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Pollution Prevention Opportunity Assessment for Landscape Waste

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**POLLUTION PREVENTION OPPORTUNITY ASSESSMENT
FOR
LANDSCAPE WASTE**

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ABSTRACT

This pollution prevention opportunity assessment was conducted to document the landscaping activities at SNL/California that generate waste and to outline options for minimizing that waste at SNL/California.

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EXECUTIVE SUMMARY

The State of California, Presidential Orders, and the Department of Energy (DOE) have all issued either legislation, orders, and/or goals to reduce the amount of municipal solid waste going to landfills, including landscape waste.

SNL/California landscaping covers approximately 5.3 acres of lawn areas and 3.9 acres identified as ground cover and shrub areas. Currently, all SNL/California landscape waste is disposed of in the City of Livermore's landfill. In order for SNL/California to meet the goals that have been set by Federal and State regulation and DOE order, the site must initiate a program to reduce, reuse, and recycle landscape waste.

This PPOA identifies the two most economical and environmentally friendly options for recycling landscape waste:

1. Grasscycling, which leaves grass clippings on the lawn, where they are naturally recycled. This option saves all costs of bagging, handling, and disposing of grass clippings. Grasscycling is highly recommended by the California Integrated Waste Management Board (CIWMB) and the Livermore Recreation and Parks Department.
2. Chipper/Shredder, which can turn tree and shrub trimmings into wood chips and mulch for weed control or garden decoration. The mulch also can be disced into the soil for additional soil conditioning.

Other options are available, but will require more effort and cost than the first two. These options are:

- Using a disposal service to send landscape waste to a recycling/compost facility, which does not save much in cost, but keeps the waste reduction goal in sight.
- Using Sandia transportation to haul the landscape waste to a recycling facility, which saves a pickup fee and uses the option of recycling the waste as compost. (It does not save labor and handling costs.)
- Composting on site, which will require more labor than the other options, but will create a supply of compost that can be used instead of chemical fertilizers.
- Increasing low maintenance landscaping where appropriate. More native plants and drought tolerant plants can be used to create appealing landscapes and with proper selection of plants will require less maintenance, less water, and generate less waste. Wood chips and rock can also be used in many places and will decrease maintenance and watering in these areas.

POLLUTION PREVENTION OPPORTUNITY ASSESSMENT FOR SNL/CALIFORNIA LANDSCAPE WASTE

Introduction

Department of Energy (DOE) orders 5400.1 and 5400.3 mandate the development of a waste minimization program.^{1,2} The program's goals are to:

- reduce volumes of hazardous wastes and toxicity,
- implement a system of tracking and reporting improvements, and
- devise a method for performing tasks.

To satisfy the requirements of this program, Sandia conducts pollution prevention opportunity assessments (PPOAs) to identify waste-generating processes. The information collected from a PPOA then is used to identify waste minimization opportunities. This pollution prevention opportunity assessment (PPOA) was conducted using Sandia's new methodology for prioritizing, evaluating, and managing site-wide waste streams. This new methodology and the list of priority waste streams are described in the latest revision of the *Pollution Prevention Opportunity Assessment Plan for SNL/California*.³

This PPOA addresses landscape waste minimization, partially in response to recent legislation and regulations.

Pollution Prevention Opportunity Assessment

Facility

The SNL/California Maintenance Engineering Department generates landscape waste during landscape and grounds maintenance. The landscaping is done by seven contract people, a working supervisor, and a Sandia point of contact.⁴

The landscaping group uses the following equipment to complete the maintenance work:

5 Toro Lawn Mowers Recycle II Commercial	1 John Deere 425 Tractor with mower deck
2 Exmark Mowers 12.5 horsepower	2 Kubota Tractors
1 Troy Bilt Weed Cutter, wide cut	1 Howse Disk
1 Rotary Cutter (flare mower)	1 FMC Street Sweeper
7 Stihl Weed Eaters	7 Forklifts
2 Power Edgers	1 Ryan Aerator
3 Power Pole Punier	2 Backpack Sprayers (5 gal.)
3 Echo Blowers	3 Hand Held Sprayers (2.5 gal.)
1 Stihl Chain Saw	2 Sprayers (50 gal. and 300 gal.)
1 Chipper/Shredder	1 Water Tank Trailer (manual watering)

Landscape waste-generating activities include lawn mowing (Monday, Tuesday, and Wednesday), weed control (Wednesday and Thursday), and pruning (when necessary, usually springtime).⁵

SNL/California has a total of 5.25 acres of lawn (228,600 sq. ft.) and 3.86 acres of ground cover (167,800 sq. ft.) in fourteen different areas.⁶

Background

The key drivers for the reduction of solid/landscape waste include the following legislation and orders.

The State of California passed the California Integrated Waste Management Act (AB 939, 1989 and 1990), which is managed by the California Integrated Waste Management Board (CIWMB). The CIWMB has policy-making and regulatory authority to ensure reduction of the quantity of waste generated and disposed in landfills, and to ensure compliance with environmental regulations.⁷

The CIWM Act emphasizes conservation of natural resources through a hierarchy of management methods to reduce, reuse, and recycle municipal solid waste. It set statutory waste diversion goals to reduce municipal solid waste going to landfills by 25% by 1995 and by 50% by the year 2000. The 25% diversion goal will be met. The next 50% goal is attainable, but will require that local governments and businesses increase the acceptance of compost, effective waste prevention practices, and continued development of markets for recycled goods.⁷ According to the CIWMB, landscape waste is the largest single component of this waste stream (15–20%).

DOE Secretary Hazel O'Leary also issued a memorandum (5/3/96) to all Heads of Departmental Elements to set goals for reducing the generation of solid wastes.⁸ One of these goals is to reduce sanitary waste by 33% by December 31, 1999, using 1993 as a baseline. Landscape waste is a significant part of the sanitary waste stream. Additionally, the DOE requires an annual Waste Reduction Report (SEM-37-92) reporting the reduction in sanitary waste.

In 1994, the President issued a memorandum to Federal agencies addressing landscape management practices on Federal landscaped grounds. Specifically, the Office of the Federal Environmental Executive issued "Guidance for the Presidential Memorandum on Environmentally and Economically Beneficial Landscape Practices on Federal Landscaped Grounds."⁹ These guidelines also address pollution prevention. These guidelines focus on five principles:

1. Use regionally native plants for landscaping;
2. Design, use or promote construction practices that minimize adverse effects on the natural habitat;
3. Seek to prevent pollution;
4. Implement water and energy efficient practices;
5. Create outdoor demonstration projects.

The State of California has set aggressive reduction goals compared to many other states, but about half of the states have landscape waste disposal restrictions in place. A few states have totally banned disposal of landscape waste; it must be recycled.¹⁰

In California, landscape waste contributes an estimated 15–20% to the municipal waste stream. It is the largest single component of California's municipal solid waste.¹⁰

Material/Waste Stream Profiles

The waste stream generated by landscaping maintenance at SNL/California consists primarily of grass clippings, shrub trimmings, and tree limbs.

Waste Generation

The Maintenance Engineering Department does not keep records of the amount of lawn clippings and other trimmings disposed of annually. These wastes are included in the sanitary waste stream, and the quantity generated can only be estimated. However, university studies indicate that a typical California lawn generates 300–400 lb. clippings annually per 1,000 sq. ft.¹⁰ Based on this formula, SNL/California's 228,600 sq. ft. of lawn area generates about 68,580–91,440 lb. clippings annually. Thus, approximately 45.7 tons of grass clippings are sent to the landfill each year. No reasonable estimate can be made on the amount of shrub, ground cover, and tree trimmings generated.

Currently, the landscapers bag the grass clippings and add them to the site's solid waste disposal bins, which also contain other solid wastes and are taken to the City landfill. Tree limbs and other woody cuttings are loaded into a bin and taken to the landfill. The costs associated with these practices are as follows:

- The tipping fee at the City landfill is \$32/ton. Assuming that 45.7 tons of grass clippings are taken to the landfill, the annual tipping fee would be \$1,463, not including the tree and shrub trimmings.
- The approximate annual costs for truck operation include: Fuel: \$420 (assuming 5 gallons per week); Maintenance: \$625 (approximately 25 hours per year).
- Labor cost is approximated at \$25/hr. for about 6 hours per week spent bagging and handling the clippings. The total cost is approximately \$7,500 per year.
- Thus, the total annual cost for handling grass clippings alone is approximately \$10,000. This figure does not include costs associated with tree and shrub trimmings.

Pollution Prevention Options

Landscape waste comprises a significant percentage of the solid waste stream, but it is a relatively inexpensive and simple waste to reduce or eliminate, with a little effort.

Figure 1 shows how the landscape process at SNL/California works now, with the landscape waste going to the City landfill. It also shows the recommended future process, which will eliminate disposal of the landscape waste through the reduce, reuse, and recycle loop.

Specific options for reducing landscape waste at SNL/California include the following.

Lawn Clippings/Leaves

Grasscycling/Mulching Mower

Grasscycling is the natural recycling of grass by leaving the clippings on the lawn. The clippings decompose quickly and release nutrients, such as nitrogen, back into the soil. In fact, enough nutrients are returned to the soil that fertilization requirements can be reduced by 15 to 25% and water use can be reduced by a similar amount. With proper mowing, watering, and fertilizing, grasscycling can produce a healthy lawn.¹⁰

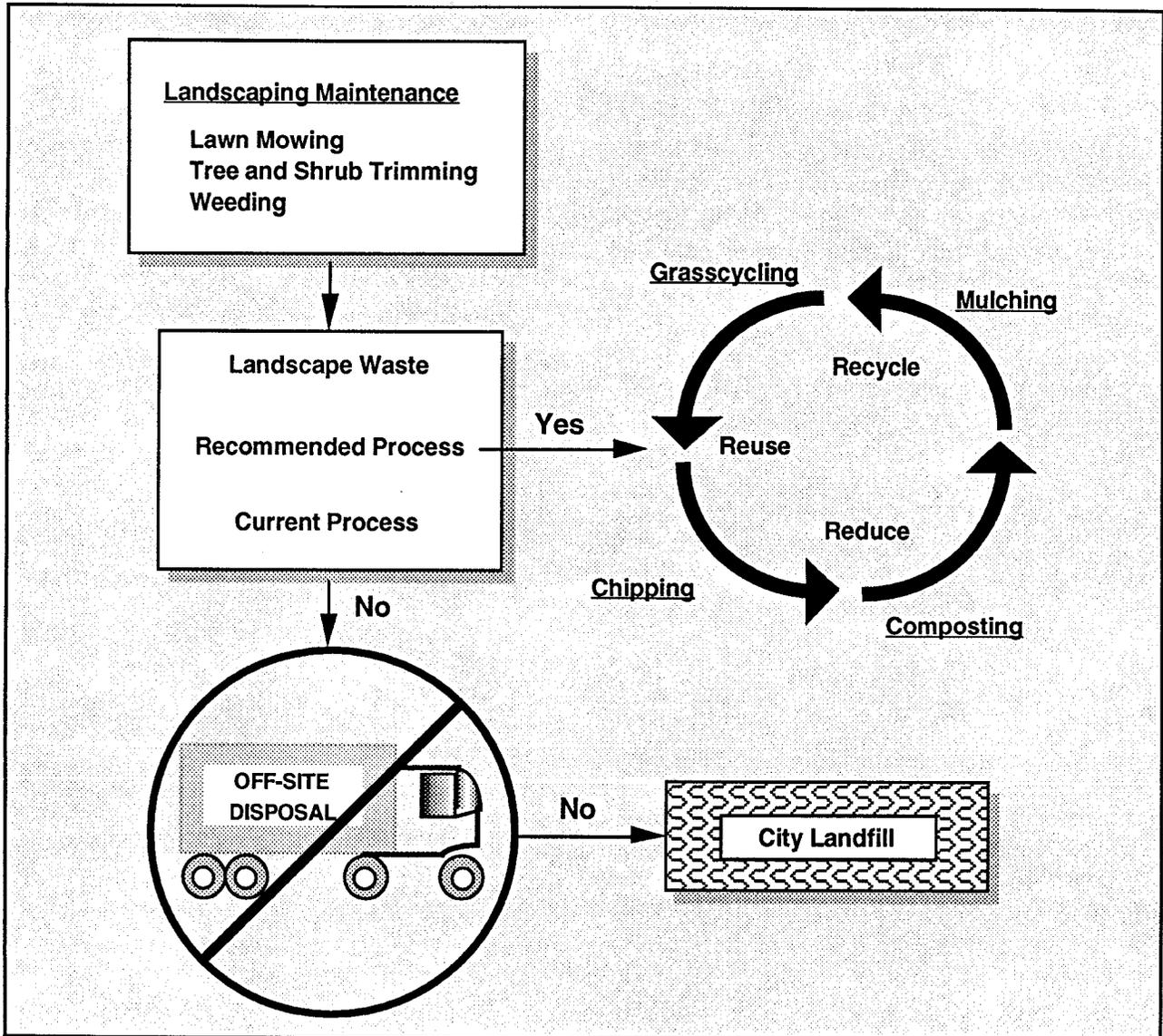


Figure 1. Current and recommended process for landscape waste disposal at SNL/California.

Grasscycling can be done with most lawn mowers with a sharp blade, but a mulching mower does the best job and is highly recommended. Mowing the grass when it is dry and removing only about one-third the length results in small clippings that can be left on the lawn. These small clippings do not cover up the lawn's surface. When done properly, grasscycling can reduce the seasonal mowing times by 50% or more because bagging and disposal of the clippings is eliminated. The cost of labor, transportation, and bags to dispose of clippings are eliminated. Additionally, by not handling heavy bags of grass clippings, landscape workers can avoid the potential for back injuries and other physical injuries.¹⁰

The State of California recommends grasscycling and uses the practice around the capitol grounds.¹¹ The CIWMB has worked with the University of California Cooperative Extension to develop information to educate the public and the landscaping industry about

grasscycling.¹⁰ Other organizations associated with landscaping, including the Livermore Area Recreation and Parks Department, recommend grasscycling whenever possible.¹²

Mulch/Disc

When lawns are too wet or too tall, grasscycling cannot be done correctly. However, the clippings can be used as mulch. In the past, SNL/California has used grass clippings as mulch in the open field areas around the site for weed control and has disced the mulch into the soil as an amendment. This practice was discontinued for undocumented reasons based on National Environmental Policy Act (NEPA) requirements. However, a more recent NEPA evaluation revealed no evidence for prohibiting the practice.

Along with saving the disposal costs associated with the current disposal method, mulching/discing would save about two labor hours per week, which is currently spent on bagging and disposing of the waste.

Off-site Recycling/Composting Facility

In cases in which grasscycling or mulching is not practical on site, off-site recycling/composting facilities may be used. This option all but eliminates the cost savings due to the facility fees and transportation costs. However, the goal to reduce landscape waste going to landfills still remains the priority.

For off-site recycling and composting, SNL/California can use the Livermore-Dublin Disposal Service (LDDS) to pick up bins of lawn clippings, tree and shrub trimmings, and clean wood pallets. This service costs \$250.00 for a 30-cubic-yard bin. The LDDS weighs the load and takes it to a transfer station where it is inspected for contamination (non-landscape waste). If the load is acceptable, LDDS takes it to a composting facility. SNL/California will be given a \$2.50/ton credit for an acceptable load.¹³

Forward Landfill and Composting is another available recycling facility, but Sandia's landscape maintenance personnel would have to transport the waste to the facility. It is located in Manteca, approximately 35 miles from the SNL/California site. The cost would likely be less than the \$250 charged by LDDS, but it is still labor- and transportation-intensive. The facility charges a \$15.00/ton tipping fee for compostable material. It composts the material and sells it to the agricultural and landscaping industries.¹⁴

Compost On-Site

The landscaping group can compost lawn clippings, small trimmings, and leaves on site. However, composting will take more labor to do a proper job than some of the other options. The advantage of composting on site is production of a rich soil amendment that can enhance soil structure, texture, aeration, and moisture regulation.¹⁰

Some of the common composting methods are:

- Windrows/Bin—Lawn clippings (greens) and leaves (browns) are mixed in equal parts and kept moist. The rows/bin have to be turned occasionally to keep them aerated. Windrows also can be aerated by air pumped through perforated pipes.
- Rotating Drum—The lawn clippings and leaves are mixed in equal parts, moistened, and placed in a rotating drum for 5–7 days. They are cured in windrows. This method speeds up the decomposition process.

Tree and Shrub Trimmings

Chipper/Shred

Tree and woody shrub trimmings can be recycled through a chipper/shredder machine. The resulting wood chips can be used for ground cover and weed control, which also saves the cost of chemical weed killers. This machine can eliminate the need for virtually any tree and woody shrub trimmings to go to a landfill, saving transportation costs, \$32/ton in tipping fees, and labor costs (approx. \$25/hr.).

SNL/CA has a chipper/shredder machine, but it is not used because it does not have a collection box due to lack of funding (approximately \$990.00). The SNL/California pollution prevention coordinator has identified funds and has requested that the box be built.

Off-Site Recycling/Compost Facility

The same off-site recycling options are available for handling trimmings as for handling grass clippings.

Low Maintenance Landscaping

The use of regionally native plants and other drought-tolerant and pest-resistant plants for landscaping can create sustainable landscapes and result in healthier, longer-lived plantings. One of the characteristics of a sustainable landscape is a reduction in the need for pesticides and fertilizers.¹¹ Reducing the use of pesticides and fertilizers addresses pollution prevention at the source. Pollution prevention is a national policy cited in the Resource Conservation and Recovery Act (RCRA) of 1976, the Pollution Prevention Act of 1990 and Executive Order 12856—the Federal Compliance With Right-to-Know Laws and Pollution Prevention Requirements of 1993.

Conclusion

The generation of landscape waste on the SNL/California can be avoided. By following one or more of the suggested options, the Maintenance Engineering Department can prevent all green waste from being disposed of in the City landfill.

In addition, both pesticides and fertilizers can be reduced by:

- Grasscycling to recycle grass clippings in place.
- Composting to recycle grass clippings and leaves for reuse as fertilizer.
- Shredding/chipping to produce chips or mulch that can be spread over areas to retard the growth of weeds and enhance the soil.
- Using regional native plants, as well as other drought-tolerant and pest-resistant plants.

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