# Florida Department of Environmental Protection
# FY 2007-08 INNOVATIVE GRANT APPLICATION FORM

**Project Information (on applicant letterhead)**

1) **Applicant Name: New River Solid Waste Association**

2) **Primary contact person: Darrell O'Neal**

3) **Complete Address:**

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4) **Telephone Number(s) (including SunCom number): 1-386-431-1000**

5) **E-mail address: doneal@nrswa.org**

6) **Project Title:**

   **Waste Tire Geoconduits for Enhancing Biostabilization at Landfills**

7) **Grant Request Amount: $72,000**

8) **Length of project (months): 12 months**

_____
Authorizing Signature

_____
Title

# PROJECT ABSTRACT

(No more than 20 lines. Every word over 20 lines will constitute a one point deduction.)
(do not delete the instructions on this page)

Approximately 20 million waste tires are generated annually in Florida. Waste tires are managed in a variety of ways including use as cushioning material in playgrounds, burning in waste to energy plants, use as drainage aggregate in civil engineering application (FDEP, 2006[1]). Annually over 4.5 million tires are disposed annually in landfills. The New River Solid Waste Association (NRSWA) proposes an innovative beneficial use of waste tires at its landfill site. The proposed study will evaluate a novel use of tires: whole tires for geoconduits for adding liquids to promote biostabilization of the waste. Bioreactor research has been conducted in some landfill units at the site. The NRSWA will subcontract with the University of Florida to assist with this evaluation. In the past, buried horizontal trenches for liquids addition were installed. The ideal practice is to use a bedding material such are rock or, more commonly in Florida, shredded tires. The availability and cost of tire shreds at New River has limited their use, but the facility does routinely collect a large amount of whole tires. In this project, the use of whole tires for the creation of geoconduits will be evaluated. This technique has the potential advantage of using a readily available source of whole tires and could solve some operational issues associated with installation of horizontal liquids addition devices. Different configurations of whole-tire geoconduits will be evaluated (banded on the surface, stacked on the surface, buried in the trench) Hydraulic performance of all of the trenches will be evaluated and compared with the published data. If successful, this application may represent a new market for whole scrap tires in the emerging field of bioreactor landfills.

[1] FDEP (2006). Waste Tires in Florida. State of the State.
http://www.dep.state.fl.us/waste/quick_topics/publications/shw/tires/SOSfinal2006.pdf accessed on 11/15/2006

# PROJECT DESCRIPTION

(1 page)

Landfills remain the most used method of solid waste management in Florida. This reliance has led to Florida becoming a leader in the more sustainable management of landfills using bioreactor technology. In this process, conditions in the landfill are created to promote the rapid biostabilization of the waste. This can have several immediate benefits to landfill operators, and should result in a much safer long-term disposal system than traditional landfill techniques. A key to operating a bioreactor landfill is the introduction of moisture to the waste. The most common methods used are the placement of perforated pipes in horizontal trenches excavated in the waste and the pumping of liquids into these trenches. The construction of these devices can be problematic for landfill operators for a number of reasons: (a) operations are disrupted, (b) waste is exposed and must be managed appropriate, and (c) the equipment needed for excavation may not always be a available at some sites. Landfill operators are always looking for creative techniques for introducing moisture that are both technically and economically effective, and that minimize impacts to routine landfill operation. One example of this is the use of shredded tires as a leachate recirculation blanket. This practice has been used elsewhere and is currently under evaluation at a landfill in Florida. The use of tires has additional benefits in that a recycled material can be used instead of a virgin mined material such as rock or a manufactured material such as geonet.

The project proposed here will evaluate the use of waste tires for a technique of distributing moisture in bioreactor landfills. The process will involve using whole tires to form geoconduits for liquids addition (and possible gas extraction) to the landfill. Geoconduits, referring to manufactured products for creating fluid transmission and distribution in geotechnical applications (soil, waste), are proposed to be manufactured from whole tires and tested as a leachate recirculation method at the New River Regional Landfill in Union County. Geoconduits differ from geopipe in that they are designed not only conduct fluids, but also to distribute them. Geoconduits manufactured from plastic materials (ribbed plastic balls in a plastic net) are used in septic drainfields; there use in landfills has been limited because of associated costs. In this application, whole waste tires would be banded together in different configurations for testing as liquids addition devices.

The NRSWA will subcontract with the University of Florida (Environmental Engineering) to refine and implement the evaluation. Ten geoconduits will be installed in one of the cells at New River Regional Landfill. Whole tires would be banded together in three configurations. Nine of the ten geoconduit will be installed by excavating a 3 ft by 3 ft trench in waste mass and placing the tires in one of three configurations presented later in the proposal (Figure 2 a, b and c). One geoconduit will be installed over a larger area at the surface (final elevation) of the landfill in a stacked configuration (figure 2 (c)). A perforated HDPE pipe would then be placed in the trench. The trench would be covered with a layer of geotextitle and then covered with cover soil. First 100 ft of the trench from the side slope edge will be backfilled with clay and no tire will be placed in this section of the trench to minimize chances of side slope seep development; solid HDPE pipe will be used for this section of the trench. The pipes will be extended and connected to the leachate recirculation hydrant. A series of instrumentations including flow meters, pressure transducers, and a datalogger would be installed to gather leachate recirculation rate and associated injection pressure for each geoconduit. A series of controlled injection tests would be conducted on each geoconduit with leachate recirculation rate and injection pressure frequently measured. The data would be compared to the published flow-pressure relationship for horizontal leachate recirculation trench system. If feasible, these geoconduits will also be evaluated for their ability to extract landfill gas.

# Criteria 1: TECHNOLOGIES or PROCESSES

(1 page)
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(20 points) The range of scoring is between 0 and 20 points, with up to 10 points for meeting one of the following sub-criteria, up to 15 points for meeting two, and up 20 points for meeting all three. Note: applicant may adjust space used to address each sub-criteria.

## Sub-criteria 1 – Not in common use in Florida.

Figure 1 presents the current waste tire management in Florida (based on data published in FDEP (2006). Civil Engineering applications include use of tires as drainfield aggregate and landfill daily cover. The applications as crumb rubber include use as rubberized asphalt and cushioning material. These applications most commonly involve shredding of tire. To the best knowledge of the author, the proposed application of tire has not been used in Florida to date.

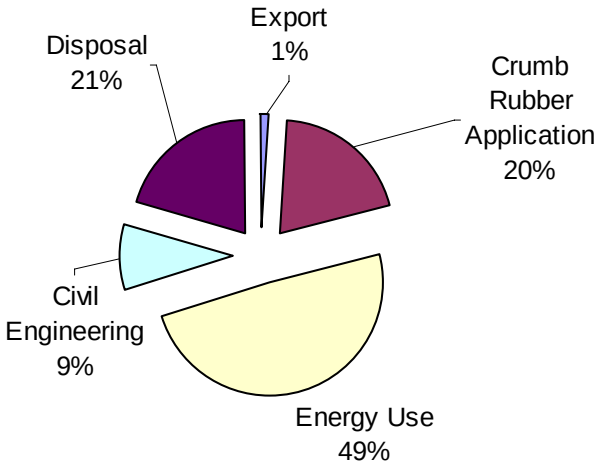


**Figure 1. Use of Waste Tires in Florida**

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

The concept of leachate recirculation at MSW has gained popularity in recent years. A variety of leachate recirculation techniques have been used in past. One commonly used method for leachate recirculation is use of horizontal trenches for recirculation of leachate. This type of system consists of an injection pipe embedded in a high permeability filler material and is installed as the waste is being deposited in the landfill. A series of these horizontal trenches are installed as landfilling progresses. Although shredded tire has been used as a filler material for recirculation trenches, shredded tire may not be available near landfill and may not be on-site shredding operation may not be economical. The use of whole tire in horizontal trenches is a novel approach.

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

New River Regional Landfill accepts waste from six surrounding counties and is not permitted to accept waste tire in absence of a long-term contract with a waste tire management facility. Currently, the facility does not have a contract to manage waste tire and do not accept waste tires. This project will open door for the facility to accept tire and beneficially use these.

# Criteria 2: TARGETS

(1 page)
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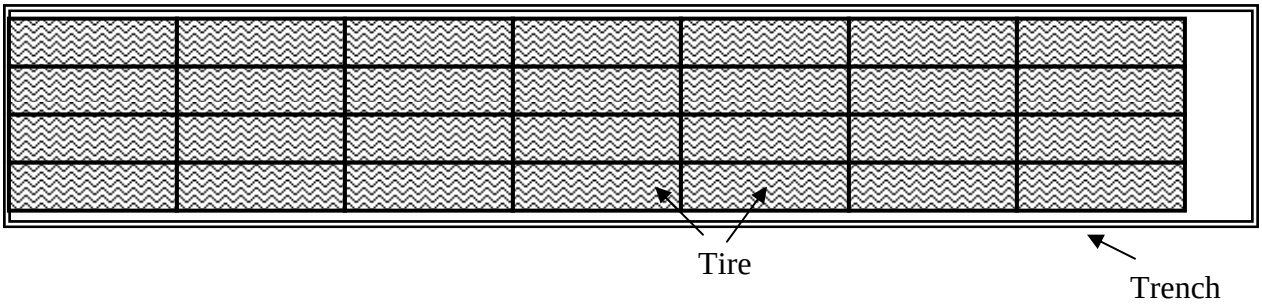
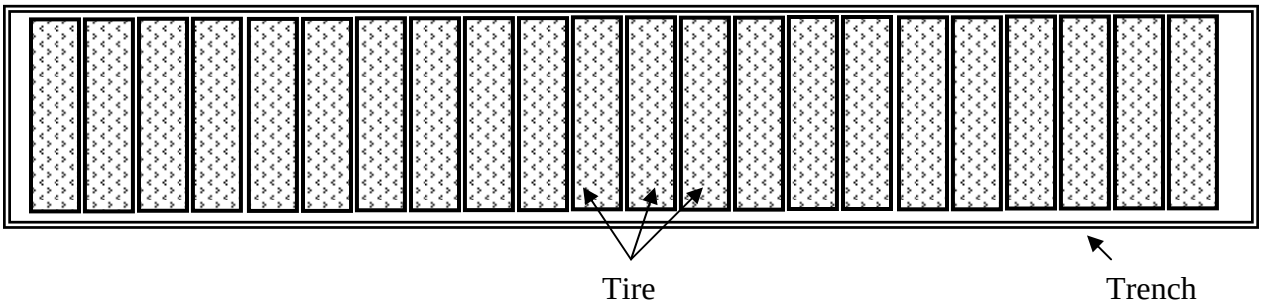
(10 Points) Demonstrate innovative processes to collect and recycle or reduce these targeted materials/sectors: Construction and Demolition Materials, Commercial/Institutional Sectors, Hurricane Debris, Pay-As-You-Throw and Waste Tires. Note: if the proposed project also includes materials/sectors other than those targeted by this criteria, the project will receive less than the maximum 10 points allocated for the criteria.

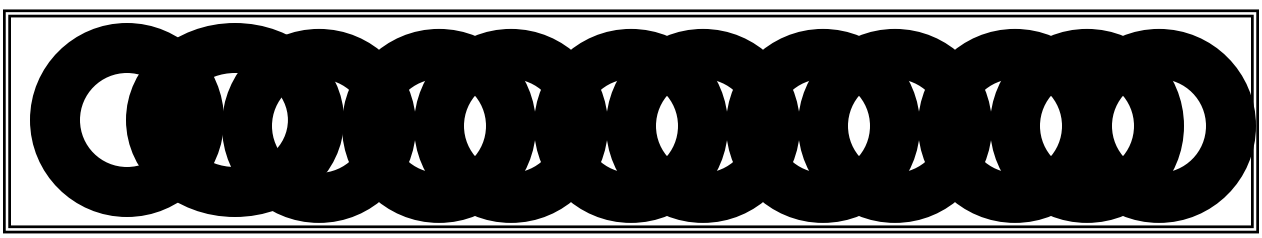
The sole waste stream targeted in this proposal is Waste Tires. Waste Tires is one of the waste streams on FDEP's target list for Innovative Recycling Grants. The tires accepted at the facility will be used for construction of leachate recirculation geoconduits. Geoconduits will be dug at the design elevation. Multiple schemes of tire arrangement in the trench will be evaluated. These schemes are schematically illustrated in following figures.




(a)




(b)



(c)

Figure 2. Arrangement of tires in a Geoconduit

# Criteria 3: BENEFITS/ COST-EFFECTIVENESS

(1 page)
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(25 points) Demonstrate the potential economic, environmental, and cost-effectiveness of the program's approach. Note: applicant may adjust space used to address each sub-criteria.

## Sub-criteria 1 - Environmental Benefits (5 points).

The proposed application of tires do not require any processing (e.g. shredding, burning etc.) of the waste stream and is thus not expected to have negative environmental impact. The other applications such as burning in a waste to energy plant, or shredding of tire for use as a cushioning material require certain tire processing and have negative environmental impacts.

## Sub-criteria 2 – Economic Benefits (5 Points).

The proposed use of tire replaces materials that a landfill practicing leachate recirculation technique or active gas collection usually procures. Therefore, the proposed application of tire is anticipated to provide some savings. The actual cost and benefit data will be collected during project execution and presented in the final report.

## Sub-criteria 3 – Cost-Effectiveness (15 Points).

As mentioned earlier, landfill usually procures material such as gravel, crushed glass, or shredded tires etc. for use during installation of leachate recirculation trenched and gas extraction trenches. Whole tires are usually available at any site and landfill management pay for the management of the tires disposed at their site. If found technically feasible, this application of tire is expected to be cost effective as landfill is saving not only by paying nothing for tire management, except for cost associated with handling of tire, but also by avoiding procurement of a filler material (gravel, crushed glass, shredded tire etc.) for installation of leachate recirculation and gas collection trenches. Actual cost data will be collected as the project progress and detailed cost-benefit analysis will be presented in the final report.

# Criteria 4: SUSTAINABILITY:

(1 page)
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(25 points) Demonstrate the sustainability of the proposed program.

New River Regional Landfill has been actively practicing leachate recirculation for past 4 years and is planning to pursue this operational technique for all the existing and future cells at the site. Landfill operator would, therefore, routinely install leachate recirculation trenches as a part of site operations. If found technically and economically feasible, installation and use of geoconduits would be continued in future even after completion of the funded project. The sustainability of the project at this site could, positively, be concluded as sustainability at sites practicing leachate recirculation. As mentioned earlier, an attempt would be made to evaluate the gas extraction capability of geoconduits. If found technically and economically feasible, use of waste tire geoconduit can be concluded as a sustainable practice at most MSW landfill; most landfills install an active gas collection system at some point during landfill operation. Actual performance data (flow-pressure data) and cost-benefit data would be presented in the final report. Other sites considering this practice would be able to take educated decision based on the outcomes of this project.

# Criteria 5: TRANSFERABILITY

(1 page)
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(10 Points) Demonstrate transferability of technology and processes and specify how the project will promote transferability. Note: applicant may adjust space used to address each sub-criteria.

## Sub-criteria 1 – Transferability of technology and processes (5 points).

Installation of liquid addition trenches and gas extraction trench are common practices at MSW landfill. It should be noted that currently only a few landfills practice leachate recirculation, however, this practice has been gaining popularity among landfill operators in recent years. The proposed installation and operation of the geoconduits could be accomplished by equipments commonly available at most landfills. The proposed application of waste tire can be completely transferred to other sites.

## Sub-criteria 2 – How project will promote transferability (5 points).

An attempt would be made to publish the technical and cost-benefit data collected in this project in a peer-reviewed engineering journal. The data collected would also be presented at landfill symposiums in Florida and other national level conferences in the US.

# Criteria 6: LOCAL SUPPORT

(1 page)
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(10 Points) Demonstrate local support for the proposed project in commitment of cash or in-kind matching funds. Please provide the name, address and phone number of ALL contributors.

- **00 points 0% up to and including 1% of total project cost**
- **01 points Greater than 1% up to and including 10% of total project cost**
- **02 points Greater than 10% up to and including 20% of total project cost**
- **03 points Greater than 20% up to and including 30% of total project cost**
- **04 points Greater than 30% up to and including 40% of total project cost**
- **05 points Greater than 40% up to and including 50% of total project cost**
- **06 points Greater than 50% up to and including 60% of total project cost**
- **07 points Greater than 60% up to and including 70% of total project cost**
- **08 points Greater than 70% up to and including 80% of total project cost**
- **09 points Greater than 80% up to and including 90% of total project cost**
- **10 points Greater than 90% up to and including 100% of total project cost**

Total project budget = $82,000
Support from New River Solid Waste Authority (equipment, operator, office space, supplies, etc.) = $10,000
Grant requested from FDEP = $72,000
Local support = 12.2%

# BUDGET

(1 page using Budget Table Template)
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Describe the project's budget allocated by task and budget categories per the Budget Table Template available from DEP's Innovative Grants web site in Microsoft Excel digital format **(www.dep.state.fl.us/waste/categories/recycling/pages/InnovativeGrants2007-08.htm).**