

2004-05 INNOVATIVE GRANT APPLICATION FORM

Project Information (on applicant letterhead)

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6) Project Title:

“100% Concrete Recovery in Sumter County - The Green Redeemer Machine”

7) Grant Request Amount: \$150,000

8) Length of project (months): 18 months

Authorizing Signature

Title

PROJECT ABSTRACT
(No more than 20 lines)

Twenty-five percent of all municipal solid waste (MSW) is construction and demolition (C&D) debris, mostly concrete.¹ This is ecologically unwise, because most of that material is recyclable. But little county program development is paid to recovering the concrete generated by developers, the transport industry and public works departments in Florida. In Sumter County, reportedly 95 percent of the C&D debris – 47,825 tons of it in 2000 – is disposed. *What if 100% of that wasted material could be recovered?* That’s what is proposed here.

Sumter’s plan would divert for reuse the discarded concrete at the generator and disposal sources – i.e., *The Villages* (a 12,369-acre residential development, Florida’s largest), County Road & Bridge projects, concrete from the *private* C&D landfill, Sumter Recycling, Inc. (SRI), and the County’s C&D hill area at its Solid Waste, Recycling & Composting Facility. The material will be processed to a consistency suitable for recycling at *The Villages*, in County Road and Bridge Construction projects, and alternative marketing applications.

The Villages built/sold 2,200 homes this past year; 500+ were concrete block. An FDEP-funded Wood Innovative Grant cited the percentage of discarded materials in five homes. One, 2,900 square feet of concrete block, generated 10,875 pounds of discarded concrete—nearly 48% of all material discarded. *The Villages*’ two most popular CB model homes alone reportedly generate 4.4-million pounds of discarded concrete annually.

SRI gets the bulk of C&D material generated in the county. Sumter will partner with SRI using the **Green Redeemer** crusher to recover/process/reuse concrete and create existing and alternative marketing opportunities within the county. By coloring it, Sumter sees an opportunity to target recovered concrete for processing into a more marketable, reusable form: “**Green-Crete**” would be used in Sumter road/bridge projects and in *The Villages* for road base, foundations/footings, etc. Green-Crete’s market potential as an aggregate in new concrete will be assessed too. Sumter targeted wood in 2001; it’s concrete now in 2004 – wow!

¹ Florida Department of Environmental Protection (FDEP) - 2000 report.

PROJECT DESCRIPTION

The project will involve the following components to recover C&D generated within Sumter County:

(1) Establish Staging Area for Materials:

The Villages, SRI and the County will work together to evaluate and identify potential staging area sites for the discarded concrete at their sites. The sites must also be large enough to provide adequate accessibility by subcontractors and collection vehicles. The sites, once selected, will be prepared to accommodate delivery of material as well as processing space, storage, and crushing equipment.

(2) Purchase Equipment:

A concrete crusher system – the **Green Redeemer** Machine -- will be needed that is compact, self-contained, and mobile. The system will probably consist of an impact crusher, screening system, side discharge conveyor with magnetic separator, and return conveyor, plus other features as may be determined necessary. The concrete processing responsibility will be shared with *The Villages*, SRI, and the County.

(3) Implement Pilot Operation:

Approximately 40 concrete block homes are constructed each month – and will be for the next five years – at *The Villages*. This generates an estimated 180 tons of discarded concrete material. Annually, 5,000 to 6,000 trucks arrive at SRI's C&D landfill to dispose of concrete. It is anticipated that the selected portable crushing equipment would be transferred between the staging areas at *The Villages*, SRI, and the Sumter County Solid Waste, Recycling and Composting Facility (SCSWF) to process the incoming material. This would occur weekly. However, volume fluctuations would dictate the schedule. When sufficient volumes of material have been processed for reuse, that material would then be transported by one of the program partners for reuse to the appropriate job site.

(4) Materials Marketing:

A significant portion of the processed material will be utilized by Sumter County on various public works projects in the following areas: 1) Road & Bridge, 2) Parks & Recreation, 3) Solid Waste, and 4) Animal Control. In addition, *The Villages* will analyze and evaluate potential reuse opportunities for road building and road expansion projects as well as innovative applications such as drainage for pipeline construction, golf courses or other recreational projects in *The Villages*' 12,369-acre development. Further, SRI will pursue opportunities for marketing processed material to local concrete companies or other appropriate in- or out-of-county vendors.

(5) Preparation and Distribution of Educational Materials:

Educational outreach will target all subcontractors regarding handling and delivery of discarded concrete materials. Sumter County will build awareness about the project by promoting the deliveries of separated concrete debris from disposal at the SCSWF scalehouse. The following education tools will be created: 1) BMP Guide, 2) Presentation, 3) News Articles, 4) Equipment Demonstrations, and 5) Informational Flyer to be distributed at the SCSWF scalehouse.

(6) Implement and Expand Partnerships:

In this case, a comprehensive public/private partnership has been established among a large commercial generator, a solid waste disposal receiving facility and a C&D landfill. The three partners are committed to developing new markets for C&D material by diverting all of the concrete in the County from disposal. Sumter County is committed to utilizing a majority of the crushed, processed aggregate in local County projects. *The Villages* is committed to identifying and piloting the use of concrete aggregate in various residential, recreational, and commercial applications. The proposed project would greatly complement the existing county program relating to best management practices for treated and untreated wood—another FDEP Innovative Grant project. The concrete component will provide an augmentation of these efforts and help complete a comprehensive model C&D program that could be duplicated in other cities and counties.

Criteria 1: TECHNOLOGIES

It is common for on-site C&D processing to occur at large *demolition* projects. However, on-site processing is not common practice at *new construction* sites. This project is designed to drastically reduce the landfilled volume of concrete discards from new construction by utilizing existing technology in a mobile application. That application focuses on recovering debris – as much as 100 percent of it – from the three largest generators of concrete in the County: 1) *The Villages* 2) SRI, and 3) SCSWF. Currently none of these sites recycle concrete debris. The project will be designed to segregate and process material at these sites rather than having individual loads from each construction site hauled to one remote facility.

Sub-criteria 1 – Not in common use in Florida

A review of studies, reports, trade journals, and Internet research has revealed no concrete recycling programs targeted at *all* of a County's concrete generators. More waste per square foot is generated in concrete block homes than wood frame homes, making these homes an appropriate target. This mobile reuse project could easily be adapted for other communities. The comprehensive nature of this type of proposed program provides an opportunity to divert large quantities of C&D debris at both generation and disposal points.

Sub-criteria 2 – Novel application of an existing technology or process

This project is unique for a number of reasons: (1) *100 PERCENT* of the County's entire concrete waste stream is targeted (generators, transfer sites, and disposal facilities). (2) Mobile/flexible equipment – the **Green Redeemer** Machine – will be *mobile* in order to fit the comprehensiveness of the proposed project. The preferred equipment will feature impact crushers, which are faster and more versatile than older compression crushers. The reduction ratio is higher and a secondary crusher is generally not needed. In addition, an impact crusher tends to shatter concrete, leaving tramp iron, rebar and mesh virtually concrete-free and ready for sale to local metal recyclers. (3) A private C&D landfill will divert and process concrete using equipment generally utilized for volume reduction purposes.

Sub-criteria 3 – Overcoming obstacles to recycling/waste reduction in new or innovative ways

Concrete is one of the largest components of the waste stream and can be found in all developments in all C&D disposal facilities in Florida's 67 counties and more than 400 cities. Concrete accounts for almost 50 percent of the waste coming from *The Villages'* concrete block model homes. The obstacles to recycling concrete in the past have been the absence of mobile processing equipment, local markets for the end product, and the lack of cooperation among commercial generators and disposal facilities.

The project is particularly innovative in that local alternative markets have been identified and will be utilized and expanded through a countywide, closed-loop recovery system. The comprehensiveness proposed by Sumter County assures an excellent probability of success. In fact, based on preliminary research, there may be greater demand for the processed concrete material than the available supply can meet. This might create markets for out-of-county material, thereby providing an outlet for neighboring counties/cities' materials.

The proposed program will establish BMPs and overcome obstacles utilizing the following components:

- (1) Identify and implement front-end waste reduction concrete construction practices.
- (2) Identify the value and flexibility of mobile equipment.
- (3) Track material generation, disposal, and recovery schedule.
- (4) Identify material to be separated, processed, and/or reused/recycled.
- (5) Identify additional large generators in the County through an Outreach Program.
- (6) Identify incoming materials that may have potential for reuse prior to processing.
- (7) Identify the reduction of concrete purchases for efficient supply-chain management prior to new construction.
- (8) Develop methods of monitoring the entire program.
- (9) Closely monitor and document program costs to help in planning long-term sustainability.

Criteria 2: TARGETS

Material Targets (Concrete, Glass): A number of reports have been published with estimated C&D generation rates as well as projected rates for the future. Florida C&D rates tend to be underestimated and are actually much higher than the national average because of the state's rapid growth and high level of new residential and commercial construction. Published reports place Florida's C&D generation at 9.4-million tons (in 1998) or 33 percent of the total solid waste generated. With construction and demolition debris now the second largest portion of Florida's waste stream, components of that stream are clearly deserving of special focus. A Waste Composition Study (WCS) at *The Villages* revealed the total volume of construction debris from the most popular designer block home to be 22,494 pounds, or 7.76 pounds per square foot. The concrete portion comprised half that total at 3.75 pounds per square foot. It can be projected that concrete block home construction in *The Villages* will produce a minimum of 2,200 tons of material per year. This figure does not include concrete discards from foundations or driveway construction at approximately 1,700 wood frame homes constructed annually, or concrete utilized in various commercial or recreational development projects at *The Villages*. A local contractor estimates that frame homes generate some 300 to 500 pounds each of discarded concrete material. This would add at a minimum an additional 265 tons of material for processing annually. In most cases, it has been an established industry standard that pure demolished *concrete* can generally be used as an aggregate in new concrete production. This material reuse option will be pursued with local concrete manufacturers. In addition, Sumter County produces a fine aggregate of crushed *glass cullet* and the possible introduction of a percentage of this material end product will be evaluated as well for possible inclusion in select concrete applications and/or a mixture of crushed glass and concrete for road base use or other public works projects. SRI also plans to separate concrete debris from deliveries from commercial vendors to their C&D landfill. SRI will partner with the County and other in- and out-of-county markets for crushed concrete.

Target Sectors (Commercial Generators): Concrete and concrete block discards from new construction developments, utilities, prisons, construction contractors and landfills are good candidates for local reuse and recycling applications. The County has identified several local markets for the processed material including base fill for county road construction, a base for foundations or footings, drainage or fill, as well as local concrete companies for possible use as an aggregate. In addition, *The Villages* has identified similar applications in which the processed concrete can be utilized in various projects throughout the development. This reuse of material back to the point of generation will create a unique "closed loop" process for the County and *The Villages*. No other project of this type has been found in which concrete and concrete block discards from two large commercial generators are source separated, segregated, and processed and recycled for reuse on similar projects on-site or on other projects in the area.

Target Importance: This project is especially important to Sumter County because of the limited C&D disposal options in the area. Currently the County diverts no concrete materials disposed. The problem is compounded by the extraordinary construction growth rate expected in the County over the next few years. The County is predicted to grow by 400 percent – 400 percent! – in the coming years through residential and commercial development. The project will provide the mechanism to divert thousands of tons of debris that would otherwise take up valuable C&D landfill space. In light of the projected growth of *The Villages* development, plus the virtual certainty of other commercial development throughout Florida, the positive and long-term effects of this project can hardly be overstated. The County, *The Villages*, and SRI are ready to partner with local existing markets for processed concrete material. With technology available to be modified for this application, the building blocks are in place for a cost-effective, replicated, sustainable C&D debris recovery program.

Criteria 3: BENEFITS

Sub-criteria 1 - Environmental Benefits

Methodology: *Finding the County's G (Green) Spot for C&D Concrete Recovery includes the following:*

Source Reduction: This project will merge the relationship between material purchasing, utilization of those materials at the work site, and identification of revised handling procedures with the potential to reduce disposal of materials. Sumter County will work with *The Villages* to review and analyze purchasing and construction practices to maximize material planning and minimize material overruns and reduce waste. Information will be provided to suppliers and subcontractors stressing the importance of product performance as well as waste reduction. Cost savings and potential labor streamlining will help maximize participation and support.

Reuse/Recycling: To involve generators in the County, *The Villages*, and local suppliers and vendors.

Sumter County: Once the appropriate equipment is purchased, Sumter will operate the equipment and process concrete and concrete block delivered to the site by contractors/subcontractors. The County will also assume the responsibility of marketing and reusing the end product material, whatever its destination for use.

Contractors (*The Villages*): The building contractors/subcontractors now are required to remove all construction debris generated by their project off-site upon job completion. The only change from this will be a requirement that concrete material discards will be delivered to a specified site, likely to be on *The Villages* property. This will result in a cost savings from avoided transportation since materials currently are being hauled to off-site.

Local Suppliers/Vendors: Economic participation incentives will be outlined for local suppliers/vendors to help establish concrete waste reduction initiatives and practices. Education will be a key component of this effort.

Toxicity: Crushed concrete, while non-toxic, can raise the pH level of water it contacts. Thus it is important to recover the concrete from unlined C&D landfills. Waste prevention and recycling of concrete (i.e., waste reduction) reduces pollution, conserves natural resources, and in many cases saves energy, but waste reduction also has another, often-overlooked benefit: It helps reduce global climate change.

Sub-criteria 2 – Economic Benefits: The economic benefits for the project include the following: 1) savings of approximately 20 cents or more per ton per mile in hauling costs to landfills; 2) eliminates disposal cost (up to \$92/ton in FL, \$49.50/ton in Sumter); 3) about 5,966 tons of concrete can be reclaimed from every one mile of concrete pavement, therefore lowering raw material costs; 4) increases the value/quality of the C&D debris material; 5) adds and expands market opportunities, both existing and alternative; 6) potentially offers payback period that covers cost of equipment purchased; 7) improves competitiveness between virgin material and recycled content debris; 8) improves environmental performance and reputation of commercial participants; 9) provides avoided disposal costs for commercial generators; and 10) expands the C&D disposal capacity of the local C&D landfill since they will use the mobile equipment. As the project expands, additional employment opportunities may result; 11) reuses the concrete material locally.

Sub-criteria 3 – Cost Effectiveness

This includes (but is not limited to) cost reduction, payback period, sustainability, and cost-effectiveness. The ease of diverting concrete/concrete block in the early residential-construction stages offers savings in sorting costs as well as in transportation costs for contractors/subcontractors. Additional economic benefits for Sumter will derive from using the finished concrete product in place of the usual road base or other fill normally purchased. Using it in place of lime rock fill will save \$8,261 to \$9,913 per year. Avoided disposal costs would be high as well (at least \$109,048.50 based on the current SCSWF rate of \$49.50/ton). The sale of rebar and wire mesh removed from the processed concrete will also realize revenue. Surplus material, if any, would be available for sale to other entities. Since the primary use of concrete on a frame construction job is the foundation and driveway, an estimate from one of *The Villages* builders is being used to calculate approximate generation numbers. Some 300-500 pounds of concrete is discarded from a frame home. *The Villages* constructs 1,700 of them per year – adding 265 additional tons of concrete material that would be available for processing.

Criteria 4: TRANSFERABILITY

Sub-criteria 1 – How will the project transfer its technology and processes?

The project is driven by a public sector agency, the County, to develop local partnerships with generators and disposal facilities in the County. It is a transferable pilot program throughout Florida.

Transferability of Technology:

The concrete crushing equipment is mobile. On a regional basis, counties could form a cooperative partnership that would allow the possible utilization of portable crushing equipment on a shared arrangement, with the unit traveling to residential construction sites on an as-needed basis. Sumter County could charge neighboring counties a nominal fee to help recover the costs of transportation and equipment maintenance.

Transferability Education Materials:

It is important to develop the correct tools that will deliver the message throughout the State to those entities that would most value information about the project and technical assistance from Sumter about the projects components. These tools and educational materials include:

- (1) BMP Guide
- (2) Statewide C&D-concrete BMP Workshop
- (3) Project PowerPoint Presentation transmitted electronically to Florida's other 66 counties
- (4) Equipment Demonstration(s)
- (5) Articles for non-traditional publications (e.g., contractors, developers, construction)
- (6) Articles for traditional industry publications (RFT, Solid Waste, Recycling, C&D)
- (7) Transmittal of approved project report electronically to 66 counties

Sub-criteria 2 – How will the project promote transferability?

Transferability Outreach:

The County will present and publish results through articles, press releases and the County website. It is important to note that *The Villages* development falls in three counties – Sumter, Lake and Marion. The C&D concrete material being generated in this tri-county area within *The Villages* property will be recovered. Sumter Recycling also receives out-of-county concrete. The recovery option being offered by Sumter Recycling allows this C&D facility to have an environmentally competitive advantage in terms of marketing their services as both landfill and recovery to other commercial generators in other counties that serve the construction industry.

Transferability Partners:

These associations, trade groups, and their individual members can provide additional outreach through their own company newsletters, Websites, and internal communications. In each of these venues, the simplicity of the program will be stressed as well as the economic and environmental incentives.

- ❑ Florida Home Builders Association – Contractors and Developers
- ❑ C&D Landfills in Florida – Private and Public Owners and Operators
- ❑ Association of Counties and Cities – (Counties and Cities in Florida)
- ❑ RecycleFlorida Today, Inc. (RFT) – RFT Members and Website
- ❑ Florida Chapter of Solid Waste Association of North America – SWANA Members and Website
- ❑ FEMA and EMS – Disaster Relief Storage Facilities and Warehouses
- ❑ Southern Waste Information Exchange (SWIX) – Large Generators and Waste Exchange

Criteria 5: LOCAL SUPPORT

Public Sector Support - Sumter County (\$40,500)

Sumter County's population is approximately 58,000 and is expected to increase by 400 percent over the next twenty years. Consequently, the County is very forward-thinking in planning for future needs and subsequent demands on local infrastructure. For this proposed project, the County will provide in-kind support for the following project components:

- Coordination of project components with program participants.
- Coordination with *The Villages* on any necessary site preparation.
- Use of County vehicles to move concrete processing equipment when necessary.
- Use of County vehicles and staff to transport finished processed concrete product to County job sites.
- Preparation of any needed signage.
- Support from all Public Works Divisions.
- Technical assistance on the project.

Commercial/Corporate Partner Support – The Villages (\$25,000)

With an average of 2,200 houses being built per year on this site, *The Villages* offers a perfect opportunity to showcase environmental stewardship in the development and construction industry. *The Villages* has agreed to work with Sumter County in the following areas:

- Identify an appropriate property location to be utilized as a staging and processing area for discarded concrete and concrete block material.
- With success, appropriate continued use of the site will continue for the remainder of the development's 10- to 12-year build-out.
- Coordinate education and compliance with building contractors and subcontractors to assure understanding of the project and orderly participation.
- Provide a model for other single-family residential construction developments.

Past experience with *The Villages* has shown its contractual control over its construction contractors, suppliers, and their employees to be environmentally aware – as well as having the contractual relationship to require them to participate in waste reduction activities.

Commercial Partner Support – Sumter Recycling (\$17,500)

The proposed project will incorporate the expertise and assistance of a private C&D facility, Sumter Recycling. The goals of this project constitute a win-win scenario for all participants involved:

- To conserve natural resources and minimize volumes of concrete waste entering the local C&D facility.
- Prepare a concrete staging area for recovery.
- Reuse and recycle discarded material into usable products to be used locally.
- Extend the life of area disposal facilities through reduced disposal of C&D debris.
- Provide a model for other C&D facilities in Florida.

Other Contributors – (\$ 32,500 – See Budget List)

BUDGET IS ATTACHED