Technical and Physical Feasibility Fact Sheet
Alternative 24: Reuse Greywater

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1. Definition of Alternative

A24: Promote, through incentives, on-site residential and commercial greywater reuse and recycling.

2. Summary of the Alternative Analysis

Greywater reuse refers to either residential or commercial reuse of water that does not contain blackwater (from toilets) or kitchen wastes. Water from sinks (excluding kitchens) laundries, bathtubs, or showers is considered to be greywater. The analysis of on-site greywater reuse feasibility for the Middle Rio Grande water planning region included investigations pertaining to:

- Existing on-site commercial greywater reuse and recycling plans and activities
- Existing and proposed local and state regulations regarding on-site greywater reuse and recycling
- Health issues regarding greywater reuse
- The successes and drawbacks of experience from similar on-site greywater reuse projects in the western U.S.
- Potential decreases in fresh water demand and wastewater return flows that could result from on-site residential greywater reuse activities
- Possible economic and water rate incentives as a means to stimulate greywater reuse
- The costs associated with implementation, retrofitting, and maintenance for commercial and residential on-site greywater reuse systems

Advantages of reusing greywater are:

- Replaces potable water use and therefore lowers water bills and possibly sewer bills
- Increases life and/or improved performance of on-site septic systems
- When used for outdoor irrigation, the nutrients in greywater may support plant growth
- Reduces energy and chemical use (why chemical, not treated a wastewater treatment plant, household would limit cleaning agents as well)
- Possibly decreases the need to expand wastewater treatment facilities

Reusing greywater also has some disadvantages:

- Has the potential to spread disease if system is not properly operated
- May develop odors if stored more than 24 hours
- May adversely impact soil (salt buildup)
- Decreases the amount of wastewater going to treatment plant, which may affect the overall wastewater system
- Lowers availability of reclaimed water for return flow credits or other uses

3. Alternative Evaluation

3.1 Technical Feasibility

Enabling New Technologies and Status

On-site greywater reuse has been implemented in many states including California, Arizona, and Texas. Local commercial businesses have also implemented on-site water recycling. For example, Octopus Car Wash locations have an underground treatment facility built in to treat and recycle water (Gates, 2003).

Engineered Plumbing Solutions Inc. is an international environmental engineering firm that has a local Albuquerque office. The firm designs, manufactures, and sells the on-site wastewater recycling system, Aquamake, that has been approved by the New Mexico Environment Department (NMED). They offer systems for commercial operations and are developing a single household system (Skrak, 2003).

Infrastructure Development Requirements

Separate plumbing is required for greywater systems. The systems are easiest to install during construction, but retrofitting is feasible if plumbing is accessible. Already constructed locations on concrete slabs or crawlspaces are difficult to retrofit (Noah, 2001).

The standard components of a greywater system include (Little, 2003):

- *Conveyance piping* to collect water from source and deliver to greywater system
- *Surge tank* to hold flows (e.g., plastic trash barrel)
- *Filter* to remove particles such as lint and hair (e.g., sock, sand filter)
- *Storage tank* to hold water until ready to use
- *Three-way valve* to allow greywater to go to sewer or septic system
- *Pump* to move water to distribution point such as irrigation system

A permit is required by NMED, which currently considers greywater under liquid waste. The permit needed is the same type of permit required for a septic system (Duttle, 1994). In issuing the permit, NMED considers treatment, storage, and disposal of the water (underground leach field versus surface disposal for irrigation). Legislation addressing greywater reuse is being considered during the 2003 New Mexico legislative session. If enacted, this legislation would exclude the permit requirement for recycling systems when applying less than 250 gallons per day if the following conditions are met:

1. System overflow is directed to existing wastewater system.
2. Storage tank is enclosed and access is restricted.
3. System is outside of the floodway.
4. There is at least 5 feet vertically between greywater and the groundwater table.
5. Pipes for greywater system are marked as nonpotable water.
6. Greywater does not leave the property.
7. Standing water is minimized and prohibited for more than 24 hours.
8. Greywater is never applied by spraying.
9. Greywater use complies with local ordinances.

Potential water sources include washing machines, bathtubs, showers, and lavatory sinks.

Total Time to Implement

The time needed to implement a greywater system varies depending upon extent of system installed (e.g., washing machine only, shower, sinks and washing machine). The time needed to retrofit an existing system is typically less than a year. Due to the number of existing systems within the planning area, it could take ten years or more to retrofit all of the existing systems. The retrofit rate is dependent on whether or not there are incentives and/or financing to assist homeowners. Installing greywater systems for all new construction could be implemented quickly, once local ordinances are revised to reflect this requirement.

3.1.1 Physical and Hydrological Impacts

Effect on Water Demand

This alternative has the potential to reduce demand for treated potable water by the amount of greywater that is recycled. The average person generates about 40 gallons of greywater per day (NSFC, 2002), and fresh water use could be reduced by 20 to 25 percent (Prososki-Marsland, 1995). However, even though the amount of diversions and water passing through a central treatment plant may be reduced, the consumptive use does not change as a result of this alternative.

The Intel New Mexico site committed to maintaining water use within its established historical range when a factory expansion was announced in 2000. Manufacturing process improvements and reuse of process waters have allowed the site to expand manufacturing capabilities and successfully operate within the site historical range of water use (Judd, 2003).

Effect on Water Supply (surface and groundwater)

This alternative does not have an effect on surface or groundwater supply.

Water Saved/Lost (consumption and depletions)

This alternative will not affect consumptive use. As discussed above, the alternative will reduce the amount of treated potable water that is needed to serve consumptive uses, but the total consumptive use will not change as a result of installing greywater systems. The greywater systems allow water that has been used internally (from laundry, sinks, etc.) to subsequently be used outside. However, consumptive uses do not change unless other adjustments are made. In fact, there is a potential for consumptive use to experience a slight increase if greywater is cheaper than other water supplies. This alternative can also affect the water supply by

decreasing the amount of wastewater returned to the treatment plant by up to 60 percent (Gelt, 2002). If water rights stipulate a return flow requirement or if other users are depending on return flows, those issues must be addressed when implementing greywater reuse.

Impacts to Water Quality (and mitigations)

Use of greywater needs to be carefully monitored by the user. Greywater should never contain wastewater from toilets, washing machine loads that contain baby diapers, or kitchen waste. Systems should be turned off when someone in the household is diagnosed with an infectious disease (Office of Arid Lands Studies, 2002). Additionally, household chemicals should never be disposed of in greywater systems.

A residential greywater reuse study was conducted by the Water Conservation Alliance of Southern Arizona (Water CASA). For a summary of finding and water quality data, visit the Water CASA website at (http://www.watercasa.org/research/residential/resindex.htm). The study supports the conclusion that kitchen sink water should not be used in the greywater systems because it carries a greater risk of pathogen exposure (e.g. fecal coliform), and recommends that residents consider the makeup of their household before installing a greywater system (Water CASA, 2000).

Watershed/geologic impacts

This alternative would not directly impact on the watershed or geology.

3.1.2 Environmental Impacts

Impact to Ecosystems

When used for outdoor irrigation, the nutrients in greywater will support plant growth, but may cause damage to soil from the buildup of salts if greywater use is not rotated with harvested rainwater or fresh water (Prososki-Marsland, 1995). Plants can be damaged from greywater containing sodium, bleach, borax, or liquid fabric softeners (Duttle, 1994). Use of biodegradable soap low in sodium content is recommended as well as selection of plants that are salt tolerant and not edible (Prososki-Marsland, 1995).

Implications to Endangered Species

This alternative has no impact on endangered species.

3.2 Financial Feasibility

3.2.1 Initial cost to implement

The cost to implement a greywater system varies greatly depending on whether the work is done by the owner or by professionals. The cost to retrofit a greywater system is estimated to range from $135 to $2,000, where plumbing is relatively accessible. Costs would be prohibitive for existing structures where plumbing is inaccessible. The cost to build a greywater system during new construction is estimated to range from $65 to $650 (Little, 2003). For example, the cost to construct the greywater treatment and distribution system for Casa del Agua was about $1,500.

For the Aquamake system, installation costs are estimated to be between $50,000 and $500,000, depending upon the size of the unit. For example, installation costs for a 300-square-foot commercial building producing approximately 1,500 gallons of water for recycling each day would be approximately $105,000 (Skrak, 2003).

3.2.2 Potential Funding Source

Possible funding sources include incentives provided by public utilities.

3.2.3 Ongoing Cost for Operation and Maintenance

Annual maintenance costs are estimated to be less than $100 up to $600 for residential greywater recycling units, depending on whether the work is performed by the owner or by a maintenance contract. The cost would cover disinfectant use and regular cleaning and replacement of filters throughout the year. The greywater filtering system needs to be cleaned on a regular basis to prevent clogging.

For the Aquamake system, operation and maintenance cost are estimated to be between $500 and $4,000, depending upon the size of the unit. For example, operation and maintenance costs for a 300-square-foot gas station would be approximately $450 per year (Skrak, 2003).

4. Advantages and Disadvantages

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