Memorandum

MIAMI-DADE COUNTY

Date: November 7, 2017

To: Honorable Chairman Esteban L. Bovo, Jr.
and Members, Board of County Commissioners

Agenda Item No. 8(M)(1)

From: Carlos A. Gimenez
Mayor

Subject: Resolution Authorizing Execution of the First Amended and Restated Research Service Agreement Between Miami-Dade County and the University of Florida to Determine the Suitability of Ash from the County's Resources Recovery Facility as a Substitute for Coal Ash in the Production of Cement

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Recommendation

It is recommended that the Board of County Commissioners (Board) approve the attached First Amended and Restated Research Service Agreement (Amendment) with the University of Florida (UF) to determine the suitability of ash from the County's Resources Recovery Facility (RRF), located at 6990 NW 97 Avenue as a substitute for coal ash in the production of cement.

This Amendment extends the agreement 24 months to November 30, 2019; addresses the disposition of the test batch of cement, in the event it cannot be used commercially; waives disposal charges; and includes two additional tasks: Task 4 - Mortar Properties & Testing Cement with and without Ash. This test will determine if the ash-amended mortar performs similar with ordinary Portland cement; and Task 5 - International Waste-to-Energy (WTE) Ash Use & South Florida Materials and Market Flow Analysis. This analysis will assess the current state of international WTE ash use in cement kilns around the world and South Florida materials, and market flow analysis with respect to WTE ash, cement production, and associated mineral demand.

Scope

The scope of work for the Agreement includes all sampling, testing, analyses, and reporting services necessary to determine the suitability of ash produced at the RRF as an alternative to coal ash in the production of cement. The impact is countywide.

Fiscal Impact/Funding Source

The Board previously adopted Resolution No. R-213-16 on March 8, 2016, which approved $118,893.00 towards this research project. Approval of this Amendment will increase the total expenditure by $68,130.00, bringing the total contract value with UF to $187,023.00.

In the event the test batch of cement cannot be used commercially, $6,500.00 for the cost of transportation of test batch cement back to the RRF ash landfill and a waiver of approximately $47,000.00 in disposal charges for 700 tons of test cement at the lower contract disposal rate of $66.79 per ton would be paid for by the Department of Solid Waste Management (DSWM).

The funding source for this project is DSWM proprietary funds.

Track Record/Monitor

This Agreement will be managed by Leonard Enriquez, Assistant Director for Technical Services, DSWM.

Background

On March 8, 2016, the Board approved Resolution No. R-213-16, which authorized a 12-month Agreement with UF to determine the suitability of ash from the County's RRF as a substitute for coal ash in the production of cement. This project has been delayed pending resolution of issues relative to the disposition of the test batch of cement in the event it cannot be used commercially. The Agreement was administratively extended to November 30, 2017, as authorized by Resolution R-213-16.

Amendments to the Agreement are necessary to ensure that the test batch of cement produced during the RRF ash test remains secure at the Titan America Pennsuco (Titan) facility until the regulatory decision regarding its commercial use is obtained from the Florida Department of Environmental Protection (FDEP). The Board will then be presented with the UF test results and FDEP decision for its consideration.

In the event FDEP disapproves the commercial use, Titan would be permitted to deliver the test batch of cement to the County's ash landfill for disposal at no charge to them, and the County would pay approximately $6,500.00 for the cost of transportation. The parties have worked together to minimize the amount of ash and resulting cement that will be generated by the test. We anticipate that the test will yield approximately 1,000 tons of cement containing approximately 300 tons of RRF ash. At the County's lower contract disposal rate of $66.79, disposal of the cement portion of the test batch (700 tons) would amount to a waiver of approximately $47,000.00 in disposal charges.

If the County receives FDEP approval for RRF ash recycling, ash landfill operating costs and long-term care costs may be reduced, and capital costs for landfill construction may be deferred significantly, dependent on our ability to market the ash. The current annual operating cost for the ash landfill is approximately $330,600.00. The capital cost for the most recently constructed ash landfill cell was $5.19 million. At the current fill rate, this new cell is anticipated to reach capacity in 2032.

The RRF produces approximately 165,000 tons of ash per year. All of this ash is placed in a secure ash landfill that must be maintained and monitored in accordance with State of Florida rules for at least 30 years after it is filled to its capacity and closed. If successful, this test may lead to the recycling of up to 85 percent of the ash produced at the RRF each year (approximately 140,000 tons). Ash recycling could potentially extend this time frame by approximately 90 years.

Coal ash is an essential ingredient in the production of cement. With the recent changes in air quality regulations worldwide, coal-fired power plants (the primary supplier of ash for cement manufacturing) are being closed down, making the ash feedstock scarce and more expensive to obtain. Local cement kilns report that coal ash is being imported from as far away as Italy to satisfy needs. Ash from coal-fired plants has higher levels of contaminants than ash from WTE plants, such as the RRF; therefore WTE ash may be a better alternative from an environmental perspective.

DSWM and its partners in this research, Covanta (RRF Operator) and Titan (a local cement manufacturer), are proposing to evaluate the use of RRF ash as a substitute for coal ash through a single day, commercial-scale, pilot test. Titan will dedicate up to a one-day cement production cycle at its local plant exclusively using the RRF ash. Additionally, Titan will monitor and evaluate the behavior of the ash during the cement production cycle. Covanta will pay to transport the ash to the Titan Facility for testing.

UF, through its Hinkley Center for Solid and Hazardous Waste Research (Hinkley Center), will perform the testing, analysis, and evaluation of the cement and cement products produced from RRF ash and compare them to cement and cement products currently and commonly available in Florida. The Hinkley

Center was created by the Florida Legislature to coordinate research by Florida universities on waste management issues requested by cities, counties, municipalities, and state agencies. The Hinkley Center is world renowned for its research into emerging waste management strategies and technologies. The Hinkley Center recently concluded similar research studies for Hillsborough County that resulted in approval for the use of ash from its WTE facility in roadbed and has reserved the same team of researchers to perform the work for the RRF project. FDEP has reviewed the concept and is supportive of the research approach. The amended Agreement and scope of work are attached.

There are a number of potential direct and indirect financial and environmental benefits that will accrue to the County, should the RRF ash be approved by FDEP as a suitable coal ash substitute.

These benefits include:

- Decrease in the amount of ash requiring landfilling by about 85 percent;
- Extend the life of the existing ash landfill;
- Allow for more capacity, thereby postponing the need for a new ash landfill;
- Increase recycling to help reach the State adopted 75 percent recycling goal;
- Enhance the protection of the environment since WTE ash has fewer contaminants than coal ash;
- Reduce the amount of greenhouse gases produced that are associated with transportation of ash, since the WTE ash is locally produced; and
- Reduce the cost of building materials by avoiding importation of raw materials from other sources.

The following additional benefits will be realized, if the previously landfilled ash can be mined and sold for cement production:

- Create a new revenue source for the County;
- Reduce existing landfill footprint; and
- Reduce long-term care costs associated with the ash landfill.

Alina T. Hudak
Deputy Mayor

MEMORANDUM

(Revised)

TO: Honorable Chairman Esteban L. Bovo, Jr. and Members, Board of County Commissioners

DATE: November 7, 2017

FROM: Abigail Price-Williams, County Attorney

SUBJECT: Agenda Item No. 8(M)(1)

Please note any items checked.

_____	**"3-Day Rule" for committees applicable if raised**
_____	**6 weeks required between first reading and public hearing**
_____	**4 weeks notification to municipal officials required prior to public hearing**
_____	**Decreases revenues or increases expenditures without balancing budget**
_____	**Budget required**
_____	**Statement of fiscal impact required**
_____	**Statement of social equity required**
_____	**Ordinance creating a new board requires detailed County Mayor's report for public hearing**
_____	**No committee review**
_____	**Applicable legislation requires more than a majority vote (i.e., 2/3's ____, 3/5's ____, unanimous _____) to approve**
✓	**Current information regarding funding source, index code and available balance, and available capacity (if debt is contemplated) required**

Approved _____ Mayor

Veto _____

Override _____

Agenda Item No. 8(M)(1)
11-7-17

RESOLUTION NO. _____

RESOLUTION AUTHORIZING EXECUTION OF THE FIRST AMENDED AND RESTATED RESEARCH SERVICE AGREEMENT BETWEEN MIAMI-DADE COUNTY AND THE UNIVERSITY OF FLORIDA TO STUDY THE SUITABILITY OF USING ASH FROM THE COUNTY'S RESOURCES RECOVERY FACILITY AS A SUBSTITUTE FOR COAL ASH IN THE PRODUCTION OF CEMENT INCREASING THE CONTRACT VALUE BY $68,130.00 TO A TOTAL AMOUNT OF $187,023.00; AUTHORIZING THE EXPENDITURE OF UP TO $53,500.00 FOR TRANSPORTATION AND DISPOSAL COSTS IN THE EVENT THE TEST BATCH OF CEMENT CANNOT BE USED COMMERCIALLY; AND AUTHORIZING AN EXTENSION OF TWENTY-FOUR MONTHS

WHEREAS, the County owns the Resources Recovery Facility (RRF) located at 6990 N.W 97th Avenue, Doral, Florida, which produces ash as a byproduct that must be disposed of in a lined landfill; and

WHEREAS, the ash produced at the RRF may be a suitable substitute for coal ash in the production of cement, thereby creating an opportunity to recycle the ash and eliminate the cost of disposal; and

WHEREAS, testing, evaluation and analysis are necessary to determine the feasibility of using this ash in cement manufacture and this First Amended and Restated Agreement clarifies the status of the test batch of cement prior to all necessary approvals; and

WHEREAS, the Hinkley Center of the University of Florida was specifically created by the Florida Legislature to perform such research and has conducted similar research for another county,

NOW, THEREFORE, BE IT RESOLVED BY THE BOARD OF COUNTY COMMISSIONERS OF MIAMI-DADE COUNTY, FLORIDA, that this Board authorizes the County Mayor or County Mayor's Designee to execute the First Amended and Restated Research Service Agreement between Miami-Dade County and the University of Florida, increasing the contact value by $68,130.00 to a total amount of $187,023.00; authorizing the expenditure of up to $53,500.00 for the transportation and disposal costs in the event the test batch of cement cannot be used commercially; and authorizing an extension of twenty-four months.

The foregoing resolution was offered by Commissioner , who moved its adoption. The motion was seconded by Commissioner and upon being put to a vote, the vote was as follows:

Esteban L. Bovo, Jr., Chairman
Audrey M. Edmonson, Vice Chairwoman

Bruno A. Barreiro	Daniella Levine Cava
Jose "Pepe" Diaz	Sally A. Heyman
Barbara J. Jordan	Joe A. Martinez
Jean Monestime	Dennis C. Moss
Rebeca Sosa	Sen. Javier D. Souto
Xavier L. Suarez	

The Chairperson thereupon declared the resolution duly passed and adopted this 7th day of November, 2017. This resolution shall become effective upon the earlier of (1) 10 days after the date of its adoption unless vetoed by the County Mayor, and if vetoed, shall become effective only upon an override by this Board, or (2) approval by the County Mayor of this Resolution and the filing of this approval with the Clerk of the Board.

MIAMI-DADE COUNTY, FLORIDA
BY ITS BOARD OF
COUNTY COMMISSIONERS

HARVEY RUVIN, CLERK

By:_____
Deputy Clerk

Approved by County Attorney as
to form and legal sufficiency. DF.

Daniel Frastai

First Amended and

Restated Research Service Agreement

Between the

University of Florida Board of Trustees

and

Miami-Dade County

The purpose of this Amendment is to modify the scope of services and fixed fee amount.

NOW, THEREFORE, in consideration of the mutual covenants and agreements contained herein, the following Articles shall now read as follows:

1. **Scope of Service to be Performed:** UF agrees to undertake and conduct the work entitled: "Evaluate the Use of Waste to Energy Bottom Ash from Miami-Dade Renewable Energy Facility as a Kiln Feed Component in the Manufacture of Portland Cement" for SPONSOR as outlined in Revised Exhibit A dated 6/13/17.
2. **Period of Service:** The research services called for by Article 1 may begin on December 1, 2015 with activities ending on November 30, 2019, unless extended by written amendment or terminated sooner following the termination provisions set forth below
3. **Fixed Fee and Payment:** SPONSOR agrees to pay a total not-to-exceed fee in the amount of $187,023 which includes a base fee of $162,023 and a contingency of $25,000 for research services to be provided under this agreement in accordance with the following schedule and receipt of UF invoices based on the percent completion of each task:

   - ☐ Task 1-Testing/Sampling Plan - $16,893
   - ☐ Task 2-Collection/testing of Bottom Ash - $15,000
   - ☐ Task 3-Collection/Testing of Control, Bottom Ash-Amendment Cement, and Cement Products – $35,000
   - ☐ Task 4-Mortar Properties & Testing Cement with and without Ash - 34,065
   - ☐ Task 5-International WTE Ash Use & South Florida Materials and Market Flow Analysis - $34,065
   - ☐ Task 6-Signed and Sealed Final report - $27,000
   - ☐ Task 7- Contingency - $25,000

   The Contingency is intended to fund supplemental related research that may present itself during the course of the scoped investigation and cannot be used without prior, written approval of SPONSOR's Point of Contact.

   The Payment shall be made to "University of Florida" and remitted to the following address:

CFO - Contracts & Grants
PO Box 113001
Gainesville, FL 32611-3001

Except as hereby modified, all terms and conditions of the original research agreement remain unchanged and in full force and effect.

Sponsor	University of Florida
Authorized Official Signature	Digitally signed by Stephanie L Gray DN: cn=Stephanie L Gray, o=University of Florida, ou=Office of Research, email=slgray@ufl.edu, c=US Date: 2017.07.22 11:41:41 -04'00'
Name	Name
Date	Date

Revised Exhibit A
6/13/17

Proposed Plan of Testing to Evaluate the Use of Waste to Energy Bottom Ash from the Miami-Dade Renewable Energy Facility as a Kiln Feed Component in the Manufacture of Portland Cement

Scope and Budget Amendment

The Miami-Dade County Department of Solid Waste Management (DSWM) has expressed their interest to beneficially use waste to energy (WTE) bottom ash from the Miami-Dade Resource Recovery Facility (RRF) in Doral, FL as a component of the cement kiln feed at the Titan Pennsuco kiln in Medley, FL. WTE fly ash will not be examined as part of this effort. The Titan kiln is located approximately 5.5 miles north of the Miami-Dade RRF. The WTE bottom ash contains ferrous and non-ferrous metals, and other minerals that are valuable in the manufacture of Portland cement.

The Hinkley Center for Solid and Hazardous Waste Management and the University of Florida have been working with the County to develop and implement a testing plan that will evaluate this proposed recycling opportunity and to obtain necessary permission from the Florida Department of Environmental Protection for long-term implementation. Logistical issues have delayed the test burn and associated testing. Additional funding is requested to successfully complete the additional task items (provided as tasks 4 and 5). The task numbers conform to those identified in the contract.

Task 1: Develop and Submit Testing and Sampling Pan

A formal sampling plan and list of tests to be conducted on the bottom ash, ash-amended and control cements, and cement products will be developed based on dialogue with the FDEP (Department). Portland cement concrete and mortar specimens will be produced using mix designs developed through conversations with the Department and will be representative of many of the cement products that could potentially be produced using the cement generated at the Titan Pennsuco facility. Mortar specimens (comprised of cement and sand without any course aggregate) would contain a higher percentage of cement than most concrete mixes and are considered to be a conservative means for evaluating element release from cement-based products. However, based on the large number of potential applications for cement, these designs would not encompass all of the potential mixes or applications for the cement produced at the facility. After a consensus agreement has been reached by all parties, the testing plan will be submitted to the FDEP for feedback.

Task 2: Collection and Testing of Bottom Ash

Bottom ash will be used as a replacement for coal ash in the cement production process on a trial basis. This ash will be stockpiled for a period of multiple weeks at the Miami-Dade RRF ash landfill. Sufficient bottom ash will be stockpiled to allow a 24-hour test period during which ash is utilized as kiln feed (approximately 300 tons). Covanta agrees to pay for the transportation of approximately 300 tons of bottom ash to the Titan Pennsuco facility in Medley from the RRF ash landfill. Prior to the test, representative samples of the bottom ash will be collected from the stockpile for baseline characterization. The ash will be sampled following the procedures outlined in the US EPA's SW-846 *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (Chapter Nine – Sampling Plan)*. The goal of this is sampling is to provide a sufficient number of samples to meet the intent of

accepted ash characterization protocol (e.g., US EPA's *Guidance for the Sampling and Analysis of Municipal Waste Combustion Ash for the Toxicity Characteristic* (EPA Pub No. EPA530-R-95-036)). This is the standard sampling procedure used for the characterization of WTE ash with respect to its status as a hazardous waste. The sample will be used to characterize the hazardous waste status of the bottom ash tested, as well as determine the bulk and trace element forms present in the material.

TCLP testing for RCRA metals (As, Ag, Ba, Cd, Cr, Se, Hg, Pb) and total concentration testing on an expanded suite of samples will be conducted on each of the ash samples collected. XRD analysis will be conducted on a composite sample created from the individual samples. Total concentration and XRD analysis will be performed to quantify the bulk and trace elemental forms present in the bottom ash. This data may be used to better understand any potential differences in the ash amended and control cements.

Sample: Miami-Dade RRF Bottom Ash	
Test	**Method**
Toxicity Characteristic Leaching Procedure (TCLP)	EPA Method 1311
Total Elemental Concentration	EPA Method 3050b
Bulk Mineral Composition Through X-Ray Diffraction	ASTM C1365: Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis

Task 3: Sampling and Testing of Control and Bottom Ash-Amended Cement and Cement Products

The Portland cement produced during the 24-hour test at the Titan Pennsuco facility (approximately 1,000 tons) will be characterized along with a control sample of cement produced without bottom ash (using coal ash). A representative sample of the ash-amended cement product will be collected over the duration of the time in which the ash-amended cement is produced. To provide a basis for comparison, a sample of cement produced where bottom ash was not incorporated as a kiln feed will be collected in the same manner. Bulk and trace elemental analysis will be conducted on the ash-amended and control cements to evaluate if the addition of the WTE bottom ash resulted in substantial changes to the trace element content of the cement or the mineral forms present.

The following tests will be conducted on the ash-amended and control cements:

Materials: *ash-amended cement, and control cement*	
Test	**Method**
Total Elemental Concentration	EPA Method 3050b
Bulk Mineral Composition Through X-Ray Diffraction	ASTM C1365: Standard Test Method for Determination of the Proportion of Phases in Portland Cement and Portland-Cement Clinker Using X-Ray Powder Diffraction Analysis

To evaluate potential changes to the leachability of concrete and mortar specimens produced using the bottom ash-amended cement, concrete and mortar samples will then be produced using both the ash-amended and control cements. The mix designs used for the concrete and mortar specimens will be determined through dialogue with the Department, Miami-Dade County, Titan and The University of Florida. To quantify trace element release from the ash-amended and control concretes and mortars, these samples will be subjected to a series of leach tests. These tests will evaluate the leaching behavior of the concrete samples and mortar samples in their intact form as well as when they are crushed to assess leaching risks if the concrete is size-reduced for recycling or disposal.

The following tests will be conducted on the ash-amended and control concretes and mortars:

Materials: *ash amended and control concrete and mortars*	
Test	**Method**
Total Elemental Concentration	EPA Method 3050b
Synthetic Precipitation Leaching Procedure	EPA Method 1312
Batch Liquid to Solid Ratio Test	EPA Method 1316
Monolith Leaching Test	EPA Method 1315
pH Static Leaching Test	EPA Method 1313

Task 4. Mortar Properties & Testing Cement with and without Ash

The testing program will include test methods to determine if the ash-amended mortar performs similarly to mortar with ordinary Portland cement. To achieve this, concrete and mortar samples (both ash-amended and control) will be submitted to a series of tests to determine its physical characteristics including heat of hydration, compressive strength, and plastic properties.

The standardized tests are as follows:

Heat of hydration - Isothermal calorimetry (ASTM C1702)
Plastic properties - Flow table (ASTM C1437)
Plastic properties - Time of setting (ASTM C403)
Compressive strength of mortar (ASTM C109)

Sample and analyze bottom ash from the RRF along with conventional mineral sources to estimate

the trace element concentration differences between cement manufactured with WTE bottom ash and that manufactured with conventional mineral sources. This task involves both a total trace element analysis and a leachable trace element analysis.

Task 5: International WTE ash use in cement kilns & South Florida Materials and Market Flow Analysis

Assess the current state of international WTE ash use in cement kilns around the world. This task involves conducting a complete literature review of the refereed technical literature and determining current industry use.

The South Florida materials flow market will be evaluated and analyzed with respect to WTE ash, cement production, and associated mineral demand.

Task 6: Drafting and Submission of Signed and Sealed Final Report

Following completion of the tests listed in Tasks 3-4 the research team will submit a report to the Department outlining the results of the research described above. Additionally, an engineering use case analysis of the potential impacts of the use of the Miami-Dade bottom ash as a component of the cement kiln feed will be provided. Throughout this process a dialogue will be established with senior Department staff in order to ensure that appropriate criteria are being evaluated. Dr. Timothy Townsend P.E. (FL Reg. # 60283) and his staff will be responsible for any use case modeling efforts and drafting of the final report.

While the parties involved in the ash testing project (Miami-Dade County, Titan, Covanta, and the University of Florida) await the FDEP review and decision regarding the test analysis and findings, the Portland cement manufactured using bottom ash from the RRF shall remain stored at the Titan Pennsuco facility. It is the intent of the parties that the results of the FDEP review and decision will be presented to the Miami-Dade County Board of County Commissioners (Board), and based on those results the Board will either grant or deny approval for the use of RRF bottom ash in the commercial manufacture of Portland cement. In the event that FDEP disallows the commercial manufacture of Portland cement made with RRF bottom ash or the Board denies approval of the same, the County agrees to accept the Portland cement generated during the test in the County's ash landfill at no charge and pay for its transportation from the Titan facility. Further, in the event that Titan is unable or prohibited from storing the test batch of Portland cement at its Pennsuco facility, the County will accept this material in the County's ash landfill at no charge and pay for its transportation from the Titan facility.

Task 7. Contingency