GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. ____

Project No. E-20-626 R5924-0A0 GTRC~~XXX~~ DATE 4 / 23 / 85

Project Director: Dr. P. Meyer School/~~XXX~~ ~~DE~~ CE

Sponsor: RUST International Corporation
Birmingham AL 35201-0101

Type Agreement: Standard Research Agmt. and P.O. #2426E-1445

Award Period: From 3/25/85 To 5/27/85 (Performance) ~~5/27/85~~ 8-15-85 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated: $		$ 20,298
Funded: $		$ 20,298

Cost Sharing Amount: $ N/A Cost Sharing No: N/A

Title: Hydrolic Model Study of Cooling Water Intake Systems at Baltimore RESCO.

ADMINISTRATIVE DATA

OCA Contact John B. Schonk x4820

1) Sponsor Technical Contact:

David Fegenbush
RUST International Corporation
Box 101
Birmingham, AL 35201-0101

205/930-1925

2) Sponsor Admin/Contractual Matters:

James A. Ryan
RUST International Corporation
Box 101
Birmingham AL 35201-0101

205/930-1172

Defense Priority Rating: N/A Military Security Classification: N/A

(or) Company/Industrial Proprietary: N/A

RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval — Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Sponsor

COMMENTS:

SPONSOR'S I. D. NO. 02.217.000.85.001

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
Research Security Services
Reports Coordinator (OCA)
Research Communications (2)
GTRC
Library
Project File
Other A. Jones

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 11/15/85

Project No. E-20-626 School/~~XXX~~ CE

Includes Subproject No.(s) N/A

Project Director(s) Dr. Paul Mayer GTRC / ~~GTX~~

Sponsor RUST International Corp. Birmingham, AL 35201-0101

Title Hydrolic Model Study of Cooling Water Intake Systems at Baltimore RESCO.

Effective Completion Date: 5/27/85 (Performance) 8/15/85 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [X] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. None Indicated Continued by Project No. None Indicated

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/GTRI Supply Services
Research Security Services
[redacted]
Legal Services
Library
GTRC
Research Communications (2)
Project File
Other A. Jones; M. Heyser; R. Embry

FORM OCA 69.285

Georgia Institute of Technology
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
ATLANTA, GEORGIA 30332

SCHOOL OF
CIVIL ENGINEERING

TELEPHONE
(404) 894- 2225

August 5, 1985

E-20-626/Mayer

Mr. David A. Fegenbush
Rust International Corporation
P. O. Box 101
Birmingham, AL 35201-0101

Subject: Baltimore RESCO Hydraulic Model Study: Final Report Contract No. 21-2426E

Dear Mr. Fegenbush,

Enclosed please find the Final Report on the RESCO hydraulic model study. The salient results of the study have been transmitted to you previously.

A video tape of the model will be submitted under separate cover.

Should you require additional clarification, please do not hesitate to call on me.

Sincerely,

Paul G. Mayer,
Regents' Professor

PGM/mch

Enclosures

RESCO HYDRAULIC MODEL STUDY:

Final Report on Project No. 21-2426E
(P. O. No. 2426E-1445, Baltimore RESCO)

by Paul G. Mayer, School of Civil
Engineering, Georgia Institute of Technology

August 5, 1985

I. Introduction

The project is known as the Baltimore RESCO plant for refuse incineration. It is located on Gwynn Creek immediately below the Old Anapolis Road in Baltimore, Maryland. During high storm water discharges large quantities of floating debris and suspended sediment are washed into the cooling water intake structure.

Mr. Joe Murphy of Rust International requested on January 25, 1985, that a proposal was prepared to conduct a hydraulic model study to study the problem. Accordingly, a proposal was submitted to Mr. David A. Fegenbush, dated February 8, 1985. Contractual arrangements for work to be performed was consummated by the issuance of a purchase order on April 4, 1985. The signee was James A. Ryan, Purchasing Agent, Rust International Corporation. The technical representative of Rust International was David A. Fegenbush. The principal investigator at Georgia Tech was Paul G. Mayer, Regents' Professor, School of Civil Engineering.

II. Scope of Work

A hydraulic model was to be built and operated in the Georgia Tech Hydraulics Laboratory. Specifically:

1. The Georgia Tech Hydraulics Laboratory (Lab) will model Gwynns Falls, both upstream and downstream of the RESCO facility intake structure, to evaluate the effect of one or more walls to deflect floating, suspended, and bed material away from the intake screens/structure. The effect on the upstream floodplain by construction of the deflection wall(s) and the effect on bed erosion of diversion walls downstream of the intake structure will also be modeled (first priority will be placed on the debris diversion wall). Appropriate test runs will be video taped in VHS format.
2. The 1:35 scale model will include flow to the intake structure at flow rates of 200, 500, 1,000, 1,500 and 2,000 cfs in Gwynns Falls. The flow will be simulated in the model based on Froude Number criterion. Not only will normal tidal range be modeled, but flood and neap tides will also be included.
3. The Lab will provide all manpower for construction the model for determining geometrical and dynamical similarity, and for hydraulic model testing. All personnel shall be experienced and qualified in their area of work. The Lab will also provide appropriate space, pumps, meters, video cameras, and tape and other required equipment.
4. Rust International will provide drawings and information on existing conditions that are needed for construction of the model. All of the laboratory work is expected to be completed within eight weeks from the contract date and a written report with recommendations at the end of the ninth week. The Lab

will provide RUST with a milestone schedule including items such as model construction start and completing, testing dates and completion of report. This schedule is to be provided within one week of the contract date.

III. The Hydraulic Model

The model was a fixed-bed replication of a protion of Gwynn Creek at the RESCO plant. It includes importantly the bend above the plant at the Old Anapolis Road bridge, the cooling water intake structure and a sufficiently long portion of the excavated intake channel. The model was scaled at 1:35 and covers a laboratory space of some eight feet by thirty-two feet. The model was built onto a platform some 27 inches above the laboratory floor. A levelled system of trusses supports the platform. Twelve-inch high side boards enclose the model space. The topography and hydrography of the area was modeled in accordance with drawings supplied by Rust International. On the platform, appropriately shaped transverse templates were mounted to provide the skeleton supports for the plywood decking used to replicate the model area. Eventually the model was sealed and fiberglassed. A coat of paint was applied to accomodate better observability both visually and for video taping.

Water was supplied to the model from the laboratory's floor storage system by means of a centrifugal pump. A three-inch diameter supply line was equipped with a calibrated oriface meter and a valve for flow control. The supply pipe discharged into a head bay from which the flow entered the model of Gwynn Creek. The model terminated in a tail bay from which the water was returned to the floor channel system. The tail bay discharges were controlled by a six-inch valve which allowed also for the regulation of the water surface elevations in Gwynn Creek.

The operation of the cooling water system was modeled by a lateral withdrawal through the intake structure. The withdrawal was accomplished by a separate centrifugal pump. The pump discharged through a one-inch PVC pipe which was equipped with a calibrated elbow meter and with a flow control valve. The flow from the cooling water system was discharged into the tail bay.

Flows through Gwynn Creek and through the intake structure could be operated independently of each other. The control of the flow depths in Gwynn Creek was also independently variable. Flow rates were set by appropriate manometer settings. The depth of flow in Gwynn Creek was measured by staff gages.

The model's topography was build to correspond to drawings made available by RUST. Important modifications were made later near the intake structure when David Fegenbush was able to provide some presentday photographs of the site (May 20, 1985). Further channel modifications were made when George Hudnet provided data on sediment accumulations at the intake structure (June 5, 1985 and July 1, 1985).

The latest channel modifications consisted of filling the excavated trench in Gwynns Falls Creek with movable bedload materials. In particular, the bulk of the accumulated sediments in Gwynns Falls was simulated by a coarse sand. A layer of fine sand was then deposited up to appropriate elevations to conform to the hydrographic information supplied by George Hudnet.

Figure 1 shows the model during construction. The view is in the downstream direction. The cooling water intake structure is located at the left edge of the model. Figure 2 shows the support trusses under the model. A close-up view of the intake structure is shown in Figure 3. Figure 4 provides a view of the pump, valve, elbow meter and manometer used to simulate Gwynns Falls Creek.

Figure 5 shows the model during operation A rubble mount diversion structure is visible upstream from the intake structure.

For the main water supply system, 3-inch piping and elbow meter was used. For the cooling water simulation, one-inch piping and elbow meter was used. For the main system the calibration yielded an equation

$$Q=0.070h^{1/2}$$

For the cooling water system the calibration yielded

$$Q=0.0106h^{1/2}$$

where Q is in units of cfs and h is in units of inches of water.

In order to simulate prototype conditions the Froude parameter was used. Accordingly, the discharge ratio between model and prototype was 1:7250 and the velocity ratio was 1:5.9.

Various model discharges could thus be modeled as follows:

Gwynn Falls System (cfs)

prototype	model	manometer (inches)
2000	0.276	15.5
1500	0.206	8.7
1000	0.138	3.9
500	0.069	1.0
300	0.041	0.34
200	0.028	0.16

Cooling Water System (cfs)

94	0.013	1.5

The water surface elevation in the model was controlled by the six-inch valve at the tail bay. The control of the water surface elevation was independent of the flow rate through the model. Flow patterns, floating debris movements and sediment depositions could thus be simulated for various prototype conditions.

GEORGIA INSTITUTE OF TECHNOLOGY — OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

Project No. E-20-626 R5924-0A0 GTRC~~XXX~~ DATE 4 / 23 / 85

Project Director: Dr. P. Meyer School/~~XXX~~ ME CE

Sponsor: RUST International Corporation
Birmingham AL 35201-0101

Type Agreement: Standard Research Agmt. and P.O. #2426E-1445

Award Period: From 3/25/85 To 5/27/85 (Performance) ~~5/27/85~~ 8-15-85 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated: $		$ 20,298
Funded: $		$ 20,298

Cost Sharing Amount: $ N/A Cost Sharing No: N/A

Title: Hydrolic Model Study of Cooling Water Intake Systems at Baltimore RESCO.

ADMINISTRATIVE DATA OCA Contact John B. Schonk x4820

1) Sponsor Technical Contact:	2) Sponsor Admin/Contractual Matters:
David Fegenbush	James A. Ryan
RUST International Corporation	RUST International Corporation
Box 101	Box 101
Birmingham, AL 35201-0101	Birmingham AL 35201-0101
205/930-1925	205/930-1172

Defense Priority Rating: N/A Military Security Classification: N/A
(or) Company/Industrial Proprietary: N/A

RESTRICTIONS

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Sponsor

COMMENTS:

SPONSOR'S I. D. NO. 02.217.000.85.001

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
~~Research Security Services~~
Reports Coordinator (OCA)
Research Communications (2)
GTRC
Library
Project File
Other A. Jones