BEFORE THE COUNCIL OF THE
METROPOLITAN SERVICE DISTRICT

FOR THE PURPOSE OF AMENDING ORDINANCE NO. 88-266B ADOPTING THE REGIONAL SOLID WASTE MANAGEMENT PLAN TO INCORPORATE THE YARD DEBRIS PLAN	)))))	ORDINANCE NO. 91-377 Introduced by: Rena Cusma, Executive Officer

WHEREAS, Metro Ordinance No. 88-266B adopted the Regional Solid Waste Management Plan; and

WHEREAS, The Environmental Quality Commission on September 9, 1988 adopted rules which identified yard debris as a principal recyclable material in the Clackamas, Multnomah, Portland, Washington and West Linn wastesheds; and

WHEREAS, Metro Resolution No. 89-1047 initiated the development of a regional yard debris plan to assist local governments in meeting the Environmental Quality Commission rules pertaining to yard debris; and

WHEREAS, The Regional Yard Debris Plan (Exhibit "A") was developed through a cooperative process of local governments, haulers, recyclers, processors and citizens; and

WHEREAS, Metro Resolution 90-1290 approved the Regional Yard Debris Plan for submittal to the Department of Environmental Quality; and

WHEREAS, The Department of Environmental Quality recommended changes and clarification in the Regional Yard Debris Plan prior to their approval; and

WHEREAS, changes to the Regional Yard Debris Plan have been made in response to the Department of Environmental Quality's comments; now, therefore,

THE COUNCIL OF THE METROPOLITAN SERVICE DISTRICT HEREBY ORDAINS:

That the Regional Solid Waste Management Plan is amended to include the Yard Debris Plan as shown as Exhibit "A" to this Ordinance.

ADOPTED by the Council of the Metropolitan Service District this 10th day of January, 1991.

, Presiding Officer

ATTEST:

Clerk of the Council

STAFF REPORT

CONSIDERATION OF ORDINANCE NO. 91-377 FOR THE PURPOSE OF AMENDING ORDINANCE NO. 88-266B ADOPTING THE REGIONAL SOLID WASTE MANAGEMENT PLAN TO INCORPORATE THE YARD DEBRIS PLAN

Date: December 11, 1990

Presented by: Richard Carson
Becky Crockett
Gerry Uba

PROPOSED ACTION

Ordinance No. 91-377 amends the Regional Solid Waste management Plan to incorporate the Yard Debris Plan (Exhibit "A"). The Yard Debris Plan establishes program and collection options to be implemented by Metro and local governments which are expected to result in an effective reduction of the amount of yard debris that would otherwise be landfilled.

FACTUAL BACKGROUND AND ANALYSIS

The Environmental Quality Commission (EQC) on September 9, 1988, adopted rules which identified yard debris as a principal recyclable material in the Clackamas, Multnomah, Portland, Washington and West Linn wastesheds. As a result of these rules, local governments requested that Metro develop a regional yard debris plan as a means for local governments to meet the EQC rules. On February 9, 1989 the Metro Council adopted Resolution No. 89-1047 for the purpose of initiating the development of a regional yard debris plan. Metro has worked closely with local governments, haulers, yard debris processors and interested citizens over the past 14 months to develop the regional yard debris plan. The EQC Unilateral Order required that the plan be submitted to DEQ by July 1, 1990.

The Metro Council approved the Regional Yard Debris Plan for submittal to DEQ on June 28th, 1990 (Resolution No. 90-1290). Since that time, DEQ has made several comments on the plan (Attachment "A") which have been responded to (Attachment "B") and agreed upon by Metro staff and the Planning Committees.

DEQ has agreed that the changes made to the plan satisfy the Department's earlier concerns and questions as stated in a letter from the Department (Attachment "C").

The following is a summary of the changes made to the plan:

1) Addition of the criteria that Metro will use to determine that adequate processing and market capacity exists to justify weekly on-route community-wide curbside collection in 1994. The criteria include demonstration of the processor's ability to process and market yard debris generated in the region without creating environmental problems.

2) Addition of specific program requirements for local governments. This is felt to be

consistent with OAR 340-60-035 (5)(d)(A-F) requiring the plan to provide information for each local government on the proposed method of collection, amount of material available, projected participation, amount of material that will be collected and processors for that material. Local governments will be required to provide this information in their Annual Waste Reduction Program using information in the plan and Metro's technical assistance.

3) Addition of steps Metro will take to show how the implementation of the regional programs will result in a continuous growth in yard debris supply to a level which will justify weekly on-route community-wide curbside collection program by 1994. The steps are processing and market strategies that Metro will implement to assure that sufficient capacity exists.

4) Addition of the requirement that programs funded through user pay must comply with the Opportunity to Recycle Act, ORS 459.190. DEQ has indicated that the program funding elements (user pay) for regional minimum collection standards could be in violation of the ORS 459.100. After deliberation between Metro and DEQ staff, the Department agreed to pursue a rule amendment of ORS 459.100 in 1991. Metro has indicated that it will work with DEQ in the rule amendment process.

5) Addition of an additional criterion that will used to determine whether local governments will implement on-route curbside collection in 1994. Specifically, it is stated that each local government in the region needs to work towards implementation of a weekly curbside collection system for yard debris unless: 1) Metro, after discussions with the region's local governments, determines that market capacity is not adequate to receive the material generated; or 2) it can be demonstrated that the cost per ton of a weekly curbside collection program is significantly greater than the yard debris collection option established to meet the minimum standards of the plan.

EXECUTIVE OFFICER'S RECOMMENDATION

The Executive Officer recommends approval of Ordinance No. 91-377 adopting the Yard Debris Plan as a component of the Regional Solid Waste Management Plan.

SOLID WASTE COMMITTEE REPORT

CONSIDERATION OF ORDINANCE NO. 91-377, FOR THE PURPOSE OF AMENDING ORDINANCE NO. 88-268B ADOPTING THE REGIONAL SOLID WASTE MANAGEMENT PLAN TO INCORPORATE THE YARD DEBRIS PLAN

Date: January 4, 1991 Presented by: Councilor Buchanan

Committee Recommendation: At the January 2, 1991 meeting, the Committee voted 3-0 to recommend Council adoption of Ordinance No. 91-377. Voting in favor were Councilors Buchanan, DeJardin and Wyers. Councilors Collier and Saucy were excused.

Committee Issues/Discussion: Becky Crockett, Senior Solid Waste Planner, presented an overview of the Yard Debris Plan. The plan sets a recycling goal for yard debris of 67% by 1993, and a goal of 93% by 1996, markets permitting. The major premise of the Plan is that it is market-based. She said that all DEQ concerns have been resolved, and DEQ has indicated it will approve the plan.

Five citizens testified about the plan. Jeanne Roy, representing Recycling Advocates, asked the Committee to consider making municipal composting available as a first-year minimum option for localities, since it appears to be the least expensive option, and since the educational value of community composting is high. David Phillips, Clackamas Solid Waste Administrator, said local governments support the plan as written, and that municipal composting should not be a minimum option because the capital costs are very high, because it would compete with the private sector, and because collection is a more critical element. He thought the educational aspects of municipal composting are best addressed through demonstration programs. John Drew, Chair of the Waste Reduction Subcommittee of the Solid Waste Technical Advisory Committee, said the subcommittee had looked at all the options, and thought the best approach was to allow a combination of activities. Louise Weidlich, representing the Neighborhood Protective Association, opposed the Plan because she believes backyard burning should remain an option, perhaps through a limited open burning period. Estle Harlan, representing the Tri-County Council, said the Plan is operationally acceptable to the haulers, and that municipal composting is not cost-effective.

Ms. Crockett said that municipal composting is viable, and has been included in the Plan as an option, although not one of the minimum first year options. She said the Waste Reduction Subcommittee determined that the Plan should focus on curbside collection in order to achieve the highest possible recycling rate.

In response to an inquiry from Councilor Wyers regarding DEQ concerns about the user pay program, Ms. Crockett said this issue will be pursued through the DEQ rulemaking process. Mr. Phillips said he believes this issue also will be pursued in the legislature.

Councilor Wyers asked if there was a consensus among Solid Waste Committee members to add municipal composting as a first year minimum option. Councilor DeJardin indicated he was hesitant to second-guess the approach taken by those involved in developing the plan, and that he was concerned about front-end capital costs and the overall effectiveness when compared to curbside collection. Councilor Buchanan said he was not personally opposed to adding municipal composting, but in view of the time spent and conclusions reached by affected parties in developing the plan, he would concur with the plan as presented.

/klf

EXHIBIT "A" (Yard Debris Plan)

to Ordinance No. 91-377

Copies of the Yard Debris Plan
can be obtained from the
Planning & Development Department
or the Metro Council Office

Regional Yard Debris Recycling Plan

Exhibit 'A' to Ordinance No. 91-377

January 1991

METRO

REGIONAL YARD DEBRIS RECYCLING PLAN

PORTLAND METROPOLITAN AREA/METRO REGION

Executive Officer
Rena Cusma

Metro Council
Tanya Collier, Presiding Officer
Lawrence Bauer
George Van Bergen
Roger Buchanan
Tom DeJardin
Richard Devlin
Jim Gardner
Gary Hansen
David Knowles
Ruth McFarland
David Saucy, Jr.
Judy Wyers

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Metro Solid Waste Policy Committee
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Earl Blumenauer
Brian Campbell
Rena Cusma
Clifford Clark
Tom DeJardin
Fred Hansen
Dale Harlan
Barbara Sullivan-Hoem
Shirley Huffman
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Judy Wyers

Metro Solid Waste Technical Committee
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Merle Irvine
Susan Keil
Delyn Kies
Lynda Kotta
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Merle Irvine
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Tyler Marshall
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Tom Miller
Dave Phillips
Peter Spendelow
Bruce Walker
Bob Wiggin
Rod Grimm
John McFarlane
Ralph Gilbert
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1) BACKGROUND

A. Purpose

On September 9, 1988, the Oregon State Environmental Quality Commission (EQC) identified yard debris as a principal recyclable material in the Portland Metropolitan Region[1]. This decision resulted in local governments being required to submit a yard debris plan to the Department of Environmental Quality (DEQ) by February 15, 1989 which would describe how the opportunity to recycle yard debris would be provided to the residents in their jurisdiction.

The EQC also identified an alternative method for local governments to plan for the opportunity to recycle yard debris. That alternative was a yard debris recycling program developed by the Metropolitan Service District (METRO). The provisions of OAR 340-60-035(5) identify specific criteria which the plan must meet in order to be considered an acceptable alternative by the DEQ.

As a result of the EQC decision, the majority of local governments in the five wastesheds requested that Metro develop a regional yard debris plan through its existing solid waste management planning process. In turn, the Metro Council adopted Resolution No. 89-1047 which initiated the development of a regional yard debris plan as an alternative method for local governments to meet the intent of the EQC decision.

The time-frame for development of the regional yard debris plan is established by the Unilateral Order (Order No. SW-WR-89-01) issued by the Environmental Quality Commission to the Metropolitan Service District. The Order states that the regional yard debris plan shall be completed and submitted to DEQ for approval no later than July 1, 1990.

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[1]Wastesheds of Clackamas County, Washington County, Multnomah County, City of Portland and City of West Linn

B. Plan Objective

The primary objective of the Regional Yard Debris Recycling Plan is to establish a yard debris recycling system that provides the opportunity to recycle to residents of the Metro region and results in keeping yard debris out of landfills. This primary objective must also consider cost-effectiveness, the existing solid waste system components and market capacity for yard debris material generated as a result of collection programs.

In order to address this objective, the plan includes:

- A thorough examination of various yard debris source reduction methods and collection programs used throughout the nation, including the State of Oregon. This examination involves a detailed economic and system cost modeling program used to assess the cost effectiveness of programs potentially feasible for implementation in the Metro area.

- A thorough analysis of projected market and processing capacity in the Metro region which is used to balance collection program implementation with regional market capacity.

- Minimum yard debris source reduction and collection program requirements for local governments which include having collection service on-line by July 1,1991.

- A short- and long-term regional yard debris recycling forecast.

- Identification of the roles and responsibilities in implementing the regional yard debris plan for DEQ, Metro, cities, counties, the solid waste industry and yard debris generators.

- Identification of the need to transition to higher volume collection programs over time consistent with increased regional market capacity.

- Provisions for each jurisdiction to provide weekly curbside collection service paid for, where feasible by a wide base of all potential users of the system.

C. Plan Governance

The Regional Yard Debris Recycling Plan governs the respective roles and responsibilities of DEQ, Metro, cities, counties, the solid waste industry and yard debris generators within the metropolitan area related to implementation of this plan.

More specifically, the plan contains requirements for those local governments which are directly affected by the EQC yard debris rules (OAR 3409-60-005 through 340-60-125).

Successful implementation of this plan, which includes local governments satisfying the requirements established by this plan, will result in the EQC yard debris rules being achieved.

Local governments that are required to implement the Regional Yard Debris Recycling Plan to comply with the EQC rules are:

Clackamas County (inside the Urban Growth Boundary)
Multnomah County (inside the Urban Growth Boundary)
*Washington County (inside the Urban Growth Boundary)

*Beaverton	Portland
*Cornelius	Gresham
*Durham	Troutdale
*Forest Grove	*Oregon City
*Hillsboro	Milwaukie
*King City	*West Linn
*Tigard	Lake Oswego
*Tualatin	Fairview
*Sherwood	Wood Village
Maywood Park	*Gladstone
Happy Valley	*Johnson City
Rivergrove	Wilsonville

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*The regional plan recognizes that the DEQ has already found these local governments in compliance with the EQC rules. However, all local governments inside the Metro jurisdictional boundary will be required to implement standards established by the regional plan over the long-term.

D) Plan Directives

The Plan is premised upon the following directives which cover all major facets of the yard debris program.

Markets

1. DEQ, Metro and local governments shall promote the utilization of yard debris products as soil amendments (mulch, compost, etc.) by public agencies, landscapers, nurseries, and homeowners in order to encourage the source-separation and recycling of yard debris.

2. Metro and local governments shall not promote the utilization of yard debris products to the extent that the competing products have to be disposed in landfills.

3. The Regional Yard Debris Recycling Plan shall be market driven with collection options to be balanced with market capacity.

Processing

4. Setting product quality standards for processors in the region will enhance yard debris compost product acceptance. Metro and the processors shall define and establish standards for yard debris products.

5. Metro will continue to test yard debris compost products and will regularly monitor product quality for compliance with standards.

6. Yard debris compost, shredding operations and collection depots may be regulated by Metro or local governments in order to: 1) manage potential adverse environmental and land use impacts; 2) insure yard debris material generated is received, processed and marketed in a predictable and equitable manner; and, 3) provide stability in establishing rates for incoming yard debris.

Collection

7. Local governments shall implement those collection programs that would produce the projected increases in yard debris consistent with market and processing capacity.

   A conservative approach should be taken in establishing

the initial yard debris collection programs due to the uncertainty that exists relative to potential market capacity for yard debris compost.

8. Metro will negotiate with each local government, through the Annual Waste Reduction Program, the program(s) that shall be put on-line at different phases of the long-term plan period.

9. Local governments shall be required to meet the collection standards established by Metro for that jurisdiction (county or wasteshed).

10. The Washington County Yard Debris Plan (and other local government plans approved by DEQ) shall be part of the regional plan. If the amount of yard debris recycled in approved plans is not comparable to the regional forecasts, Metro will negotiate compatibility.

Financing

11. The guidelines in Chapter 10 of the RSWMP shall provide a basis for how the local government programs shall be financed.

12. The cost of processing source separated yard debris shall be paid for by processor's tip fee and market revenues.

13. The regional plan encourages the use of the current method of financing promotion/education (i.e., Metro, local governments and haulers promotional programs).

14. The regional plan encourages the use of the current method of financing marketing of yard debris products (i.e., Metro and processors product testing, advertising, research and development programs).

E) Yard Debris in the National Context

BACKGROUND

National Context

As states and local governments face limited landfill space and increasing solid waste disposal costs there has been increased exploration of ways to divert recyclable materials from landfills and incinerators. Yard debris represents the largest single component of material destined for disposal and as a result is being targeted by most jurisdictions across the nation. There has been a proliferation of regulations prohibiting open burning of yard debris to improve air quality.

National figures indicate that yard debris makes up about 18 percent, by weight, of the solid waste stream. In Los Angeles, yard debris is the largest single component (30 percent weight) of the city's residential wastestream. Metro's first waste characterization study in December 1987, showed that about 10.7 percent of the regional waste landfilled is made up of yard debris.

Methods of diverting yard debris away from landfills include:

1) outright ban of the materials;

2) promotion of source reduction through home composting;

3) promotion of municipal and private composting programs; and

4) redesign of the current solid waste collection system to pick-up source separated yard debris at the curb or at depots located in close proximity to residential neighborhoods for recycling.

Connecticut, New Jersey and Pennsylvania have banned leaves from all solid waste facilities except composting facilities. The states of Florida, Illinois, Minnesota, and Wisconsin and numerous counties and municipalities have passed legislation that will ban the disposal of yard debris at landfills and incinerators. Carver County, Minnesota, passed laws specifying that leaves, grass, prunings and garden waste cannot be collected with mixed municipal waste if that waste is going to be disposed

of in a metropolitan area disposal facility.[2] In Michigan, it appears that legislation will be passed banning yard debris from landfills beginning in 1993.[3]

The City of Los Angeles recommends source reduction activities as integral to the city yard debris recycling program. As stated in the city's Recycling Implementation Plan (April 1989), source reduction would include home mulching of yard debris and use of low water-use landscape plans which must be approved by the city before a building permit can be issued. The Los Angeles plan also recognizes the need for the integration of yard debris collection with processing and end product distribution.

Yard debris composting facilities are being encouraged by many states. In New Jersey and Broome County, New York composting facilities are allowed to operate under less stringent environmental regulations. Several states and local governments are also developing sitting and operational guidelines for yard debris processors. The objective of this approach is to ensure facility existence and quality control of the products produced by such facilities. Processing permits are required in the states of Florida, Illinois, New York, Washington and Wisconsin.

Seattle landfills an estimated 86,000 tons of yard debris annually which accounts for 12 - 15% of its total waste stream. This includes an estimated 29,000 tons of grass clippings, 16,800 tons of leaves, 20,000 tons of prunings and 20,200 tons of other material. A City ordinance states that yard waste cannot be mixed in with regular garbage for disposal, but must be kept separate.

The city's "Clean Green" composting programs are designed to handle 75% of the yard waste disposed. In early 1989 the City implemented a three-pronged approach to diverting yard waste which includes:

1. Curbside collection of separated yard waste city-wide for a fee of $2.00 per month. Residents are permitted to put out up to 5 sixty-pound bundles per week.

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[2]BioCycle, "Local, Regional and State Policies", The BioCycle Guide to Yard Waste Composting, pp. 17-18, The JP Press, Inc., Emmaus, Pennsylvania.

[3]BioCycle, "Tenfold Increase in Programs" The BioCycle Guide to Yard Waste Composting, pp. 15-16, The JP Press, Inc. Emmaus, Pennsylvania.

2. Collection of separated yard waste at both the north and south transfer stations during all open hours for a discounted tipping fee.

3. Encouraging backyard composting by providing free bins to City residents and training them on how to use them.

By December 1989 approximately 43,000 tons of yard waste was collected through both programs with three-quarters of it coming from curbside pickup and one-fourth coming from residential and commercial deliveries to the transfer stations. The backyard composting component was initiated in November 1989 so its contribution on the overall recycling rate will not be measured until the end of 1990. Seattle's yard debris program has resulted in diverting more yard debris out of the waste stream than was expected. This has resulted in stockpiling of large quantities of material awaiting development of a processing system and end use of their yard debris.

F) Yard Debris in the Oregon Context

B. Oregon Context

In 1983, the Oregon Environmental Quality Commission found that "a ban on backyard burning in the Portland metropolitan area was necessary to meet air quality standards and that alternatives to burning were reasonably available to a substantial majority of the people in the affected area". The EQC decision was supported by the following:

- o air pollution from burning caused a significant nuisance and resulted in adverse health impacts;
- o numerous alternative disposal techniques for yard debris were available;
- o reasonable cost disposal alternatives were available to most individuals; and
- o some local governments and neighborhood associations within local governments such as Gladstone, Beaverton, Oregon City, West Linn and Portland have had programs more convenient and less costly for citizens to dispose of or recycle their yard debris.

In November, 1984 the EQC adopted rules that:

1. banned open burning of yard debris in areas where alternative disposal methods are feasible and practicable;
2. encouraged the development of alternative disposal methods; and,
3. emphasized resource recovery.

A map of the area impacted by the burn-ban is shown in Figure 1.

This decision was instrumental in forcing the development of alternative methods for managing the collection and use of yard debris throughout the region. The Portland Metro area has been recognized nation-wide for its yard debris processing system (Grimms and McFarlanes) and existing curbside collection and municipal composting programs (Oregon City, Gladstone and West Linn) which came into existence as alternatives to back-yard burning. A complete description of these programs are included in Appendix 1. Summary of Current Yard Debris Recycling Activities, January, 1990.

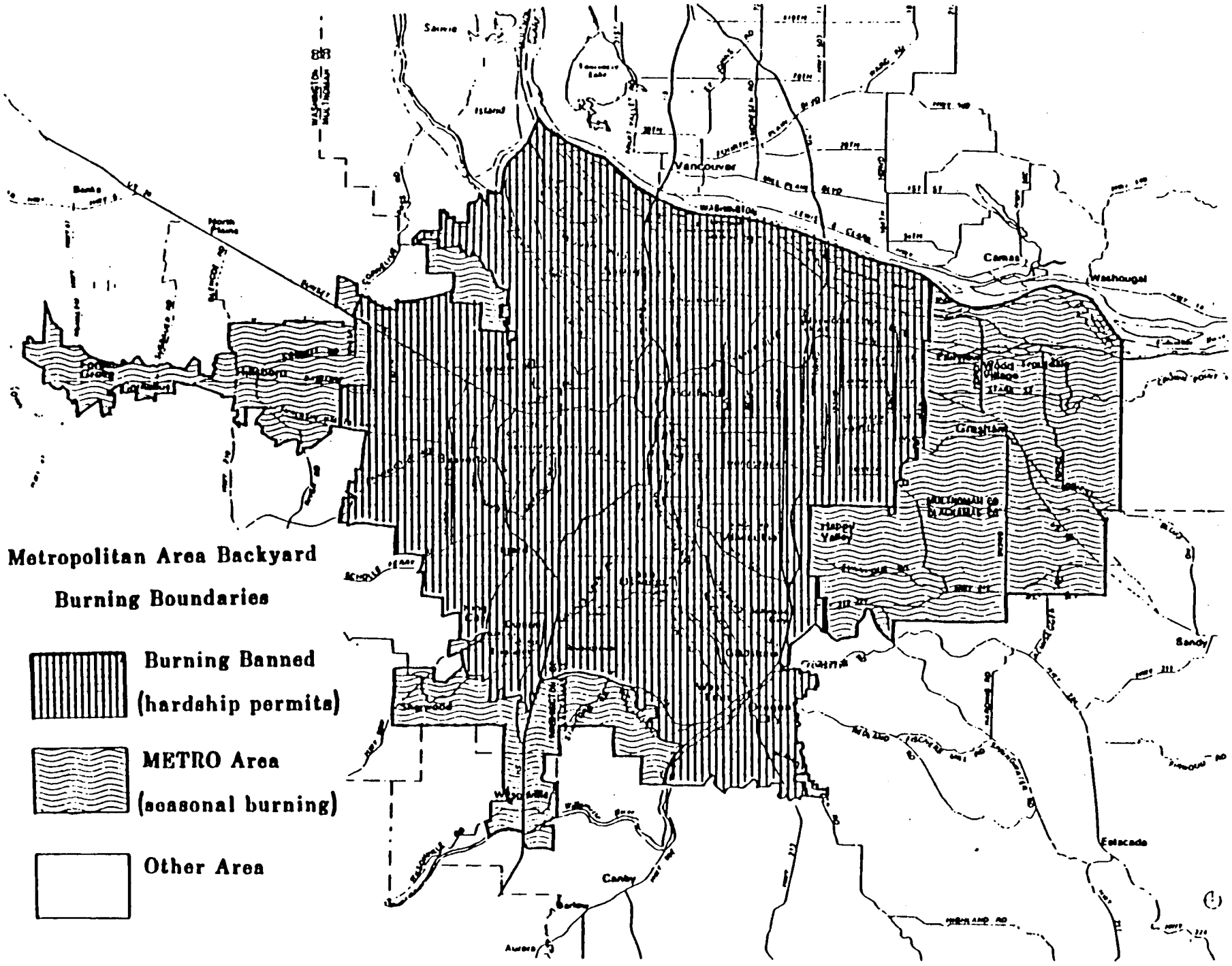

Metropolitan Area Backyard
Burning Boundaries
Burning Banned
(hardship permits)
METRO Area
(seasonal burning)
Other Area
Vancouver
Camas
Washougal
Gresham
Sandy
Estacada
Canby
Aurora

Figure 1

In 1984 the EQC adopted rules (OAR 340-60-030) relating to implementation of the Oregon Opportunity to Recycle Act (SB 405, 1983 Oregon Legislative Assembly). These rules did not list yard debris as a principal recyclable material. However, in the same year the EQC directed staff to return in one year with a recommendation on identification of yard debris as a principal recyclable material.

On September 9, 1988 the EQC adopted rules which identified yard debris as a principal recyclable material in the Portland metropolitan region. These new rules require local governments to plan and implement programs which provide the opportunity to recycle yard debris.

Since the rules were adopted, two wastesheds, West Linn and Washington County, and three cities (Gladstone, Johnson City and Oregon City) have opted to prepare their own plans. DEQ approved the West Linn plan in April, 1989 and conditionally approved the Washington wasteshed plan in January 1990. The Washington wasteshed plan is conditioned on complying with the regional plan. DEQ approved the plans submitted by the three cities in May, 1989. In the West Linn plan it is projected that 60-62 percent of the yard debris generated in the wasteshed would be recycled annually, over the next four to five years, at the West Linn Recycling Center.

The West Linn recycling center is also the site of a permanent municipal composting operation that uses an aerobic composting method to process 12,000 loose cubic yards of yard debris into organic soil conditioning amendment-recycled (OSCAR). West Linn's plan further estimates a doubling of the 2000 loose cubic yards of yard debris that is currently either home composted or taken to other yard debris recycling facilities.

The Washington County wasteshed plan offers an integrated system of self-haul collection depots, on-call fee-for-service curbside collection and education and promotion programs. One of the major regional processors, Grimm Fuel Company, is located in the southeast corner of the wasteshed. The plan projected that proposed programs would divert 60 percent of the yard debris generated in the wasteshed from the wastestream by June 1992.

Gladstone, Johnson City and Oregon City plan to continue their weekly curbside collection programs. These programs presently exceed the performance standards in OAR 340-60-125(5).

II) CURRENT SYSTEM

The Portland metropolitan area has experienced a high level of yard debris recycling relative to the rest of the nation since the back yard burn rules were adopted by the EQC. In 1987 yard debris recycling was estimated to be 22 percent of the total yard debris generated in the region. Then, in 1988, the yard debris recycling level estimate increased to 25.6 percent. (NOTE: These recycling estimates do not include home composting or chipped material from mobile chipping services.)

These existing recycling levels are indicative of the enormous effort that has already been put forth by DEQ, Metro, local governments, recyclers, haulers, processors, chippers, commercial landscape contractors and citizens towards the common goal of recycling yard debris.

In developing a regional yard debris plan it is necessary to first gain an understanding of the current activities which have already resulted in the Portland Metropolitan area being recognized nationally as a leader in yard debris recycling. Appendix 1, of the Regional Solid Waste Management Plan "Summary of Current Yard Debris Recycling Activities" contains a comprehensive overview of the yard debris system in the region.

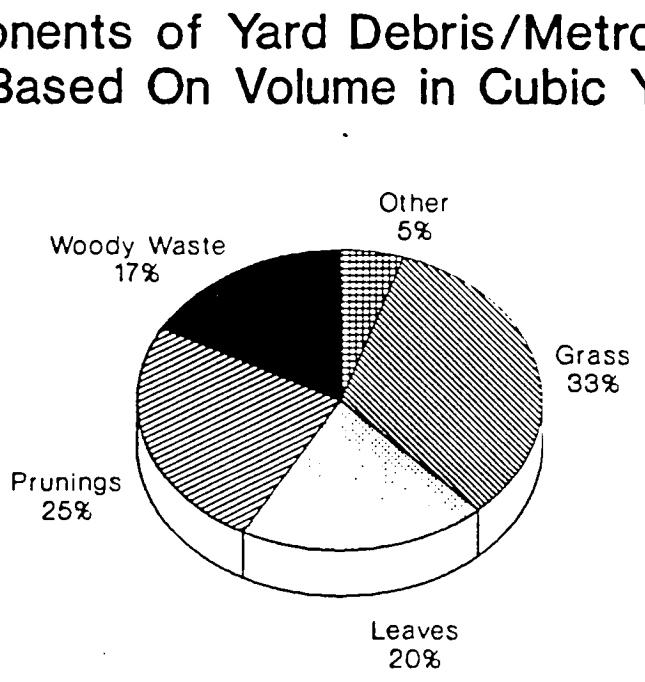
This plan builds on these earlier yard debris recycling efforts. Program recommendations for the region are derived in large part by experience gained as a result of the existing yard debris system.

The following are important background facts including excerpts from Appendix 1, "Summary of Current Yard Debris Recycling Activities" which provide some basics about the existing system to assist the reader in understanding the basis for the technical analysis and recommendations contained within later sections of this plan.

A) Yard Debris in the Wastestream

"Yard debris", as the term is commonly used in the metropolitan region, consists of prunings, leaves, grass and other woody waste (typically branches no larger than six inches in diameter[4]) as shown in Figure 2.

FIGURE 2



In 1987 METRO studies showed that approximately 10.5 percent of waste landfilled was yard debris (see Figure 3). This yard debris percentage is obtained through waste characterization studies undertaken at regional disposal facilities.

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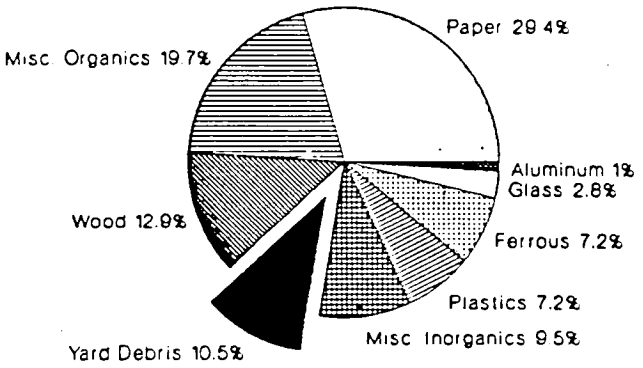
[4]Larger diameter material (such as tree stumps or roots) are defined by Metro as a separate part of the wastestream. Planning for disposal of large items such as these is part of the "Special Select Waste Planning Process" and includes other bulky items like construction or demolition debris.

FIGURE 3

Yard Debris Landfilled in 1987



METRO
(1988 Solid Waste Data Report)

In order to estimate the total amount of yard debris generated in the region, the total tons of yard debris landfilled are added to estimates of the amounts home composted, composted by local jurisdictions, burned, disposed illegally, and recycled by local processors (both major collection sites and independent, mobile chippers). Figure 4[5] shows estimates of the total yard debris generation figure.

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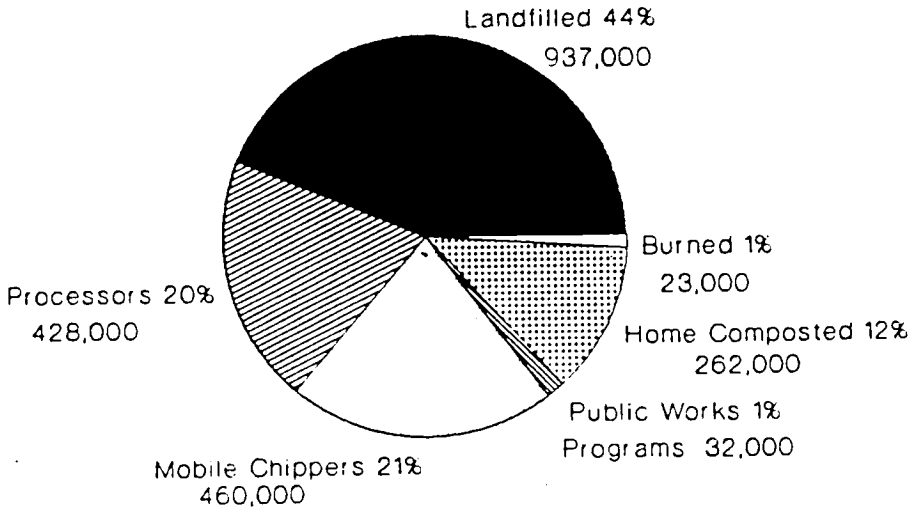
[5]It is important to note that the generation figures estimated in Figure 4 are different than earlier generation methodologies. For example, in order to estimate the overall yard debris recycling level in METRO's 1988 Recycling Levels report, amount disposed (derived from the 1987 Waste Characterization Study) was added to amount recycled (obtained from the two major processors) to obtain amount generated:

Material	Disposed Tons		Recycled Tons		Generated Tons		Percent Recycled
Yard Debris	110,820	+	38,235	=	149,055	or	25.6%

This formula did not take into consideration source reduction efforts, yard debris burned, nor the processing of the independent chippers. As an element in the regional yard debris planning process, METRO staff has developed the new methodology reflected in Figure 4. This methodology is described in detail in Appendix II of the RSWMP, "Estimated Yard debris Generation In The Portland Metro Region".

FIGURE 4

Estimated Yard Debris Generation (% Based on 2,142,000 Loose Cubic Yards)



B) Reduction and Collection Programs

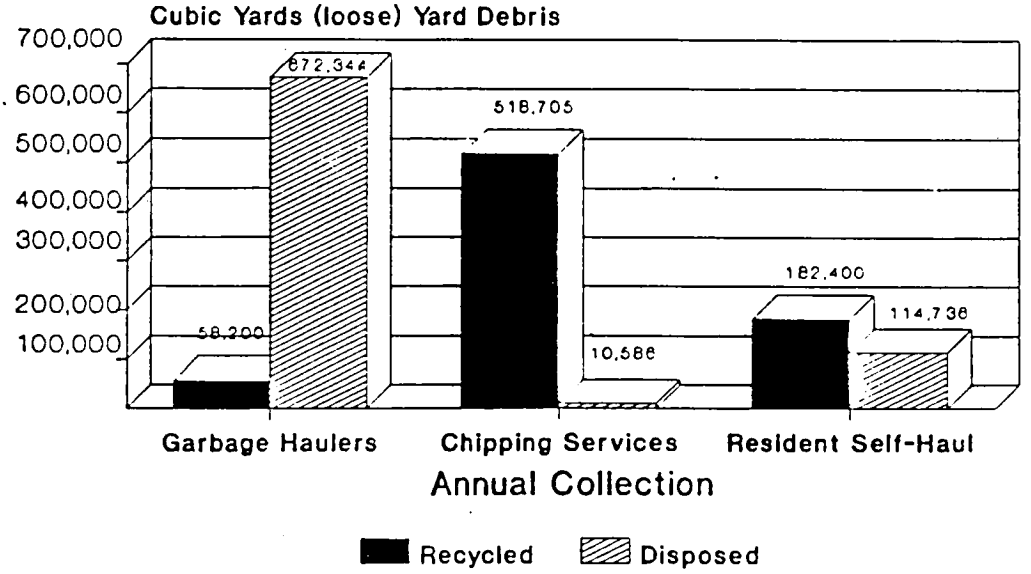
Yard debris recycling activities in the region can be separated into source reduction and collection programs. Source reduction programs are those that result in yard debris not entering the collection end of the system. The primary source reduction activity that has prevailed in the region is that of home composting. A regional survey of recycling attitudes commissioned by Metro in 1989 reported that about 33 percent of the respondents compost their yard debris. Source reduction programs are also practiced by over 100 municipal parks in the region, through on-site composting of yard debris.

The collection of source separated (clean) yard debris is managed by both public and private entities.

Options range from seasonal decentralized, self-haul clean ups to weekly, city-wide curbside collection on the same day as garbage collection. In addition to the wide array of current options, funding sources range from fee for service to municipal property tax. Estimates of corresponding participation levels range from five to 95 percent.

FIGURE 5

Primary Methods of Collection



Neighborhoods in Portland, Beaverton and parts of Washington County have successfully organized annual self-haul and curbside chipping programs. These programs are coordinated by homeowner associations (such as Sweetbriar in Troutdale and Raleigh West in Washington County) or by volunteer groups that are recognized by the local jurisdictions (such as neighborhood associations in Portland, or community planning organizations in Multnomah County and Washington County). Participation levels for the annual programs are in the range of two to seven percent. The amount recovered per single family dwelling at the annual programs is not available.

In 1988 six cities (Beaverton, Fairview, Gresham, Hillsboro, Lake Oswego, and Milwaukee) implemented seasonal self-haul cleanups (2 to 4 events per year) and three cities (King City, Sherwood, Tualatin) implemented seasonal city-wide curbside cleanups. The participation level for these seasonal clean-up programs is estimated at a range of 20-75 percent per event.

Regularly scheduled collection programs are also in existence in the region. Currently the City of Beaverton provides a monthly self-haul collection depot which is operated by a private company. Three cities (Gladstone, Johnson City and Oregon City) provide weekly curbside collection to their residents. The average participation level for these weekly curbside collection programs is 75 percent, and the average household recovery level per quarter ranges from one half cubic yard per household in the Fall and Winter to 2.4 cubic yards per household in the Spring.

C) Processing Methods and Facilities

In October 1989 seven major facilities were processing yard debris in the METRO region. In addition over one hundred mobile chipping services provided curbside services. Four facilities (Grimm's, McFarlane's, West Linn and U.S.A.) are producing compost products.[6]

Three facilities (East County Recycling, American Container and Recycling, and Lakeside Reclamation Landfill--commonly referred to as Grabhorn Landfill) provide limited processing of yard debris by either shredding or chipping.

Table 1 provides an overview of the major facilities and their estimated volume

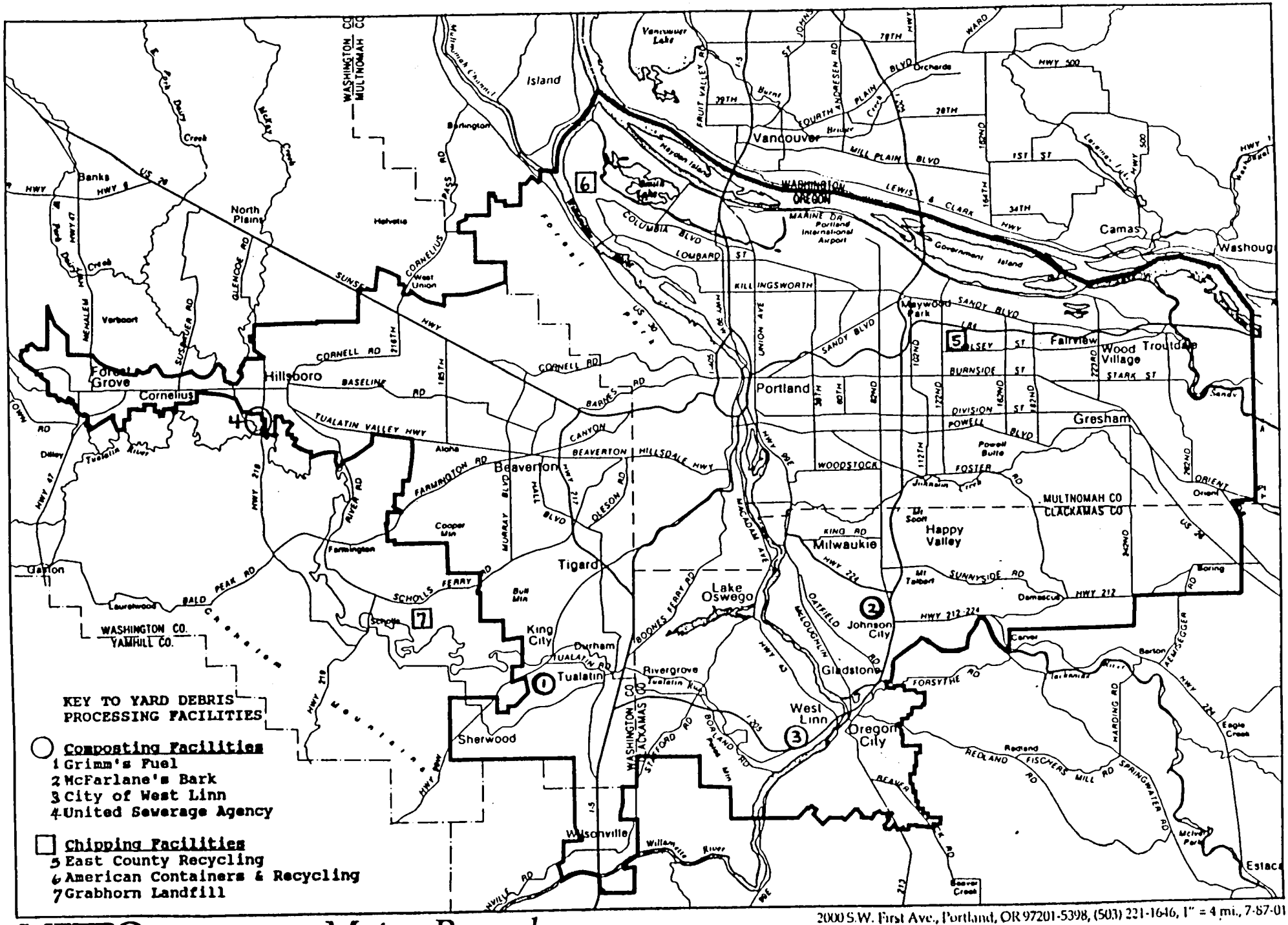
TABLE 1

List of Major Yard Debris Processors

Type of Processor	Estimated 1988-89 Volume Received	Percent
Composting Facilities (33% of Total Volume):		
Grimm's Fuel	155,815 cu.yds.	17.5
McFarlane's Bark, Inc.	99,797	11.2
City of West Linn	12,000	1.4
United Sewerage Agency (USA)	5,600	0.6
Farmer's Plant Aid	16,693	2.0
Shredding Facilities (8% of Total Volume):		
East County Recycling	23,000	2.6
American Containers & Recycling	48,000	5.4
Grabhorn Landfill	1,650	0.2
Subtotal	362,555	40.7
Mobile Chipping Services (59%)	529,291	59.3
Estimated Total Yard Debris Processed:	891,846 cu.yds.	100.0

Figure 6, Map of Yard Debris Processing Facilities illustrates

[6]Farmers Plant Aid Corporation will soon be the region's fifth processor of yard debris compost. The company began transferring yard debris from St. Johns Landfill in November and began processing the material in the spring.



METRO

2000 S.W. First Ave., Portland, OR 97201-5398, (503) 221-1646, 1" = 4 mi., 7-87-01

MAP OF MAJOR YARD DEBRIS PROCESSING FACILITIES

Figure 6

the locations of these major processors. Two composting facilities and one shredding facility are located in the west side (Washington County) of the Portland metropolitan region. One composting and two shredding facilities are located in the north/northeast of the region (Multnomah County), and two composting facilities are located in the southeast portion of the region (Clackamas County). The City of West Linn's composting facility is open only to residents of the City and those residents outside the City boundary but inside the city's urban growth boundary.

D) Markets

Yard debris in the METRO region is currently used in three major forms: loose debris, chipped debris and composted debris. The first product is simply yard debris in its original form as loose debris. As loose yard debris, it is commonly used as fill material. (Occasionally people will refer to spreading of tree limbs and leaves in low area as "sheet composting" but if no mechanical means is used to break down the largest limbs and volume is not sufficient to create heat, then it is unlikely a full compost process is occurring. However, the natural decomposition process will occur at a slow rate over the years.)

The second form, chipped or shredded yard debris, necessitates a low level of processing. Commercial chippers in the area report these chips are being used: 1) as an agricultural cover or residential mulch, 2) to control erosion on trails, or 3) to spread in livestock paddocks to control mud. In addition, one processor is using shredded debris as a hogged fuel for his own furnaces.

The third form yard debris takes as an end product is that of compost. It may be used as a 100 percent yard debris product or blended with sand, sawdust or other materials. Commercially produced 100 percent yard debris compost is currently marketed as a mulch, a soil conditioner and amendment and a decorative top dressing.

Compost is often blended with other materials, such as top soil, sand or barkdust. These blended compost products are used for the same purposes as 100 percent yard debris compost with the additional use as a potting mixture.

This plan is premised upon balancing appropriate collection systems with market capacity for yard debris compost. It is therefore important to evaluate yard debris compost demand.

In order to get a good overall perspective on the demand side of the market for yard debris compost (YDC) it must first be viewed

as a component of the larger market for bark dust, sawdust, and other composted soil amendments. The volume of YDC sold by Grimm's and McFarlane's combined amounted to 76,829 yards in 1988 while bulk sales of barkdust within a 50-75 mile radius of Portland are on the order of 1.5 million yards. Sales of bagged barkdust plus other competing products probably bring this figure closer to 1.75 million yards. Yard debris compost thus makes up less than five percent of the total market for all related soil amendments.

Two potential competitors exist in the compost marketplace, or soon will exist, in the METRO region. The first is sewage sludge compost. The second is a new product that will enter the marketplace in the near future after the completion of METRO's new municipal solid waste (MSW) compost facility.

Sewage Sludge Compost

Both the City of Portland and the Washington County Unified Sewage Agency (U.S.A.) produce sewage sludge compost. U.S.A.'s product is mixed with yard debris chips and is marketed primarily in bulk quantities.

Portland's sewage sludge compost product is sold under the name, "Garden Care Compost", and is marketed for similar applications as yard debris compost.

Municipal Solid Waste Compost (MSW)

The MSW facility is expected to begin producing compost by July, 1991. Riedel Environmental Technologies (owner and operator of the facility) has entered into contracts with end users of the MSW compost to ensure that the MSW compost does not directly compete with yard debris compost products. Metro and Riedel negotiated specific contractual restrictions on MSW compost sales aimed at protecting yard debris compost markets from MSW compost competition. Even with these provisions in place, yard debris processors and sewage sludge compost representatives strongly believe that the introduction of MSW compost to the marketplace will have a negative impact on their sales.

E) Metro Programs

As a leader in regional yard debris recycling efforts, Metro has implemented several yard debris recycling programs, including:

- Sponsorship of two compost studies in 1986 and 1988 in order to understand the region's market structure and identify potential marketing efforts and strategies,

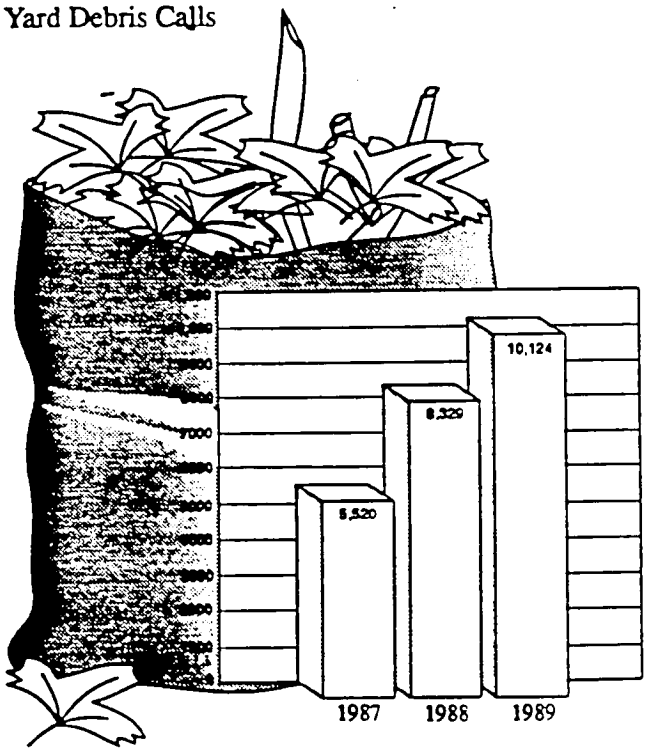
especially the extent of promotional efforts that would be needed to market yard debris products in the region;

- Quarterly yard debris compost tests for herbicides, nutrient content, pathogens, weed seed presence and identification and seed germination;
- Funding demonstration plots testing the effects of yard debris compost on plant growth;
- Regional survey of recycling attitudes;
- Promotion of and education on use of yard debris compost at marketing events (e.g., trade shows) aimed at landscapers, nurseries and the general public;
- Promotion of backyard composting through advertising and handbooks such as "The Art of Composting"; and
- Institutional Purchasing Program (Ordinance No. 89-303) requiring the purchase of yard debris compost and sewage sludge compost to serve as a model for procurement programs by public institutions, local governments, and businesses in the region.

Metro also maintains a Recycling Information Center (RIC) which handled 42,822 phone calls in 1989. About 25 percent of the calls were related to yard debris.

Figure 7 illustrates the number of phone calls received. Most of these calls were made by the residential sector.

FIGURE 7



III) TECHNICAL ANALYSIS

In order to develop a comprehensive yard debris program for the region it was necessary to conduct a thorough analysis of viable source reduction and collection options, regional processing capacity and regional market capacity. This included developing a database of information and assumptions significant to conducting the analysis. This section of the plan describes the analysis and further identifies key components of the database used in the analysis.

A) Technical Data of Significance

1) Yard Debris Recycling Level (1989)

As stated in Section II, it was determined that yard debris recycling levels in the region were at 22% in 1987 and rose to 25.6% in 1988. These estimates are taken from Metro's annual recycling survey and do not include some significant components of the yard debris recycling activities in the region. Specifically, these estimates do not include efforts by mobile chippers, home composting and city collection events (City Public Works).

A more accurate assessment of the current yard debris recycling level in the region is as follows.[7]

TABLE 2

Regional Yard Debris Recycling Level

	Loose Cu.Yds.	Tons
Total Generated	2,142,000	238,000
Received by Processors	428,330	47,600
Chipped by Mobile Chippers	460,480	51,160
Home Composted	261,700	29,100
City Public Works Events	31,500	3,500
Total Recycled	1,182,000	131,360

Percent of Yard Debris Generated Which is Recycled (aprx)= 55%

The current regional recycling level of 55% includes yard debris generated by both the residential and commercial sectors. Figure 8, illustrates the recycling activities which are used to compute the recycling level estimate.

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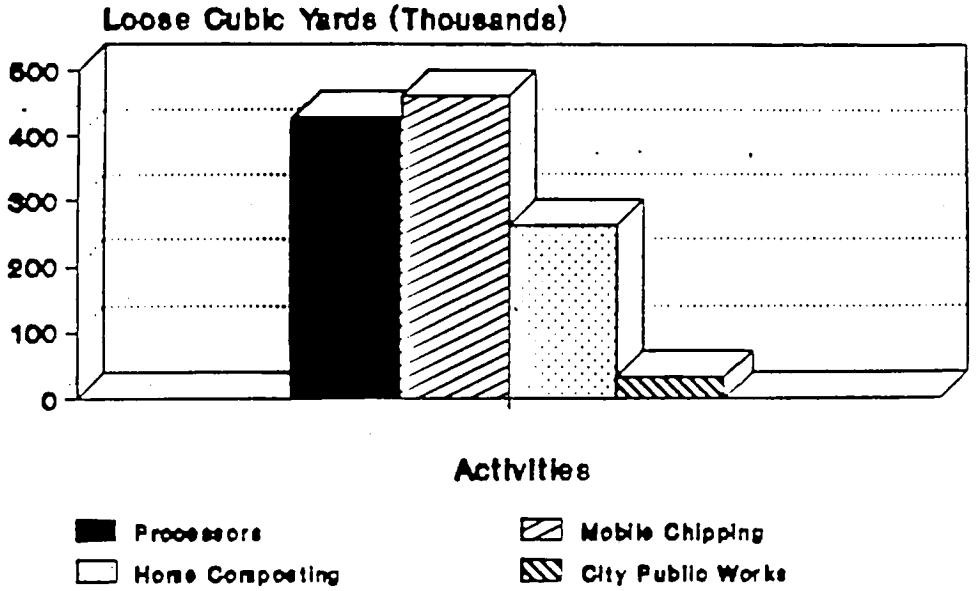
[7]See Appendix II, "Estimated Yard Debris Generation in the Portland Metro Region", Metro, 1990.

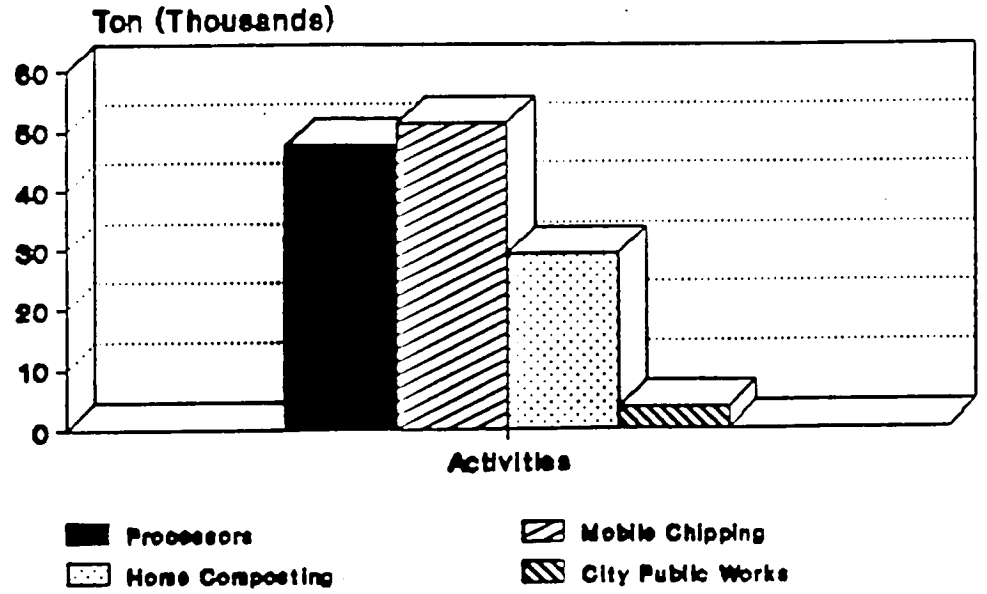
FIGURE 8

RECOVERY/RECYCLING ACTIVITY
By Volume



1989

RECOVERY/RECYCLING ACTIVITY
By Weight



1989

2) Yard Debris Generated By Single Family Dwellings[8]

It is estimated (1989) that the average amount of yard debris generated per single family dwelling per year is 5.8 loose cubic yards. This amount is significant for local governments and haulers in designing yard debris collection programs. In planning a program for yard debris collection it should be understood that on the average, each residential user of the collection program will generate 5.8 loose cubic yards annually.

The following Table 3 shows residential volumes that potentially could be available within each local government for collection:

[8]Appendix II, Estimated Yard Debris Generation In the Portland Metro Region, Metro 1990.

TABLE 3

YARD DEBRIS GENERATION BY LOCAL GOVERNMENT (Metro, 1989)

COUNTY	LOCAL GOVT.	SINGLE FAMIL DWELLING UNIT (SFD)	YARD DEBRIS GENERATED (Loose Cubic Yards)
CLACKAMAS		49,098	284,768
	Gladstone	2,859	16,582
	Happy Valley	460	2,668
	Johnson City	270	1,566
	Lake Oswego	9,470	54,926
	Milwaukie	5,254	30,473
	Oregon City	5,040	29,232
	Rivergrove	128	742
	West Linn	5,183	30,061
	Wilsonville	1,533	8,891
	Unincorp. Urban	18,901	109,626
MULTNOMAH		157,958	916,156
	Fairview	484	2,807
	Gresham	13,706	79,495
	Maywood Park	297	1,723
	Portland	116,052	673,102
	Troutdale	2,043	11,849
	Wood Village	686	3,979
	Unincorp. Urban	24,690	143,202
WASHINGTON		65,316	378,833
	Beaverton	9,566	55,483
	Cornelius	1,122	6,508
	Durham	334	1,937
	Forest grove	3,108	18,026
	Hillsboro	9,351	54,236
	King City	654	3,793
	Sherwood	1,124	6,519
	Tigard	7,612	44,150
	Tualatin	3,002	17,412
	Unincorp. Urban	29,443	170,769
	TOTAL	272,372	1,579,758

3) Yard Debris Conversion Ratios

The following tables identify the various conversion factors used throughout this Plan. It should be noted that establishing yard debris conversion ratios is not an exact science. In the field, conversions may vary depending on specific situations. These conversion ratios are recognized as approximations based on experience by collectors, chippers, and processors.

Volume to Volume Conversion Ratios

From	To	Ratio
Loose Cubic Yards[9]	Mechanically Compacted Cubic Yards	3:1
Loose Cubic Yards	Composted Cubic Yards[10]	4:1
Loose Cubic Yards	Chipper's Loose Cubic Yards[11]	2:1

Volume to Weight Conversion Ratios

Item	Units	Ratio
Mechanically Compacted Cubic Yards	Tons (2000 Lbs.)	2.6 - 3.0
Loose Cubic Yards	Tons (2000 Lbs.)	8:1 to 10:1

[9]Appendix II, Estimated Yard Debris Generation in the Portland Metro Region, Metro 1990.

[10]Appendix II, op. cit.

[11]Appendix II, op. cit.

Volume to Weight Estimates

Item	Units	Weight
Loose Cubic Yards	Pound (Lbs.)	200 - 250
Loose Chipped Cubic Yards	Pound (Lbs.)	.55-75
Mechanically Compacted Cubic Yards	Pound (Lbs.)	650 - 750
Composted Cubic Yards	Pound (Lbs.)	600 - 700

4) Participation/Recovery Levels

A primary factor used in evaluating recycling collection programs is resulting participation and recovery levels. The collection systems analysis contains cost estimates which are derived in part by determining participation and recovery levels for each collection option evaluated. It is therefore important to have an understanding of these factors and how they are used. For the purpose of this Plan, participation level is defined as the number of generators who use the yard debris collection service. Recovery level is defined as the amount of yard debris expected to result from a collection program. Recovery level is derived by multiplying the participation level times the amount of yard debris recovered per participant.

Participation levels are really a reflection of the public's willingness to use various types of collection programs. They are difficult to predict for all types of waste recycling programs. Many factors, some controllable and others beyond the control of the public agency, will influence the level of participation by the public. For curbside collection of household recyclables a large body of experience exists from which it is possible to derive average participation rates for a program that includes certain defined characteristics. Even so, demographic factors in different communities, the level of local public awareness of the solid waste crisis, the environmental consciousness of the public, and the treatment of the program by the press can influence participation as strongly as program design features.

For yard debris collection programs the problems in establishing accurate participation and recovery levels are substantially greater because:

1) Very few programs have been in operation long enough to have obtained reliable data;

2) Many independent factors influence existing programs differently;

3) There are no standard monitoring or reporting techniques; and

4) Very few studies have been done to objectively test participation and recovery levels or even capture and compare data provided from a large number of programs.

For these reasons, the reliability of the collection systems analysis could be questioned, due to the difficulty in establishing accurate participation and recovery level estimates.

In view of non-existent historical or national data, experience was the determining criterion for establishing participation and recovery levels for source reduction and collection options identified in this Plan. Specifically, the levels were developed through numerous discussions with haulers, recyclers, DEQ, Metro, local government staff and processors about the mechanics of existing collection programs and what results could be expected from proposed programs. (See Appendix IV.)

Based on experience, the following assumptions were made in establishing participation and recovery levels:

1. Participation levels are a function of frequency and convenience of the collection service. Figure 9, illustrates this correlation.

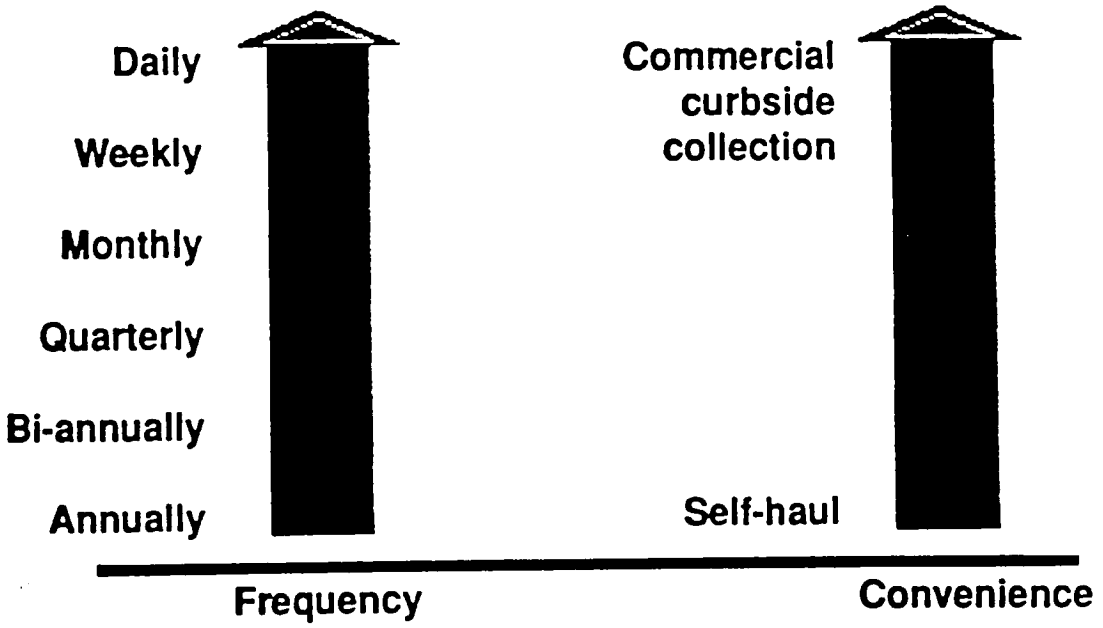
2. Collection options will be well publicized, therefore the generators' willingness to use the service is predicated on factors other than promotion and education.

3. Residents from outside the region will not be using the regional programs.

4. The amount of yard debris recycled by a household could not be greater than the estimated generation per single family dwelling (described above).

5. Data from existing programs was used where existing programs and data existed. For programs contained in the analysis which currently do not exist in the region or for

FIGURE 9



which little data has been collected, higher or lower participation and recovery levels were established using knowledge about existing programs as a deciding factor. In addition to the assumptions, the following factors were also considered for estimating participation and recovery levels for each category of collection programs analyzed:

- Source reduction program
  - space
  - knowledge of how to compost
  - cost
- Self-haul collection
  - Convenience (e.g., distance of depot from yard debris generators)
  - availability of the right vehicle to transport the material.
  - tip fee or method of funding.
  - frequency of service.
- Curbside collection
  - required method of material preparation.
  - method of program funding (user-pay or cost spread across user base).
  - frequency of service.
  - routed or non-routed.

B) Source Reduction and Collection Programs Analysis

To determine the appropriate yard debris recycling program for the region several preliminary analysis were undertaken. A comprehensive list of programs used across the country for handling yard debris was developed. The programs were grouped into two management areas - source reduction and collection options. Cost variables were also developed and used to determine the cost-effectiveness of the options.

1) Source Reduction Program

The analysis recognizes that the most efficient way to divert yard debris from transfer stations, landfills and incinerators is source separation. The current method of generating yard debris separately from other municipal wastes confirms that the material can be easily separated by homeowners, landscapers or grounds-keepers, and tree-service companies.

Use of the material at the source, including basic composting procedures, was the main factor considered in designing the source reduction programs for the region. Environmental and economic impacts to local governments and residents were also taken into consideration.

After evaluating several home composting programs across the country, it was determined that there were actually three strategies currently used by various communities: 1) distribution of information packages on home composting procedures; 2) distribution of composting bins to residents[12]; and 3) community composting education sites program[13].

The analysis also recognizes that the region could recycle more yard debris with a systems integration strategy. The material recycled through the special waste management system could be utilized by the yard debris management system. For example, wood and other types of demolition debris could be used to construct panels of home composting bins.

The outcome of the above considerations are the following source reduction options:

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[12]King County, "Yard Waste Programs", 1989 Waste Reduction and Recycling Workshop, Seattle, Washington, 1989.

[13]Seattle Tilth Association, Master Composter Resource Manual, April 1987

1. "Home Composting Bin Project" that will utilize materials recovered from demolition debris for constructing of home composting bins;

2. "Permanent Home Composting Education Sites" that could be established in the City of Portland, and locations in Clackamas, Multnomah and Washington counties;

3. "Home Composting Bin Workshops and Permanent Home Composting Education Sites" (i.e., a combination of the above options).

Description of and implementation procedures for the recommended source reduction program are provided in Appendix III and Sections VI respectively.

2) Collection Programs

In designing a yard debris collection system there are many program variations that must be considered. These variations include the following:

1. Type of collection (self-haul to a temporary storage site or processor vs. pickup at the curbside by hauler);

2. Volume and type of material being collected (loose cubic yards vs. very loose vs. packed vs. chipped);

3. Type of temporary storage equipment (drop box vs. packer truck);

4. Optimum distance between the processor or depot and the generators (i.e., high vs. low density collection system); and

5. Schedule of collection (annual, quarterly, monthly, weekly).

A preliminary screening of national programs reduced the large number of potential programs to the list in Figure 10. A complete description of programs listed in Figure 10 is included in Appendix III.

FIGURE 10
(COMPREHENSIVE LISTING OF YARD DEBRIS COLLECTION OPTIONS)

RESIDENTIAL SELF-HAUL MATRIX

FREQUENCY OF SERVICE	SELF-HAUL OPTIONS	LINE NO	VARIATIONS
Annual (1/Year)	Neighborhood Cleanup events	1	Packer Truck-needed volunteer staffing
Seasonal (2/Year)	City Cleanup Events	2	Drop Box - City and Hauler Staffing
		3	Packer Truck - City and Hauler Staffing
Quarterly (4/Year)	City Cleanup Events		(No Program Modeled)
Monthly (12/Year)	Depots	4	LD-Drop Box - City and Hauler Staffing
		5	LD-Packer Truck-City and Hauler Staffing
		6	HD-Drop Box - City and Hauler Staffing
		7	HD-Packer Truck-City and Hauler Staffing
(6 or 8 Months/ Year)		8	R -Drop Box-City and Hauler Staffing
		9	R -Packer Truck-City and Hauler Staffing
(Weekly 45-52/ Year	Depots	10	LD-Drop Box-City and Hauler Staffing
		11	LD-Packer Truck-City and Hauler Staffing
		12	HD-Drop Box-City and Hauler Staffing
		13	HD-Packer Truck-City and Hauler Staffing
Weekly (45-52 Year)	Permanent Depot Sites	14	LD-Drop Box-City and Hauler Staffing
		15	MC-Drop Off-City Staff
		16	HD-Drop Box-City and Hauler Staffing
DAILY	Permanent Depot Sites		(No Program Modeled)

Key: LD - Low Density R - Rotating
MD - High Density MC - Municipal Compost Facility

CURBSIDE MATRIX

FREQUENCY OF SERVICE	CURBSIDE OPTIONS	LINE NO	VARIATIONS
Annual (1/Year) (Routed)	Neighborhood Cleanup Curbside	1	Curbside only - User pay (UP)
Seasonal (2/Year) (Routed)	City Cleanup Curbside	2	Hauler only - Cost spread across base (SAB)
Quarterly (4/Year) (Routed)	City Cleanup Curbside	3	Hauler only - Cost spread across base (SAB)
		4	Chipper only - Cost Spread across base (SAB)
Monthly (12/Year) (Routed)	Curbside Collection	5	Hauler only - Cost sperad actoss base (SAB)
		6	Hauler only - User pay (UP)
Weekly (45-52/Year) (Routed)	Curbside Collection	7	Hauler only - Cost spread across base (SAB)
		8	Hauler only - User pay (UP)

During the preliminary screening several factors were used to determine potential programs for the Metro region. These factors included compatibility, availability of equipment, and capital cost.

Current collection efforts throughout the region (which range from annual neighborhood cleanups to regularly scheduled curbside collection) confirm that the designated options in Figure 10 are compatible with the region's overall waste reduction program. Ease of program implementation in the region was another aspect of compatibility considered. As evidenced in the program description in the appendix, only two types of collection equipment (packer trucks and drop boxes) were considered for use in the designated options.

Capital cost, availability and ease of implementation, as evidenced elsewhere in the country, were the principal factors that led to further analysis on the use of packer trucks and drop boxes for the region's programs. Other types of collection equipments such as mechanical claw-truck, vacuum leaf collector-truck and front-end loader/dump truck are very expensive.[14] Availability of these particular types of equipment in the region is also questionable. Besides, the use of equipment other than packer trucks for curbside programs does not encourage generators to place their yard debris on their curbs in a neat fashion, thus they create environmental hazards.

a) Cost of Programs

Before measuring the performance of the designated programs, cost variables of the programs were determined. Local costs of the variables were also estimated.[15]

Primary cost variables for the source reduction and collection options are:

- Administration (salary and overhead);
- Promotion;
- Site development (for permanent self-haul depot and municipal composting options);

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[14]Mark D. Selby, "Yard Waste Collection" BioCycle, June 1989, pp. 52-54.

[15]Appendix IV, "Cost Estimates of Designated Yard Debris Recycling Options", Metro, 1989.

- Capital improvement (for permanent self-haul depot and municipal composting options);
- Capital equipment (for permanent self-haul depot and municipal composting options);
- Operation (includes maintenance); and
- Disposal Cost (tip fee at yard debris processing facilities).

Due to inability to provide precise variable costs (e.g., administration) for each local government in the region, a generic cost model was designed for a hypothetical city of 20,000 population, (that has 6,000 single family dwellings).

Total costs per option was estimated and divided by the option's regional collection capacity to get the cost-effectiveness (or cost per loose cubic yard) of that option that was used in the overall program evaluation.

There are some factors that have not been directly incorporated into the model which may affect costs and must be evaluated by each jurisdiction during implementation. For example, topography, conditions of local streets, and socio-economic conditions affecting participation.

b) Performance Evaluation

Criteria for Selecting Collection Options

A program performance evaluation was conducted in order to determine those options that the region should consider for implementation during the plan period. The evaluation was based on the following measures of program performance:

i. Percent loose cubic yard recovered per single family dwelling: This is a measure of the ability of the option to recycle a significant portion of the yard debris generated in the region and is calculated for each collection option analyzed as illustrated in Figure 11.

ii. Cost per loose cubic yard recovered: This is an assessment of the cost-effectiveness of collecting one loose cubic yard of yard debris;

iii. Technical feasibility: This is a measure of the

effectiveness, reliability, flexibility and compatibility of the collection option within the solid waste system;

iv. Neighborhood impacts: This is an assessment of the extent of noise, litter, and odor that could arise as a result of the implementation of the option; and

v. Potential for Contamination: This is an assessment of the extent of contamination of the recycled material expected from a collection option.

The first two performance measures are objective criteria, and can be quantified. The last three performance measures are subjective criteria and are more difficult to quantify. Additional evaluation steps were completed to determine the relative effectiveness of the programs.

Figure 11 contains a summary of the measures used to evaluate the options. Total collection, annual cost and average regional collection per option shown in Figure 12 is for information only; the information in these columns were not used in final evaluation and ranking of the options. The five criteria for selecting the options were ranked using the following methodology:

Scoring

Performance measurements on all criteria shown in Figure 12 were converted to a common unit of measurement so they could be aggregated. For example, percent recycled per SFD can not be added to dollars. The method frequently used, and used in this case, to achieve this purpose was scoring.

For each criterion, a scale (of 1 - 5) was established that awards points to an option depending on where its measurement of performance falls on that scale. For example, percent cubic yard recovered per SFD vary from 6 percent to 66 percent. If programs were scored for this criterion on a scale of 1 to 5, then one possibility for converting percent-measurements to scores is to let 6 percent equal 0 point, 66 percent equal 5 points, and so on for all scores in between.

The above procedure was used to score the options on the criteria except for cost per loose cubic yard criterion. Using the average cost per loose cubic yard, which is in the range of $7.07 to $14.60, a linear computation of scores was applied in order to determine the best fitting scores used for final evaluation. The

FIGURE 11

Summary of Performance

SUMMARY OF PERFORMANCE FOR YARD DEBRIS REDUCTION AND COLLECTION OPTIONS (FOR A CITY OF 20,000 POPULATION)

KEY: DB = Drop Box; PT = Packer Truck; (N-P) = Non Permanent; (P) = Permanent; (SAB) = Cost spread across customer base; (UP) = Cost borne by users

OPTIONS	Line #	Total Collection /Recycling (Loose Cu. Yds.)	Annual Cost to LG 1990	Percent CY Recovered per SFD	Cost per Loose Cubic Yard	Technical Feasibility	Neigh'd. Impacts	Potential for Contamination	Average Regional Collection per Option * (Loose Cu. Yds.)
SOURCE REDUCTION:									
Compost Bin Project	A	1,980 - 6,300 (4,140)	$3,145	17% - 37% (27.0%)****	$0.42 - $1.59 ($1.00)	reclaim building materials	none	none	411,826
Permanent Sites	B	"	$2,291	17% - 37% (27.0%)	$0.31 - $1.16 ($0.73)	siting constriants	"	"	411,826
Compost Bin & Permanent Sites	C	"	$3,248	17% - 37% (27.0%)	$0.43 - $1.64 ($1.00)	both of above	"	"	411,826
SELF-HAUL OPTIONS: (UP)									
Annual Neigh'd Cleanup -PT	1	633 - 1,978 (1,305) **	$11,437 - $20,583	2% - 7% (4.6%) **	$10.41 - $18.07 ($14.24) **	residents access to haul vehicle	localized illegal dumping	moderate due to volume	44,941
Seasonal City Cleanup -DB	2	2,136 - 4,747 (3,445)	$29,070 - $53,437	4% - 9% (6.5%)	$11.26 - $13.61 ($12.44)	"	localized traffic & illegal dumping	"	118,482
" -PT	3	2,136 - 4,747 (3,445)	$27,568 - $50,099	4% - 9% (6.5%)	$10.55 - $12.91 ($11.73)	"	"	"	118,482
Monthly Low Density (N-P) -DB	4	3,956 - 7,911 (5,934)	$52,311 - $89,230	7% - 15% (11.0%)	$11.28 - $13.22 ($12.25)	"	"	minimal due to high staffing	204,279
" -PT	5	3,956 - 7,911 (5,934)	$49,528 - $83,666	7% - 15% (11.0%)	$10.58 - $12.52 ($11.55)	"	"	"	204,279
Monthly High Density (N-P)-DB	6	4,747 - 9,494 (7,121)	$65,770 -$111,073	9% - 18% (13.6%)	$11.69 - $13.86 ($12.73)	siting constraints access to haul veh	"	"	245,135
" -PT	7	4,747 - 9,494 (7,121)	$62,431 -$103,396	9% - 18% (13.6%)	$10.89 - $13.15 ($12.02)	"	"	"	245,135
Monthly Rotating Depot -DB	8	5,934 - 11,076 (8,505)	$73,049 -$121,044	11% - 21% (16.0%)	$10.93 - $12.31 ($11.62)	"	"	"	292,800
" -PT	9	5,934 - 11,076 (8,606)	$68,875 -$113,254	11% - 21% (16.0%)	$10.23 - $11.61 ($10.92)	"	"	"	292,800
Weekly Low Density (N-P) -DB	10	7,911 - 14,240 (11,076)	$91,508 -$150,680	15% - 27% (21.0%)	$10.57 - $11.57 ($11.07)	access to haul vehicle	"	"	321,321
" -PT	11	7,911 - 14,240 (11,076)	$85,944 -$140,564	15% - 27% (21.0%)	$9.87 - $10.86 ($10.37)	"	"	"	321,321
Weekly High Density (N-P) -DB	12	11,867 - 17,801 (14,834)	$156,982-$212,361	22% - 34% (28.0%)	$11.93 - $13.23 ($12.58)	"	"	"	610,698
" -PT	13	11,867 - 17,801 (14,834)	$148,636-$199,841	22% - 34% (28.0%)	$11.23 - $12.53 ($11.88)	"	"	"	610,698
Weekly Low Density (P) -DB***	14	9,889 - 16,060 (12,975)	$113,813-$171-408 (see fotenote)	19% - 30% (24.5%)	$10.67 - $11.51 ($11.09)	siting constraints vandalism	localized reoccuring illegal dumping	"	446,690
" Municipal Compost (P)***	15	11,867 - 17,801 (14,834)	$51,545 - $80,445 (see fotenote)	22% - 37% (29.5%)	$3.40 - $4.34 ($3.87)	siting, vandalism, equipment down time & tech. capability	localized noise, odor and reoccuring illegal dumping	"	610,698
" High Density (P) -DB***	16	13,845 - 19,620 (16,733)	$203,800-$257,703 (see fotenote)	26% - 34% (30.0%)	$13.13 - $14.72 ($13.93)	siting constraints access to haul veh.	localized reoccuring illegal dumping	"	676,067
CURBSIDE OPTIONS:									
Annual Neigh'd Cleanup Chipping (UP) -PT	1	4,945 - 7,911 (6,428)	$62,436 - $94,418	19 - 30% (24.5%)	$11.93 - $12.63 ($12.28)	enough mobile chippers; chipper billing	city wide noise; highest congestion	none	221,303
Seasonal City Cleanup(SAB)-PT	2	11,867 - 18,987 (15,427)	$88,645 -$137,062	22% - 36% (29.0%)	$7.22 - $7.47 ($7.35)	& hauler staffing; periodic processing overload	city wide litter; highest congestion	if bags - yes	631,125
Quarterly City Cleanup(SAB)-PT	3	13,845 - 22,152 (18,000)	$102,094-$158,581	26% - 42% (34.0%)	$7.16 - $7.37 ($7.26)	"	city wide litter; high congestion	"	619,646
Quarterly City Cleanup Chipping (SAB)	4	13,845 - 22,152 (18,000)	$155,196-$244,745	26% - 42% (34.0%)	$11.05 - $11.21 ($11.13)	adequate equipment & chipper billing	city wide noise; high congestion	none	619,646
Monthly City Wide (SAB) -PT	5	17,406 - 25,316 (21,360)	$126,303-$180,100	33% - 48% (40.5%)	$7.11 - $7.26 ($7.19)	adequate trucks; fund; and hauler staffing.	city wide litter; medium congestion	if bags - yes	736,404
Monthly City Wide (UP) -PT	6	3,956 - 7,911 (5,934)	$59,768 - $111,588	7% - 15% (11.0%)	$14.10 - $15.11 ($14.60)	hauler billing and staffing	city wide litter	"	204,279
Weekly City Wide (SAB) -PT	7	26,740 - 33,861 (30,300)	$189,783-$238,201	50% - 64% (57.0%)	$7.03 - $7.10 ($7.07)	adequate trucks and funding	city wide litter; lower congestion	"	1,043,185
Weekly City Wide (UP) -PT	8	7,911 - 15,823 (11,867)	$61,746 -$115,543	15% - 30% (22.5%)	$13.60 - $14.10 ($13.85)	adequate trucks and hauler billing	city wide litter	"	408,558

* Effectiveness of collection option for the whole region.

** Denotes Average for Purpose of Ranking.

*** Startup cost (site development, capital improvement and equipment and maintenance) for Permanent Depots and Municipal Composting operations.

1. Weekly Low Density (P) - DB = $36,750.00
2. Weekly Municipal Composting (P) = $218,570.00
3. Weekly High Density (P) - DB = $144,000.00

FIGURE 12

Evaluation Matrix

EVALUATION MATRIX FOR YARD DEBRIS COLLECTION OPTIONS (FOR A CITY OF 20,000 POPULATION)

Key to Scores

1. % cubic yards recovered per SFD
2. Cost per cubic yard
3. Technical feasibility
4. Neighborhood impacts
5. Potential for contamination

OPTIONS	Line #	Score 1	Score 2	Score 3	Score 4	Score 5	Total	Ranking	Annual Cost $
SOURCE REDUCTION:									
Compost Bin Project	A								
Permanent Sites	B								
Comp. Bin & Permanent Sites	C								
SELF-HAUL OPTIONS: (UP)									
Annual Neigh'd Cleanup	1	1.0 (3)	1.1 (3.3)	4 (8)	5 (10)	3 (6)	(30.3)	16	11,437 - 20,583
Seasonal City Cleanup -DB	2	1.3 (3.9)	1.8 (5.4)	4 (8)	4 (8)	3 (6)	(31.3)	--	29,070 - 53,437
" -PT	3	1.3 (3.9)	2.0 (6.0)	4 (8)	4 (8)	3 (6)	(31.9)	15	27,568 - 50,099
Monthly Low Density (N-P)-DB	4	1.6 (4.8)	1.9 (5.7)	4 (8)	4 (8)	4 (8)	(34.5)	--	52,311 - 89,230
" -PT	5	1.6 (4.8)	2.1 (6.3)	4 (8)	4 (8)	4 (8)	(35.1)	10	49,528 - 83,666
Monthly High Density (N-P)-DB	6	1.8 (5.4)	1.7 (5.1)	3 (6)	4 (8)	4 (8)	(32.5)	--	65,770 - 111,073
" -PT	7	1.8 (5.4)	1.9 (5.7)	3 (6)	4 (8)	4 (8)	(33.1)	14	62,431 - 103,396
Monthly Rotating Depot -DB	8	2.0 (6)	2.1 (6.3)	3 (6)	4 (8)	4 (8)	(34.3)	--	73,049 - 121,044
" -PT	9	2.0 (6)	2.3 (6.9)	3 (6)	4 (8)	4 (8)	(34.9)	11	68,875 - 113,254
Weekly Low Density (N-P) -DB	10	2.3 (6.9)	2.3 (6.9)	4 (8)	4 (8)	4 (8)	(37.8)	--	91,508 - 150,580
" -PT	11	2.3 (6.9)	2.5 (7.5)	4 (8)	4 (8)	4 (8)	(38.4)	6	85,944 - 140,564
Weekly High Density (N-P)-DB	12	2.9 (8.7)	1.7 (5.1)	3 (6)	4 (8)	4 (8)	(35.8)	--	156,982 - 212,361
" -PT	13	2.9 (8.7)	2.0 (6.0)	3 (6)	4 (8)	4 (8)	(36.7)	7	148,635 - 199,841
Weekly Low Density (P) -DB	14	2.6 (7.8)	2.3 (6.9)	3 (6)	4 (8)	4 (8)	(36.7)	8	113,813 - 171,408
Weekly Municipal Compost (P)	15	2.9 (8.7)	5.0 (15.0)	2 (4)	3 (6)	4 (8)	(41.7)	3	51,545 - 60-445
Weekly High Density (P) -DB	16	3.1 (9.3)	1.2 (3.6)	3 (6)	4 (8)	4 (8)	(34.9)	12	203,800 - 257,703
CURBSIDE OPTIONS:									
Annual Neigh'd Cleanup Chip (UP)-PT	1	1.7 (5.1)	1.8 (5.4)	2 (4)	2 (4)	5 (10)	(28.5)	18	62,436 - 94,418
Seasonal City Cleanup (SAB)-PT	2	2.9 (8.7)	3.6 (10.8)	4 (8)	2 (4)	4 (8)	(39.5)	5	88,645 - 137,062
Quarterly City Cleanup(SAB)-PT	3	3.3 (9.9)	3.7 (11.1)	4 (8)	3 (6)	4 (8)	(43.0)	2	102,094 - 158,581
Quarterly City Cleanup Chip(SAB)-PT	4	3.3 (9.9)	2.3 (6.9)	2 (4)	2 (4)	5 (10)	(34.8)	13	155,196 - 244,745
Monthly City Wide (SAB) -PT	5	3.8 (11.4)	3.7 (11.1)	2 (4)	3 (6)	4 (8)	(40.5)	4	126,303 - 180,100
Monthly City Wide (UP) -PT	6	1.6 (4.8)	1.0 (3.0)	3 (6)	4 (8)	4 (8)	(29.8)	17	59,768 - 111,588
Weekly City Wide (SAB) -PT	7	5.0 (15)	3.7 (11.1)	2 (4)	3 (6)	4 (8)	(44.1)	1	189,783 - 238,201
Weekly City Wide (UP) -PT	8	2.5 (7.5)	1.3 (3.9)	4 (8)	4 (8)	4 (8)	(35.4)	9	111,388 - 215,226
WEIGHTING FACTOR (For Reference)		HIGH (x3)	HIGH (x3)	MEDIUM (x2)	MEDIUM (x2)	MEDIUM (x2)			

linear scores were computed within the 1 - 5 range in order to keep the overall evaluation scale in a uniform format.

Scores on all criteria were determined for each collection option as shown in Figure 12.

Weighting

The scores for each option on all criteria were also multiplied by weights that reflect their relative importance. For example, a score of 5 on cost may be much more important than a score of 5 on contamination. To be able to aggregate scores into a single indicator of overall performance, the Waste Reduction Subcommittee decided how much more important. Weights of 3 (for high) and 2 (for medium) were used as shown in the bottom of Figure 12.

Refer to Appendix VI for the final ranking of the designated collection options.

C) Yard Debris Processing Capacity Analysis

The purpose of the processing capacity analysis is to determine yard debris processing capacity in the region and to further establish any potential limitations to existing or future increases in processing capacity. Processing includes the three basic operational steps--initial processing, decomposition and post-processing which are required to make a compost product.

The Composting Process

Composting, at least conceptually, is relatively simple. It describes the biological process whereby microorganisms degrade organic materials into relatively stable, complex organic matrix. This matrix is high in humus content and, depending on the source material, may be high in nitrogen and other types of nutrients essential for proper plant germination and development. The resulting material is compost, and when it is applied as either a surface or subsurface treatment to soil, it becomes integrated into the soil as a vital component in a healthy soil ecosystem.

Composting consist of two separate types of processes, aerobic or anaerobic. Anaerobic composting takes place in an oxygen deficient environment and is accomplished by microorganisms which do not require oxygen directly for sustained biologic activity. These organisms frequently create methane or sulfur dioxide gas, both of which have an unpleasant odor and may create health hazards in sufficient quantities. Aerobic composting takes place in an oxygen sufficient environment and is accomplished primarily by microorganisms which do require oxygen for sustained biologic activity. These organisms do not generally create either methane or sulphur dioxide gas, and this process is much less likely to create any type of health, environmental or aesthetic concerns. For these reasons, the aerobic based composting is generally practiced in the Metro region.

The process of aerobic composting is highly dependent on a number of specific control parameters. These parameters include, among others, the quantity of oxygen available for biologic uptake, the moisture content of the composting material, the effective temperature, the availability of essential nutrients for microbial use and Ph. Because this is an aerobic (oxygen dependent) process, the available oxygen supply is perhaps the most essential control parameter. In the absence of oxygen, aerobic decomposition will be replaced by anaerobic decomposition. This is a very slow process which can take over 3 years to complete and, as mentioned previously, often results in the generation of offensive odors.

Composting Technology

The production of yard debris compost generally involves three (3) basic operational steps. These are:

A. Initial processing.

B. Decomposition.

C. Post-processing.

Initial processing consists of preparing the incoming yard debris for processing. This typically includes steps such as manual or mechanical de-bagging, removal of unwanted materials, mechanical reduction and/or mixing of the yard debris. Decomposition is the heart of compost processing. It consists of the actual biological actions taking place during which the organic structure of the yard debris is metabolized and reduced. This biological action may be either aerobic, anaerobic or both. After substantial completion (ultimate completion of the composting process would yield a simple mineral sand), the finished compost typically needs to be screened, shredded or mixed with other materials to be suitable for sale or use. This finishing process is referred to as post-processing.

Because composting is a natural process, it can be carried out with only minimal intervention, if desired. The primary purpose of intervening. When composting is practiced with the intent of producing compost on a commercial scale, some level of intervention is essential. The level of intervention in the composting process is determined by the level of technology employed. In general, there are four (4) basic levels of technological intervention currently popular and in practice today. These are:

1. Minimal-level technology composting.

2. Low-level technology composting.

3. Intermediate-level technology composting.

4. High-level technology composting.

1. Minimal-Level Composting

Minimal-level composting is a very low cost approach to composting. It requires less labor and capital than the other levels of technology, but more land. It is characterized by the

use of large, static pile windrows which are turned infrequently, usually yearly (static pile windrows mean that air is not forced through the pile mechanically). There is only minimal mechanical reduction of the feed stock (yard debris), if any at all, and the total production cycle may take over one (1) year to complete.

Windrows are typically twelve (12) feet high, twenty-four (24) feet wide and of variable length (determined by the length of the available land). Typically, the center of these windrows heat up quickly and become anaerobic as the available oxygen is consumed. This transition from aerobic to anaerobic decomposition is marked by the generation of unpleasant odors. These odors frequently require substantial buffer areas (up to 1/4 mile between the compost rows and the surrounding area) to prevent neighbor complaints. Since rapid composting requires aerobic conditions, it can take up to three (3) years for composting to be complete using minimal-level technology composting.

2. Low-Level Technology Composting

Low-level technology composting is perhaps the most common methodology currently in use today. This approach is more labor and capital intensive than minimal-level composting, but may require less land. It is characterized by the use of smaller windrows, typically six (6) feet high, twelve (12) feet wide and of variable length (as above). The use of smaller windrows allows the centers of each to remain aerobic during the entire process. These windrows are turned, generally quarterly and are frequently combined with other windrows as their volumes decrease. This process takes as much as eighteen (18) months to produce a reasonably stable compost product.

Because low-level technology composting windrows never become anaerobic, odor production is not a significant problem. This permits the use of a smaller buffer zone around the plant than that recommended for minimal-level technology composting. However, the use of smaller windrows requires more land for the actual production of compost, so land requirements may only be slightly lower than for minimal-level technology composting.

3. Intermediate-level Technology Composting

Intermediate-level technology composting is the second most common methodology currently in use. This approach is significantly more labor and capital intensive than low-level composting but requires less land. It is characterized by the same use of smaller windrows, typically six (6) feet high, twelve (12) feet wide and of variable length (as above), however, the windrows are turned much more frequently, about once per month. The use of smaller windrows and more frequent turning allows the

centers of each to remain aerobic and significantly accelerates the completion of the composting process. This process also marks the first use of large pre-composting mechanical reduction equipment.

The mechanical reduction equipment typically consists of one or more pieces designed to reduce the size of the particles to be composted. The smaller size greatly accelerates the decomposition process and results in a higher quality compost product at the end. The entire composting process can take as long as twelve to eighteen (12 - 18) months to produce a reasonably stable compost product. Automated windrow turning machines are frequently used.

Because intermediate-level technology composting windrows never become anaerobic, odor production is not a significant problem. This permits the use of the small buffer zone discussed above. The use of small windrows requires the same amount of land for the actual production of compost as low-level technology composting, but the process is greatly accelerated so less land must be dedicated to composting.

4. High-level Technology Composting

High-level technology composting resembles intermediate-level technology composting with the addition of forced aeration of the compost windrows. The addition of forced aeration greatly reduces the composting time, and may be supplemented by aggressive moisture control as well. Most processors using this approach also have sophisticated process control mechanisms which continuously monitor the production process.

Typically, the forced aeration of the windrows occurs very early in the production cycle. In systems which also monitor moisture, humidity controls are used to add water vapor or mist to the forced airstream to maintain compost moisture levels. After composting under these "optimal" conditions for a period of from two to ten (2 - 10) weeks, the compost is then moved to a static pile windrow for final composting. This approach, used in conjunction with frequent turning of the windrows, can result in a finished compost product in approximately three to four (3 - 4) months. Odor generation, as above, is of little concern. In fact, some composting plants which use a high-level technology approach actually have an enclosed process whereby all composting is performed under cover in a building and air captured and circulated back through the forced aeration system.

Land Requirements

There are several factors which must be considered when evaluating the impacts related to land requirements and the associated limitations. These factors include access, site grading and other physical conditions, public acceptance, potential environmental impacts, amount of land area required and specific permitting requirements. These factors create a major constraint on the theoretical processing capacity.

The land area required for a composting operation varies with the volume and types of waste composted and the type of equipment and level of technology employed in processing the materials. On average, about three acres of land will be needed for each 10,000 cubic yards of yard debris collected. Less land may be required if materials are predominantly soft and leafy, if a compost turner is used and if materials are ground prior to windrowing. Woody materials, materials not size-reduced prior to windrowing and materials turned by a front loader may increase the land area required for the project.

The project site should be relatively close to the waste sources in order to minimize transportation costs of the fresh materials and to promote participation in the project. Roads providing access to the site should be capable of supporting project related traffic without adverse impact on road conditions, traffic patterns or noise levels. Water and electrical service should be available at the site, sewer access may also be required.

The surface of the site should be level or slightly sloped, well-drained and capable of supporting heavy equipment in all weather conditions. A paved surface or hard dirt surface is desirable. In all but the driest areas, some pavement will be necessary in order to provide winter processing capability. In some cases, a drainage collection system may be necessary both to assure winter vehicular access and to prevent anaerobic conditions from developing at the base of the windrows. Drainage should not be discharged directly into lakes or other bodies of surface water or be allowed to enter the groundwater table.

Existing Processors

Yard debris processing in the region is dominated by two (2) principal processors whose combined production of yard debris products is approximately ninety-three (93%) percent of the region's total. Both currently use intermediate-level technology composting, with limited use of high-level technology composting. Both processors utilize hammer mills for mechanical reduction

(both use an almost identical size mill) in their pre-processing line. Also, both processors use static windrows or piles with frequent turning to accelerate the decomposition process. Additionally, one is beginning to experiment with a forced aeration concept to further accelerate the composting process.

The actual processing capacity of each processor is difficult to determine with any degree of confidence. The maximum theoretical processing capacity for these two processors can be estimated by considering which step in the production process in least sensitive to changes in the operating environment. The major steps in this production process are:

1. Receive and process incoming material.

2. Mechanically reduce the size of the incoming material.

3. Move the reduced material to a screening area for size gradation.

4. Screen the material, and reprocess over-sized pieces.

5. Move suitably sized material to the composting area.

6. Place the compost feed stock into windrows or piles for composting.

7. Reprocess reject material.

It is clear that the mechanical reduction process is the least sensitive to changes in the production environment, and hence represents the ultimate single limiting factor. The mechanical reduction process at the two (2) major processors can be described as follows:

Approximate effective area of the opening of each hammer	.07 cubic feet.
Revolutions per minute of the hammer mill	1,200
Number of hammers	28
Number of operating shifts per day	1
Length of the production shift per day	8 hrs.

A critical control parameter is the relative efficiency of the processing operation. The operational efficiency (OE) is difficult to determine with any degree of exactness. Some of the variables which determine OE are density of the feed stock,

failure mode of the feed stock, rebound characteristics of the feed stock, clearances between the hammers and slots and feed stock delivery mechanism. Typical values for this type of equipment range from 10% to 15% operational efficiency.

Processing capacity for the two major processors, was calculated using a sensitivity approach that uses the full range of possible values for operational efficiency. It is probable that the actual value is somewhere between those shown. Because of the age and operating condition of the equipment used by both processors, actual production levels are likely to be nearer the 10% value.

Cubic yards of production per day @ 10% operational efficiency:

(.07)(1200)(28)(60)(8)(.10)/(27) = 4200 cu.yds./day.

Cubic yards of production per year:

(4200)(220) = 924,000 cubic yards per year per processor.

Cubic yards of production per day @ 15% operational efficiency:

(.07)(1200)(28)(60)(8)(.15)/(27) = 6,200 cubic yards per day.

Cubic yards of production per year:

(10500)(220) = 1,364,000 cubic yards per year per processor.

As can be seen from the above calculations, maximum theoretical production capacity for each of the two major processors is between 2,000,000 and 2,700,000 loose cubic yards of yard debris per year. These figures must be tempered with the realization that neither processor devotes the full available production time to yard debris processing. Both process other materials in addition to yard debris. This results in the operation of what is essentially a continuous production plant in batch mode. This type of operation reduces overall production efficiency and capacity. The resulting inefficiency cannot be approximated by a linear assignment of production time to the maximum theoretical production capacity possible since there is, in effect, a penalty for operating a continuous process in batch mode.

Processing Capacity

The current production capacity of the two major processors is approximately 861,000 loose cubic yards of yard debris per year. At these levels of production, it is clear that a large percentage of the maximum theoretical capacity is either being devoted to processing other product lines or is lost to operational inefficiency. If this allocation of capacity were to be utilized for processing yard debris, there could be an additional 2,000,000 loose cubic yards of capacity available.

Both major processors have other product lines, such as bark and wood chips, which require an allocation of production time. Allocations are based on current product demand and several other factors. To remove these products from the production schedule would require either additional production capacity to handle these materials or that the return on investment for yard debris increase dramatically. Since neither scenario is likely, and because of the implicit penalty for using a continuous processing plant in batch mode, a more rational assessment of available capacity is required.

If the economics of yard debris remain constant over time, then only modest unused capacity would be available for increased processing levels. If yard debris becomes less economic, then it is rational to assume that a shift away from processing it would occur. If additional economic incentives were available, then a shift toward additional production would be rational.

Estimated production capacity for the year 1995 shows a significant increase, up from approximately 950,000 total for the region in 1990 to almost 2,400,000 by 1995. The additional capacity is largely attributable to one of the two major processors who plans on a significant increase in production capacity. Whether this increase is due to a reallocation of existing production capacity from other product lines to yard debris, or the addition of new capacity is not know at this time.

Possible increases in capacity beyond 1995 is virtually impossible to forecast. In a recent survey, all of the existing processors indicated that they have no expansion plans for that far into the future. Each indicated that whatever does happen will be the direct result of economic conditions, availability of supply and availability of stable markets for the finished products.

Limitations On Processing Capacity

In a production environment, many factors can limit capacity. Operational inefficiency, abnormal maintenance requirements and

limited material handling capability can all act to reduce the ultimate production capacity of a plant. In this case, the primary limitations on the ultimate, or theoretical maximum, production capacity are as follows:

1. Inefficiency caused by operating a "continuous" mode processing facility in "batch" mode.

2. Limited capacity of various components in the material handling process, such as the conveyor system, the trommel screen and the front end loaders.

3. Inefficiency caused by having to regrind a substantial portion of the yard debris to obtain a consistent, high quality compost feed stock.

4. Space requirements and associated limitations due to limited expansion area.

These, and other production factors, cause a severe reduction in the theoretical maximum production capacity. It is likely that this reduction is at least 10% - 20%, and may actually be as high as 40% - 50%. It is virtually impossible to determine the actual reduction in capacity that any of these factor may cause. However, since the maximum theoretical production capacity is estimated as 2,000,000 - 2,700,000 loose cubic yards per year, it is likely that the actual production capacity is on the order of 1,500,000 - 2,000,000 loose cubic yards per year.

One factor which was not listed, but which has a significant impact on the production capacity is market demand. This factor, perhaps more than any other, is the single greatest determinant of production volume. Since this is such an important element in determining the overall system capacity and behavior, it will be examined in greater detail below.

D) Yard Debris Market Capacity Analysis

The purpose of the market capacity analysis is to evaluate the potential for marketing increased quantities of yard debris product within existing market niches. This part of the technical analysis is significant in that compost market capacity is the deciding factor in the Plan for determining what level of collection programs are necessary to be put on-line in the region. Specifically, this Plan is a market driven plan. Collection programs which would result in more yard debris being generated than that which the market can readily consume will not be required to be implemented in the region.

This analysis includes a long-term and a short-term compost market capacity projection. The purpose of the long-term analysis is to gain a better understanding of the market potential and price sensitivity for compost products in the region over the next 20 years. The purpose of the short-term analysis is to determine the level of collection service appropriate to be put on line by July 1, 1991 consistent with expected market capacity at that time. These projections are an estimate of demand for yard debris compost at current market prices. The analysis also describes long-term compost market capacity projections at prices higher and lower than current market prices.

The yard debris market capacity analysis is partially predicated upon two prior market studies commissioned by Metro in 1986 and 1988. They are:

> Northwest Economic Associates, "Market Analysis of Portland Metropolitan Area Yard Debris", September 1986

and

> Cal Recovery Systems Incorporated, "Portland Area Compost Products Market Study", October 1988

These earlier studies were instrumental in the region gaining a better understanding of the market dynamics of yard debris compost and related products. However, the studies were seriously limiting in information necessary to make adequate assessments about market capacity in the region for purposes of determining what level of collection service should be established. These limitations include:

1. Market demand was projected only to 1990. This projection was not adequate in establishing collection standards for local governments beginning July 1, 1991 consistent with expected market demand.

2. The earlier studies did not consider or analyze how price changes could affect market demand. This was felt to be an important factor for establishing a market strategy for the regional plan.

1) Long-Term Market Capacity

The long-term market capacity analysis focuses on establishing demand curves for yard debris compost products based upon records of the amount of yard debris compost (YDC) products actually sold at typical market prices and some assumptions regarding the proportion of competing products that YDC would displace or be displaced by if its price were to go down or up. The demand curve derived by this method was then projected through time for each year from 1990 to 2010.

Marketing Factors Overview

In order to get a good overall perspective of the demand side of the market for yard debris compost (YDC) it must first be viewed as a component of the larger market for bark, sawdust, manure, and other composted soil amendments. The total combined volume of YDC sold by the area's processors, amounted to approximately 83,000 yards in 1988 while bulk sales of bark within a 50-75 mile radius of Portland were on the order of 1.5 million yards[16]. Sales of bagged bark plus other competing products probably bring this figure closer to 1.75 million yards. Yard debris compost presently makes up less than five percent of the total market for all related soil amendments and top dressing products.

It is not known at this time how close a substitute municipal solid waste (MSW) compost will be when the Riedel MSW composter comes on line in mid 1991. Contract restrictions were negotiated to prevent MSW compost from competing in price with yard debris compost and sewage sludge compost, though it can be sold at or above the prevailing price of YDC. It is estimated that the Riedel facility will produce 75,500 tons of compost per year. This is the equivalent of triple the amount of YDC compost currently being marketed[17]. MSW compost will be more suitable as a soil conditioner than as a top dressing, thus it will not directly compete with YDC as a top dressing. Also, it will be targeted more toward commercial tree farms, bare root nurseries, and other markets in which YDC is not a competitor. However, if MSW compost were to achieve widespread consumer acceptance, it could have some negative impact on the market for YDC.

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[16] "Market Analysis of Portland Metropolitan Area Yard Debris", Northwest Economic Associates, Sept 1986, p.11.

[17] One cu. yd. of YDC weighs approximately 600 lbs. Thus a ton of compost contains (2,000/600) = 3-1/3 cu. yds. Dividing 83,029 by 3-1/3 equals 24,908 tons of compost.

A potentially significant factor in the expansion of markets for yard debris compost is the planned entry into the market of a new major processor. The contract for the processing of source separated yard debris from the St. John's Landfill has been awarded to Farmer's Plant Aid Corp. From their North Portland location FPA plans to expand the geographic market for bulk YDC (both of the other processors are located in the south part of the Metro region) and to develop a market for bagged YDC.

Description Of Yard Debris Products

For the purposes of this analysis, yard debris products include both pure compost and blends of compost with other materials. Compost is made from the trimmings of woody and herbaceous vegetation that have been ground, decomposed over a period of time under controlled conditions, and screened to a generally uniform size of particles. Chips are composed of yard debris that has undergone only the most basic processing operation of being chipped into small pieces. Compost is composed of yard debris that has been ground, decomposed over a period of time under controlled conditions, and screened to a generally uniform size of particles.

It is important to distinguish between the terms yard debris compost (YDC) and yard debris compost products (YDC products). YDC will refer to material that is entirely composed of composted yard debris. The majority of YDC, however, is actually marketed as blends with other materials such as soil, bark dust, and mushroom compost. Some of these blends contain as little as 50 percent YDC. This study did not distinguish between the different YDC blends. Rather all demand figures are in terms of sales of YDC products. The amount of actual YDC marketed is thus less than figures indicated for blends.

Uses For Chipped Yard Debris

Chipped yard debris is a coarse material which is not decomposed. Based upon conversations with the operators of chipping services it appears that yard debris chips are primarily used for:

1. Weed control mulch in areas where the appearance of the material is not of prime concern.
2. Mud control on dairy and beef operations.
3. Ground cover for paths and walkways.
4. Surface cover in horse paddocks.

Uses For Yard Debris Compost

Yard debris compost may be produced in different degrees of fineness (particle size). In coarse form, its primary application is as a top dressing (mulch). Finer grinds may be incorporated into the soil as a conditioner. As a mulch, YDC is applied to the surface of the soil to:

1. Conserve soil moisture.
2. Lessen weed problems.
3. Provide an attractive looking surface.
4. To surface pathways and muddy areas.
5. Form final cover for landfills during closure.

Finer grades may be mixed into the soil as a conditioner to:

1. Add organic matter.
2. Improve its structure, texture, and moisture holding capabilities.

SubMarkets For Yard Debris Compost

In order to estimate the substitution of yard debris compost for competing products, it is first necessary to examine the individual market segments in which soil amendments are sold. The following is a brief summary of each of the major groups of YDC users considered in this study. This is important as the degree of substitutability will likely be different for the different users as well as for the different applications. The uses considered in this study were:

Residential

Residential use of YDC as a soil conditioner and mulch by homeowners is the single largest market for yard debris compost. This is the submarket where promotional efforts to change tastes and preferences in favor of compost may have the greatest effect over time. At all price levels, promotion of the product to make consumers aware of its existence, its properties, and its availability will be a decisive factor. The analysis assumes the existence of an effective and sustained promotional program.

Landscaping

The nature of the building and marketing of spec homes makes cost minimization a key factor for financial success. In this type of landscaping there is also a great deal of builder discretion in specification decisions. For these reasons it is assumed that for use as a soil conditioner the degree of substitution of YDC for more expensive soil conditioners in this market would be relatively high.

A principal objective in commercial landscaping is low maintenance. Since bark breaks down much more slowly than yard debris compost, it is expected that there would be relatively little substitution of YDC for bark for use as a top dressing.

Institutional

Institutional uses include the landscaping of roadsides and public buildings. With minimization of expensive application labor a key factor, the greater longevity of bark, as compared with compost will limit its adoption for public landscaping purposes where a mulch is required. Use as a soil conditioner, however, could be substantial in some cases. YDC may be a superior product for temporary cover on newly seeded slopes where bark may tend to wash away. If procurement policies that favor recycled materials are adopted and enforced there would be a greater degree of substitution of compost for other materials. The institutional market is relatively small, however, and would not have a very significant impact.

Nurseries

Nurseries desire a uniform and predictable product for use in their potting mixes. Though bark lacks some of the desirable properties of yard debris compost, it is superior to compost as regards this overriding concern over uniformity. Research done at the OSU Experiment Station, however, has shown yard debris compost to give excellent results when used in place of higher priced peat moss as a potting soil component. It appears that performance of the material rather than price is the determining factor in this market.

Market Channels for YDC Products

For the most part, yard debris compost is marketed directly by the processors in bulk form, either by loading it into customers' pickups and trailers or by the processor providing delivery. Currently, little yard debris compost is marketed through nurseries (of five Metro area nurseries surveyed, none carried

YDC).[18] The majority of the compost is used for residential and commercial landscaping purposes either as a top dressing (mulch) or as a soil conditioner. A small amount of yard debris compost is marketed in bagged form. This could change if Farmer's Plant Aid (FPA) is successful in developing the market for Bagged YDC. FPA has already established a successful marketing program for other bagged garden products including manures, peat moss, and bark. These products are currently marketed through retail garden shops. Thus FPA already has access to the necessary marketing channels.

Factors That Affect The Demand for Yard Debris Products

Yard debris chips and YDC products effectively constitute two separate markets for yard debris, each with its own demand curve and each with a different price elasticity of demand. The current equilibrium price of yard debris compost is approximately $55 to $60 per unit[19] while chips are generally given away or sold for a nominal price. Though an examination was made of the volume of chips and their disposition, the demand analysis presented in this report pertains only to YDC products.

The determinants of the demand for yard debris compost are:

1. Population
2. Income
3. Housing starts
4. Retail sales of Metro area nurseries, and
5. The price and availability of substitute products.

Population, income, and interest rates affect the housing and construction markets from which the demand for landscaping services is derived. Increases in population and income, and decreases in interest rates will cause an increase in the demand for housing and for landscaping. An increase in landscaping, in turn, creates an increase in the demand for materials such as YDC. Decreases in population and income, and increases in the interest rate will cause a decrease in the demand for housing and for landscaping. A decrease in landscaping will, in turn, decreases the demand for yard debris products. Due to the

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[18] Telephone survey completed during November, 1989.

[19] One unit equals 7.4 cubic yards.

absence of historical data on YDC product sales and the fact that econometric methods could not be utilized, all of the above mentioned variables were not explicitly used in establishing estimates of demand curve for YDC products. Population projections were used as the primary variable in estimating the demand curve for different points in time.

Assumptions

In the absence of strong evidence to the contrary, it is ordinarily assumed that current trends regarding population, income, housing, and consumption patterns will continue into the future. However, it must be taken into consideration that over the past several years the Portland Metropolitan area economy has experienced a period of strong recovery following the recession of the early eighties and that many economists predict an eventual leveling off of this expansion phase. The market for YDC, because it is so dependent on the landscaping industry, is likely to be unusually sensitive to economic conditions.

Products are said to have time, place, and form utility. That is to say a product has greater utility to consumers if it is available when they want it, where they want it, and in the form they want it. In the case of yard debris compost, time, place, and form utility may be limiting factors in market demand. At present, yard debris compost is mostly available in bulk through a limited number of processors. The assumption made in this analysis is that YDC will be aggressively marketed in both bulk and bagged form.

It was assumed that prices of products that compete with YDC will remain stable. This is an assumption that has to be examined carefully with respect to bark. If the quantity of bark were to go down due to a decline in logging or if bark were to be diverted in significant quantities from landscaping use to use as a hogged fuel, then its price could potentially increase to the point where YDC would become a much more economically attractive landscaping alternative.

The present study considered only yard debris and compost that was utilized at a site other than the site at which it was produced. Thus home composting was excluded as being a non-market commodity. The study also excluded yard debris that is co-composted with sewage sludge. Sludge/yard debris mixed compost has a different nutrient value from YDC and user perception and pricing of the co-composted product also varies significantly from that of straight YDC or YDC blends. The amount of YDC products produced and marketed in 1988 by McFarlane's Bark, Grimm's Fuel Co., the city of West Linn, and

the City of Portland is estimated to be approximately 83,000 cubic yards.

Both chipped and composted yard debris are often used as final cover during the closure of landfills. In 1988 the operator of the St. Johns Landfill purchased 59,760 cubic yards of YDC from McFarlane's.[20] The landfill is scheduled to go through the process of closure during 1991 and 1992. The volume of yard debris derived cover contracted for 1990 is 44,467 cubic yards (13,340 tons). The volume required between 1991 and 1995 amounts to an additional 235,425 cubic yards, or 47,085 annually.

For the purpose of this analysis, the tipping fees charged for source separated yard debris at the processor facilities were assumed to remain stable.

Methodology

Yard debris compost has only been on the market on a commercial scale for about four years. For this reason there are only three year's worth of data available for estimating a demand function. This is clearly too little data to estimate a demand curve using standard econometric methods. The task is further complicated by the fact that the product is in an expansion phase following its introduction into the market. After most of the early adopters have begun using the product, the rate of increase in demand will begin to slow.

It was hypothesized that the demand curve for yard debris compost would likely be similar to the demand curve for bark dust, a closely competitive product. However, contacts with the Oregon State Department of Forestry, the Forestry Department at Oregon State University, and a computerized library search using Portland State University's ABI Inform system failed to turn up any information related to the demand for bark dust.

The analysis was done in two steps. The first step was to estimate the location of three points on the present demand curve for YDC. Each point correspondeds to the quantity of yard debris demanded at a different price. The particular prices chosen were zero, the current average (or equilibrium) price for the most popular YDC products, and a price equal to that of competing products. In its use as a top dressing, the closest competing product is bark. In its use as a soil conditioner, competing

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[20] This amount is not included in the previously mentioned total of 83,000 cu. yds.

products include manures, mushroom compost, and other related products.

Grimm's and McFarlane's both sell various blends of YDC. Grimm's largest selling YDC product is actually 100 percent YDC which is screened and sold as Garden Mulch. McFarlane's largest seller is a blend that contains 80 percent YDC and is sold as Compo-Stuff. The quantities used in estimating the demand curves includes all YDC and blends sold. Thought was given to using a weighted average of the prices for different YDC products against which the quantities could have been plotted. However, the effect of plotting a weighted average price against the sum of the volumes of all YDC products sold would have been a reduction in the apparent price for YDC and a corresponding understatement of the amount demanded at all prices. Another approach would have been to estimate separate demand curves for each blend, but since each of these products comprise only a small proportion of total sales, it was judged impractical to estimate separate demand curves for each. Thus, as a practical alternative, the price for fine grade Garden Mulch and fine grade Compo-Stuff were used as being representative of all yard debris compost products.

After three points on the demand curve were estimated using the procedure described above, a smooth curve was then fitted to the data using a logarithmic. This logarithmic function is the estimated demand curve for yard debris compost.

The second step in the analysis was to estimate the shifts that are expected take place as changes occur in the factors that influence demand. Such changes include population, income, the number of housing starts, increased efforts at promoting and marketing yard debris compost, and the use of YDC for landfill cover. Demand was estimated for each year from 1988 through 2010.

Data Collection

Much of the data regarding the marketing of yard debris and bark was taken from recent studies done for Metro by the consulting firms of Northwest Economic Associates and Cal Recovery. Primary data specific to the present study was gathered through a telephone survey of chippers/tree services performed by Northwest Economic Associates and Metro staff.

Quantity Demanded At Current Average Price

Metro has already accumulated sales data on yard debris compost from the region's major processors. Prices seem to be clustering close together at a level just below that of bark. Based on information provided by the processors it appears that sales are

just keeping pace with production such that the market is cleared and there exists neither a shortage nor a surplus. Since the market appears to be in equilibrium, the amount of yard debris compost presently being sold is assumed to be equal to the maximum that can be sold at the current average price given the present level of market promotion and the current adoption rate of use. As consumer knowledge about the product spreads, however, the quantity demanded at the current price is expected to increase.

The 1988-89 average market price for YDC picked up at the processor's facilities ranged from about $7.50 to $10 per cubic yard, depending upon the size of the lot purchased. The total number of cubic yards marketed was 83,029 cubic yards. According to the Cal Recovery report (pp. 4-42), the average volume of YDC used per residence is 0.5 cubic yards.[21]

TABLE 4

BREAKDOWN OF YDC USE BY APPLICATION AND USER

APPLICATION	PERCENT OF TOTAL	YDC VOLUME	RESIDENTIAL %	RESIDENTIAL CU YDS	LANDSCAPING %	LANDSCAPING CU YDS	INSTITUTIONAL %	INSTITUTIONAL CU YDS	NURSERY %	NURSERY CU YDS
Top Dressing	46	38,193	75	28,645	25	9,548	0	0	0	0
Conditioner	44	36,533	69	25,208	21	7,672	10	3,653	0	0
Potting Soil	10	8,303	0	0	0	0	0	0	100	8,303
TOTAL	100	83,029		53,853		17,220		3,653		8,303

[21] Portland Area Compost Market Study, Cal Recovery, Inc., October 1988. p. 4-42.

Quantity Demanded At A Zero Price

Yard debris compost is a substitute for bark as a top dressing. As a soil conditioner it is competitive with manure, peat moss, and other composted products. As the price of YDC is reduced, two scenarios are possible. The first is that as the compost price is lowered from its equilibrium price, the prices of competing products are also dropped in order to retain market share.

In the second scenario, prices of competing products would remain fairly stable and there would simply be a partial displacement of these materials by YDC. It is expected that the latter scenario is more likely, though some price adjustment of competing products is likely to occur.

At a price of zero it is also possible that yard debris compost would become economically feasible for new uses including agriculture, erosion control, and mud control at construction sites. Depending upon transportation and application costs, these latter uses could conceivably absorb large quantities of material. However, since estimates of potential use are not available at this time, they have been omitted from the analysis.

There is little empirical data from which to base an estimate of the quantity demanded at a zero price and it was beyond the scope of this research to conduct surveys of potential users[22]. Therefore, much of the analysis was based upon realistic assumptions regarding market absorption. The demand curve derived from these assumptions forms a baseline which can be refined as more data is accumulated. Three responses will occur in response to a price reduction:

1. YDC products will substitute for competing products,

2. Current users will increase their consumption, and

3. New users will enter the soil amendment markets.

Substitution of Yard Debris Compost For Non-Bark Soil Amendments

In order to estimate the quantity of other soil amendments that would be displaced by YDC products if YDC were a free good, the behavior of each user group was examined with regard to its use of both top dressings and soil conditioners. The estimated

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[22] Surveys to elicit answers regarding what one would do in a hypothetical situation are of questionable validity anyway.

displacement of competing products by YDC was then calculated as a weighted average.

Bark was considered separately from products that compete with YDC directly as a soil conditioner. This is because bark is primarily used as a top dressing and potting mix component but it is not generally incorporated into the soil as a conditioner. The volumes of these competitive soil conditioners, broken down by user, is presented in Table 5. Allocation of these products across user groups is assumed to be in the same proportion as YDC for use as a soil conditioner.

TABLE 5

NON-BARK PRODUCTS THAT COMPETE WITH YDC

PRODUCT	RESIDENTIAL	LANDSCAPE	INSTITUTIONAL	NURSERY	TOTAL
Sewage Sludge	Negligible	40,000	10,000	24,000	74,000
Manure	232,000	7,000	200	92,000	331,200
Sawdust	23,000	35,000	100	99,000	357,000
Mushroom Compost	45,000	5,000	200	26,000	76,200
Peat Moss	22,000	5,000	Negligible	48,000	75,000
Other	27,000	5,000	4,800	15,000	51,000
TOTAL	349,000	97,000	15,500	504,000	965,000

In order to estimate the amount of these non-bark products displaced by YDC at a price of zero, assumptions were made regarding the percentage of each application/user combination that could reasonably be expected to be displaced. The total displacement was then calculated as a weighted average. The estimated displacements, both in terms of percentages and total cubic yards are given in Table 6. The total amount of non-bark products estimated to be displaced by YDC products is 272,271 cubic yards.

TABLE 6

SUBSTITUTION OF YDC FOR COMPETING SOIL CONDITIONERS WHEN THE YDC PRICE IS ZERO

	TOP DRESSING		SOIL CONDITIONER		POTTING SOIL		TOTAL SUBSTITUTION
	%	CU YDS	%	CU YDS	%	CU YDS	
Residential	20	77,240	35	107,257			184,497
Landscaping	20	19,310	35	32,644			51,954
Institutional			35	15,545			15,545
Nurseries					15	20,276	20,276
TOTAL		96,550		155,446		20,276	272,271

*Cal Recovery, Inc., p. 1-6. The Cal Recovery report presented a range of values for each of the above listed products. In order to take a conservative approach, the figures used here are from the low end of that range.

Although there may be some use of mushroom compost as a top dressing, its use is negligible relative to bark and therefore it was not considered as a substitute in this market. All other non-bark products are suitable only as substitutes in the container and nursery markets.

Substitution of Yard Debris Compost for Bark

Bark is the product that is most competitive with yard debris compost for use as a top dressing. Because of its availability in large quantities as a byproduct of the Pacific Northwest's lumber industry, bark has long been the standard product used as a mulch by homeowners and landscapers and as a component of the potting soils used by the Northwest's large nursery industry.

At a price of zero, YDC would displace some amount of bark as a top dressing and as a potting mix component. The estimated displacement by percentage ant total cubic yards for each combination of application and user are given in Table 7. The total amount of bark displaced is 289,340 cubic yards. The sum of the displaced bark and non-bark soil amendments is 561,611 cubic yards. It is worth noting that, because the bark market is so large, every percentage point of the bark market displaced by YDC amounts to a considerable volume of material.

TABLE 7

SUBSTITUTION OF YDC FOR BARK WHEN THE YDC PRICE IS ZERO

USER	TOP DRESSING %	TOP DRESSING CU YDS	POTTING SOIL %	POTTING SOIL CU YDS	TOTAL SUBSTITUTION CU YDS
Residential	20	176,200			176,200
Landscaping	20	48,000			48,000
Institutional	20	940			940
Nurseries			10	64,200	64,200
TOTAL		225,140		64,200	289,340

Entry Into the Market of New Soil Amendment Users

In addition to the substitution effect, a reduction in the price of YDC would be expected to result in an increase in the number of users, as those with low reservation prices who previously used no soil amendments at all find it advantageous to enter the market when YDC is a free good and only the transportation cost need be considered.

The number of potential new users is limited by the current pool of non-users, primarily residential. According to the residential telephone survey done by Cal Recovery (p. A-2), only 27 percent of the respondents do not currently use soil amendments. Of this number, a significant proportion may be renters who would not enter the market even if transportation were the only cost[23]. The assumption was made that five percent of that 27 percent of the region's 522,000 households[24] would enter the market to become new users of yard debris compost if its price were zero. This amounts to .05 (.27) (522,000) = 7,047 new users. It was assumed that these new users come into the market at a lower level of usage than established users. The original Cal Recovery figure of 0.5 cubic yards per household was used for a total increase in YDC usage resulting from the entry into the market of new users of 3,523 cubic yards.

Increase In Per User Demand

It is expected that at a zero price for YDC, current users of organic soil amendments would also increase the total level of amendments used as well as substituting YDC for bark. An increase in the quantity demanded per user would likely result from more frequent renewal of mulch applications and more extensive use of YDC as a soil conditioner. Part of the increase would come of users finding additional uses for the material such as mud control. The increase would be primarily among residential and landscape users. The increases in use for both user categories were assumed to be 10 percent for use as a top dressing and 25 percent for use as a soil conditioner. The total increase in use was estimated as a weighted average.

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[23] Sixteen percent of all respondents listed themselves as renters.

[24] The Regional Forecast, Metro, June 1989, p. 26.

TABLE 8

TOTAL QUANTITY OF YDC DEMANDED WHEN THE PRICE IS ZERO

USER	Top Dressing (1) Sub for Bark	Top Dressing (2) Current Incr App	Soil Conditioner (3) Sub for Non-Bark	Soil Conditioner (4) Current Incr App	Potting Soil (5) Sub for Bark	Potting Soil (6) Sub for Non-Bark	Potting Soil (7) Current App	TOTAL
Residential	176,200	31,510	107,257	31,510				346,476
Landscaping	48,000	10,503	32,644	9,590				100,737
Institutional	940		15,545					16,485
Nurseries					64,200	20,276	8,303	92,778
TOTAL	225,140	42,013	155,446	41,099	64,200	20,276	8,303	556,476

The results are presented in Table 8. Columns (1) and (5) of that table are taken directly from Table 7. Column (3) is taken from Table 9. Columns (2) and (4) of Table 8 were calculated by multiplying current usages from Table 1 by 1.1 and 1.25, respectively in order to reflect the assumed usage increases of 10 percent for use as a top dressing and 25 percent for use as a soil conditioner. The total estimated displacement is 556,476 cubic yards. Adding in the estimated usage by new households entering the market yields a total demand, excluding landfill cover, of 600,000 cubic yards when the price of yard debris compost is zero.

Quantity Of YDC Demanded At A Higher Than Average Price

Table 9 shows Grimm's and McFarlane's prices for yard debris compost, fir bark, and hemlock bark. All prices are for a fine grade material. Hemlock bark is superior to fir bark in that it has no splinters.

TABLE 9

1988-89 PRICES FOR YARD DEBRIS COMPOST AND BARK

TYPE OF PRODUCT	GRIMM'S PRICE PER CUBIC YARD	GRIMM'S PRICE PER UNIT	McFARLANE'S PRICE PER CUBIC YARD	McFARLANE'S PRICE PER UNIT
Yard Debris Compost	$10.00	$65.00	$ 8.80	$55.00
Fir Bark	$11.00	$70.00	$11.25	$72.00
Hemlock Bark	$12.00	$76.00	$11.25	$72.00

*Based on scoop prices. One scoop equals 1.25 cu. yd.

Grimm's and McFarlane's have experimented with their price structures and arrived at prices which presumably maximize profits. At present Grimm's fir bark price is ten percent higher than their compost price. The spread for McFarlane's is 28.4 percent. The difference in the spreads may partially reflect the fact that Grimm's concentrates its commercial compost sales more on the relatively less price sensitive nursery market while McFarlane's has targeted the more price sensitive landscaping market. It may also reflect differences in marketing strategies. As with a price decrease, an increase in the price of YDC would be expected to impact the different user/application combinations to differing degrees. The reasons are the same as before: YDC is more substitutable with non-bark amendments used as soil conditioners than it is with bark used as a top dressing and because the landscaping sector is believed to be more price sensitive than the residential sector. Homeowners who have gone through the process of trying yard debris compost and subsequently adopted the practice of using it as a soil conditioner do not generally regard it as being inferior to manures and other alternative products. Thus, even if YDC were as expensive as competing products, it is assumed that there would be only five percent decline in YDC use as users substitute alternative products, though, the speed with which potential new users would adopt trial use of the product would be greatly slowed. Due to their greater price sensitivity, ten percent of the landscaping and institutional use of YDC was assumed to switch over to the more traditional soil conditioning products.

Assuming a 15 percent decline in sales in the residential submarket and a 25 percent decline in the nursery, landscape, and public agency submarkets, the total loss in sales was calculated as the weighted average. The estimated extent of substitution of competing soil conditioners for YDC is given in Table 10. The estimated extent of substitution of bark for YDC is given in Table 11. These results, along with the estimated decrease in application due to the higher price alone are compiled in Table 12.

TABLES 10, 11, 12

SUBSTITUTION OF COMPETING SOIL CONDITIONERS FOR YDC WHEN THE YDC PRICE = PRICE OF COMPETING PRODUCTS

	TOP DRESSING		SOIL CONDITIONER		POTTING SOIL		TOTAL SUBSTITUTION
	%	CU YDS	%	CU YDS	%	CU YDS	
Residential	10	2,865	5	1,260			4,125
Landscaping	15	1,432	10	767			2,199
Institutional			10	365			365
Nurseries					5	415	415
TOTAL		4,297		2,393		415	7,105

SUBSTITUTION OF BARK FOR YDC WHEN THE YDC PRICE IS = BARK PRICE

USER	TOP DRESSING		POTTING SOIL		TOTAL SUBSTITUTION CU YDS
	%	CU YDS	%	CU YDS	
Residential	10	2,865			2,865
Landscaping	25	2,387			2,387
Institutional					
Nurseries			15	1,245	1,245
TOTAL		5,252		1,245	6,497

TOTAL QUANTITY OF YDC DEMANDED WHEN THE PRICE IS = PRICE OF COMPETING PRODUCTS

USER	Top Dressing		Soil Conditioner		Potting Soil		TOTAL
	(1) Sub for YDC	(2) Current Decr App	(3) Sub for YDC	(4) Current Decr App	(5) Sub for YDC	(6) Current Decr App	
Residential	(2,865)	25,781	(2,865)	23,947			43,999
Landscaping	(2,387)	5,754	(1,432)	6,905			8,839
Institutional				3,288			3,288
Nurseries					(1,661)	6,227	4,567
TOTAL	(5,252)	31,534	(4,297)	34,140	(1,661)	6,227	60,693

Shifts in the Demand Curve Over Time

Figure 1 of Appendix V is the estimated demand curve for 1988. For planning purposes, this demand curve has been projected forward for each year out to the year 2010. Projecting the demand for any good or service as far as 20 years into the future is fraught with uncertainty even when data is abundant. Lifestyles, tastes and preferences, demographics, economic conditions, and nearly every other determinant of demand is likely to change in unanticipated ways over such a long time horizon. With yard debris compost the dearth of time series data makes the enterprise even more tentative.

The rate of growth in YDC product sales for Grimm's and McFarlane's combined was 20 percent between 1987 and 1988. Based on records covering the first ten months of 1989, the growth rate from 1988 to 1989 is projected to be 12 percent. As the market approaches saturation, growth in sales is expected to lessen even more.

By the year 2010 the number of households in the region is projected to be 762,280[25], a 46 percent increase over 1987. Thus, based on population growth alone the amount of YDC consumed may be expected to increase by the same percentage. However, promotional efforts are anticipated to result in an increase in use beyond that attributable to population growth alone. The increase is expected to come from both an increase in the proportion of households using YDC and an increase in YDC use per household. It is important to note that these increases are expected to result from promotion, a non-price factor, and should not be confused with sales increases resulting from a reduction in price. It is judged that by the year 2010, non-price factors can increase per household YDC consumption by 20 percent or more over the present level.

In order to reflect the uncertainty regarding increases in per household use of YDC, demand curves were estimated using two different rates of increase. The rates used were 21 percent and 51 percent. The difference between the curves plotted at each rate should be interpreted as a reasonable range for the true demand function.

The growth rate based on projected increases in the number of households plus a total increase in per household use of YDC of 51 percent over a 20 year period is:

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[25] The Regional Forecast, p. 26.

12 percent per year through 1989

8 percent per year through 1994,

5 percent per year through 1999,

2 percent per year through 2004 and

1 percent per year through 2009.

The growth rate based on projected increases in the number of households plus a total increase in per household use of YDC of 21 percent over a 20 year period is:

12 percent per year through 1989

6 percent per year through 1994,

3 percent per year through 1999,

1.5 percent per year through 2004 and
1 percent per year through 2009.

Based on this scenario, the quantities of yard debris compost that could be marketed in each year at each of the prices considered are presented in Table 10. Since sales of YDC for landfill cover comprise only a temporary market segment, they have been added on rather than included in the base.

Conclusions

The shape and positions of the estimated demand curves in the graphs in Appendix V are more certain for prices close to the current price of $9.00 per cubic yard and less certain the farther one moves from this price in either direction. The logarithmic function chosen to fit the curves to the estimated points was one of an infinite number of curvelinear functions that could have been selected. However, some experimentation with other functions including higher order polynomials gave very similar results at prices over $5.00 per cubic yard.

In order to determine what range of price/quantity combinations is relevant for decision making purposes a rough estimate was made of the total amount of yard debris generated in the region. Though there is much uncertainty associated with the number, 2.7 million cubic yards appears to be a reasonable estimate. Based on a reduction ratio of loose yard debris to finished compost of somewhere between 7-to-1 and 6-to-1, this means that if all the

yard debris in the region could be collected and processed into compost, the total quantity of YDC would range from about 386,000 to 450,000 cubic yards. Thus, the portion of the demand curve that lies to the right of the 450,000 cubic yard mark on the Figures depicting demand for the late 1980's and early 1990's is not within the relevant range. This region corresponds to a price range of $2.00 to $3.00. If the demand curves are reasonably accurate then it seems unlikely that YDC products would have to be sold for a price less than about $2.00 per cubic yard even if all yard debris generated were processed into compost and sold. It is even less likely that compost would ever have to be given away in order to dispose of it. For later years, yard debris generation is expected to increase along with the projected increase in the number of households.

For any particular price, the corresponding point on the demand curve indicates the maximum amount of YDC product that can be sold. The sale of any greater volume of product will necessitate a decrease in the price. As indicated in Figure 22 of Appendix V, even in the year 2009 the projected amount of YDC products demanded at a typical price of $9.00 per cubic yard (in 1989 dollars) is below the processed equivalent of all the region's yard debris. Thus, it appears possible that more source separated yard debris can be collected than can be marketed in the form of YDC at current average prices. It should be noted, however that the development of additional uses for YDC and/or extraordinary marketing efforts on the part of the processors themselves can cause the demand curves to shift to the right enabling more YDC products to be sold at the same prices indicated in Figures 1 through 24 of Appendix V).

2) Short-term Market Capacity

The purpose of the short-term market analysis is to determine the capacity of the yard debris compost market by July 1991 when local governments are expected to begin implementation of the plan requirements. Projected capacity is to be balanced with appropriate collection options that are recommended for local government by July 1991. Short-term capacity was based on market performance for the period 1986 to 1989 for which data was available. As shown below in Table 13, there is evidence that the market is still growing or that it is currently on the "steep" of the growth curve.

TABLE 13
Estimates of Short-term Market Growth

Year	Percent Change From Previous Year
1986	-
1987	37 %
1988	20 %
1989	14 %
1990	15-20 % expected
1991	10-15 % expected

The information in Table 13 suggests that over the next two years (1990 and 1991) growth in market demand for yard debris compost is expected to be in the range of 25 - 35 percent under current market efforts by the processors and Metro. Current market data indicates that 80,000 composted cubic yards was sold in the region in 1989. Additional growth resulting from the 25 - 35 percent increase is estimated at 24,000 composted cubic yards. The resulting market capacity for 1991 is estimated at 104,000 composted cubic yards.

Existing Market Capacity	80,000 composted cu. yds.
Expected Market Growth (30%)	24,000 " " "
	104,000

In addition to increased market demand expected due to normal market growth, about 47,000 composted cubic yards of yard debris products will be needed as cover for the St. John's Landfill annually for years 1991, 1992, and 1993.

Based on the above information total market demand for yard debris products expected for 1991 is estimated as follows:

Existing Market Capacity	80,000 composted cu. yds.
Expected Market Growth (30%)	24,000 " " "
St. John's Cover	47,000 " " "
	151,000 " " "

IV) PROGRAM CONCLUSIONS/IMPLEMENTATION REQUIREMENTS

This section of the Plan provides an explanation of the conclusions formulated from the established plan policy directives, knowledge and experience obtained from the existing yard debris and solid waste system and results of the technical analysis. These conclusions and implementation requirements are the basis for the tasks identified in the five year work program for DEQ, Metro and local governments in carrying out the regional yard debris program.

SUMMARY

The following is a summary of the yard debris plan conclusions and implementation requirements:

Policy Directives

The Plan is premised upon a comprehensive set of policy directives. Of primary importance are those directives which articulate that the regional yard debris plan is to be a market-driven plan. Specifically:

- "The Regional Yard Debris Recycling Plan shall be market-driven with collection options to be balanced with market capacity;" and
- "Local governments shall implement those collection programs that would produce the projected increases in yard debris consistent with market and processing capacity;" and
- "A conservative approach should be taken in establishing the initial yard debris collection programs due to the uncertainty that exists relative to potential market capacity for yard debris compost."

Existing System

Experience with the existing yard debris system in the region has indicated that changes are necessary to achieve a yard debris system which is more efficient and conducive to yard debris recycling. Of primary importance are the need for Metro to:

1. Regulate the yard debris processors (preferably by franchise) to insure that material generated is received, processed and marketed in a predictable and equitable manner; and,

2. Provide an effective diversion program which results in yard debris getting to the processors instead of dumped as mixed solid waste at disposal facilities.

Market/Processing Capacity

The processing capacity analysis in the Plan indicates that the primary limitation to increasing yard debris through the processing end of the system is market capacity. The long-term market capacity analysis shows that over time market capacity may exist to support a high volume collection system such as a weekly curbside program. However, the short-term market capacity analysis shows that the demand for compost estimated in 1991 (the first year of program implementation) is 151,000 composted cubic yards. This figure represents the market capacity level to which the first year (1991) local government collection program standards are established.

Collection Programs

The collection programs analysis in the Plan indicates that the most efficient collection system is one which provides frequent (weekly) convenient (curbside) service paid for by a wide base of all potential users of the service. Therefore, each local government in the region needs to work towards implementation of a weekly curbside collection system for yard debris unless: 1) the region can demonstrate that market capacity is not adequate to receive the material generated; or 2) it can be demonstrated that the cost per ton of a weekly curbside collection program is significantly greater than the yard debris collection option established to meet the minimum standards of the plan. This is felt to be a realistic objective within 3 years of plan implementation (by July 1, 1994).

The collection programs established as the minimum standard to be implemented by July 1, 1991 are:

Self-haul:	o	monthly rotating depot (user pay[26])
	o	weekly low density depot (non-permanent, user pay)
	o	weekly low density depot (permanent, user pay)
Curbside:	o	weekly (user pay)
	o	monthly (user pay)

[26]Users of a yard debris recycling depot or curbside collection service pay a fee determined by the service provider. User pay programs must comply with ORS 459.190.

These programs have been established as the minimum standard based in part on balancing yard debris volumes generated from these programs with expected market capacity for 1991. In designing collection programs, local governments need to consider the costs associated with transitioning the program established in 1991 to a curbside collection system within a relatively short time. A local government has the option to implement any collection program they wish as long as the volumes generated from these other collection programs are at least equal to the range of volumes expected from the collection options identified above. If a local government chooses to implement a new collection program that will be known to generate volumes greater than those identified above, then that local government will need to work with Metro in determining and managing the impact of the resulting additional volumes of material on market capacity.

If a local government implements a depot system, it will also be necessary for that local government to provide on-call user pay curbside collection service since some residences don't have the capability to self-haul their material and therefore need this service available to them. At a minimum, this service needs to include drop box collection service.

The plan recognizes the importance of enhancing the existing yard debris source reduction activities in the region. Therefore, local governments also need to work cooperatively with Metro and the wasteshed representatives to establish and carry out four (4) home-composting education site projects in the region.

The following section of the plan describes these conclusions and implementation requirements in greater detail.

A) Policy Directives.

Section I of this Plan identifies a comprehensive set of policy directives which establish its policy premise. The policy directives of primary importance are those which articulate that the regional yard debris plan is to be a market driven plan. Specifically,

- "The Regional Yard Debris Recycling Plan shall be market driven with collection options to be balanced with market capacity,"
- "Local governments shall implement those collection programs that would produce the projected increases in yard debris consistent with market and processing capacity," and
- "A conservative approach should be taken in establishing the initial yard debris collection programs due to the uncertainty that exists relative to potential market capacity for yard debris compost."

The "market" as implied throughout this Plan is the yard debris compost market. The technical analysis identified that while there are other end uses for yard debris, the end use as compost is really the only established and viable market for yard debris as a product.

It should be noted that this "market driven" concept is somewhat skewed in that current yard debris collection and compost market activities include government involvement, particularly by Metro. However, the degree and influence of government involvement for yard debris is probably not any greater than that of government regulations and influences applied to other commodities.

The alternative approach to a market driven plan is to develop an "avoided cost" plan. A plan premised upon "avoided cost" would mean that yard debris programs would be justifiable to the extent that they cost less than the cost of disposal established for the solid waste system. Avoided cost is usually determined by adding up costs of collection, transfer and disposal of solid waste. Sometimes environmental considerations and future value of saved landfill space are also factored in.

While the Plan does not analyze and determine the avoided cost to the system as a result of diverting yard debris, a quick review of the cost per ton of the most intensive collection systems identified in the analysis would indicate that most of the residentially generated yard debris in the system can be collected at a cost less than disposal. While this quick review may theoretically be correct, there are a couple of reasons why

this approach was not justifiable for the metro area. First, for yard debris, the transfer of dollars which are supposed to be saved by the material not being disposed (avoided cost) doesn't really completely happen for material generated by the residential sector. Often, people who don't have yard debris collection service dispose of the material by stockpiling it in their backyard, throwing it on an empty lot or by making crude attempts at home composting instead of paying to dispose of it at a landfill or transfer station. Many yard debris collection programs around the country have determined that yard debris is actually "generated" as a result of providing a yard debris collection service. That is, material comes in to the yard debris collection system that would not otherwise be picked up by the hauler as mixed solid waste.

It should also be noted that the "avoided cost" formula assumes that dollars are saved by not disposing of the recyclable material. For yard debris, this transfer of dollars from disposal to recycling is an extremely difficult transaction to make. The yard debris system is made up of both private and public entities, all of which are sometimes subsidizing the system by dollars not related to yard debris and in some cases not related even to solid waste disposal and sometimes collecting dollars for providing a yard debris service for which little or no expense is incurred until future years (in the case of a processor).

The second primary reason for not establishing an "avoided cost" system is because it is not acceptable to stockpile yard debris in the region. It is felt that this type of system (based on "avoided cost") would result in large quantities of yard debris being piled up at processors sites awaiting processing and composting. This concern is a reality for other yard debris programs across the country and has also been a reality for the metro area in the past. Stockpiling yard debris is proven to result in contamination of the material -- at times to the degree such that yard debris has to be put in the landfill. Further, problems with fires, rodent control, water quality, odors and aesthetics are all very real when the material is stockpiled in large quantities.

B) **Existing System.**

Section II of this Plan describes the existing yard debris system. While the existing system is meritorious, experience has indicated that changes are in order to achieve a system which is more efficient and conducive to yard debris recycling.

Of primary importance to the successful implementation of a regional yard debris system is the need to regulate the yard debris processors and the need to provide an effective yard debris diversion program for the commercial users of the system.

1) Regulating the Processors:

Grimm's Fuel Company and McFarlane's Bark, Inc. have been the key to the region's successful yard debris recycling program to date. These privately owned and operated companies have been recognized nationally for their innovation and overall accomplishments in effectively processing large volumes of yard debris and consistently producing a high-quality compost product.

However, experience has shown that in order to achieve receiving, processing and marketing of even greater volumes of yard debris a higher degree of certainty needs to exist relative to the processors. The most effective way to insure such certainty is to regulate the processing component of the yard debris system.

The objective of such regulation is to insure that yard debris collected by the local government collection system is received, processed and marketed in a predictable and equitable manner. To achieve this objective, three primary issues need to be addressed through a regulatory means. They are:

1) Establish standards for determining acceptability of yard debris at the processing facility.

Currently, the regional processors primarily only allow "clean" loads of yard debris at their facilities. In the past, exceptions to this standard have been taken to allow yard debris in bags to be received for processing. This special provision has been allowed to facilitate an efficient local government yard debris collection service.

With all local governments being required to implement a yard debris collection service there is a need to determine what loads of yard debris are acceptable and which are not. This needs to be evaluated and decided upon by balancing the needs of the local government collection system with the capability of the processors to efficiently handle the incoming material. These standards are necessary in order for local governments and

haulers to design collection programs which are compatible with the regional processing system. Further, these standards give the processors the ability to reject, receive and assess appropriate prices for incoming loads in a consistent and well defined manner, thus avoiding potential claims of discrepancies by local governments or haulers.

Further, drop box companies in the region claim that they maintain policies to not take drop boxes of yard debris to area processors even though it may result in a disposal cost savings. Their claims are premised upon experiences which suggest that if processors, find any degree of contamination in the drop box, the whole load is rejected. Standards for determining acceptable and unacceptable loads need to address this issue in conjunction with carrying out an effective yard debris diversion program.

2) Maintain stability in establishing rates charged for incoming loads of yard debris.

Experience with the existing system indicates that the yard debris processors adjust their rates for incoming yard debris based on their individual business operations at varying times throughout the year. This results in a high degree of unpredictability in accurately assessing the annual cost of a collection program for local governments and haulers alike. In order to implement a more efficient yard debris system in the region, processors should set and adjust rates on a regular schedule with adequate notice to Metro, local governments and haulers.

Further, Metro should seek enabling code revisions such as establishing maximum rates for processors, licensing, franchising or contracting to more effectively provide adequate financial certainty to local governments in determining the annual processing costs of local yard debris collection programs.

It is not Metro's intent to establish the actual rate charged for incoming yard debris at processing facilities. The objective is to provide predictability in the rate setting process for all entities impacted by yard debris rate adjustments.

3) Establish product quality standards for yard debris compost products

The quality of compost products is a key factor for the long-term success of yard debris composting in the region. Metro's past and current tests of the products indicate no problems with the region's compost products. However, as the cost of disposing mixed solid waste continues to increase more yard debris composting facilities may come on line. There is no guarantee that the quality of the region's compost products will continue to be the same. The production and sale of poor quality yard debris products could result in loss of customers/users and would negatively affect the overall regional yard debris system. Establishing product quality standards will help assure that the high quality of compost products is maintained.

These issues will need to be negotiated and further developed between Metro and the processors. Other issues may also be appropriate for consideration under a license, franchise or contract issued by Metro after the above objectives are resolved, such as continued data collection, processing techniques and operational impact mitigation.

2) Yard Debris Diversion Program

Existing solid waste system practices indicate that an effective yard debris program cannot be achieved without a good diversion program aimed primarily at commercial users of the system. The yard debris Plan defines commercial users as drop box companies, general contractors, and landscape contractors which dispose of relatively large loads of yard debris on a frequent basis. The objective of a yard debris diversion program is to establish adequate incentives or disincentives which effectively results in yard debris getting to the processors, instead of it being dumped as mixed solid waste at disposal facilities.

For the purpose of this Plan, several strategies and programs are identified to provide Metro a basis for designing an effective yard debris diversion program. The volume impact of a diversion program has been estimated as shown on Figure 13. Figure 13 illustrates that the equivalent of approximately 18,000 composted cubic yards of yard debris is expected to be recoverable upon implementation of the program. It should be noted that this is felt to be a very conservative estimate in that yard debris volumes potentially available from waste going to the St. Johns landfill have not been accounted for.

Regulatory Programs

A) Full Disposal Ban:

The EQC/DEQ or Metro could require that all yard debris generated within the Metro region be banned from disposal at landfills receiving that material. This could be enforced by Metro at all regional transfer stations and Metro owned land disposal facilities. All loads would be inspected for yard debris prior to its discharge; should a load contain significant quantities of uncontaminated yard debris the hauler would be required to separate it at the transfer station or be required to direct to the nearest yard debris processor. Haulers could receive a penalty (i.e., higher tip fee) from Metro for disposing loads of yard debris which are non-processable due to contamination.

Numerous states, counties and municipalities throughout the country have passed legislation banning the disposal of yard debris at landfills and incinerators. A key to making a disposal ban effective is to make them a part of a comprehensive approach that includes adequate recycling alternatives. It should be noted that a disposal ban may result in an increase in illegal dumping activity.

B) Mandatory Source Separation:

The EQC/DEQ or Metro could require all commercial, institutional, and residential generators of yard debris to keep yard debris separate from MSW and direct it to yard debris processors. Penalties could be levied by Metro at disposal facilities for non-compliance or as a surcharge levied by the local government or hauler upon collection.

Successful mandatory recycling programs have been enacted in the states of Rhode Island and New Jersey for multiple materials. A key function of a mandatory source separation program is to educate generators on the availability of recycling options. The enactment of a ban is virtually impossible to enforce, but has strong symbolic value which can motivate generators to actively recycle the materials.

C) Mandatory Institutional Purchasing:

A direct approach to expand yard debris markets is to mandate that public agencies purchase yard debris compost. Metro could direct all state and local governments within the Metro region to increase their procurement programs for yard debris compost. The Annual Waste Reduction Program For Local Government specifies that all jurisdictions within the Metro region take steps to utilize yard debris compost in parks and at public facilities, as

FIGURE 13

POTENTIAL YARD DEBRIS DIVERSION LEVELS

		METRO SOUTH	HILLSBORO	TOTALS
1.	TOTAL 1989 WASTE DELIVERED TO THE FACILITY - TONS	341,000	102,000	443,000
2.	SELF HAUL - PERCENT	16%	20%	N/A
3.	COMMERCIAL DROP BOX - PERCENT	25%	70%	N/A
4.	SELF HAUL WASTE - TONS	55,000	20,000	75,000
5.	COMMERCIAL DROP BOX WASTE - TONS	85,000	71,000	156,000
6.	SELF HAUL YARD DEBRIS - PERCENT	10%	36%	N/A
7.	COMMERCIAL DROP BOX YARD DEBRIS - PERCENT	5%	5%	N/A
8.	SELF HAUL YARD DEBRIS - TONS	5,500	7,500	13,000
9.	COMMERCIAL DROP BOX YARD DEBRIS - TONS	4,500	3,500	8,000
10.	SELF HAUL YARD DEBRIS RECOVERABLE - PERCENT	80%	80%	N/A
11.	COMMERCIAL DROP BOX YARD DEBRIS RECOVERABLE - PERCENT	50%	50%	N/A
12.	SELF HAUL YARD DEBRIS RECOVERABLE - TONS	4,000	SEE BELOW	4,000
13.	COMMERCIAL DROP BOX YARD DEBRIS RECOVERABLE - TONS	2,000	2,000	4,000
14.	TOTAL YARD DEBRIS RECOVERABLE - TONS	6,000	2,000	8,000
15.	TOTAL YARD DEBRIS RECOVERABLE - COMPOSTED CUBIC YARDS	13,500	4,500	18,000

CALCULATION METHODOLOGY AND KEY ASSUMPTIONS

1. RECOVERABLE YARD DEBRIS IS CALCULATED AS FOLLOWS: FIRST, THE TOTAL TONNAGE DELIVERED TO METRO SOUTH AND HILLSBORO IS SHOWN ON LINE 1. THIS IS THEN MULTIPLIED BY THE PERCENTAGE OF SELF HAUL YARD DEBRIS, LINE 2, AND THE PERCENTAGE OF COMMERCIAL DROP BOXES, LINE 3, TO GET LINE 4, SELF HAUL TONNAGE, AND LINE 5 , COMMERCIAL DROP BOX TONNAGE. THESE LINES ARE THEN MULTIPLIED BY THE PERCENTAGE OF LOADS CONTAINING YARD DEBRIS, LINES 6 AND 7, TO GET THE TONNAGE OF SELF HAUL YARD DEBRIS, LINE 8, AND THE TONNAGE OF COMMERCIAL DROP BOX YARD DEBRIS, LINE 9. METRO STAFF THEN ESTIMATED THE MAXIMUM PERCENTAGE POTENTIALLY DIVERTABLE ASSUMING EFFECTIVE DIVERSION METHODS CAN BE IDENTIFIED AND IMPLEMENTED, LINES 10 AND 11. LINES 8 AND 9 WERE THEN MULTIPLIED BY LINES 10 AND 11 TO DETERMINE THE MAXIMUM POTENTIALLY RECOVERABLE YARD DEBRIS TONNAGES, LINES 12 AND 13. LINE 14 IS THE TOTAL OF THE SELF HAUL TONNAGE AND THE COMMERCIAL DROP BOX TONNAGE. THIS LINE WAS CONVERTED INTO COMPOSTED CUBIC YARDS OF YARD DEBRIS BY MULTIPLYING THEM BY 9 (THE CONVERSION RATIO OF LOOSE CUBIC YARDS OF YARD DEBRIS PER TON) AND THEN DIVIDED BY 4 (THE CONVERSION RATIO OF LOOSE CUBIC YARDS OF YARD DEBRIS PER CUBIC YARD OF FINISHED COMPOST). THE RESULT IS SHOWN ON LINE 15.

2. ALL FIGURES SHOWN ABOVE HAVE BEEN ROUNDED OFF TO REFLECT UNCERTAINTY.

3. THE STAFF ESTIMATE OF MAXIMUM PERCENTAGE POTENTIALLY DIVERTABLE ASSUMING EFFECTIVE DIVERSION METHODS CAN BE IDENTIFIED AND IMPLEMENTED IS BASED ON THE EFFECT OF VARIOUS FACILITY LIMITATIONS AND OPERATIONAL CONSIDERATIONS SUCH AS COMMERCIAL DRIVERS NOT KNOWING WHAT TYPE OF MATERIAL IS IN A LOAD PRIOR TO DISPOSAL.

4. THE EFFECT, IF ANY, OF THE CLOSURE OF THE ST. JOHNS LANDFILL ON YARD DEBRIS COLLECTION LEVELS IS CURRENTLY BEING REVIEWED AND ANALYZED BY METRO STAFF AND IS NOT AVAILABLE AT THIS TIME.

5. THE HILLSBORO SELF HAUL YARD DEBRIS RECOVERABLE TONNAGE SHOWN ON LINE 12 IS CURRENTLY ACCOUNTED FOR BY THE COLLECTION OPTION METHODOLOGY PREVIOUSLY RECOMMENDED BY VARIOUS METRO COMMITTEES.

6. LINES 2 AND 3 SHOW SELF HAUL AND COMMERCIAL LOADS CONTAINING GREATER THAN 80% YARD DEBRIS BY VOLUME.

7. COMMERCIAL DROP BOX LOADS ARE THOSE LOADS HAULED TO THE FACILITY IN DROP BOXES BY COMMERCIAL GARBAGE COLLECTION COMPANIES. THESE LOADS INCLUDE ALL TYPES OF DROP BOXES FROM ALL SOURCES, BUT DO NOT INCLUDE PACKER TRUCKS USED TO HAUL RESIDENTIAL GARBAGE. PACKER TRUCK LOADS OF RESIDENTIAL GARBAGE ARE TOO CONTAMINATED TO RECOVER EFFECTIVELY. SELF HAUL LOADS ARE THOSE LOADS HAULED TO THE FACILITY IN CARS OR PICKUP TRUCKS, INCLUDING SINGLE AXLE TRAILERS THAT WERE CHARGED THE NON-COMMERCIAL SELF HAUL RATE.

well as in other public works applications where soil amendments are used.

Additional provisions could be made by the EQC/DEQ to require government agencies at all levels (state, regional, and local) to use yard debris compost in all cases where ground cover or soil amendment products are purchased. Governments choosing to purchase non-recycled materials would be required to petition the DEQ and demonstrate that yard debris compost is not an adequate substitute.

Fee and Price Mechanisms

A) Current and Planned Diversion Credits:

Metro currently offers a reduced rate at the St. Johns Landfill to encourage source separation of yard debris. Self-haulers are charged a flat rate of $10 per trip for loads of source-separated yard debris in contrast to $15 for mixed solid waste. Commercial haulers are charged $25 per ton (with a minimum charge of $10) for source-separated yard debris in contrast to $41.75 per ton for mixed solid waste.

Part of the 1990 Metro South Transfer Station retrofit will include a depot for receiving source-separated yard debris. Because of design constraints at the facility, only limited quantities of the material will be collected for processing. Metro East Transfer Station will also have a drop box available for receiving source-separated yard debris. The same fee differential currently employed at St. Johns Landfill will be applied to source-separated yard debris at Metro South and Metro East.

B) Promotion/Education

Successful source-separation of yard debris by generators requires an aggressive promotional/educational effort on the part of the state, Metro, and local governments, as well as haulers, disposal facility operators and yard debris processors.

C) Market/Processing Capacity Conclusions

Section III of this Plan includes an analysis of yard debris processing and market capacity. The processing capacity analysis indicates that the primary limitation to increasing yard debris through the processing end of the system is market capacity. The market capacity analysis is an assessment of both long-term and short-term demand for yard debris compost. The long-term demand

study indicated that, if the market is given time to adjust and if yard debris compost is aggressively promoted, then all of the yard debris compost that can realistically be collected can be processed and sold but only at prices substantially below the range of prices that currently prevail in the market. The long-term study further concluded that within the range of current prices the growth of sales is projected to be much more moderate. This study indicates that over time, market capacity may exist to support a high volume collection system such as a weekly curbside program.

However, it is clear that enough uncertainty, related to the amount of capacity available at a reasonable price, exists so that it is not appropriate to use the long-term projections for the purpose of establishing the first year minimum standards for yard debris collection programs for local governments. For this plan, the long-term demand analysis establishes that the future for increased market capacity is optimistic. It also establishes a good premise for evaluating market activity closely in order that the region is provided an early determination for when adequate market capacity will exist to justify all jurisdictions having a weekly curbside collection program.

The short-term market capacity analysis is relatively simple. It indicates that based on data collected from 1986-1989, a 25-35% increase in demand for yard debris can be expected through 1991. This means that market capacity will grow from 80,000 composted cubic yards in 1989 to about 104,000 composted cubic yards in 1991. The short-term analysis also shows that about 47,000 composted cubic yards of compost will be used as cover for the St. John's landfill for the years 1991, 1992 and 1993. Demand for yard debris compost in 1991 is estimated to be approximately 151,000 composted cubic yards. This figure is significant in that it represents the market capacity level to which the first year (1991) local government collection program standards are established.

D) Collection Programs Conclusions

Section III of this plan describes the analysis conducted for the purpose of evaluating and ranking several potential source reduction and collection programs. This analysis clearly indicates that the most efficient collection system is one which provides frequent (weekly) convenient (curbside) service paid for by a wide base of all potential users of the service. This type of collection system is proven to be the most cost-effective.in terms of the cost per cubic yard of material generated from that system. Further, this type of collection program has the highest recovery rate (amount recycled) of all the programs evaluated.

The findings of the collection analysis indicate that the region needs to work towards implementation of a community-wide weekly on-route curbside collection system for yard debris, provided that market capacity exists to receive the material generated. At this time it is inconclusive as to what is the best method for applying the cost for such a service across all potential users of that system. For some jurisdictions a tax base might be an option, whereas a fee applied to a utility bill may work better in other jurisdictions. For jurisdictions that are not able to get a tax base and have no unified utility billing program, a user pay system may prove to be the most practical approach to finance the collection service. However, such an approach may not result in the high levels of participation that may be desired.

For the purpose of local governments planning and designing their collection programs it needs to be recognized that an objective of the regional yard debris system is to ultimately achieve implementation of on-route weekly curbside collection system within each jurisdiction. This is felt to be a realistic objective in the fourth year of plan implementation (July 1, 1994) unless: 1) the region can demonstrate that market capacity is not adequate to receive the material generated; or 2) it can be demonstated that the cost per ton of a weekly curbside collection program is significantly greater than the yard debris collection option established to meet the minimum standards of the plan. This objective needs to be factored into the design of collection programs which are required by July 1, 1991. Specifically, local governments need to consider the cost of transitioning the collection system established in 1991 to a curbside collection system within a relatively short time. Local governments need to consider the cost of amortizing equipment necessary to establish the July 1, 1991 program.

Jurisdictions which currently do not have any yard debris collection programs may find it best to initiate some type of regularly routed user pay curbside collection system instead of

investing money in establishing a new depot system. For jurisdictions which already have some level of depot service, it would still be important to balance the cost of providing the required level of service for July 1, 1991 with additional depots to the cost of a regularly routed user pay collection system.

E) Minimum Collection Program Standards

In establishing the minimum standards for local government collection programs it is first necessary to balance expected market capacity for 1991 with the collection programs which generate volumes of material consistent with that market capacity. Further, it is necessary to account for yard debris volumes that are expected to be generated by commercial users of the system. This accounting for yard debris volumes coming into the processing system can be termed the yard debris "supply".

Figure 14 illustrates how market capacity is balanced with yard debris supply for the purpose of establishing collection program recommendations.

The Plan recognizes that there are four major factors which comprise the yard debris supply:

1. Yard debris currently going to processors through existing collection and self-haul programs;

2. Yard debris expected to go to processors as a result of implementing new residential collection programs;

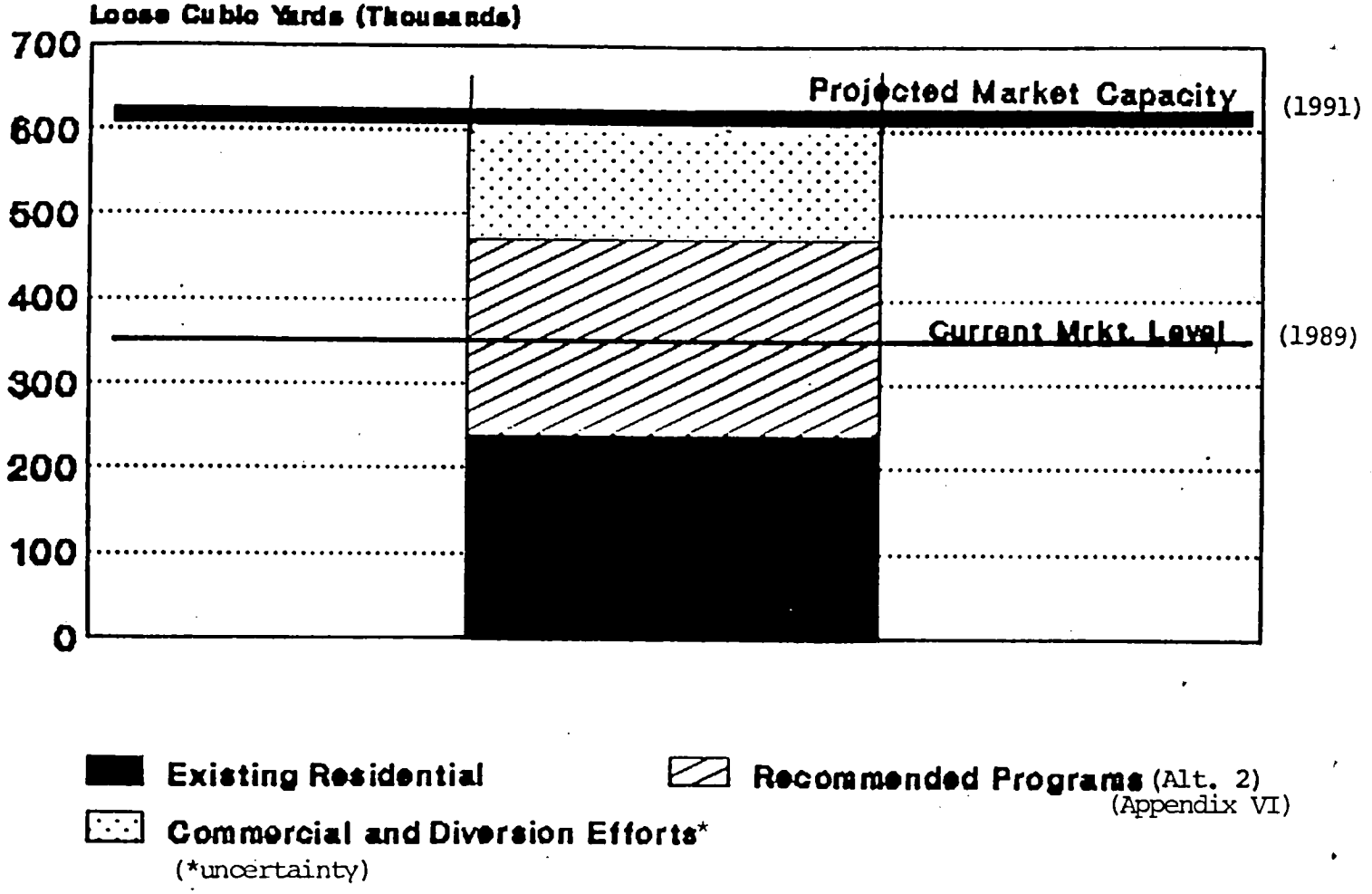
3. Yard debris expected to go to processors from the commercial sector resulting from promotion, education and homeowner preference; and,

4. Yard debris expected to go to processors as a result of an effective yard debris diversion program aimed primarily at commercial users.

The yard debris diversion program volumes are established above. The other three supply factors are included in the market alternatives and collection scenarios in Appendix VI. This Appendix illustrates how various collection program volumes relate to various market scenarios. Based in part on balancing collection volumes with the 151,000 composted cubic yards of

FIGURE 14

Recommended Regional Yard Debris Collection/Processing/Marketing Efforts



market demand the following collection programs have been established as the minimum standard for yard debris collection to be implemented by July 1, 1991:

Self-haul:	o	Monthly Rotating Depot (user pay)
	o	Weekly Low Density Depot (non-permanent, user pay)
	o	Weekly Low Density Depot (permanent, user pay)
Curbside:	o	Weekly (user pay)
	o	Monthly (user pay)

These programs are identified in Appendix VI under the Alternative 2 market scenario. The monthly (user pay) program from the Alternative 1 market scenario was included as an option to meet the minimum collection standard in order to provide local governments flexibility in establishing the best collection program for their individual situation. The collection programs which establish the minimum standard for July 1, 1991 are summarized in Appendix VII. Also included in Appendix VII is a source reduction program. Local governments are required to implement the source reduction program to meet the minimum standard.

If a local government implements a depot system, it will also be necessary for that local government to provide on-call user pay collection service since some residents do not have the capability to self-haul their material. At a minimum, this service needs to include drop box collection service. Each local government will need to determine the minimum volumes (example 5 or 10 yard drop box) appropriate for this collection service based on an evaluation of the most efficient way to provide it in their jurisdiction.

While these programs are appropriate as the starting point for a region-wide collection system based on 1991 projected market capacity, the plan analysis indicates that there will need to be an increase in collection service beyond these minimum standards to respond to market growth. For this reason, the region will re-evaluate the yard debris system by July 1, 1993 and determine if it should begin providing on-route curbside collection service in 1994 to all residents in the region. This re-evaluation shall include an assessment of both the long-term adequacy of collection programs established to meet the July 1, 1991 requirements, processing capacity and the market demand.

The criteria for determining adequate processing capacity and market demand include but are not limited to the following:

Processing Capacity

a) Evidence of a sustained upward trend in production of products containing composted yard waste;

b) Demonstration that equipment capacity remains stable or improves;

c) Record of continued/improved operations, limited down-time;

d) Ability to consistently provide products that meet the minimum requirements of established testing; and

e) Demonstration that processors are not stockpiling incoming material for more than six months.

Markets Capacity

a) Sustained upward trend in sales of product;

b) Consistent, favorable product test results;

c) Demonstrated new market penetration;

d) Annual market analysis comparing yard debris products to other competitive products; and

e) Demonstration that incoming materials are processed and marketed within two years of receipt.

F) Local Government Flexibility

Metro's primary role as the regional government in the tri-county area is to provide assistance to local governments in managing and carrying out activities and functions of regional significance. In this capacity, Metro has established a cooperative working relationship with local governments for planning and carrying out waste reduction activities including a regional yard debris program. In keeping with this cooperative relationship, the regional yard debris program allows flexibility for local governments in meeting the minimum collection standards. Specifically, a local government can implement any collection option they wish including those listed in Alternatives 2-5 of Appendix VI as long as the volumes generated from these other collection options are at least equal to the range of volumes expected from the collection options identified in Appendix VI. A local government may also use any funding option they wish including those in the plan analysis (user pay or cost spread across base of potential users of the service) as long as the program design and implementation procedures do not discourage residents from recycling yard debris. If a local government chooses to implement a new collection program that will be known to generate volumes greater than those programs listed in Appendix VI, that local government will need to work with Metro in determining and managing the impact of the resulting additional volumes of material on market capacity.

V) RECYCLING FORECAST

1). PHASE I

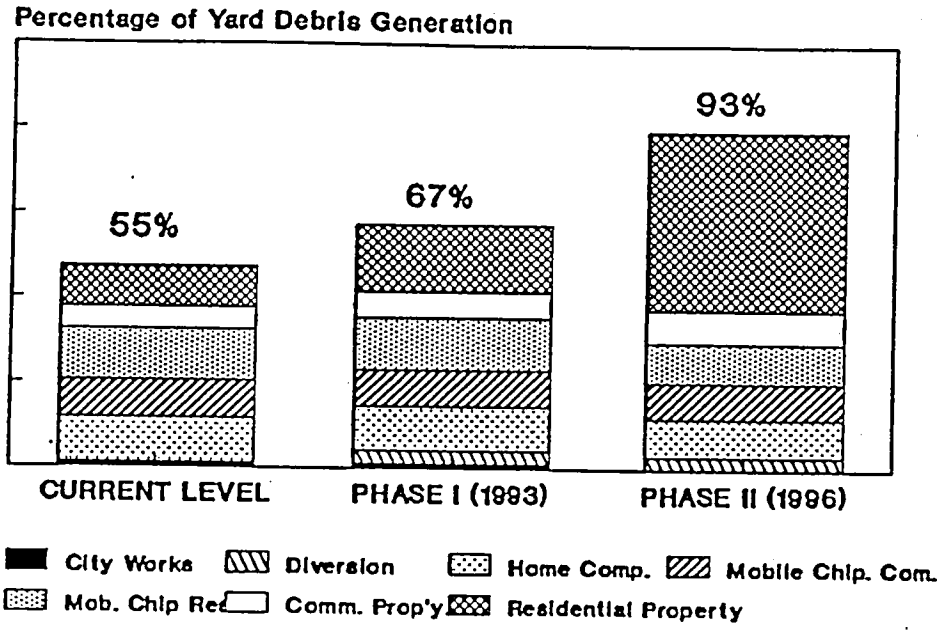
Successful implementation of the program recommendations established for July 1, 1991 will increase yard debris recycling in the region to 67% by 1993. This increase is based on growth in residential and commercial recycling as shown in the "key" following Figure 15. This increase is also based on diversion of 72,000 loose cubic yards at Metro facilities. Additional information on breakdown of the forecast is presented in the "key" below.

2). PHASE II

Successful implementation of a regional weekly curbside collection program (cost spread across users base) if established by July 1, 1994 will increase yard debris recycling in the region to 93 % by 1996 (5 years after initiation of the regional yard debris recycling program) as shown in the graphs in the next page. Estimates of annual increases are also shown in one of the graphs. This forecast is based on: 1) growth in residential and commercial recycling as shown in the "key" following Figure 15; 2) a 25% decline in mobile chipping in the residential sector; 3) adjustment of home composting (25% of the region's households continuing to home compost their yard debris); and 4) diversion of 72,000 loose cubic yards from Metro facilities. Additional information on breakdown of the forecast is presented in the "key" below.

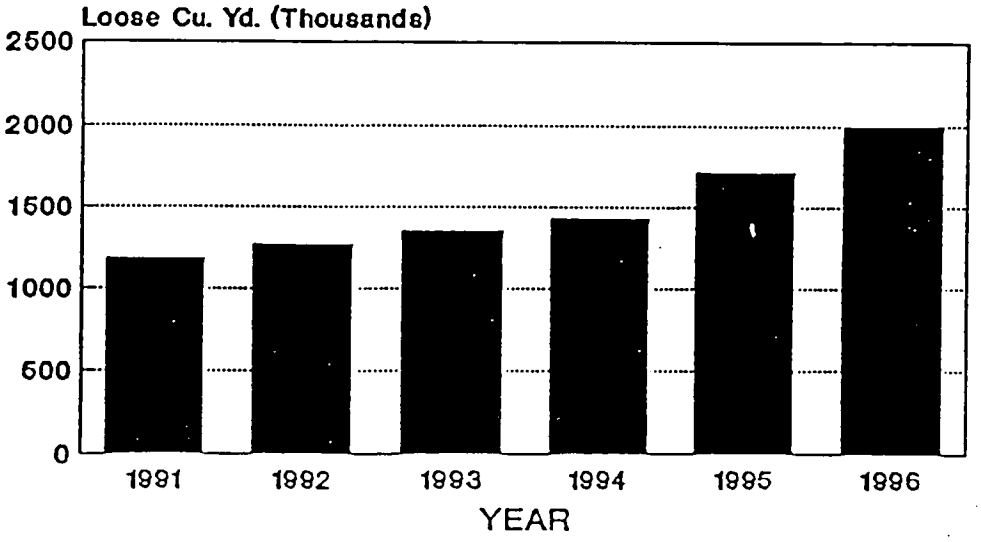
FIGURE 15 (a & b)

RECYCLING FORECAST



*SEE KEY NEXT PAGE

ANNUAL ESTIMATES
1990/91 - 1995/96



KEY TO FIGURE 15a

Yard Debris Generation	=	2,142,184	loose cubic yards
	or	238,020	tons
Current Level			
Residential Property	=	240,000	loose cubic yards
Commercial Property	=	122,555	" " "
Mobile Chipping Residential	=	305,927	" " "
Mobile Chipping Commercial	=	220,332	" " "
Home Composting	=	261,722	" " "
City Works	=	31,500	" " "
TOTAL	=	1,182,036	" " "
TOTAL (TON)	=	131,337	tons
RECYCLING LEVEL	=	55%	
Forecast: Phase I (1993)			
Adjusted Residential Property	=	396,800	loose cubic yards
Adjusted Commercial Property	=	147,300	" " "
Mobile Chipping Residential	=	305,927	" " "
Mobile Chipping Commercial	=	220,332	" " "
Home Composting	=	261,722	" " "
Diversion	=	72,000	" " "
City Works	=	31,500	" " "
TOTAL	=	1,435,581	" " "
TOTAL (TON)	=	159,509	tons
RECYCLING LEVEL	=	67%	
Forecast: Phase II (1996)			
Adjusted Resident'l (Curbside)	=	1,051,700	loose cubic yards
Adjusted Commercial Property	=	196,400	" " "
Adjusted Mobile Chip.Resid'l.	=	229,445	" " "
Mobile Chipping Commercial	=	220,332	" " "
Adjusted Home Composting	=	224,820	" " "
Diversion	=	72,000	" " "
TOTAL	=	1,994,697	" " "
TOTAL (TON)	=	221,633	tons
RECYCLING LEVEL	=	93%	

3). IMPACT ON REGIONAL WASTE REDUCTION FORECAST

In order to determine the contribution that proposed regional programs will make to the regional waste reduction forecast, Metro's system measurement study will be updated. Hence, the overall impact of the Plan forecast will be illustrated in the updated system measurement study.

VI) TIMELINE

July 1, 1990	Regional Yard Debris Recycling Plan Submitted to DEQ
July 1, 1990 - June 30, 1991	Local governments design local yard debris collection programs consistent with plan recommendations
July 1 - December, 1990	DEQ plan review; Metro adoption of final plan; local government/Metro intergovernmental agreements completed
July 1, 1991	Local governments initiate yard debris collection service and other program standards identified in the five-year work program
June - August, 1992	First year program evaluation
June - August, 1993	Second year program evaluation and determination of need for weekly curbside collection or other higher intensity collection program consistent with market capacity
Sept., 1993 - June 30, 1994	Local governments design local collection programs consistent with results of June - August, 1993 program evaluation
July, 1994	Local governments initiate on-route weekly community-wide curbside collection unless Metro's program evaluation in 1993 finds that market capacity is inadequate.
June - August, 1995	Program evaluation
June - August, 1996	Program evaluation

VII) REGIONAL YARD DEBRIS PROGRAM STANDARDS (Five-Year Work Program)

This section of the plan identifies the specific tasks to be carried out by DEQ, Metro and local governments in obtaining successful implementation of the regional yard debris system.

Department of Environmental Quality Programs

A) Technical Assistance

Provide technical assistance to Metro and local governments in carrying out the Regional Yard Debris Recycling Plan. This includes participation on committees relevant to necessary regional coordination for program implementation, assistance in coordinating reporting procedures for local governments and Metro and maintaining a knowledge base for local governments to use on implementation of yard debris programs across the nation.

B) Markets

Assist in providing additional market capacity for compost products by requiring all state agencies to use yard debris or sewage sludge compost in and around the Metro region where ground cover or soil amendment products are specified in state projects. Agencies choosing to purchase non-recycled materials should be required to petition the DEQ that yard debris or sewage sludge compost is not an adequate substitution. Enact penalties in the form of written reprimands to state personnel in charge of projects that are conducted in violation of this requirement. Such reprimands shall be copied to the Director of Environmental Quality and the Executive Officer of the Metropolitan Service District.

C) Promotion/Education

Include information on yard debris recycling and yard debris products in promotion and education materials developed by the State to promote recycling.

METRO Programs

A) General

Continue implementation of the Materials Markets Assistance, Financial Incentives, Technical Assistance, Promotion and Education, Rate Incentives, Bans on Disposal, Institutional Purchasing and System Measurement programs established in the Waste Reduction Chapter of the RSWMP.

This includes conducting an annual evaluation of the regional yard debris program as a component of the System Measurement Program. For yard debris, the annual evaluation shall include an assessment of market capacity in part to determine when a higher level of collection service should be required beyond the first year collection program.

B) Annual Work Programs

Yard debris program coordination and implementation standards shall be identified as a component of the annual work programs as established in the Waste Reduction Chapter of the RSWMP.

C) Markets

Continue efforts to identify and create additional market potential for yard debris products. This includes working with local governments who implement collection systems that are known to generate higher volumes of yard debris than established market capacity to manage the resulting yard debris volumes. Metro shall also intervene in the marketing and/or use of yard debris, and take other timely and appropriate steps to minimize economic impacts on collection, if required collection standards results in the inundation of yard debris on existing markets.

Steps Metro will take to assure that sufficient processing and marketing capacity exists:

Processing

a) Continue established relationship with processors to keep abreast of business plans, provide technical assistance;

b) Provide technical assistance to individuals or companies desiring to start processing businesses; and

c) Carry out cooperative promotional campaigns geared toward proper source separation of product.

Markets

a) Continue general promotional campaigns on purchasing product;

b) Promote the purchase of recycled soil amendments by governments and business through Metro's Institutional Purchasing Program;

c) Continue to perform demonstration projects which will evaluate the compost products' performance in new uses (i.e. erosion control);

d) Work with processors to formulate product specifications;

e) Market product through trade shows displays, technical assistance to nursery groups and other professional organizations; and

f) Provide information to targeted audiences regarding use of yard debris compost.

Metro will monitor the implementation of the above market strategies to make sure that there is a balance between supply of yard debris materialS and demand for yard debris products. Part of the monitoring efforts will be devoted to determining the impact of various local government collection programs and the extent of local government readiness to initiate on-route curbside collection. In the event that demand for yard debris products grows at a faster rate than supply of yard debris materials, those local governments that are ready to implement on-route curbside collection before July 1994 will be encouraged to do so.

D) Regulating Yard Debris Processors

1. Regulate (through franchise, contract or license) the major yard debris processors in the region to assure that yard debris generated by local government collection systems is received, processed and marketed in a predictable and equitable manner. At a minimum this includes:

   a) establishing standards for determining what are acceptable and unacceptable loads of yard debris for

receiving or rejecting loads at the processing facility;

b) establishing stability in rate adjustments for incoming material; and

c) establishing product quality standards for yard debris compost products.

Establishing standards for acceptable and unacceptable yard debris loads and determining rate adjustment issues should be completed prior to July 1, 1991 in order to assist local governments in designing and budgeting their collection programs.

2. Evaluate the need to have local governments license or permit yard debris chippers and processors who process small amounts of yard debris. The assessment of need should include identifying the benefits to the chippers and small processors to be gained by a license or permit program such as keeping an updated listing in Metro's Recycling Information Center for distribution to the general public. This assessment should be completed by July 1, 1991. If the assessment concludes that a license or permit program is necessary then that program should be established in the first year of local government program implementation (July 1, 1991 - July 1, 1992).

E) Diversion Program

Establish an effective diversion program which results in yard debris getting to regional yard debris processors instead of dumped as mixed solid waste at disposal facilities. Development of a diversion program needs to include consideration of the concepts identified in Section IV of this Plan. The diversion program needs to be in place by July 1, 1991.

F) Source Reduction Program

Implement Year 1 of regional home composting demonstration sites identified in Appendix VII of this Plan. The sites need to be designed to conduct hands-on workshops on how to build and use compost systems.

G) Funding

Assist local governments in carrying out the Yard Debris Program by providing funding for local governments consistent with guidelines established in Chapter 10 of the RSWMP.

Local Government Programs

A) General

Continue implementation of local government programs established in the Waste Reduction Chapter of the RSWMP. This includes development of annual work programs and annual evaluation of waste reduction programs, including yard debris.

B) Source Reduction Program

Assist and participate in establishing one of the four home composting education sites in the region by July 1, 1991. This includes working closely with Metro and the wasteshed representative to set up the site and providing promotion and education materials to persons within a local government on "how to build composting bins", "how to home compost", "how to use compost products" and "how to use the composting education sites".

C) Collection Program

Provide a yard debris collection service system to residents within the jurisdiction. This includes:

- Showing in the Annual Waste Reduction Program the proposed method of collection, amount of material available, projected participation, amount of material that will be collected, and processor for that material.
- Providing a service which results in generating yard debris volumes consistent with those collection options listed in Appendix VII of this Plan.
- Having collection service on line by July 1, 1991.
- Evaluating the collection service program annually and participating in the regional decision of when a higher intensity collection service needs to be established.
- Adjusting the collection service to a higher intensity consistent with the regional decision of when this should occur.
- Working with Metro in managing the market impact of yard debris volumes generated if a new collection system is put on line which is known to generate more yard debris volume than those collection systems identified in Appendix VII.

- Provide on-call, fee for service, source separated, drop box service if a depot system is established to meet the minimum collection standards. A minimum amount of material for collection (i.e., 5 or 10 yard drop box) under this curbside service shall be determined by each jurisdiction based on establishing an efficient means to provide this service.

D) Promotion/Education

Develop and implement a promotion and education program aimed at both residential and commercial generators of yard debris. The purpose of the program should be to let people know about available yard debris collection services, home composting and the uses for yard debris compost. The program should be in effect by July 1, 1991.

E) Markets

Assist in providing additional market capacity for compost products by requiring all local government projects to use yard debris compost where ground cover or soil amendment products are used unless it can be determined that yard debris compost is not an adequate substitute.

VIII) Funding

Overview

A basic premise of the Regional Yard Debris Recycling Plan is that costs associated with initial implementation of the plan will be recovered in the form of user fees. Additional costs for education, promotion and administration of programs will be borne by local governments and Metro.

Guidelines for Metro's role in long-term funding for local government programs are provided in the Financing chapter of the Regional Solid Waste Management Plan. The Chapter also describes the types of funding mechanisms that may be available to local governments. They include the following:

1. Tax Financing

   - Property tax
   - Local income tax
   - Municipal utility tax
   - Excise tax
   - Special tax levies
   - Real estate transfer tax

2. User Charges

   - Direct user charge
   - Progressive user charge

3. Franchise Fees

4. Debt Financing

   - General Obligation Bonds
   - Revenue Bonds
   - Guarantees and Insurance

5. Special Assessments

6. Current Revenue

7. Other

- Certificates of Participation (COPs)
- Grants from the Waste Reduction Trust Fund established by House Bill 3482 of the 1989 Oregon Legislative session
- Grants from the Environmental Protection Agency for solid waste management planning efforts
- Grants from Metro as outlined in Financing Chapter Local Government Guideline #1.

The chapter describes the above mechanisms in detail.

LIST OF APPENDICES

I. SUMMARY OF CURRENT YARD DEBRIS RECYCLING ACTIVITIES

II. ESTIMATED YARD DEBRIS GENERATION IN THE PORTLAND METRO AREA

III. DESCRIPTION OF DESIGNATED SOURCE REDUCTION & COLLECTION OPTIONS

IV. COST ESTIMATES OF DESIGNATED SOURCE REDUCTION & COLLECTION OPTIONS

V. LONG-TERM DEMAND CURVES FOR YARD DEBRIS COMPOST PRODUCTS

VI. MARKET ALTERNATIVES AND COLLECTION SCENARIOS

VII. DESCRIPTION OF REGIONAL SOURCE REDUCTION & COLLECTION PROGRAMS WHICH MEET MINIMUM STANDARDS

VIII. LOCAL GOVERNMENTS STATUS IN MEETING MINIMUM REGIONAL YARD DEBRIS RECYCLING REQUIREMENTS

IX. METRO-LOCAL GOVERNMENT INTERGOVERNMENTAL AGREEMENT PACKET

METRO
JUNE 1990

METRO

2000 SW First Avenue
Portland, OR 97201-5398
(503) 221-1646
Fax 241-7417

April 1, 1991

John Kauffman
County Clerk
Clackamas County Courthouse
807 Main Street
Oregon City, OR 97045

Dear Mr. Kauffman:

Enclosed are true copies of the following ordinances adopted by the Metro Council. Please file these ordinances in the Metro file maintained by your County.

1. Ordinance No. 91-377, For the Purpose of Amending Ordinance No. 88-268B Adopting the Regional Solid Waste Management Plan to Incorporate the Yard Debris Plan

2. Ordinance No. 91-381, For the Purpose of Amending Metro Code Chapter 2.02, Section 2.02.040(e), Relating to Confirmation by Council of Certain Appointments to Fill Positions

3. Ordinance No. 91-383, An Ordinance Authorizing the Issuance of Revenue Bonds and Bond Anticipation Notes of the Metropolitan Service District for the Purpose of financing the Acquisition, Renovation, Furnishing and Equipping of an Administrative Offices Building for Use in the Operations of the District; and Establishing and Determining Other Matters in Connection Therewith

4. Ordinance No. 91-384, An Ordinance Adopting a Final Order and Amending the Metro Urban Growth Boundary for Contested Case No. 90-3:Washington County

5. Ordinance No. 91-382, Amending the FY 1990-91 Budget & Appropriations Schedule to Increase the Convention Center Capital Fund Personal Services Appropriation

6. Ordinance No. 91-388, For the Purpose of Amending Metro Code Chapter 5.05, Regulating the Flow of Solid Waste Originating Within the Boundaries of the Metropolitan Service District

7. Ordinance No. 91-370A, An Ordinance Amending Ordinance No. 91-340A Revising the FY 1990-91 Budget & Appropriations Schedule for the Purpose of Adopting a Supplemental Budget and Creating the Smith and Bybee Lakes Trust Fund

8. Ordinance No. 91-387A, An Ordinance Amending Ordinance No. 90-340A Revising the FY 1990-91 Budget & Appropriations Schedule for the Purpose of Funding Initial Financing and Purchase Costs of the Hanna Property

9. Ordinance No. 91-378A, For the Purpose of Amending Metro Code Chapter 2.02, Section 2.02.040(e), Relating to Confirmation by Council of Certain Appointments to Fill Positions

Sincerely,

Paulette Allen
Clerk of the Council

METRO

2000 SW First Avenue
Portland, OR 97201-5398
(503) 221-1646
Fax 241-7417

April 1, 1991

Charles D. Cameron
County Administrator
150 N. First Avenue
Hillsboro, OR 97124

Dear Mr. Cameron:

Enclosed are true copies of the following ordinances adopted by the Metro Council. Please file these ordinances in the Metro file maintained by your County.

1. Ordinance No. 91-377, For the Purpose of Amending Ordinance No. 88-268B Adopting the Regional Solid Waste Management Plan to Incorporate the Yard Debris Plan

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Sincerely,

Paulette Allen

Paulette Allen
Clerk of the Council

METRO

2000 SW First Avenue
Portland, OR 97201-5398
(503) 221-1646
Fax 241-7417

April 1, 1991

Jane McGarvin
Clerk of the Board
Multnomah County Courthouse
1021 S.W. Fourth Avenue
Portland, OR 97204

Dear Jane:

Enclosed are true copies of the following ordinances adopted by the Metro Council. Please file these ordinances in the Metro file maintained by your County.

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Sincerely,

Paulette Allen

Paulette Allen
Clerk of the Council