrated SWM	Land Disposal	Market Considerations	Public & Political Input	Recycling	Siting Requirements	Solid Waste Generation	SWM Planning	SWM System Implementation	Solid Waste Transfer	Source/Waste Reduction	Special Wastes
Office Paper Recycling Guide										✓							
Office Paper Recycling, An Implementation Manual										✓							
Official Recycled Products Guide							✓			✓							
Processing Costs for Residential Recyclables at MRFs							✓			✓							
Recoverable Resource Audit Handbook	✓															✓	
Recycling & Incineration: Evaluating the Choices		✓			✓					✓							
Recycling Works!										✓							
Recycling Laws Update																	
Review of Composting Literature, 2nd Edition				✓													

APPENDIX B. GLOSSARY

- Aerated static pile (ASP)** A composting technology in which air is forced mechanically through the material being composted. Air is drawn or blown through the pile by pumps and a network of perforated pipes. In this way, the piles have to be turned little, if any, during the active compost process.
- Aeration:** In composting, the process of bringing compostable organic matter into contact with air by means of turning (ventilating) to promote the aerobic microbial degradation.
- Aerobic:** A biochemical process (or condition) occurring in the presence of oxygen. Composting is an aerobic process that also produces carbon dioxide.
- Air classification:** A process utilizing an air stream to separate materials by differences in density and aerodynamic properties.
- Anaerobic:** A biochemical process (or condition) occurring in the absence of oxygen. Much of the biodegradation that takes place in landfills is anaerobic. The principal anaerobic degradation products of organic materials are carbon dioxide, methane, and water.
- Ash:** The noncombustible (inorganic) residue remaining after burning of combustible substances.
- Baler:** A machine used to compress and bind materials together to reduce volume and to create a readily stackable, storable and shippable unit.
- Biodegradable material:** A material (usually organic) that is capable of being broken down into simpler structures chemically and/or physically through the action of microorganisms. Most organic wastes, such as food wastes and paper, are biodegradable. Plastics, while organic, are (with few exceptions) not biodegradable.

- Blue bag:** Refers to the use of special color plastic bags (usually blue, by convention) to store source-separated household recyclable materials. The "blue bags" may be collected separately in a curbside recycling program or, as has been done in a few programs, commingled with other waste for separation later at a suitable facility.
- Blue bin:** Refers to the use of special bins (usually blue, by convention) to store source-separated household recyclable materials that are to be separately collected in a curbside recycling program.
- Bottom ash:** The solid material that remains after combustion. (It is distinguished from the "fly ash" that is swept out the stack and collected in suitable pollution control devices.)
- Bulky Waste:** Large items of municipal solid waste, including appliances, furniture, and carpet, that are not usually handled by normal solid waste collection methods.
- Buy-back center:** A facility where payment is made for the delivery of recyclable materials.
- Capture rate:** For a recyclable material, the percentage of generated material that is actually recovered from a *participating* household. Different recyclable materials usually have different capture rates; *e.g.*, containers that are difficult to clean will likely have a lower capture rate than those which require little or no cleaning. Households participate in two ways that affect the capture rate: (1) how often they may set out recyclable materials for collection; and (2) how much of the recyclable material in their household that they set out, rather than discard.
- Co-collected:** Usually refers to collecting separately contained recyclable material and refuse in the same collection vehicle either commingled or in a separate compartment(s).
- Co-composting:** The composting of two or more types of organic materials together; for example, sewage sludge and municipal solid waste.

- Commercial waste:** Waste materials originating in wholesale, retail, institutional, or service establishments such as office building and stores. Most waste haulers classify multi-family dwellings, such as apartment complexes, as commercial sources. (Some cities require housing units above a certain size, usually four-family units, to obtain commercial waste service, rather than provide municipal service.)
- Commingled recyclable materials:** A mixture of several recyclable materials in one container.
- Compost:** The stabilized product from the controlled aerobic biodegradation of organic matter, often of waste. Often described as a humus.
- Compostable material:** Organic material that can be composted (*i.e.*, can be aerobically biodegraded); may include (1) mixed (organic fraction) municipal solid waste, either source separated or central facility separated, (2) yard trimmings, (3) food processing and similar residues, (4) manure and agricultural residuals, (5) biosolids (sewage sludge).
- Composting:** A natural biological degradation process (usually aerobic) that is controlled and accelerated by some process. Organic waste materials are transformed into a humus end product.
- Construction and demolition debris:** Concrete, brick, asphalt, lumber, wallboard, plumbing, and other such building materials discarded in the construction or demolition of a building, road, etc.
- Cullet:** Clean, crushed or broken glass added to a furnace as a raw material to make new glass.
- Curbside collection:** Collection of household wastes or recyclable materials that are set out next to the street, usually in bin(s) or bag(s).
- Curbside recycling:** The collection of household recyclable materials that have been placed near the street by the resident.

- Curing:** The last stage of composting that occurs after most of the biodegradable material has been decomposed. The objective is to produce a highly stabilized product, *i.e.*, one that will not continue to compost.
- Dirty MRF** See Mixed Waste Processing Facility (MWPF).
- Discards:** The term usually used to describe the residues after municipal solid waste (or some fraction of it) is processed for recovery for recycling or composting. These discards are usually combusted or disposed of in sanitary landfills.
- Disposal:** Combustion and/or landfilling of solid waste.
- Diversion:** Directing material away from a disposal facility. Usually refers to material recovered for reuse, recycling, and/or composting.
- Diversion rate:** A measurement expressed as a ratio (or percent) of the material diverted from disposal by any means to the total amount of material handled.
- Drop-off center:** A common type of facility where recyclable and/or compostable material is accepted. Usually, materials are delivered to the site and dropped into appropriate storage containers with no payment made for materials. The facility may or may not have an attendant on duty.
- Eddy current separator:** A device that passes a varying magnetic field through feed material, inducing electric currents in the nonferrous metals present in the feedstock. These "eddy currents" create a magnetic field opposite to the applied magnetic field. The fields repel each other causing the nonferrous metals to separate them from the remaining feedstock.
- Flow control:** A legal requirement that solid waste or recyclable material that is collected be delivered to a specified facility. The facility most commonly would be a waste to energy facility and/or a MRF.

- Fly ash:** Small, solid particles of ash and soot generated when coal, oil, or waste materials are burned. Fly ash is suspended in the flue gas after combustion and can be removed from the flue gas by a number of pollution control devices.
- Fresh compost:** Organic matter that has gone through the thermophilic stage of composting. It has undergone partial decomposition but is not yet completely converted and stabilized.
- Garbage:** Spoiled or waste food that is thrown away, generally classified as wet food waste.
- Generation:** The amount (weight, volume, or percentage of the overall waste stream) of materials and products as they enter the waste stream *before* materials recovery, composting, or combustion take place.
- Hazardous waste:** Waste material that may pose a threat to human health or the environment, the definition, disposal and handling of which is regulated by federal law.
- Household hazardous waste:** A household-generated waste that by virtue of its composition and/or chemical properties is defined as hazardous.
- In-vessel composting:** A composting method in which the material is continuously mixed and aerated mechanically while contained in a tank or similar device.
- Incinerator:** An engineered, controlled facility for the combustion of waste. Common usage often (and incorrectly) infers there is no energy recovery. (At the early part of the century, such devices were also called destructors and crematories.)
- Infrastructure:** In the context of (integrated) solid waste management, any and all of the equipment and facilities *needed* to allow the full system(s) to operate. Includes storage containers, collection vehicles, processing facilities and equipment, combustion units, and/or landfills. It also includes the institutional and organizational arrangements to assure performance of the solid waste management system.

- Integrated solid waste management:** A practice of using several management and technical methods to reduce, recover, and dispose of solid waste in ways that protect public health and the environment. These techniques include: source reduction, recycling, composting, fuel production, combustion with energy recovery, incineration (destruction), and sanitary landfilling.
- Intermediate Processing Facility (IPF):** See **Recyclables processing facility**.
- Life cycle inventory (LCI):** The identification and quantification of energy, resource usage, and environmental emissions arising from all stages in the life of a particular product, process, or activity, from raw material acquisition to ultimate disposal, "cradle to grave."
- Market:** Where a material changes hands between a willing buyer and seller. Ultimately, the material reaches an end user. For example, in the case of recovered newspapers destined for use in recycled content newsprint, the "market" could be a MRF, a paper dealer, a paper mill, a newspaper publisher, or the ultimate consumer.
- Materials recovery facility (MRF):** A facility designed to sort commingled recyclable materials and process them to meet the buyers' specifications. (See also **Recyclables processing facility (RPF)**.)
- Methane:** An odorless, colorless, flammable, and explosive gas. It occurs in nature and is produced by organic material undergoing anaerobic decomposition, such as in a landfill or marsh. Also called "marsh gas."
- Mixed paper:** Contains a mixture of papers primarily found in residences and offices, including direct mail, newspaper, magazines, boxboard, food board, and specialty grades.

- Mixed waste processing facility (MWPF):** Refers to a facility that accepts mixed MSW and separates the MSW into components; recyclable materials are sorted and remaining organic materials may be separated into compostable or combustible fractions; a residue will remain for landfilling may also be referred to as a "dirty MRF."
- Modular Combustor:** Smaller-scale waste combustion units prefabricated at a manufacturing facility and transported to the combustion site. Several units may be erected at a site; they are designed to operate independently. Modular combustor units usually do not recover the energy of combustion.
- Monofill:** A landfill dedicated to disposing of a single waste material, such as ash from a combustion facility.
- MSW management:** The systematic administration of activities that provide for storage, source-separation, collection, transfer, processing, treatment, and/or disposal of municipal solid waste.
- Municipal solid waste** Non hazardous solid wastes from residential, commercial, institutional, and industrial sources. Includes most postconsumer durable and nondurable goods, containers and packaging, food wastes, and yard trimmings. Does not include nonhazardous waste such as industrial process wastes, construction and demolition wastes, agricultural wastes, mining wastes, and sewage sludge.
- Participation rate:** The percentage of households participating in an activity (such as curbside recycling) compared to the total number of households served by the activity. Usually measured by some time period such as a month. (See also **Set Out Rate**).
- Recoverable material:** Materials that still have useful physical or chemical properties after serving their original purpose and can be reused or recycled for the same or other purposes.
- Recovery:** The removal of materials from the waste stream for the purpose of recycling, composting, producing fuel products, energy recovery, or other useful purpose. (See also **Recycling**.)

Recovery rate: The fraction or percentage of a material recovered over a specified time period compared to the total amount generated over that same time period, e.g., a year.

Recovery system: A system by which recyclable materials are separated from the waste stream for reuse or remanufacturing, or energy recovery.

Recyclable materials: Materials that, after serving their original purpose, can be processed or remanufactured into secondary raw materials or new products. Informally, often called "recyclables."

In some cases the term is applied by a regulatory agency only if a collection and processing infrastructure exists.

Recyclable Processing Facility A facility where recyclables are processed for shipment to an entity that converts them to a usable product. (See also Materials Recovery Facility [MRF]).

Recycling: Any of the activities necessary for a recovered material to be used in a new product. Recycling thus involves any and all of the following steps: separating, collecting, processing, market or free distribution, remanufacturing (if done), and purchase/use by a consumer. By this definition, someone separating materials in the home for a community recycling program is "recycling." Also: use of a recovered material in any useful product, even if the recovered material is still identifiable. Examples include re-use of newspapers in animal bedding and use of crushed glass as an aggregate for road building. Includes exports of recovered materials. Recycling also includes separating a waste material and processing it so that it may be used again as a raw material for products, which may or may not be similar to the original.

Recycling rate: The amount of a material recycled compared to the amount of that material generated.

- Refuse:** Putrescible and non-putrescible solid wastes including kitchen discards, rubbish, ashes, incinerator ash, street cleanings, and market, commercial, office and industrial wastes. Also refers to that portion of municipal solid waste remaining for disposal after recovery for recycling/composting.
- Resource recovery:** A general term used to describe the extraction of materials or energy from wastes. In recent years, it has been used principally to mean waste-to-energy projects. (See **Recovery**.)
- Reuse:** The return of a product or commodity into the economic stream for use in exactly the same form and kind of application as before, without any change in its identity.
- Sanitary landfill:** A controlled method of disposing of refuse on land without creating nuisances or hazards to public health or safety, by utilizing the principles of engineering to confine the refuse to the smallest practical area, to reduce it to the smallest practical volume, and to cover it with a layer of soil at the conclusion of each day's operation or at more frequent intervals. The technique includes careful preparation of the fill area, control of leachate, and a specified volume of dirt to be spread over each volume of waste. A sanitary landfill must comply with all applicable regulations or it is classified as an open dump.
- Secondary materials markets:** Markets for recyclable materials.
- Secondary material:** A material that is used in place of a primary, virgin or raw material in manufacturing a product. Materials that might go to waste if not collected and processed for reuse.
- Set-out rate:** The total number of households setting out targeted materials over a specified time period compared to the total number of households served. Usually the time period is a week. The set out rate is almost always lower than the participation rate. The set-out rate should be

- reported along with the methods used to for its determination.
- Source reduction:** The design, manufacture, purchase, or use of materials so as to reduce the amount of waste generated or resources consumed.
- Source separation:** Separation of designated recyclable, reusable, or compostable materials at the point of (waste) generation.
- Special waste:** Items that may require special or separate handling, such as household hazardous wastes, bulky wastes, tires, and used oil.
- Stabilization:** The stage of composting following rapid decomposition. It is characterized by slow metabolic processes, lower heat production, and the formation of humus.
- Subtitle D:** Refers to the solid, nonhazardous waste section of the Resource Conservation and Recovery Act (RCRA). Thus, a "Subtitle D waste" is classified as nonhazardous.
- Tip fee:** A charge, usually stated in dollars per ton or dollars per cubic yard, for the unloading of material at a transfer station, MRF, combustion facility, or landfill. It is the price to be paid for the waste management service.
- Tipping floor:** Unloading area for vehicles that are delivering MSW to a municipal waste management facility; or for delivering recyclables to a MRF.
- Transfer station:** A facility at which solid waste is transferred from collection vehicles to larger tractor-trailer vehicles to improve the efficiency of transport to a more distant waste management facility (e.g., a landfill).
- Trash:** Material considered worthless that is usually thrown away. Generally defined as dry waste material, but in common usage it is a synonym for garbage, rubbish, or refuse.

- Tub grinder:** Machine used to grind or chip wood for mulching, composting, or size reduction.
- Utilization rate:** The ratio of recovered paper used as a raw material input to produce a finished paper grade compared to the total production of that grade.
- Variable rate user fees:** A charge for solid waste services based on the volume or weight of waste set out for collection.
- Volume based user fees:** A charge for solid waste services based on the volume of waste set out for collection.
- Volume reduction:** The processing of waste materials so as to decrease the amount of space the materials occupy, usually by compacting, baling, or shredding (mechanical), combustion (thermal), or composting (biological).
- Waste reduction (waste minimization):** Any management method that results in a reduction of the quantity and/or toxicity of materials or products that enter the waste stream.
- Waste stream:** A term describing the total flow of solid waste from homes, businesses, institutions, and manufacturing plants that must be recycled, combusted, or disposed of in landfills; or any segment such as the "residential waste stream."
- Waste-to-energy combustion:** Waste management method in which (mixed) waste is burned and the heat recovered, such as by generating steam and/or electricity.
- White goods:** Obsolete large household appliances such as refrigerators, stoves, washing machines and dryers.
- Windrow composting:** Compostable material is formed into elongated piles called windrows, which are periodically turned mechanically for the purpose of mixing and aeration. Generally, the windrows are several feet high and can be tens or hundreds of feet long.
- Yard trimmings:** The portion of solid waste comprised of leaves, grass clippings, prunings, and other natural organic wastes that result from gardening, mowing, and clean-up.

LIST OF ABBREVIATIONS

EPA	U.S. Environmental Protection Agency
fob	free on board
HDPE	high density polyethylene
LCI	life cycle inventory
MRF	materials recovery facility
MSW	municipal solid waste
OCC	old corrugated containers
ONP	old newspapers
PET	polyethylene terephthlate
RCRA	Resource and Conservation Recovery Act
RPF	recyclables processing facility
SW	solid waste
TPD	tons per day