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November 2, 2006

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Re: Summary Expert Report: Pro Forma Economic Analysis
New Jersey Natural Resource Damage Claims
New Jersey v ExxonMobil Corporation
3TM Project KW-062006-01

Gentlemen:

3TM International is pleased to submit our "Summary Expert Report: Pro Forma Economic Analysis; New Jersey Natural Resource Damage Claims, New Jersey v ExxonMobil Corporation." If you have any questions regarding this Summary Expert Report, please contact us.

Sincerely,
3TM INTERNATIONAL, INC.

Randy D. Horsak, PE

EXHIBIT
Horsak 2
12-13-07

3TM INTERNATIONAL, INC
Houston, Texas

Summary Expert Report: Pro Forma Economic Analysis

New Jersey Natural Resource Damage Claims
New Jersey v ExxonMobil Corporation
Bayonne and Bayway, New Jersey Sites

November 2, 2006

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ISSUANCE OF EXPERT REPORT AND DISCLAIMER

This Expert Report is an accurate and authentic representation of the goals and objectives, scope of work, work methodologies and protocols, site conditions, analytical testing results, Conclusions and Recommendations, and Findings and Opinions associated with our work on this Project.

This Expert Report is limited to the matters expressly covered herein, and reflects only the physical areas sampled or otherwise evaluated, and the site conditions that existed at the time the Work was performed. This Expert Report reflects our efforts which were limited to information that was reasonably ascertainable at the time of the Work, and may contain informational gaps, inconsistencies, or be otherwise incomplete due to the unavailability or uncertainty of information.

This Expert Report was prepared for the use of the Client only. In the event the Client distributes this Expert Report outside its own organization, such Expert Report shall be used in its entirety. 3TM International assumes no liability or takes any responsibility for the interpretation of the information presented in this Expert Report by any third party, or any actions taken or not taken as a result of such interpretation. Under no circumstances does 3TM International accept responsibility for conditions, liabilities, or risks at the site assessed, whether they are identified in this Expert Report or not, to the extent that 3TM International neither caused nor contributed to them.

3TM International warrants that all Work provided under this Engagement was provided in a workman-like, diligent, efficient, legal, ethical, and proper manner consistent with current industry practice for such Work. 3TM International has completed this Work using generally accepted environmental engineering practice and judgment for such Work, experience on similar projects, written and verbal information provided to us by others, and observations made during the conduct of the Work. Information obtained through interviews with knowledgeable persons is based on the best of their knowledge at the time of interview. Reasonable care was exercised in the execution of the Work; however, 3TM International makes no warranty, express or implied.

The Findings and Opinions stated herein are based on widely known and accepted environmental engineering and scientific principles, personal environmental engineering and scientific judgment, personal experience gained throughout professional careers, and information and data obtained and/or made available to 3TM International, and should not be inferred in any manner beyond that stated in this Expert Report.

We reserve the right to retract, alter, modify, add to, delete, or clarify any or all of these Findings, Opinions, Conclusions, and Recommendations upon evaluation of any further pertinent information and data that may become available in the future.

Randy D. Horsak, PE
Principal Engineer

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1.0 Introduction

1.1 Purpose of the Expert Report

3TM International was retained by the State of New Jersey through the law firms of Kanner & Whiteley of New Orleans, Louisiana and Nagel Rice & Mazie of Roseland, New Jersey to prepare an Expert Report that properly describes the economic costs associated with restoring certain contaminated areas at the former ExxonMobil Bayonne and Bayway refinery properties and converting them into productive wetlands. Hereinafter, the restoration work is referred to in this Expert Report as the "Restoration Program."

The purposes of our assignment were to:

- Summarize the physical areas that have been determined to require restoration in order to construct new productive wetlands and/or forested areas, based on the work of other experts on this case
- Develop technical and economic models for use in estimating costs associated with the Restoration Program
- Perform a Pro Forma Economic Analysis of the reasonable technical methodologies associated with the Restoration Program
- Recommend additional site characterization and other studies necessary to better define the nature and extent of contamination, or to gather other scientific or engineering information that is necessary to design and implement an acceptable Restoration Program
- Prepare an Expert Report which summarizes these issues and which will clearly and succinctly present facts to the Court

This Expert Report summarizes the environmental and other data that address these issues.

1.2 Thrust and Limitations of This Expert Report

The thrust of this Expert Report is to provide the Court with reasonable and useful information regarding the restoration of the identified contaminated properties. It is not intended to serve as the final Restoration Program, a preliminary design, or a bid document for prospective contractors.

Our Expert Report is necessarily limited by several factors, including the following:

- The purposes, goals, objectives, and criteria of the Restoration Program and associated activities, as determined by the property owners, regulatory agencies, other consultants, or other parties associated with this case

- The nature and extent of the contamination at the properties, as determined by the property owners, regulatory agencies, other consultants, or other parties associated with this case

- Limited available information regarding the design, construction, and operation of both the historical and current facilities insofar as they effect the restoration of impacted areas and the construction of productive restored wetlands

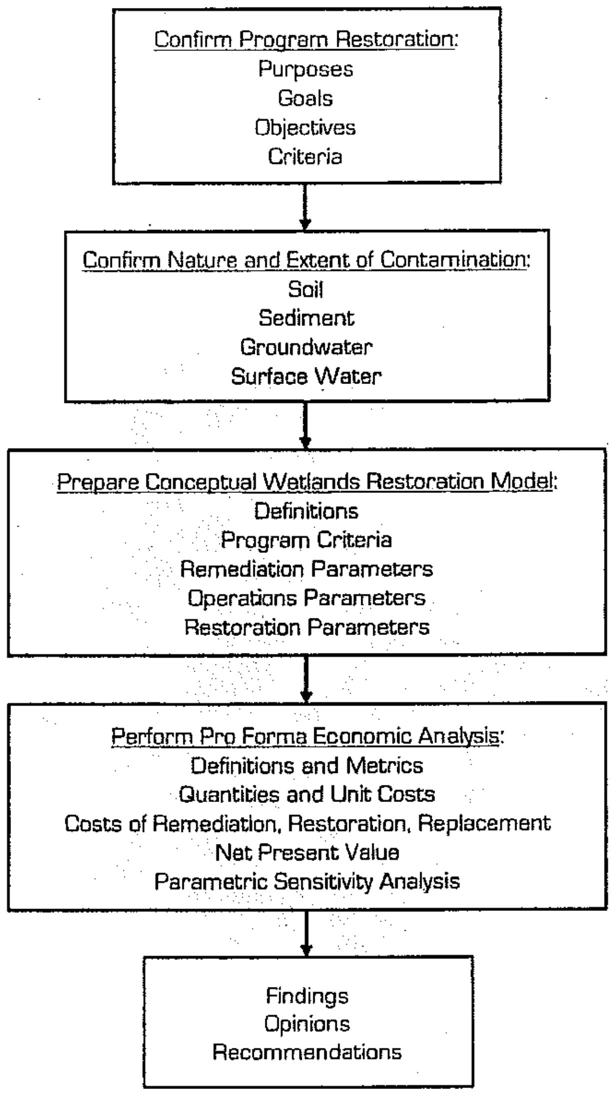
- Unit rates and prices provided to us by potential contractors and others which were used as inputs in the economic analysis

- The ability of all stakeholders to facilitate the execution of the Restoration Program such that the Restoration Program described can be achieved in a timely manner

- Limitations of time and the availability of information that would allow 3TM International to capture information and unit costs for all parameters associated with the Restoration Program

1.3 Issuing of Supplemental Expert Reports

This Expert Report is being issued to meet a deadline, and reflects our efforts which were limited to information that was reasonably ascertainable at the time of our work, and may contain informational gaps, inconsistencies, or be otherwise incomplete due to the unavailability or uncertainty of information. 3TM International will supplement this Expert Report as necessary.



3TM Expert Report Project Methodology

Section 1.0 At a Glance . . .

Purposes of the Expert Report:

- Summarize the physical areas that have been determined to require restoration in order to construct new productive wetlands, based on the work of other experts on this case.
- Develop technical and economic models for use in estimating costs associated with the Restoration Program
- Perform a Pro Forma Economic Analysis of the reasonable technical methodologies associated with the Restoration Program
- Recommend additional site characterization and other studies necessary to better define the nature and extent of contamination, or to gather other scientific or engineering information that is necessary to design and implement an acceptable Restoration Program
- Prepare an Expert Report which summarizes these issues and which will clearly and succinctly present facts to the Court

2.0 Nature and Extent of Contamination

2.1 Introduction

The New Jersey Department of Environmental Protection (NJDEP) has well said, "Wetlands are now being recognized for their vital ecological and socioeconomic contributions."

This section of the Expert Report briefly summarizes the nature and extent of contamination at the ExxonMobil Bayonne and Bayway properties, insofar as they impact the construction of productive wetlands at the properties and the cost of the Restoration Program.

For purposes of this Expert Report, the term "nature" is used to describe the types of toxic chemicals (e.g., hydrocarbons, toxic metals, pesticides) and other substances that have impacted various environmental media at the property (e.g., surface soils, subsurface soils, sediments, surface water, groundwater, and ecosystems). The term "extent" is used to describe the three-dimensional impact of such impacts, including both the lateral extent (e.g., acres, square feet) and depth (e.g., feet below ground surface) of the impacts.

Since their construction, the operations of the ExxonMobil facilities at Bayonne and Bayway have resulted in the impact of a major portion of the properties, including the contamination of surface and subsurface soils, sediments, groundwater, surface water, ambient air, and ecosystems. The locations of the two refineries are shown on Figure 1, Appendix A.

The ExxonMobil Bayonne facility has an extensive owner/operator history as a petroleum refinery and storage terminal. From 1877 to 1971, the primary activity at the Bayonne Plant was petroleum refining. At the peak of plant operations in 1936, Standard Oil Company owned and operated approximately 650 acres on Constable Hook.

By 1971, all refining operations had been discontinued at the Bayonne Plant. Plant acreage essentially remained the same from 1971 to 1993. From 1972 to 1993, the plant was operated by Exxon as a petroleum products storage terminal and specialties plant.

Two Exxon divisions, Exxon Company, U.S.A. and Exxon Chemicals America, carried out operations at the Bayonne Plant. Exxon Company U.S.A. operated a marketing terminal consisting of the storage, packaging, and distribution of petroleum products. Exxon Chemicals America operated a limited chemicals plant that manufactured lube oil additives; the Chemical Plant was partially dismantled during the period of 1991 through 1993.

The entire plant area, with the exception of the Lube Oil Area and the contiguous Pier No. 1 and Stockpile Areas, was sold to IMTT in April 1993. ExxonMobil still operates and maintains the Lube Oil Area as a lube oil and wax products storage, blending, and packaging terminal [Reference: Site History Report Bayonne Plant, Geraghty & Miller, November 1994].

The ExxonMobil Bayway facility is an active 1,300 acre industrial facility located in a heavily industrial area within the cities of Linden and Elizabeth, Union County, New Jersey. The facility has been in continuous operation since 1909.

ExxonMobil Corporation owned and operated the refinery from 1909 until its sale to Tosco refining Company in 1993. Phillips Petroleum Company bought Tosco Corporation in early 2001, and in 2002 merged with Conoco, Inc. to form ConocoPhillips Company.

The Bayway facility consists of a main petroleum refining facility, a petrochemical manufacturing facility, tank fields, a fuel distribution terminal, process areas, offices, chemical plants, mechanical shops, wastewater treatment units, pipelines, railroad crossings, and tanker docks. Refinery products include motor gasoline, home heating oil, heavy fuel oil, jet fuel, diesel fuel, asphalt, and chemical feedstocks. Products associated with the West Side Chemical Plant include additives for motor oil and high purity propylene. Products associated with the former East Side Chemical Plant included lighter hydrocarbons for product alcohols, ketones, white oils, and other chemicals produced until 1988. (Reference: TRC Raviv Associates, Inc. p. 2.)

2.2 Contamination at the ExxonMobil Bayonne Facility

As a result of more than 100 years of industrial use, the ExxonMobil Bayonne property has significant and widespread impacts to various environmental media, including surface soils, subsurface soils, sediments, and groundwater. Contamination of the land and water at the Bayonne Refinery began in the late 1800s and continues to this day. Hazardous substances released from the facility are present in both soils and groundwater. The sources of these contaminants include historical spills, overflows, breaches, pipeline breaks, and waste disposal from the facility. The contaminants released have resulted in the impact of natural resources both on the property and beyond the property boundaries. (Reference: Site Histories of the ExxonMobil Bayway and Bayonne Refineries, Stratus Consulting).

The nature and extent of these impacts will drive any remediation efforts that are necessary to construct productive wetlands. In turn, they also significantly affect the cost of implementation. The accuracy of any cost estimate is necessarily tied to the accuracy of the delineation of contaminated environmental media.

For a more detailed discussion of the nature and extent of environmental impact at the ExxonMobil Bayonne Facility, the reader is directed to reports prepared by Stratus Consulting Inc. The location of various Investigation Areas of Concern (AOC) at the Bayonne facility is shown in Figure 2.

2.3 Contamination at the ExxonMobil Bayway Facility

Contamination of the land and water at the Bayway Refinery began in the early 1900s and continues to this day. Hazardous chemicals released from the Bayway facility, including organic contaminants and metals, are present in soils, sediment, surface water, and groundwater near the facility. Sources of these contaminants include discharges, waste spills, overflows, breaches, pipeline breaks, and waste disposal from the facility. The contaminants released are transported via migration pathways. Thus, natural resources on- and off-site are exposed to contamination. (Reference: Site Histories of the ExxonMobil Bayway and Bayonne Refineries, Stratus Consulting).

The nature and extent of these impacts will drive any restoration efforts that are necessary to construct productive wetlands. In turn, they also significantly affect the cost of implementation. The accuracy of any cost estimate is necessarily tied to the accuracy of the delineation of contaminated environmental media.

For a more detailed discussion of the nature and extent of environmental impact at the ExxonMobil Bayway Facility, the reader is directed to reports prepared by Stratus Consulting Inc. The location of various Investigation Areas of Concern (AOC) at the Bayway facility is shown on Figure 3.

Section 2.0 At a Glance . . .

The ExxonMobil Bayonne and Bayway Facilities have widespread contamination

- ExxonMobil Bayonne Facility
  - Soils contaminated with hydrocarbons, heavy metals, pesticides, PCBs
  - Sediments contaminated with hydrocarbons, heavy metals, pesticides
  - Groundwater contaminated with hydrocarbons, heavy metals, pesticides, PCBs
- ExxonMobil Bayway Facility
  - Soils contaminated with hydrocarbons, heavy metals, pesticides, PCBs
  - Sediments contaminated with hydrocarbons, heavy metals, pesticides, PCBs
  - Groundwater contaminated with hydrocarbons, heavy metals, pesticides, PCBs
  - Surface water contaminated with hydrocarbons, volatile organics, PCB's pesticides, and heavy metals.

3.0 Conceptual Wetlands Restoration Model

3.1 Overview

3.1.1 Terminology

Wetlands are defined by the Clean Water Act as "those areas that are inundated or saturated by surface or groundwater at a frequency or duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The Conceptual Wetlands Restoration Model addressed in this Expert Report considers the technically feasible alternatives for restoring contaminated property *vis a vis* the construction of productive wetlands, considering the nature and extent of contamination described in Section 2.0. Importantly, the Conceptual Wetlands Restoration Model is a *conceptual* model, that is, various elements of the Restoration Program are defined for purposes of analysis, and not necessarily as a formal proposal or recommendation of what should or should not be implemented by the stakeholders. 3TM International recognizes that a variety of viable alternatives may exist that can achieve overall goals.

For purposes of this Expert Report, the terms "Remediation" and "Clean Up" are used interchangeably and are defined as those actions that are aimed at removing, stabilizing, isolating, treating, decontaminating, detoxifying, decommissioning, or otherwise managing the hazardous wastes at a contaminated property in order to comply with environmental regulations and ensure that risks to the environment and human health are either eliminated or reduced to prescribed safe levels.

The term "Restoration" is defined as those actions that are aimed at repairing damage to a contaminated property that has been caused by human activity, industrial activity, or natural disaster. The ideal restoration would be to restore the property as closely as possible to its natural condition before it was disturbed or impacted by the releases of contaminants. Scientifically, restoration involves the manipulation of the physical, chemical, and biological characteristics of a contaminated property.

As used in this Expert Report, the primary difference between restoration and clean up is the level of effort potentially associated with any particular action. For example, a human health risk-based clean up may be proposed which would require that all contaminated soils be cleaned to some target concentration, say 100 parts per million (ppm) for Contaminant X. However, cleaning a property to such a level presupposes that it would be acceptable to leave residual contamination in place.

While the 100 ppm level may be protective of human health under certain conditions, this level may not be protective of ecological resources at the property, thereby mandating that the target be much lower, or restoring the property to the conditions that existed prior to discharges. Further, the levels of Contaminant X at the property during "original conditions" or pre-discharge conditions may have been significantly less that 100 ppm, or even non-detect.

Thus, restoration of a property to original natural conditions may require clean up to levels substantially below human health risk-based criteria.

For purposes of this Expert Report, the term "Replacement" is defined as those actions that are aimed at developing new environmental resources at alternative locations for those instances in which restoration is not feasible. The new resources would be comparable to the resources that had been damaged. Replacement does not necessarily indicate that clean up of contaminated property would not be required.

3.1.2 Restoration and Replacement Criteria

The Restoration Program must be implemented in accordance with given criteria. This Expert Report considers three primary criteria that must be satisfied and that will determine the type and cost of any engineering solution necessary to support restoration and/or replacement:

- Criterion 1 – Compliance with environmental regulations, including Federal, state, and local regulations
- Criterion 2 – Reduction of contamination at the properties to levels that will support productive wetlands and forested areas
- Criterion 3 – Restoration of the properties to pre-discharge natural conditions and to levels that will support productive wetlands and forested areas

Criterion 1, compliance with environmental regulations, is a given inasmuch as any solution will necessarily require compliance with all regulatory drivers, regardless of how liberal or stringent they may be, including acts, laws, regulations, policies, directives, orders, and other requirements.

Similarly, Criterion 2, reduction of contaminants at the properties to target contaminant levels that will support productive wetlands, is similarly a given, regardless of the actual value of the target levels, since to do otherwise makes little technical sense since the wetlands must be productive and sustaining over the long term, and not limited by residual contamination or other factors.

Typically, a cleanup to a criterion of "original background conditions" refers to a cleanup to levels that are natural and not the result of human activity.

For purposes of this Expert Report, Criterion 3 defines "pre-discharge natural conditions" as those conditions that existed on Constable Hook and at Bayway prior to any processing of petroleum hydrocarbons by ExxonMobil, its predecessors and subsequent operators.

Chronologically, this corresponds to a date of circa 1909 for the Bayway refinery (Geraghty and Miller Site History Report, 1993) and 1877 for the Bayonne refinery (Geraghty and Miller Site History Report, November 1994). According to documents acquired from the NJDEP, ExxonMobil and its predecessors owned and operated the Bayway refinery from circa 1909 until it was sold to other parties during the 1990 - 2000 timeframe. The current operator is ConocoPhillips. ExxonMobil and its predecessors have had a continuous presence on

Constable Hook since 1877. Portions of the refinery have been sold to other operators over the past 20 – 30 years. Today, ExxonMobil operates only a small portion of the Bayonne refinery.

A secondary issue arises as to how to measure pre-discharge natural conditions. Some chemicals that are potential contaminants at the property are indigenous. For example, arsenic is a metalloid that is naturally occurring in most surface soils at varying but low concentrations. Any arsenic concentration greater than a pre-discharge level would be considered contamination.. Other chemicals, such as total petroleum hydrocarbons (TPH), may be present at a site but may or may not be indigenous.

For the Restoration Program, the goal of restoring the contaminated facilities to their original natural conditions and pre-discharge natural conditions, thereby satisfying Criterion 3, will be measured by using either analytical laboratory practical quantification limits (PQLs) for the analytes under consideration (e.g., TPH, benzene, chromium) or other limits necessary to sustain a productive wetland. These have been determined by other consultants associated with this case.

3.2 Parameters for Restoration Model

The restoration criteria used in this Expert Report are based on recommendations made by other consultants associated with this case, including Stratus Consultants, DPRA, and Toxicological & Environmental Associates (TEA). These criteria were used as primary inputs to the Pro Forma Cost Model and Economic Analysis, and are described below.

Additionally, project-related parameters are included, such as program management, general permitting, civil engineering design, surveying, geotechnical and tidal studies, procurement, and the preparation of plan and specification documents for bidding purposes.

3.2.1 Program Management Parameters

Program Management is a high-level managerial function by a dedicated technical, legal, business, and administrative team that is structured to provide for the overall planning, organizing, and controlling of the Restoration Program.

Program Management includes pre-construction activities such as the coordination among the various stakeholders – plaintiffs, defendants, regulatory agencies, financial team, engineering team, scientific team, construction team, and the general public. An important element of Program Management will be communication and document control systems. An equally important element of the program will be the use of adaptive management techniques whereby the decision-making process is responsive to changing concerns or information.

It is envisioned that a dedicated Program Management team will serve for the entire project duration of 30 years. This will include a two-year design phase, a four-year remedial construction and infrastructure modification phase, a two-year wetlands construction phase, and a twenty-two year monitoring phase. Main phase and sub-phase overlapping will be anticipated and will be part of the overall program. The details of the timing of construction and sub-phase overlaps will be a critical task in the design phase of the Restoration Program.

The three main design phases of the Restoration Program are:

- Engineering Design of Cleanup
- Infrastructure Rebuilding Design
- Wetlands Construction Design

Engineering Design of Cleanup will include the following:

- Civil Engineering - Design of earth works, surface and subsurface hydrology
- Geotechnical – Soil, groundwater, and sediment characterization
- Geophysical Studies – Location of buried structures and obstructions
- Additional Environmental Testing
- Surveying and GIS data bases
- Permitting – Application and granting of environmental and other permits and approvals
- Procurement – Preparation of plans, specifications, and bid documents and awarding of contracts to contractors

Infrastructure Rebuilding Design will include the following:

- Civil/Infrastructure Engineering
- Geotechnical
- Surveying & GIS
- Permitting (NJPDES, SWPPP, other)
- Procurement – Preparation of plans, specifications, and bid documents and awarding of contracts to contractors

Wetlands Construction Design will include the following:

- Civil Engineering
- Wetlands Delineation and Determinations
- Threatened & Endangered Species Studies
- Cultural Resources Studies

- Geotechnical
- Tidal Survey
- Surveying and GIS
- Permitting
- Public Meetings
- Procurement – Preparation of plans, specifications, and bid documents and awarding of contracts to contractors

While the majority of these tasks will be conducted during the initial two-year design phase, it is likely that additional design work will be required during the subsequent remediation, restoration, or monitoring phases of the Restoration Program.

3.2.2 Clean Up Parameters

Clean up of contaminated media involves the development of metrics for a number of cost parameters, such as the areas and volumes of contamination that need to be cleaned up or removed prior to wetlands restoration. Other cost parameters, such as project management, scheduling, and project management control systems, are umbrella tasks which may be handled as either percentage of total construction costs or as lump sum line items. The clean up cost parameters and units used in the Pro Forma Economic Analysis are given in the tabular summary shown in Table 3-1 (Appendix B).

These parameters and metrics were used to calculate costs associated with soil excavation, dewatering, and the transportation and disposal of waste materials. These metrics were also used to calculate volumes of sediments requiring dredging, stabilization, transportation, and disposal. Details of the metrics used are given in Table 4-3. Additional metrics for water clean up are included in Table 4-4.

3.2.3 Facility Operation Parameters for Demolition

In addition to the physical remediation of contaminated environmental media, many areas at which wetlands will be constructed will also require either the removal or replacement of existing and historical refinery operation structures. The cost parameters and units used in the Pro Forma Economic Analysis are shown in Table 3-2.

These parameters and metrics were used to calculate costs associated with the removal of existing infrastructure, both surface and subsurface, in preparation for wetlands restoration construction. Details of the metrics used are given in Table 4-3.

3.2.4 Facility Operation Parameters for Reconstruction

At the Bayway Refinery some of the areas requiring restoration include areas where tank fields and pipelines are now located. These tanks and pipelines will be rebuilt elsewhere on the refinery property. In addition, since the area between the waterfront on Arthur Kill and the main refinery is to be restored to intertidal and subtidal wetlands, the parameters include a provision for a causeway to be constructed over the restored wetlands. No infrastructure reconstruction is planned or included in this cost estimate for the Bayonne Refinery or any pipelines connecting the Rahway River tank field with the main part of the Bayway refinery. The cost parameters and units used in this economic analysis are shown in Table 3-3.

These parameters and metrics were used to calculate costs associated with the reconstruction of existing infrastructure that would be required to operate the refinery during and after wetlands restoration. The reevaluation and resubmittal of various permits due to a change in facility operations would be cost items during the early design phase of the restoration. Details of the metrics used are given in Table 4-3.

Figure 6 shows the location of the proposed replacement main and lateral pipelines at the Bayway refinery. The main pipeline connects the plant areas to the waterfront, whereas the laterals connect various areas to the waterfront and the main pipeline. Also shown in this figure are the locations of the seawater pipelines and a proposed causeway over the restored wetlands to support vehicular traffic between the main part of the refinery and the waterfront. A more detailed discussion of the nature and costs of these infrastructures are included in a report prepared by Quad Consulting (Reference: Quad Consulting, November 1, 2006 Report).

Figures 7 through 9 show the locations of various tank foundations that will require removal prior to wetlands construction activities.

3.2.5 Restoration Construction Parameters

Creating productive wetlands from contaminated property involves the placement of clean soils and vegetation in such a manner as to take advantage of local hydrologic conditions such as natural streams, tidal currents, and connections to other water bodies. Many parameters are involved in establishing a productive wetlands program, including the parameters shown in Table 3-4.

These parameters and metrics were used to calculate costs associated with the construction of wetlands in the areas requiring remediation. The reevaluation and resubmittal of various permits are cost items during the early design phase of the restoration. Details of the metrics used are provided in Table 4-3.

3.2.6 Restoration Monitoring Parameters

Following the construction of the restored wetlands, the continual monitoring of the growth, function, and values of the wetlands will occur over at least a 22-year time frame from the last planting until the time when the wetlands can be self-sustaining. Parameters that will be monitored include physical and biological parameters such as nutrients, pH, contaminant loadings, and exotic species. The parameters associated with establishing a productive wetlands program are shown in Table 3-5.

These parameters and metrics were used to calculate costs associated with the monitoring of the restored wetlands. Catastrophic spills and cleanups were not considered in the cost model or the parameters, although the potential for such exists. Details of the metrics used are provided in Table 4-3. Additional metrics for restoration monitoring are provided in Table 4-5.

3.3 ExxonMobil Bayonne Facility

The proposed wetlands restoration program for the Bayonne Facility includes about 25 acres on Constable Hook. This is only a partial restoration of damaged wetlands associated with the Bayonne refinery since most of the land is currently used for industrial purposes by others. Specifically, this includes:

- Removal of the docks and land adjacent to Kill Van Kull in the Pier No. 1 area and in the southern portions of the Lube Oil area to restore to intertidal wetlands
- Removal of bulkheads and contamination along portions of Platty Kill Canal to restore to subtidal wetlands
- Removal of contaminated media and infrastructures from the Stockpile Area to restore to intertidal wetlands
- Removal of the eastern portion of the General Tank Field to restore to intertidal wetlands
- Removal of a portion of the Piers and East Side Treatment Plant Area to restore to intertidal wetlands

A more detailed description of the specific wetlands restoration habitats are provided in the Stratus Consulting Report(s). The locations of the existing facilities are shown in Figure 2 and the proposed areas of restoration are shown in Figure 4. The base maps used for these Figures and area estimates (in acres) were prepared by Stratus Consulting. A listing of infrastructures such as tanks, pavements, pipes and foundations are provided in Table 3-6 and a listing of large tank (API and floating roof) ring foundations is provided in Table 3-7.

3.4 ExxonMobil Bayway Facility

The proposed wetlands restoration program for the Bayway Facility includes about 552 acres, mostly along Morses Creek, the Reservoir Area, along portions of Piles Creek, and palustrine forested areas near the southern part of the facility. These areas include:

- Adjacent to Morses Creek, east of the NJ Turnpike, that lies within former intertidal and subtidal wetlands of the creek

- Area north of Morses Creek, west of the turnpike, and represents former intertidal wetlands
- Portions of the reservoir area that are located between the Tremley and Gas Component Tank Fields and represent mixed former subtidal and intertidal wetlands along with a small area of palustrine forest areas
- Areas that are associated with the Landfills and the SLOU that are mostly former intertidal wetlands
- The 40-Acre Tank Field are former palustrine and upland forests
- Piles Creek that are former subtidal wetlands

A more detailed description of the specific wetlands restoration habitats are provided in the Stratus Consulting Report(s). The locations of the existing facilities are shown in Figure 3 and the proposed areas of restoration are shown in Figure 5. A listing of infrastructures such as tanks, pavements, pipes and foundations are provided in Table 3-6 and a listing of large tank (API and floating roof) ring foundations is provided in Table 3-7.

Section 3.0 At a Glance . . .

Conceptual Wetlands Restoration Model:

- Wetlands defined by the Clean Water Act
- The Conceptual Wetlands Restoration Model considers technically feasible alternatives
- Restoration is defined as actions aimed at repairing damage to previously existing and productive wetlands.

Remediation and Replacement Criteria:

- Restoration of the property to original pre-discharge conditions

Parameters for Restoration Models

- Program Management - 30 years
- Engineering Design of Cleanup - soil, sediment, water, relocation and replacement of active remediation systems
- Infrastructure Rebuilding Design - Removal of existing infrastructure in affected areas, reconstruction of infrastructure in non-restoration areas
- Wetlands Construction Design - Wetlands permitting, construction, planting, and long-term monitoring employing adaptive management practices

ExxonMobil Bayonne Restoration Parameters

- 25 acres
- Pier No. 1 area and southern portion of Lube Oil area
- Platty Kill Canal
- Stockpile area
- Eastern portion of the General Tank Field adjacent Upper NY Bay

ExxonMobil Bayway Restoration Parameters

- 552 acres
- Morses Creek
- Piles Creek
- Reservoir Area
- Area between Waterfront and NJ Turnpike
- Pitch Area
- Landfills and SLOU
- 40-Acre Tank Field

4.0 Pro Forma Cost Model and Economic Analysis

4.1 Overview

As used in this Expert Report, the term "Pro Forma Economic Analysis" is defined as the analysis of the scientific, regulatory, financial, and logistical considerations and parameters associated with the restoration or replacement of the impacted properties based on certain facts, assumptions, and calculations. Pro Forma Economic Analyses differ from formal engineering cost estimates in that the latter estimates are frequently based on well defined performance standards and associated engineering designs, responsive bids and other information from restoration or remediation contractors, and other detailed information.

For the Pro Forma Economic Analyses discussed herein, 3TM International used information in the public domain and also contacted various commercial contractors in order to solicit unit rates and prices for the primary parameters associated with the restoration effort.

The meaningfulness of a Pro Forma Economic Analysis can be enhanced by using sensitivity analysis. The term "Sensitivity Analysis" as used in this Expert Report refers to analyses that determine the impact of changing the value of one or more parameters in the Pro Forma Economic Analysis, by allowing a range of plausible inputs to be considered when there is uncertainty about the true value of the input. For this Expert Report, the two primary parameters are quantity and unit price.

The term "quantity" refers to dimensional measurements of related work items, such as feet of pipeline to be removed, cubic yards of contaminated soil to be cleaned up, number of trees to be planted, etc. Quantity is estimated from available maps, drawings, data, and other information and, as subsequently explained, is subject to professional judgment. The quantity and quality of available information necessarily affect the accuracy and confidence of such judgment. "Unknowns," while problematic, can be addressed as contingencies. Alternatively, they can be addressed by using statistical methods that relate financial risk to funding levels.

The term "unit price" (or, "unit rate) refers to the cost associated with a dimensional measurement of related work, such as cost per foot to remove pipeline, cost per cubic yard to remediate contaminated soil, cost to plant a tree, etc. For large projects, such as the contemplated Restoration Program, unit price is sensitive to quantity in many (but not all) instances. For example, a contractor may quote a price of $100 to plant a tree, based on an estimated quantity of 10 trees; however, if the quantity of trees to be planted increases to 1000, then the unit price may drop to, say, $90 per tree. Competition among prospective contractors during the contracting phase of the Restoration Program may result in pressure to drive unit prices downward.

The restoration of any property is relatively straightforward and generally consists of a number of critical steps:

- Initial sampling and analysis to confirm the presence of any contamination, and sequel sampling and analysis to further delineate the nature and extent of contaminated zones in all environmental media (e.g., soil, sediment, groundwater)

- Determination of decontamination and cleanup criteria
- Feasibility study to assess various technical alternatives for restoration
- Selection of the most appropriate restoration actions
- Procurement of approved contractors to implement the restoration
- Oversight activities during the restoration process
- Confirmation testing to ascertain that the property has been properly restored

4.2 Economic Analysis Metrics

Economic analysis metrics include may include a wide spectrum of analytical methodologies, with varying degrees of sophistication and levels of detail, which can be used to estimate the cost of implementing an engineering solution. Broadly, such analyses take into account several categories of costs:

- Fixed Costs - costs associated with purchased equipment, earth modifications, etc. which are required for the project, and which are typically incurred only once during the initial stages of the project, and are independent of quantity
- Variable Costs - costs associated with labor, materials, supplies, etc. which are a function of quantity or use over time, and are typically incurred during the lifetime of the project
- Financing Costs - costs associated with administrative costs, insurance, bonding, legal, taxes, etc.
- Time Value of Money - costs associated with interest rates, inflation, etc.

The accuracy of the final economic estimate is necessarily a direct function of the accuracy of the various cost components. For example, if the estimator simply "assumes" that a certain pump could cost $5000, based on experience, available literature, or whatever other factor, then the accuracy will necessarily reflect such an estimate. On the other hand, if the estimator develops engineering specifications for the pump, solicits bids from qualified pump vendors, and then selects a certain pump at the quoted price, the estimate will then necessarily be more accurate.

Similarly, if the cost is based on quantities of some parameter, for example cubic yards of material to be excavated, then the final cost estimate will necessarily reflect the accuracy of both the quantity (e.g., cubic yards) and unit cost rate (e.g., $/cubic yards).

4.3 Forecast Versus Realized Costs

In general, the realized (i.e., actual) cost to restore a contaminated property is frequently higher than the cost estimated in the Pro Forma Economic Analysis. This is because actual field conditions and logistical factors are largely unknown at the time of analysis and not fully known until the work either has been better defined by additional study or (in some cases) substantially underway.

This is especially true in the remediation of contaminated soil and groundwater, since unidentified contamination "hot spots" or deeper contamination may exist that may require additional treatment or management at a unit price significantly higher than the original estimate. In other instances, the extent of contamination may be greater than originally assumed due to limited field information, so that the actual cost to restore the property is higher than originally estimated.

Still another consideration is "cost growth," that is, increased costs as a result of unanticipated changes in project objectives, delays in schedule, adverse weather conditions, and other factors. As project execution issues arise throughout the project, "change orders" may be required to adapt to unanticipated field or logistical conditions, which result in schedule delays and associated increased costs.

Acceptable methods of accounting for these issues include adding a contingency to the overall cost estimate or performing a financial risk assessment, to account for something that can happen, but that generally is not anticipated. Contingencies are inherently not obvious, and Murphy's Law is real.

In many instances, such contingency costs can range from 10% to 50% (or more) of the original estimated base cost. Therefore, the estimated costs presented in this Expert Report are probably biased low, unless noted otherwise.

4.4 Costs of Restoration

The economic costs associated with restoration represent a complex issue, and one with a variety of major and minor parameters such as water type (e.g., fresh, brackish, saline), hydrology (e.g., surface water, groundwater), physical setting (e.g., river, coastal), vegetation (e.g., emergent, forested), and other factors.

In projects involving the enhancement of an existing wetland, the restoration of a degraded wetland, or the preservation of an existing wetland, many of the cost parameters become significant. However, in general, the restoration of a property from a highly impacted condition to that of a productive wetland requires a substantial commitment of funds to the remediation of contaminated soil, sediments, surface water, and groundwater in order to support the wetland. In such cases, the costs to remediate the contamination dominate the economics of the overall Restoration Program rather than the cost to construct the wetlands themselves.

Such is the case for the ExxonMobil Bayonne and Bayway properties. The existing levels of contamination in multiple environmental media will require that such contamination be first removed prior to the construction of any productive wetland. This process will require several major categories of activities:

- Program Management
- Pre-Construction Activities

- Remediation Activities
- Construction of Wetlands Activities
- Wetlands Maintenance and Monitoring Activities

These activities are described in more detail below, and are shown diagrammatically over the 30-year life of the Restoration Program in the Gantt Chart in Figure 10.

4.4.1 Program Management

For such a comprehensive effort that is contemplated by the Restoration Program, Program Management will be required to ensure that the overall program is properly planned, organized, and controlled. A senior management function, Program Management is not the specific management of an individual task (e.g., dredging of contaminated sediments), but rather is directed at overall management of the scope of work, technical objectives, work processes, budget, schedule, insurance, legal, tax, regulatory, and financial matters associated with the work.

For purposes of this Expert Report, 3TM International has assumed that this effort will be managed either internally by the State of New Jersey or outsourced it to an independent environmental management firm. Program Management will be in effect for the duration of the Restoration Program, and is assumed to be a 30 – year activity requiring a small group of professional and administrative personnel to oversee all work.

4.4.2 Pre-Construction Activities

These activities include several sub-tasks, including: planning of the work, performing additional site characterization studies, obtaining various permits and approvals from regulatory agencies, surveying, geotechnical and other testing, selecting an engineering design contractor, engineering design, selecting a remediation contractor(s), procuring services and materials, and similar tasks.

Planning tasks include various meetings among all the project stakeholders to more fully define the goals, objectives, scope, schedule, and budget of the work. We have assumed that various permits and approvals for the work would have to be obtained from both Federal agencies and the NJDEP, and that the NJDEP would expedite such granting in order to facilitate the restoration process.

In addition, an engineering design contractor would be selected to oversee surveying, geotechnical, geophysical, and other testing, and similar tasks, and to prepare detailed engineering designs of the program, performance specifications, and construction bid specifications. Bid packages would then be issued to pre-qualified construction contractors, and contracts would be awarded to the selected contractor(s). Upon awarding of remediation and wetlands construction contracts, various services and materials would then be procured in anticipation of the field work.

For purposes of this Expert Report, we have assumed that these activities will require two years, although an accelerated program could require less time and a protracted program may require more than two years.

4.4.3 Remediation Activities

Remediation Activities include several sub-tasks, including: mobilization and staging, removal of above-ground infrastructure, removal of below-ground infrastructure, installation of major equipment, civil construction and earthwork, removal and/or treatment of contamination, transportation and disposal of waste material, and similar tasks. Included in each of these sub-tasks is project management for that particular sub-task.

The selected construction contractor(s) would be responsible for procuring all equipment, field personnel, supplies, and materials necessary to execute the work. Mobilization to the project site would then occur, and an on-site staging area would be established. This could include office space during the entire duration of the Restoration Program to facilitate the execution of work.

Above-ground infrastructure would then be removed and/or relocated, including storage tanks, piping, roadways, bulkheads, earthen dams, utilities, and other ancillary facilities. Similarly, below-ground infrastructure would be removed and/or relocated, including storage tanks, piping, groundwater monitoring wells, utilities, and other ancillary facilities. In some instances, such infrastructure may be critical to existing refinery operations, and would have to be relocated to not only support continued refinery operations but also to minimize interference with the Restoration Program itself.

Earthwork associated with the remediation effort would then be implemented, such as dredging of contaminated sediments, installation of slurry walls and sheet piling, topographic leveling, site preparation, run-off control, and other tasks.

Remediation of contaminated soils, sediments, and groundwater would then begin, using the appropriate technologies. Remediation may ultimately include removing, stabilizing, isolating, treating, decontaminating, detoxifying, decommissioning, or otherwise managing the hazardous wastes at the contaminated property. This would include surface soils, deeper soils, sediments, groundwater, surface water, and contaminated ecosystems. In the case of waste material removal, transportation and disposal of such wastes to an approved commercial waste management facility would be required.

For purposes of this Expert Report, we have assumed that these activities will require four years, although an accelerated program could require less time and a protracted program may require more than four years.

4.4.4 Construction of Wetlands Activities

Construction of Wetlands Activities include several sub-tasks, including: mobilization and staging, removal of unwanted vegetation, backfilling of restored areas with clean soil, grading and land contouring, soil preparation, planting of desired vegetation, hydration, and similar tasks.

For purposes of this Expert Report, we have assumed that these activities will require two years, although an accelerated program could require less time and a protracted program may require more than two years.

4.4.5 Wetlands Maintenance and Monitoring Activities

Upon completion of the construction of the wetlands, periodic maintenance and monitoring will be required. Maintenance of the wetlands could include pollutant removal, addition of nutrients and other amendments, muck removal, storm water runoff control, erosion control, insect control, repairs to access roads, and similar tasks. Monitoring would include the collection of samples from various environmental media (e.g., soil and groundwater) to ensure that contaminant levels do not exceed the restoration criteria in the future and that appropriate nutrients exist for productive wetlands.

For purposes of this Expert Report, we have assumed that these activities will continue about 22 years. However, if the wetlands become productive and stable in less time, this activity could be reduced in scope or duration.

4.5 Net Present Value

The implementation of the Restoration Program will require various levels of expenditure over the life of the program. For purposes of this Expert Report, this is termed the "cash outlay," and is the numerical sum of all expenditures made during the 30-year period.

The net present value (NPV) is an economic term that determines the equivalent worth, or value, at the present time of all the expenditures that will be made during the life of the program, at some given interest rate. The term is expressed in the following equation:

$$NPV_0 = V_n [1 / (1 + i)^n]$$

where

NPV_0 = net present value at some given time, t = 0
V_n = value of a future payment, t = n
i = interest rate
n = number of time periods

The net present value is frequently used as a metric for projects in which costs are incurred over a long period of time. This equation is made more complex by considering other factors such as the rate of inflation, gradient or other cash flow profiles, and other factors (all of which are beyond the scope of this Expert Report).

For purposes of this Expert Report, we have assumed a simplified cash flow profile in which expenditures are made over a span of 30 years to account for the remediation of contaminated areas, followed by wetlands construction, and then followed by wetlands maintenance and monitoring. The result is a net present value that is equivalent to the cash outlay over a period of 30 years. This value, in turn, represents the level of initial investment necessary to implement the Restoration Program.

4.6 Quantities and Unit Costs

Two key parameters in any cost estimate are quantities and unit costs. For most restoration projects, these parameters dominate the analysis and can significantly influence sensitivity analyses.

For this project, 3TM International either obtained or estimated quantities from the various expert reports prepared and issued by Stratus Consulting, Toxicological & Environmental Associates (TEA), and Quad Consulting.

Unit costs were derived from both available technical literature and communications with remediation and restoration contractors throughout the United States, including the Northeast United States. When appropriate, unit costs were adjusted to account for differing geographical construction cost indices (e.g., Gulf Coast unit costs were escalated to account for higher costs in New Jersey).

Specific unit cost items that were obtained include the cost for soil, sediment, water, infrastructure removal and reconstruction, and wetlands construction. These items are summarized in Table 4-1 (Summary of Unit Rates and Cost Research) and are used in Table 4-3 (Summary of Metrics and Cost).

4.6.1 Quantities

3TM International obtained quantities from the reports issued by the various technical experts associated with this case, primarily Stratus Consulting and TEA. For some parameters, primarily refinery infrastructure, 3TM International estimated quantities based on data and other information contained in copies of plans obtained from the NJDEP. While many of these engineering drawings were undated, most provided relevant information on the number of pipes, locations, and related infrastructure. Below is a partial list of several drawings that were reviewed:

- Drawing of Sewer System, Figure 1, Block Plan 24, Process Sewer, International Technology Corporation, June 1989
- Waterfront Pipeline Drawings, Humble Oil Refining Company, Circa 1969
- Drawing, Condenser/process sewer Block Plan 29, Condenser International Technology Corporation, April 1989
- Plans of Water Tank Field (Plans 40, 44, 45, March 1989.
- Morses Creek Dredging, Undated Drawing No. M091
- Upper Tremley Separator Drawing (M102), Drawing 1-85AA. June 1968

Additionally, distances were scaled using aerial photographs available on Google Earth.

A summary of the quantities used in this Expert Report is provided in the Metrics Section of the Master Cost Model in Appendix C.

4.6.2 Unit Costs from Technical Literature

3TM International also reviewed unit cost information from various technical documents in the public domain. For example, technical literature from the US Army Corps of Engineers, US EPA, and the Interstate Technology and Regulatory Council (ITRC) were reviewed.

4.6.3 Unit Costs from Potential Contractors

Communications with potential contractors generally included responses to a conceptual design, general project location and timing, and approximate quantities from which the contractors verbally provided 3TM International with approximate unit costs or lump sum costs.

Verbal unit costs are very useful in Pro Forma Economic Analyses; however, they should not be construed as firm bids to execute a project. In contrast, firm bids require a bid package that accurately defines the scope of work, performance standards, contractual requirements, nature and extent of contamination, project schedule, project logistical considerations, and similar information. Verbal quotes do not include these considerations, per se, but are nevertheless indicative of such cost components.

For this project, verbal unit costs were obtained from the following contractors:

- Geo-Con – Protective Slurry Wall
- Gehagan & Bryant – Wetlands Construction and Dredging
- D'Appolonia Engineers – Soil investigations and Well Installation
- CH2M Hill – Construction and Demolition of Roads
- Huitt-Zollars – Construction and Demolition of Foundations

4.7 Estimated Cost for the Restoration Program

3TM International estimated the total cost of the Restoration Program by calculating and summing the cost components associated with all the pertinent activities: program management, pre-construction, remediation, construction of wetlands, and wetlands maintenance and monitoring, as described in Section 3.0. To simplify calculations, a "base case" was defined using the metrics provided by Stratus and TEA, and metrics which 3TM International estimated from maps and aerial photographs. Unit costs for the base case are those directly provided by various sources and vendors.

The total estimated cash outlay for the Restoration Program base case is $2.457 billion, over a nominal 30-year period. This is the numerical sum of all cost elements associated with the Restoration Program. The equivalent net present value of this cash outlay is $1.594 billion (at a10% discount rate). Sensitivity analyses were performed on this base case, and are subsequently described.

4.8 Parametric Sensitivity Analysis

3TM International performed three levels of parametric sensitivity analyses for purposes of identifying key parameters that affect the overall cost of the Restoration Program.

The first level of sensitivity analysis ("Level 1") is simply computing a relative percentage value for each cost parameter in the Excel summary sheets. This is included as Table 4-9. For example, if a certain cost component (i.e., line item) was $100,000, then the relative percentage of this amount compared to the total cost of the Restoration Program was calculated as:

$$\text{Relative Percentage (\%)} = (\text{Cost Component} \div \text{Total Cost}) \times 100$$

The significance of this percentage is straightforward - the smaller the percentage, the less impact that parameter influences the total cost; the larger the percentage, the more impact that parameter influences the total cost.

The second level of sensitivity analysis ("Level 2") focuses on major cost drivers and assumes either a decrease or increase for certain key parameters, such as discount rate, quantities, and unit costs. The significance of these decreases or increases is explained in more detail below.

The third level of sensitivity analysis ("Level 3") looks at the risks associated with various cost parameters and then defining statistical distributions of the estimated costs for each category. A Monte Carlo simulation method is then used to determine the cost probability distribution for the Restoration Program as a whole.

4.8.1 Results of Parametric Analyses – Level 1

The Level 1 parametric sensitivity analysis indicates that seven of the 32 cost elements account for 93% of the total Restoration Program costs:

- 62% - soil excavation, transportation, and disposal
- 17% - dredging and disposal
- 8% - soil and sediment backfilling
- 5% - pipeline replacements

The remaining 25 cost elements are all less than 1% of the total costs each. These percentages are shown in Table 4-9.

4.8.2 Results of Parametric Analyses - Level 2

The net present value (NPV) is presented for a range of discount rates (5%, 10%, and 15%), and the effects of varying the quantity or unit cost are presented for a range of adjustment multipliers (0.8, 1.0, and 1.2). The significance of these ranges is subsequently discussed.

Summary Results of Pro Forma Economic Assessment (Base Case)			
Total Cash Outlay	NPV at 5% DR	NPV at 10% DR	NPV at 15% DR
$2.457 billion	$1.962 billion	$1.594 billion	$1.313 billion

Effect of Quantity or Unit Cost Adjustment Multiplier of 0.8 Soil and Sediment Removal, Disposal, and Backfill			
Total Cash Outlay	NPV at 5% DR	NPV at 10% DR	NPV at 15% DR
$2.027 billion	$1.617 billion	$1.313 billion	$1.081 billion

Effect of Quantity or Unit Cost Adjustment Multiplier of 1.2 Soil and Sediment Removal, Disposal, and Backfill			
Total Cash Outlay	NPV at 5% DR	NPV at 10% DR	NPV at 15% DR
$2.885 billion	$2.307 billion	$1.875 billion	$1.544 billion

NPV - Net Present Value
DR - Discount Rate

An annual summary of the total project cash outlay and net present values for discount rates of 5%, 10%, and 15% are provided in Tables 4-6 through 4-8.

Effect of Discount Rate

Calculations were made on the base case total cash outlay using net present value discount rates of 5%, 10%, and 15% to account for uncertainty in future interest rates. The forecast of interest rates was beyond the scope of this Expert Report, other than to identify a range of discount rates for purposes of the sensitivity analysis. Similarly, the evaluation of such uncertainty factors as inflation rates was beyond the scope of this Expert Report.

As would be expected, the discount rate has a major impact on the total Restoration Program cost. For the base case, the estimated net present value of the total cash outlay ranges from $1.962 billion (5% discount rate) to $1.594 billion (10% discount rate) to $1.313 billion (15% discount rate).

Effect of Quantities

Calculations were made on the base case total cash outlay using quantity adjustment multipliers of 0.8, 1.0, and 1.2 to account for uncertainty in actual quantities for the project. When those calculations were made on the primary cost drivers (soil, sediment, and backfill) the parametrics were identical to changing the unit rates by the same amount. The uncertainty in quantities is due to insufficient site assessment data that describes the nature and extent of contamination.

In particular, 3TM International assumed that, for any given physical area, the quantity of impacted environmental media would be based on the maximum depth of contamination observed (through sampling and analysis) for that area, even though the contamination may not be homogeneous in that area.

The 0.8 adjustment multiplier reflects a smaller waste area than that defined by other experts. This would account for overly conservative estimates, although some contingency for this uncertainty is a natural consequence given the nature and scope of the contamination. The 1.0 adjustment multiplier reflects the estimated quantities provided to 3TM International by Stratus, TEA, Quad Consulting and internal analysis of maps and photographs. The 1.2 adjustment multiplier reflects conditions in which the original estimate is biased low due to significant unknown site conditions. As previously discussed, ultimate quantities will probably be greater than the original estimates due to uncertain and limited site assessment information at this time.

Varying the quantities resulted in an estimated total cash outlay of $2.027 billion to $2.885 billion, with corresponding changes in net present values as previously shown.

Effect of Unit Costs

Calculations were made on the base case net cash outlay using unit cost adjustment multipliers of 0.8, 1.0, and 1.2 to account for uncertainty in actual unit costs for the project.

The 0.8 adjustment multiplier reflects conservative verbal quotes from potential contractors, and may be more consistent with competitive bids from contractors for a large project. The 1.0 adjustment multiplier reflects the actual verbal unit rates quoted to 3TM International by potential contractors. The 1.2 adjustment multiplier reflects cost components that may have been underestimated or not included in the contractor quotes.

The Level 2 parametric sensitivity analyses indicate that soil, sediment removal, disposal, and backfill continue to be the primary cost drivers for the Restoration Program.

The results of varying unit costs for soil and sediment removal, disposal, and backfilling are the same as the results of varying unit quantities, since these two parameters are multiplied together to yield a cost.

4.8.3 Results of Parametric Analyses - Level 3

Rather than simply adding a fixed contingency to the estimated cost of the Restoration Program, the Level 3 parametric sensitivity analyses used the Katmar Software Project Risk Analysis (PRA) to provide insight into financial risk associated with varying total project cash outlays (i.e., project funding levels). The Katmar PRA program is based on the Monte Carlo process which is a commonly used simulation technique for modeling random processes and systems. This financial statistical program uses the input for the estimated minimum and maximum costs, or cost ranges for each of the 32 sub tasks shown on Table 4-9, that are anticipated for a project to calculate (among other things) the probability of a project cost overrun for a defined level of total project cash outlay.

The minimum estimated cost assumes the most favorable combination of economic parameters that drive the total cost - well-defined (i.e., low) volumes, the lowest unit cost rates, etc. In contrast, the maximum estimated cost assumes the most unfavorable combination of economic parameters - poorly defined and low-biased (i.e., high) volumes, the highest unit cost rates, etc. For example, in the subtask Foundations Removal, the low cost was set at 85% of the base case cost and the high cost was set at 130% of the base case cost. Other subtasks were assigned low costs ranging from 50% to 90% of the base case cost, whereas the high costs for each subtasks ranged from 110% to 200% of the base case cost, depending on the relative certainty of the data and assumptions that were used to generate that specific base cost. On average, the low sub task cost was set at 77% of the base case cost, and the high sub task cost was set at 134% of the base case cost.

A summary of this risk analysis output by the Katmar PRA is shown in the cumulative probability "S curve" of Figure 11. The same data used to generate the curve is shown in tabular form in Figure 11. The cumulative probability curve provides an indication of the probability of the realized cost for the Restoration Program (i.e., the actual cash outlay for the project at the end of the 30-year program) being less than the amount originally estimated during the planning of the Restoration Program.

As the funding level increases, the cumulative probability of the realized cost being less than the estimated cost increases. For example, if the project funding were set at $2.172 billion, then the probability of the total cost being less than or equal to this amount would be only 30%. If the project funding were set at $2.631 billion, then the probability of the total cost being less than or equal to this amount would be 95%. The estimated cash outlay of $2.457 billion (base case cost) corresponds to a probability of about 73% that the funding will be adequate.

4.9 Supplement to Pro Forma Cost Estimate

As previously discussed, this is a Summary Expert Report. 3TM International will prepare a Supplemental Expert Report which will address the following:

- Our Expert Report indicates that soil clean up is the primary cost driver for the Restoration Program. However, additional information on alternative disposal methods or beneficial reuse of the soils at another location will be obtained for the supplemental report in order to reevaluate the overall project costs. This information may include alternative soil cleaning technologies and transportation alternatives.

- Our cost estimate has captured roughly 90% of all the cost components associated with the Restoration Program. Other cost components which were not considered include the costs associated with removal or working around common carrier pipelines, the removal or relocation of other roads and railroads, the impact to the New Jersey Turnpike, the impact to high voltage transmission lines and impacts to local traffic patterns, site security, and public infrastructure in the Linden, Elizabeth, and Bayonne communities. Therefore, the estimated costs of the Restoration Program are probably biased low.

Section 4.0 At a Glance . . .

The results of the Pro Forma Economic Analysis indicate

- The estimated total cash outlay for the Restoration Program is approximately $2.457 billion.
- This corresponds to a net present value cost of $1.313 billion to $1.962 billion for a discount rate range of 5 – 15%.
- Contaminated soil excavation, removal, and disposal are the primary cost drivers, accounting for 62% of total Restoration Program costs.
- Financial Risk Simulation in Today's Dollars
  - $2.172 billion - 30% probability of adequate funding
  - $2.631 billion - 95% probability of adequate funding
  - $2.457 billion – 73% probability of adequate funding (base cost)

5.0 Findings, Opinions, and Recommendations

3TM International has prepared a series of Findings, Opinions, and Recommendations, as presented below, which are based on our work.

The Findings and Opinions stated herein are based on widely known and accepted environmental engineering and scientific principles, personal environmental engineering and scientific judgment, personal experience gained throughout professional careers, and information and data obtained and/or made available to 3TM International, and should not be inferred in any manner beyond that stated in this Expert Report. All Opinions rendered are within a reasonable degree of environmental engineering and scientific certainty.

We reserve the right to retract, alter, modify, add to, delete, or clarify any or all of these Findings, Opinions, Conclusions, and Recommendations upon evaluation of any further pertinent information and data that may become available in the future.

5.1 Findings and Opinions

3TM International's Findings and Opinions include the following:

- Soil, sediment, and groundwater contamination extends to almost 580 acres of historical wetlands at the ExxonMobil Bayonne and Bayway refineries. Toxic contaminants include petroleum hydrocarbons, heavy metals, pesticides, PCBs, and other substances.
- The restoring of certain contaminated areas at the former ExxonMobil Bayonne and Bayway refineries and converting them into productive wetlands are technically feasible, from both scientific and engineering perspectives.
- A nominal 30-year Restoration Program schedule is envisioned, which will include two years of pre-construction activities, four years of clean up and infrastructure demolition and reconstruction activities, two years of wetlands construction activities, and twenty-two years of wetlands maintenance and monitoring. This schedule is feasible.
- The total estimated cash outlay for the Restoration Program base case is $2.457 billion, over a nominal 30-year period. This is the numerical sum of the cost elements associated with the Restoration Program. The equivalent net present value of this cash outlay is $1.594 billion (at a10% discount rate).
- Contaminated soil excavation, removal, and disposal, and backfilling are the primary cost drivers, accounting for 62% of total Restoration Program costs.