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September 12, 1973

National Aeronautics and Space
Administration
Goddard Space Flight Center
Greenbelt, Maryland 20771

ATTENTION: Distribution

RE: Type I Progress Report - New Jersey
Coastal Mapping: NAS5-21765

Gentlemen:

The New Jersey Department of Environmental Protection and Earth Satellite Corporation are pleased to submit a Type I Progress Report for the two month period ending August 31, 1973.

A. TITLE: Application of ERTS-1 Data to the Protection and Management of New Jersey's Coastal Environment (SR #304)

B. PRINCIPAL INVESTIGATOR: Mr. Roland S. Yunghans, New Jersey Department of Environmental Protection

C. CO-PRINCIPAL INVESTIGATORS: Dr. Edward B. Feinberg, New Jersey Department of Environmental Protection
Dr. Frank J. Wobber, Earth Satellite Corporation

D. CO-INVESTIGATOR: Mr. Robert L. Mairs, Earth Satellite Corporation

E. PRINCIPAL CONTRIBUTORS: Mr. Robert T. Macomber, Earth Satellite Corporation
Mr. Dennis Stanczuk, Earth Satellite Corporation

F. OBJECTIVES OF INVESTIGATION:

- to develop useful information products from ERTS-1 monitoring of tidal and nearshore circulation and sedimentation
- to apply these products to the management and protection of New Jersey's coastal zone, and facilitate allocation of funds in shore protection, planning, etc.

- to estimate benefits from ERTS to the New Jersey Department of Environmental Protection

G. SUMMARY OF ACCOMPLISHMENTS:

The primary accomplishments during this two month period of the experiment are summarized on the following pages by phase. The most significant accomplishment during this reporting period was the completion of the initial information products package and the subsequent briefing of NJDEP personnel by EarthSat on their use. Accomplishments are detailed by task in the TASK STATUS REPORT (Appendix A).

PHASE I: PRE-LAUNCH PREPARATION

- All pre-launch preparation tasks have been completed except for letter contacts with other coastal states. A brochure is in the final stages of preparation detailing specific accomplishments realized in New Jersey.

PHASE II: FIRST LOOK ANALYSIS

- All first look analysis tasks have been completed. Many of these tasks are implicitly carried over into Phase III analysis even though they are not so stated.

PHASE III: CONTINUING DATA ANALYSIS

- All ERTS-1 data, collateral aircraft data, and ground truth data are being analyzed for the preparation of information products.

- Work is progressing on a shore erosion/accretion case study in a developed versus an undeveloped beach area.

- Problem areas receiving the most analysis during this reporting period have been centered on ocean outfall placement, offshore waste disposal, forage crop for the Atlantic Brant, and coastal zone surveillance (developmental change detection).

H. SIGNIFICANT RESULTS

- Briefings and interviews were held between NJDEP and EarthSat personnel on the use of the ERTS-1 information products submitted in the Type II Report.

- Rates of erosion and accretion of the shoreline are being calculated for two test areas along the New Jersey coast. Measurements are made on aerial photographs taken over the last 20 years and processed by computer. The rates are presented in graphic form on an ERTS-1 base map at a scale of 1:125,000.

  These rates are being used to determine the effectiveness of various shore protection structures at preventing sand removal and encouraging sand accumulation. Information on maintenance and construction expenditures is being used to obtain a cost effectiveness ratio for various shore protection devices. The relationship of erosion rates, property value, and project cost are all criteria for selection of site type and extent of a shore protection structure.

  Compilation and evaluation of historical data will identify past decision making patterns. The effectiveness of these decisions with respect to erosion rates, property value, and project cost, can be used as an added criteria for future allocation of money and the selection of site and type of structure to be built.

I. PROBLEMS:

Neither NJDEP nor EarthSat have directly received any imagery since the April 7, 1973 overpass, 1258-15082. We have been able to obtain copies of the imagery through another investigation so analysis has not stopped, but we would appreciate renewed delivery. It was assumed this delay was due to the late approval (August 2, 1973) of the Data Analysis Plan and that delivery would resume shortly thereafter.

J. RECOMMENDATIONS FOR TECHNICAL CHANGES:

None

K. CHANGES TO STANDING ORDER FORMS:

None

Sincerely yours,

Original Signed by:

Roland S. Yunghans
Chief, Office of Environmental
Analysis
New Jersey Department of
Environmental Protection

Frank J. Wobber
Director, Geosciences and
Environmental Applications
Division
Earth Satellite Corporation

Attachment
RSY/FJW/kw

APPENDIX A

TASK STATUS REPORT

Contract NAS5-21765

▨ = Completed Tasks

TASK	HEADING	STATUS	COMMENTS
		PHASE I	
3.1.1	Determine existence of Pre-ERTS imagery for analysis	Completed 10/1/72	Visits were made to NASA MSC (Earth Resources Aircraft Data Bank) at Houston, Texas. A catalog of aircraft imagery has been prepared and delivered to NJDEP for use by state offices.
3.1.2	Assemble ERTS Data Analysis Equipment at NJDEP	Completed 2/1/73	The NJDEP ERTS data analysis facility at the Trenton, New Jersey Headquarters is operational. Basic image analysis equipments are available for ERTS investigators.
3.1.3	Analyze Pre-ERTS imagery set as a demonstration of technique	Completed 10/1/72	ERTS-1, Apollo, and aircraft imagery and their analysis were used to brief NJDEP officials. A manual for reference by state representatives was prepared and distributed.
3.1.4	Organize and conduct preliminary briefing with NJDEP	Completed 10/5/72	Briefing was held at NJDEP to demonstrate remote sensing techniques and possible products to be developed from ERTS. A manual for reference by state representatives was prepared and distributed.
3.1.5	Select candidate test sites	Completed 11/5/72	The Northern New Jersey Shore will be the primary test site with secondary test sites to be studied as NJDEP interest, or environmental problems arise.
3.1.6	Collect and organize existing ground truth data	Completed 12/1/72	A bibliography has been prepared. Collection of pertinent ground truth will continue throughout experiment. These data will be delivered to NJDEP.

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		PHASE I	
3.1.7	Perform reconnaissance of test area	Completed 2/15/73	EarthSat field-checked the northern New Jersey test site in February, 1973. In addition, a reconnaissance of the entire test area was made subsequent to studies conducted at the northern New Jersey test site. EarthSat suggests a modification to this task. In the future, a phone call will be made directly to the DEP advising them of EarthSat's intention to conduct field checking. This will be followed by a brief written communication to document the timing and content of the field exercise.
3.1.8	Develop final interview plan and conduct interviews	Completed 12/10/72	Interviews with key personnel in early December have led to initial plans for information products. Subsequent briefings after initial products are prepared will be needed. EarthSat will work closely with NJDEP in using the products.
3.1.9	Prepare ground truth collection plan	Completed 3/1/73	A multi-agency cooperative ground truth effort was planned for the period April 6-13, 1973.
3.1.10	Instrument test sites	Completed 4/7/73	Instrumentation (current meters, transmissometer, spectraradiometers, temperature recorders, PRT-5, tide gauge, etc.) was initiated in late March 1973 and was completed for the Northern Test area on April 7, 1973.
3.1.11	Prepare aerial survey plan	Completed 4/7/73	Five aircraft collected supplementary data over test site during ground survey effort on April 7, 1973; the NASA JSC C-130, NASA

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			Wallops C-54, University of Michigan C-47, and two helicopters.
3.1.12	Collect ground truth data	Completed 4/7/73	Preliminary field sampling was accomplished during reconnaissance survey and extensive sampling was completed during the April 7, 1973 effort.
3.1.13	NJDEP shall assemble equipments specified in 3.1.9 at (Toms River Facility)	Completed 4/7/73	NJDEP personnel and equipments were made available and used during April 7, 1973 ground survey effort. Personnel and equipments were coordinated from Monmouth Beach Marine Police Station.
3.1.14	Prepare line base maps for test area using simulated ERTS imagery	Completed 5/1/73	The production of line maps as designated in contract are unnecessary because all of the specified information is available on the USGS 7-1/2 minute quadrangle sheets and NOS and Naval Oceanographic Office nautical charts.
3.1.15	Use simulated ERTS imagery for candidate base maps	Completed 6/30/73	A folio of candidate ERTS-1 products has been assembled. The folio includes analytical maps for shore protection planning, ocean outfal placement, and effects of barge-dumped waste disposal. NOTE: ERTS imagery was available and there was no need to simulate it.
3.1.16	Develop and conduct Preliminary Cost-Benefits Analysis	Completed 6/15/73	The method's package for assessing and documenting benefits has been established. Two alternative methods for quantifying benefits were discussed with NJDEP (histori-

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▨ 3.1.17	Brief NJDEP on use of candidate information products	Completed 7/13/73	Following the approval of the Principal Investigator, DEP personnel were briefed on the utilization of ERTS information products as well as methods for assessing benefits. This briefing took place during the week of July 9-13, 1973. It is anticipated that a close interaction between EarthSat and DEP personnel will occur throughout the remainder of the program so as to facilitate full product utilization to various Department offices.
3.1.18	Establish letter contacts with other States	Pending	
▨ 3.1.19	Prepare plan for analysis of ERTS imagery	Completed 12/1/72	Due to compression of Phase I, initial analysis plan for ERTS Imagery was established during initial briefings with NJDEP.

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		PHASE II	
3.2.1	First-look analysis of first imagery	Completed 9/29/72	First-look analysis documented in first NASA progress report.
3.2.2	Analyze all ERTS imagery during Phase II	Completed 4/30/73	EarthSat has analyzed all ERTS-1 imagery as received and is in the process of developing information products. Tasks 3.1.15 and 3.2.2 are essentially the same because of the early receipt of ERTS-1 imagery. As a matter of routine, all scientific observations related to coastal processes made during ERTS-1 imagery analysis are documented on EarthSat forms which constitute permanent project records (Appendix A).
3.2.3	Analyze all ERTS imagery during Phase II by spectral band	Completed 4/30/73	All ERTS imagery is routinely analyzed by spectral band. These analyses have been referenced in previous progress reports and are part of a continuing program of image analysis. The usefulness of each spectral band (for seasons to date) has been determined and will be summarized in the First-Look Data Analysis Report. Judgements as to the usefulness of each spectral band were documented for NJDEP in October, 1972 at the initial briefing session.
3.2.4	Map coastal land-forms and outline the wetlands	Completed 3/1/73	Maps showing the outline of New Jersey wetlands as well as principal coastal ecozones (as judged from ERTS imagery) have been prepared and were delivered to NJDEP in July, 1973.

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		PHASE II	
3.2.5	Use optical analysis equipment, and enhancement techniques in analysis of ERTS imagery	Underway	This is a continuing Task and will be underway throughout the experiment. Equipment includes, I²S Digicol, I²S Addcol, Bausch & Lomb ZTS, MacBeth Densitometer, etc.
▨ 3.2.6	Review and finalize information distribution with NJDEP	Completed 7/9/73	A flow diagram has been prepared and delivered to NJDEP as a convenient visual reference to describe the ERTS information products distribution system. The relationship of each product to study objectives and a schedule for distribution of information products within the Department is presented. It is anticipated that the distribution system will be continually updated as new Department needs and products evolve.
▨ 3.2.7	Distribution of information products within NJDEP according to approved schedule.	Completed 7/13/73	Information products shall be distributed through the Principal Investigator, who will ensure that the necessary responses from Department personnel are obtained. EarthSat shall keep the Department informed of any difficulties in acquiring supporting data and of the results of product evaluation by NJDEP personnel. As specified in Task 3.1.8, close interaction between Department and EarthSat personnel is anticipated as a continuing function for the duration of the experiment.
▨ 3.2.8	Prepare preliminary data analysis report at completion of Phase II	Completed 4/20/73	EarthSat has prepared a preliminary data analysis report which details analytical results through May 15, 1973 summarizes the utility of each ERTS band for coastal

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		PHASE II	
▨			studies, and includes copies of specific experimental analyses which have been conducted. Some results have already been reported in a paper presented at the NASA Goddard Symposium on Significant ERTS-1 Results.
▨ 3.2.9	Prepare a revised data analysis plan for Phase III	Completed 5/1/73	The revised Data Analysis Plan has been submitted.
▨ 3.2.10	Preliminary data analysis report and revised data analysis plan sent to NASA	Completed 6/1/73	
▨ 3.2.11	Finalize format and content of information products package for Phase III	Completed 7/13/73	Most of ERTS information products developed as a result of Department needs, respond to a one-time-only need and/or an immediate response, e.g., oil spills or pollution of coastal waterways and beaches, etc. Routine (repetitive) deliverables will include dredge spoil disposal and coastal surveillance maps prepared for NJDEP field inspectors. It is unlikely that rapid changes will occur in all of the information products delivered to NJDEP as was originally anticipated. The scale, format, or content of repetitively utilized products is subject to change.

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		PHASE III	
3.3.2	Modify data analysis procedures	Underway	
3.3.3	Distribute final information products on a routine basis	Underway	All ERTS data, collateral aircraft data, and ground truth data received during the investigation will be analyzed to the extent necessary to prepare practical information products. Additional field observations will be required in the conduct of this task.
3.3.4	Work closely with NJDEP to best apply and distribute information products and document benefits derived thereof	Underway	The requirements of this task are basic to the investigation and are being met by EarthSat as the program proceeds.
4.3	Prepare final report	Underway	Sections of the final report are being written as the experiment progresses.
4.4	Prepare a program for continuing ERTS applications within New Jersey	Pending	
4.5	Prepare coastal states briefing package	Underway	A brochure for coastal states is presently being prepared detailing the work performed under this investigation.