3 ENVIRONMENTAL IMPACTS OF PROPOSED ACTION AND MITIGATION MEASURES

3.1 Topography, Geology and Soils

The construction of the Project will require typical earthworks activities such as cut and fill. However, it is not anticipated that these activities will cause significant impacts on the geomorphology, topography and soils of the Site as these were largely impacted by the construction and operation of the former paper mill. Neither is expected that earthworks for the off-site components of the Project will cause significative impacts on these resources, as they also constitute areas previously impacted by road construction (PR-2, etc.) and the Central Cambalache Sugar Mill.

Earthworks activities at the Site include the deposit of approximately 382,000 cubic meters of artificial fill and compaction of fill, in a 2-3 meters range above existing grade in areas where the structural elements of the Project will be located. It also requires the extraction and removal of alluvium or alluvial deposits to secure the necessary foundations and structural elements. The preliminary geotechnical study performed at the Site indicates that structures must be founded on pile type deep foundations, due to the inability of soils to withstand structural loading, which will also cause a temporary direct impact on the geomorphology of the area where earth crust material will be removed to drive foundations. However, due to the small footprint impact of drilling areas for the piles and because it will be a temporary impact, these activities are not expected to result in significant adverse impacts.

Extraction or cutting of earth crust materials (alluvium) is also contemplated on the western portion of the Site and out of the Project's construction foot print to temper or adjust existing conditions within the Site to the recommendations of the H-H Study (see **Appendix B**). This impact will be mitigated by using, where possible, the same excavated material to back-fill trenches and grading activities to obtain desired surface gradients.

Furthermore, the installation of raw water lines and power lines, included as part of the Project, will only cause a temporary impact on the geomorphology of the area, since they will be installed underground.

In addition, most will be located along existing roads or their rights of way and will be located in cross-country areas previously impacted by anthropogenic actions.

Fill and cut activities in the mentioned areas will cause a direct permanent impact on the topography within the Site due to the alteration of existing topographic levels, even though the Project's final grading will harmonize with the existing flat topography of the Site and surrounding areas.

During the operation phase, no impacts are expected to occur in addition to those identified during the construction phase in terms of soil erosion, once soils are stable. On the other hand, a Planting Plan will be designed to include the planting of native species typical of the environment of the Site and that will also improve the environment in the area of the Project.

Mitigation Measures

Mitigation measures to be implemented during the construction phase will consist of best management practices to control erosion and sedimentation of the land surface as a result of earthworks as contemplated in Regulation No. 5754, Regulation for the Control of Erosion and Sedimentation Prevention and with the ESC Plan for the project, which will be filed before EQB. The earth crust incidental extraction permit application will be filed at DNER to comply with Regulation for the Extraction, Excavation, Removal and Dredging of Earth Crust Components, Regulation No. 6916.

As a mitigation measure to minimize sediment loss caused by erosion it will be important to implement erosion controls. The following practices will aid in minimizing the generation of sediments at the Site and prevent them from flowing towards low-lying areas and to the RGA:

- Prior to the construction phase, the developer will obtain the required permits by EQB for the ESC Plan or the General Consolidated Permit and Incidental Activity Permit authorized by the ARPE or OGPE.

- Additionally, the following mitigation measures will be used such as geotextile fabric material made of straw or other organic biodegradable alternative (not plastic) and will be installed under the earth's crust excavated material and above it to prevent runoff during

periods of precipitation.

- Sediment traps and hay bales will be placed to trap sediment that may reach surface water and surrounding areas

- Where necessary, diversion ditches will be created in order to intercept and slow the speed of runoff so it will carry less erosive flow levels.

- Small compacted soil berms will be created to intercept runoff flowing on proposed slopes, reducing the area of water displacement and directing them to other erosion control measures.

- The necessary and appropriate measures shall be implemented to effectively accommodate increased levels of runoff caused by changes in soil conditions and the earth's crust, prevailing the natural pattern of drainage, and

- The restoration of vegetation cover will be based on the conditions and the use of the land prior to construction of the Project.

Lastly, once the construction of the Plant has been completed the areas of preparation (stockpiling of earth's crust material, preparation of access roads to development area, etc.) will be substantially restored to its original state by implementing measures like soil compaction. This mitigation shall include debris removal and other exogenous material remaining from construction activities.

3.2 Hydrologic Systems and Water Quality

Impacts to water systems and water quality as a result of the development of the Project will be limited to an increase in storm water runoff generation as a result of local precipitation and their diversion through engineering works and practices. Significant cumulative environmental impacts to water quality of hydrologic systems are not anticipated during the construction phase of the Project, development of infrastructure nor during the operational phase.

During the construction phase preventive measures such as the ESC Plan will be implemented to prevent impacts to hydrologic systems and therefore impacts to water quality.

These measures will be developed to minimize that sediments derived from earthworks gain access to water bodies including the RGA. Additionally, a storm water management plan will be designed which will comply with state and federal regulations for the Project's construction phases and during Project operation.

However, construction projects involve a series of activities that can potentially cause land erosion and sedimentation. These activities are related, but not limited to, removal of topsoil, hauling fill material and earth's crust material resulting from extraction, traffic of heavy equipment, among others. However, as specified above, best management practices will be implemented to minimize pollutants such as sediments, paint, solvents, cement mix, vehicle fluids, etc., and prevent them from gaining access to the storm water system and eventually water resources. In addition, portable toilets will be used during construction, so that no adverse impact from sanitary waste waters is anticipated to the quality of nearby water bodies.

Regarding the artificial channels and "overflow" areas (2.49 acres) identified as wetlands in the Study of Jurisdictional Determination (See **Appendix E**) discussed in **Section 2.7.4**, **Wetlands**, and in **Section 3.5-Environmental Impacts** that will be impacted during the construction phase of the Project due to the deposit of artificial fill, the water flow through these channels will not be interrupted, so that their water quality will not be affected as a result of this action. In addition, as previously expressed these channels are artificial in nature and are connected to the existing storm water system inside the Site. Mitigation measures to be implemented to compensate for the loss of natural habitat are also included in Section 3.5.

Moreover, the construction of off-site works to be completed include the excavation of trenches with maximum depths of 1.5 meters from existing ground elevation to install the brackish water outlet line from the discharge water system located at Caño Tiburones. This action will not cause any adverse impact to hydrologic systems since appropriate measures will be taken, to prevent that excavated sediments are transported into a body of water. In addition, these works will take place on or near the right of way of the road where the proposed pipeline alignment is located. **See Section 1.4.8 and Figure 1-23** for the water pipe route.

The use of at least two (2) retention ponds is anticipated (western portion of the Project) as structural mitigation measures to store storm water runoff, which will discharge in a laminar way

on the adjacent soil and as part of the system design for storm water in compliance with Regulation No. 3 of the PRPB.

During the operation phase best management practices will be implemented to minimize potential impacts of the storm water system discharge to water bodies. Some of these measures may include the installation of grease traps, filters and rip-rap, in inlet areas to the storm water system at discharge point to the lagoons and the RGA. As part of the SWPPP an inspection plan schedule prior and after precipitation events will be developed to identify areas that need maintenance to minimize impacts to streams and lowlands through the storm water system.

As part of the environmental planning for the Project, CSA conducted an exploratory investigation, which included sampling of soil and groundwater in the area formerly occupied by the paper mill and four (4) retention ponds, to detect potential adverse impacts to soil, groundwater and water bodies as a result of that action. For this purpose, laboratory testing of samples collected yielded results of non detection for contaminants in soil and groundwater.

On the other hand, during its operation phase the Project will not generate direct discharges of pollutants into water bodies. The sanitary and sewage systems for the plant will be connected to the sanitary trunk located in the PR-2 so there will be no direct impact to subsoil, surface water or groundwater. If necessary a wastewater treatment system will be evaluated to comply with the requirements of the AAA. If required, a treatment plant will be designed to be built to comply with the appropriate permissions.

Impacts to groundwater during the operation phase of the Project can be evaluated based on the following criteria: (a) interference with recharge areas; (b) resource depletion; (c) potential degradation of groundwater; and (d) contamination of a public water supply.

Soil permeability and the infiltration capacity of rainwater will be affected by the buildings to be constructed as part of the Project, which will occupy approximately 44% of the Site and occupy approximately 82 *cuerdas*. The structures and permanent buildings reduce soil permeability and thus recharge that may occur in this area to the subsoil, which will be approximately 15% to 20% compared to the original condition. Therefore, it is pertinent to set the above within the context of the characteristics of the North Limestone Aquifer, in regards to its extension and infiltration

area. It encompasses approximately 700 square miles (USGS) and includes the upper aquifer and lower aquifer as expressed above.

Furthermore, as mentioned in **Section 2.3.2 aquifers** the main area of water infiltration into the aquifer occurs in the upper alluvial valley and mountainous area of the RGA basin. The proposed area of the Site to be impacted by the project occupies a space of 82 *cuerdas* or 0.05 percent of the extent of the aquifer. In addition, those areas of the Project that will not be impervious will continue to recharge the subsoil and therefore the superior aquifer, therefore no significant impact is expected to the recharge capacity of the aquifer as a result of the development of impervious surfaces in the Project.

The main source of aquifer recharge mentioned previously is runoff generated by precipitation, which percolates through permeable surface blanket deposits directly into the ground conduits typical of karst dissolution as sinks, solution (*trenches*), pits, fractures or fissures present in bedrock, among others.

As for the water supply for the Project (discussed in previous sections) it will be obtained from brackish water surplus and daily discharged by the DNER Station from El Vigía, which is not utilized, resulting in a positive management of this water resource as a result of the construction of the Project. This implies that the aquifer will not be impacted as a result of resource depletion as a result of groundwater extraction which will be used as part of the operation of the Plant. Furthermore, it should be noted that groundwater present in the Project area and the one to be used from Caño Tiburones have hypersalinity characteristics (brackish water), therefore it is not used as a public potable water supply by the AAA. For more details see **Section 2.4.2, Groundwater Quality.**

The project does not represent an impact to water bodies by precise sources of pollution as it does not involve discharges of pollutants that would cause further degradation to groundwater, to those already caused to this resource by agricultural and insdustrial activities on the valley. Similarly, it is not anticipated that it will have additional impacts of nonpoint sources to a public water supply as the AAA water standards and requirements will be met.

It is pertinent to note that mitigation measures will be implemented during construction and

operation of the Project. Fuel and oil that will be used during construction will be placed in areas designated for storage. Chemicals and fuels as mentioned previously will be protected by secondary containment systems. When the equipment is not operating, it will be parked in a designated area. Also during the operation a Spill Prevention Plan (SPCCP, for its acronym in English) and the SWPPP plan will be implemented during construction and operation of the plant.

The project provides for the use of six tanks for storing substances that will be used in the plant. All tanks, regardless of their location will be installed with a secondary containment system as a precautionary measure to prevent chemicals or fuels from spills gaining access to the storm water system, soil and water bodies, as required by in force regulations.

3.3 Flood Prone Areas

Based on Insurance Rate Map Flood (FIRM acronym), panel 230J from November 18, 2009 (see **Figure 2-10**), the Site is located in Zone AE, within the RGA floodway, with base flood (100-year) elevations of 5.2 meters (17.06 feet) above mean sea level (msl, for its acronym in English).

As part of the P-EIS, an H-H Study was prepared (see **Appendix B)** to analyze current conditions in the RGA and determine new floodway boundaries based on updated topography and modeling, in compliance with the requirements of Regulation No. 13 of the Planning Board.

Floodway limits have been revised to run along the perimeter of the Project to reclassify the Site as Zone AE outside floodway zone, where Section 7.03 of Regulation No. 3, is applicable. **Figure 20** in **Appendix B** presents the proposed boundaries of the floodway. The proposed amendment would require a modification to the topography of the area between the Project and the RGA channel for the maximum ground elevation to be 3.5 meters-msl, and provide a greater flow area along the banks of the RGA as presented in **Figure 21** in **Appendix B**.

The application for amending the Map for Flood Prone Areas [case number 2010-06-0208-JPI (E)] was filed at the Planning Board on October 8, 2010. Please refer to **Appendix B** for more information on the H-H Study.

3.4 Air Quality

This section presents the potential impacts to air quality that may be caused by the Project. Discussion of potential impacts has been divided into: impacts during construction and impacts during operation. It is not expected that the Project negatively affects air quality of the area during construction and operation phases.

3.4.1 Construction Phase

Air emissions resulting from construction activities are of temporary and intermittent character, attributing the main impact to fugitive dust emissions. The removal of vegetative cover, materials handling and heavy equipment traffic will cause fugitive dust transport during the construction period. Another source of particulate matter will be the heavy equipment used in

construction. This type of equipment usually uses "diesel" fuel. Emissions from diesel-using equipment are generally lower than emissions from equipment that use gasoline although more visible, due to the emission of particulates (Wark and Warner, 1981).

- Fugitive dust emissions - The construction works will result in fugitive dust emissions due to earth disturbance activities, excavations, erosion by wind and vehicular movement. These emissions depends on soil moisture, digging operations, soil type, atmospheric conditions of wind speed, precipitation and temperature.

- Fugitive dust will not affect the vicinity area; the Project site is widely separated from residential areas.

- Vehicle Emissions - Construction vehicles will generate additional fugitive dust emissions as result of the traction from tires. It is anticipated that the use of equipment such as excavators, dump trucks, cranes and others will produce a temporary and not significant impact to air quality in the area.

The Regulation for the Control of Atmospheric Pollution promulgated by the EQB indicates that reasonable precautions should be implemented when thre are activities that cause the transport of particulate matter.

- The general consolidated permit, required by the EQB for the emissions of fugitive dust, will be requested prior to the construction phase.

- Water will be used to control dust generation caused by earth disturbance activities and materials used during construction works, as well as the transit of heavy equipment.

- During dry days water must be sprayed on areas whenever necessary, so that the material is not transported due to wind or vehicular movement.

- Trucks will not be loaded over their carrying capacity.

- Truck load will also be covered to avoid the transportation of particulate matter.

- Soil residues and other materials will be removed from paved roads.

- The accumulation of loose material in areas susceptible to strong wind currents for long periods of time will not be allowed.

- The speed of motor vehicles and heavy equipment should be regulated in the Project area and on the access roads. This will be achieved through the installation of signs in visible areas, warning the speed limit.

- The contractor and / or project inspector must outline a plan to make daily inspections to asure the implementation of preventive measures to control fugitive dust. Compliance with these measures will be confirmed during and at the end of each workday, and especially at the end of each work week.

3.4.2 Operation Phase

Energy Answers conducted an air quality impact study (see **Appendix C**) that shows that Project emissions comply with the National Ambient Air Quality Standards (NAAQS) regulations. The Air Quality was developed based on extensive analysis for the Plant PSD pre-construction permit application required by the EPA.

Below is a summary of both federal and Puerto Rico regulations for the control of air quality that are applicable to the Project and the analysis that demonstrates that the Project will not have an adverse impact on air quality. Details of each of these analyzes are presented in **Appendix C**.

3.4.3 Applicable Regulatory Requirements

The proposed project will be subject to both EPA and EQB air quality control regulations. These are listed and summarized below:

EPA

- *New Source Review* and *Prevention of Significant Deterioration (PSD*) include:
    - Site-specific Best Available Control Technology (BACT) emission limits
    - Air Dispersion Modeling Impact Analysis to quantify the potential impact to environmental air quality;
- New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAPs)

- Maximum Achievable Control Technology

EQB

- Major Source Location Approval / Major Source Construction Permit
- Puerto Rico Emissions Standards

New Source Review and PSD

The New Source Review (NSR) program, enacted by the U.S. Congress in 1977, aims to preserve air quality in areas that meet the National Ambient Air Quality Standards (attainment areas), and to achieve a fast progress towards clean air in non-attainment areas. In attainment areas such as Arecibo, the NSR is implemented under the federal program known as PSD.

The PSD regulation requires new major stationary sources or existing major stationary sources proposing major changes, to be evaluated prior to construction to ensure compliance with the NAAQS and applicable PSD air quality permitted "increments". The PSD regulation also requires new major sources to install Best Available Control Technology (BACT) to reduce emissions.

The Plant is listed in one of the 28 categories of major sources subject to PSD. A listed source would be subject to PSD review if it has the potential to emit 100 tons per year or more of any regulated pollutant under the Clean Air Act (CAA). According to the proposed emission potential, the Plant is considered a PSD major source, which is subject to PSD pre-construction evaluation and permit procedures for several criteria pollutants and other regulated air pollutants. The **Table 3-1** PSD Applicability summarizes the applicability of PSD by pollutant according to their emission potential:

Table 3-1: PSD Applicability

Pollutant	PSD Major Source Criteria[1] (tons/year)	Potential Emission Rate[2] (tons/year)	PSD Required Review
Carbon Monoxide	100	702	Yes
Nitrogen Oxide (as NO2)	100	347	Yes
Sulfur Dioxide	100	256	Yes
Particulate Matter (PM)	100	46.1	No
Particulate Matter < 10 microns (PM10)	100	45.1	No
Particulate Matter < 2.5 microns (PM2.5)	100	24	No
Volatile Organic Compounds (Ozone Precursor)	100	63	No
Lead	0.6	0.25	No
Asbestos	0.007	N/A	No
Beryllium	0.0004	0.003	Yes
Fluorides (as HF)	3	13	Yes
Mercury	0.1	0.06	No
Sulfuric Acid Mist	7	55	Yes
Hydrogen sulfide (H2S)	10	N/A	No
Total Reduced Sulfur Compounds (H2S included)	10	N/A	No
Vinyl chloride	1	N/A	No
Municipal Waste Combustor Organics (measured as total tetra-thru octa-chlorinated dibenzo-p-dioxins and dibenzofurans)	3.5E-6	4.5E-5	Yes

(1) Source: 40 CFR 52.21

(2) Estimated maximum annual emission rates assume both boilers operate at a heat input rate of 500 MBTU/hr for 8760 hours

The EPA Region 2 is responsible for evaluating the PSD permit application for the Plant and other major sources in Puerto Rico.

As part of the PSD permit program, the Plant is required to evaluate control technologies for each pollutant that may be emitted. A thorough evaluation (top-down) must be completed to determine what emission control technology constitutes BACT for each pollutant.

On the other hand, it is required to complete an air quality impact analysis and a secondary impacts analysis. The impact analysis requires the applicant to use dispersion models approved by EPA to predict the maximum impacts on ambient air quality.

NSPS and NESHAPs

In addition, the Plant is subject to NSPS codified under Title 40 CFR, Part 60, which specify the minimum performance requirements for certain new sources or modifications of existing sources. These are listed below:

- Subpart A-General Provisions-Establishes notification requirements and maintenance of records; performance tests, compliance with standards and maintenance requirements, monitoring requirements, and general notifications and reporting requirements.
- Subpart Da- Performance Standards for Steam Electric Power Generation Plants establish emission limits for particulate matter, opacity, SO2 and NOx. The plant is subject to these emission limits for the occasional use of fuel No. 2 fuel auxiliary burners and for exceeding the capacity of 450 MMBTU/hr for each of its boilers.
- Subpart Eb- Performance Standards for Municipal Waste Combustion Plants; apply to facilities that process more than 250 tons per day of MSW and set stringent emission standards for metals, opacity, acids, dioxins and furans, NOx and fugitive emissions from ash handling. It also requires the implementation of Good Combustion Practices to minimize emissions, location requirements, implementation of management planning, preparation of a materials separation plan, and to conduct periodic training for operators.
- Subpart III- Performance Standards for Stationary Compression Internal Combustion Engines: applies to emergency generators manufactured after July 2005, and requires that manufacturers certify their compliance with referenced standards.

The plant is also subject to NESHAPs and therefore is considered a major source under Section 112 of the CAA. Section 112 establishes standards to reduce HAP emissions based on control technology. The emission control system of the Plant meets the control level considered MACT.

Pre-Construction Approval from the EQB

Rules 201, 202 and 203 of EQB's RCAP establish the requirements for approval and construction permits for major stationary sources. Rule 201 describes the rules for granting location approval for a new major stationary source. Among them is the requirement to

demonstrate that emissions from the new major stationary source will not cause any NAAQS to be exceeded. In addition, a public hearing is required for the location approval. It should also describe the operation of the new source, the emission control system and the air quality impact analysis that demonstrate that the increase in allowable emissions from the proposed new major stationary source will not significantly cause or contribute to air pollution in violation of any NAAQS and that the net benefit to air is demonstrated in accordance with Rule 202, unless otherwise it is exempted.

Exceptions of the Rule 201 state that filing an air quality impact analysis modeling is not required as part of the application for location approval when the proposed source uses at least 50% of waste derived fuel. Nevertheless, Energy Answers completes a modeling analysis for the PSD pre-construction permit application of EPA and will also file a construction permit application pursuant to Rule 203 of the EQB regulation.

EQB Emission Rules

Rules 401 to 417 set emission rules applicable to authorized stationary sources. To this end, Rule 403 states specific limitations for the emission of air pollutants with opacity greater than 20 percent in an average of 6 minutes. Rule 406 sets a limit to the emission of particulate matter in excess of 0.3 pounds per million BTU. Rule 407 specifies an allowable emission rate of particulate matter from non fuel burning equipment (eg. silos, and conveyors) based on the total weight of the material to be processed. In general, it is anticipated that the emission limits established in the PSD are equal or more stringent than those permitted by Rules 403, 406 and 407. Thus, the Plant will also be in compliance with the EQB air quality standards.

3.4.4 Air Quality Impact Analysis

As indicated, PSD requires conducting an air quality impact analysis, using approved air dispersion modeling methods for each pollutant expected to be emitted in significant amounts (see **Table 3-2**). The purpose of the analysis is to demonstrate whether a facility meets the NAAQS and the increments allowed by PSD. In the event that the impacts that are very conservatively modeled are below significant impact levels (SILs), the analysis concludes. The SIL are assessment tools used to determine whether emissions from a proposed source would

have significant impacts on air quality in the area. If modeled impacts are below the SILs these would be considered as *de minimis* or insignificant and do not require to the PSD permit applicant to conduct a cumulative impact analysis. This analysis requires that the impact of the new and existing sources in the area be cumulatively measured.

PSD regulations also require the establishment of ambient air monitoring before construction can be approved. Like the SILs, PSD regulations include Significant Monitoring Concentrations (SMCs) that are levels on which the permitting agencies require one year of ambient air monitoring prior to construction. However, if the dispersion model establishes that concentrations are below the SMCs, the source is considered as *de minimis* and the agency may exempt the applicant from the requirement of pre-construction monitoring.

The NAAQS, PSD allowable increments, the SMCs and SILs are included in the **Table 3-2** below.

Table 3-2: Ambient Air Quality Standards, PSD Increments, Significant Impact Levels, and Significant Monitoring Concentrations

Pollutant	Period	Ambient Air Quality Standards NAAQS ($\mu g/m^3$)	PSD Increment Class II ($\mu g/m^3$)	SIL ($\mu g/m^3$)	SMC ($\mu g/m^3$)
SO_2	1-hour	195[1]	*	8	*
	3-hours	1,300	512	25	*
	24-hours	365	91	5	13
	Annual	80	20	1	*
PM_{10}	24-hours	150	30	5	10
	Annual	Revoked	17	1	*
$PM_{2.5}$	24-hours	35	9	1.32	4.0
	Annual	15	4	0.32	*
CO	1-hour	40,000	*	2,000	*
	8-hours	10,000	*	500	575
NO_2	1-hour	188[3]	*	8	*
	Annual	100	25	1	14
Pb	3-months	1.5	*	*	0.1
Fluorides	24-hours	*	*	*	0.25

Legend: *= None

Notes:

1. EPA issued the 1-hour SO2 NAAQS in June 2010. At the same time, EPA revoked the 24-hour and annual SO_2 NAAQS, although they will remain in effect temporarily until further rulemaking is finalized..

2. $PM_{2.5}$ PSD increments, SIL, and SMC were issued on September 29, 2010. The effective date of the final rule is pending publication in the Federal Register, which has not occurred as of this writing..

3. EPA issued the new 1-hour NO2 NAAQS in February 2010.

Model Selection:

Dispersion models are mainly used to estimate ambient concentrations of regulated emissions. These models consider specific parameters for the source such as stack height, exit temperature, flow rate, weather conditions, among others.

AERMOD model (version 09292) approved by EPA was used to predict maximum concentrations of regulated emissions in enviromental air quality. AERMOD was selected to predict ambient concentrations in simple, intermediate and complex terrain surrounding the proposed facility. The AERMOD modeling system includes preprocessor programs (AERMET (version 06341), AERSURFACE (updated January 2008), and AERMAP (version 09040)) to create the required electronic input files for meteorology and receptor terrain elevations. It is worth noting that AERMOD is the recommended model in USEPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W) (USEPA 2005).

Model Options:

The AERMOD "regulatory default" option will be used for this analysis. This model option directs AERMOD to use the following techniques:

- The elevated terrain algorithms requiring input of terrain height data for receptors and emission sources;
- Stack tip downwash (building downwash automatically overrides);
- The calms processing routines;
- Buoyancy-induced dispersion; and
- The processing routines for meteorological data.

Description of the Source and Operation Scenarios:

The facility will have the following emission sources:

- Two (2) spreader-stoker boilers with a heat input rating of 500 MMBTU/hr each, equipped with three (3) No 2 Fuel Oil-fired burners each;
- MSW receiving, processing and PRF storage operations;
- Fly and bottom ash transfer, processing and storage operations;

- Storage Silos (lime, pulverized activated carbon, flyash);
- One (1) cooling tower, with 4-cells (air-cooled condenser type);
- One (1) diesel fuel-fired emergency generator set (0.25 MW); and
- One (1) diesel fuel-fired emergency firewater pump (0.1 MW)

Energy Answers is committed to install advanced air quality control systems on the Plant that qualifies as the Best Available Control Technology (BACT) for its operations. Independently operating emissions control systems will be installed for each boiler, consisting of the following technologies:

- An activated carbon injection system to remove heavy metals, including mercury and dioxins and furans compounds;
- A Turbosorp ® dry circulating fluid bed scrubber system to remove acid gases using lime injection
- A fabric filter (baghouse) to control particulate emissions (including metals); and,
- A regenerative selective catalytic reduction (RSCR) system for reducing emissions of nitrogen oxides (NOx).

The boilers are expected to operate near the design capacity of 500 MMBTU/hr each. For the purposes of the air quality impact analysis, this is defined as the 100 percent load scenario. In addition Energy Answers evaluated the 110 percent load (550 MMBTU/hr each) as representing the short-term maximum scenario.

The air dispersion model requires the input of certain site-specific data to produce results that are representative of the actual site conditions. These data include stack coordinates, height, diameter, emission rates, temperature and exit flow rate. **Table 3-3** provides a list of these data for the 110% and 100% operating scenarios.

Table 3-3: Source Stack Parameters and Emission Data

Source ID	Vent #	Boiler Load	Stack Height (m)	Stack Diameter (m)	Exit Velocity (m/s)	Temp (K)	Emision Rate (g/sec)			
							CO	NO2	SOx	PM10
Boiler 1	P-5	110%	95.52	2.13	32.81	431	11.09	5.46	4.06	0.634
		100%			28.82	431	10.08	4.97	3.69	0.577
Boiler 2	P-6	110%	95.52	2.13	32.81	431	11.09	5.46	4.06	0.634
		100%			28.82	431	10.08	4.97	3.69	0.577
Cool1	P-11	N/A	10.7	9.14	7.62	311	N/A	N/A	N/A	0.0054
Cool2	P-12	N/A	10.7	9.14	7.62	311	N/A	N/A	N/A	0.0054
Cool3	P-13	N/A	10.7	9.14	7.62	311	N/A	N/A	N/A	0.0054
Cool4	P-14	N/A	10.7	9.14	7.62	311	N/A	N/A	N/A	0.0054
MSW1	P-1A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MSW2	P-1B	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PRF	P-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ash	P-15	N/A	20+/-	1.52	15.52	311	N/A	N/A	N/A	0.0322
Trans1	P-3	N/A	16.5	0.83	17.47	311	N/A	N/A	N/A	0.0216
Trans2	P-4	N/A	16.5	0.83	17.47	311	N/A	N/A	N/A	0.0216
Silo 1	P-9	N/A	13.1	0.18	18.59	311	N/A	N/A	N/A	0.00108
Silo 2	P7	N/A	30.5	0.18	18.59	311	N/A	N/A	N/A	0.00108
Silo 3	P-8	N/A	38.1	0.18	18.59	311	N/A	N/A	N/A	0.00108
Generator	P-16	N/A	10.0	0.152	49.2	779	1.097	2.70	0.00113	0.028
Gen. FWP	P-17	N/A	10.0	0.152	49.2	708	0.278	0.32	0.00021	0.014

Emission rate calculation were developed using equipment specifications, published emission factors, and the approximate design parameters for the proposed Plant. Where appropriate, the emission estimates were based upon the proposed BACT performance levels that are guaranteed by the manufacturers of the equipment and control devices, and, therefore, represent conservative estimates of actual emissions.

The height of chimney in each emission point was evaluated to comply with Good Engineering Practices (GEP).

Meteorological Data:

Careful consideration was given to selecting a location from which to obtain meteorological data to ensure the data is representative of conditions at the Project site. Complete meteorological data, available at the San Juan International Airport station for the last five (5) consecutive years (2005 to 2009) was obtained. Additionally, one year of historical data (August 1992 to August 1993) was available from PREPA in Cambalache which has a meteorological station within one mile of the subject site. Both data were used to complete the detailed analysis. This was important in order to format and compile the 1992-1993 PREPA Cambalache meteorological data for use in the AERMOD modeling. The PREPA Cambalache data included wind direction, wind speed, temperature, and solar radiation. To complete the meteorological data set, data representing cloud cover, height, pressure, and relative humidity were extracted from the 1992-1993 meteorological data set collected in San Juan.

The plant will have the potential to emit several pollutants from the list in **Table 3-1 PSD Applicability** over its corresponding PSD significant emission threshold and therefore need to be examined according to the PSD process. This test involves an analysis of air quality impacts for CO, NO_2 and SO_2 using an EPA-approved model. In addition, PM_{10} and $PM_{2.5}$ emissions were analyzed, although these are below the current level PSD. At present, no standards have been promulgated for other compounds identified and therefore were not modeled. However, BACT and MACT technology efficiently controls emissions of these compounds.

Results of the Air Quality Model:

Table 3-4 lists the maximum modeled ambient air concentration for CO, PM_{10}, $PM_{2.5}$, NO_2, and SO_2 in comparison with Significant Impact Level (SIL) Class II. Two operating scenarios were modeled based on100% normal operating level and 110% peak operating level.

Table 3-4: Model Results – Significant Impact Levels Evaluation

Parameter	Operation Scenario	Average Period		Maximum Concentration ($\mu g/m^3$)	Class II SIL ($\mu g/m^3$)	UTM Northing (meters)	UTM Easting (meters)
CO	110 %	1	High	136	2000	746602	2036551
	110%	8	High	35	500	742658	2042988
PM_{10}	110%	24	High	4.3	5	742527	2042426
	100%	Annual	High	0.85	1	742527	2042426
$PM_{2.5}$	110%	24	High	0.54	1.3	741561	2036624
	100%	Annual	High	0.10	0.3	741663	2042191
SO_2	110%	1	High	49.8	8	742602	2035551
	110%	3	High	16.6	25	742602	2035551
	110%	24	High	3.45	5	741561	2036624
	100%	Annual	High	0.64	1	741663	2042191
NO_2 [1]	110%	1	Alto	68	8	742739	2042949
	100%	Annual	Alto	0.89	1	742637	2042975

1. NO2 concentration estimated as 75% of the NOx predicted by modeling based on EPA Guidance for the Tier II NO2 calculation method (EPA, 2010)

Modeled concentrations below the Significant Impact Level (SIL) indicate that potential emissions will not cause or contribute to a violation of the NAAQS or PSD allowed increment. Values shown for CO, PM_{10} and $PM_{2.5}$ were found to be below SIL, and no further analysis is required for these compounds. Maximum modeled concentrations were found to exceed the one-hour SIL for SO_2 and NO_2. Concentrations of NO_2 and SO_2 were below the SIL for all other evaluated time periods. Consequently, a cumulative impacts analysis is required in order to demonstrate that the NAAQS would no be exceeded.

The limited cumulative impact analysis requires that emissions from additional nearby major stationary sources of SO2 and NO2 be analyzed along with the emissions of the Plant. As part of the analysis and with the assistance of the EQB, emissions data from nearby stationary emission sources were collected and it was determined that the nearest emission source that would likely influence the analysis is the PREPA's Cambalache power generation plant. The maximum permitted emission rates at the PREPA's Cambalache power generation plant were modeled with the emission point parameters and its location (coordinates). The results of this analysis are illustrated in the following table. When modeling cumulative impacts, AERMOD is used with the same data input specifications. However, where the maximum impacts are used for comparison to the SIL, the impacts representing the 98th and 99th percentile were used for the 1-hour NO2 and SO2 for comparison to the NAAQS. Results of this analysis, that represents the maximum operating scenario of 110%, are tabulated in **Table 3-5**.

Table 3-5: Model Results - Cumulative Impact Levels

Parameter	Averaging Period		Maximum Concentration µg/m^3	Background Ambient Concentration µg/m^3	Total Ambient Concentration µg/m^3	NAAQS µg /m^3
SO_2	1	High	41.3	86.5	128	195
NO_2	1	High	101[1]	72	173	188

1. NO2 concentration estimated as 75% of the NOx predicted by modeling based on EPA Guidance for the Tier II NO2 calculation method (EPA, 2010). 1 hour NO2 Concentration reported is the 8th highest, representing the 98th percentile of the annual daily maximum 1 hour concentrations to show compliance with the NAAQS..

Based on these results, emissions from the proposed facility are expected to result in ambient concentrations that are below the NAAQS for NO2 and SO2.

3.4.5 Additional Impacts Analyses

Per the requirements of 40 CFR Part 52.21(o), Energy Answers completed an analysis of potential impairment to visibility, soils and vegetation that could occur as a result of the proposed source. Energy Answers also evaluated the air quality impact as a result of residential, commercial, industrial and other type of growth associated with the Plant. This evaluation was conducted per the 1990 Draft USEPA NSR Workshop Manual Guidance.

Visibility Impairment Analysis:

A visibility impairment analysis is required for *Class II floor areas. Class II floor areas* include the following areas that exceed 10,000 acres in size, as of August 7, 1977:

- National monuments;
- National primitive areas;
- National Reserves;
- National recreational areas;
- National wild and scenic rivers;
- National wildlife refuges; and
- National lakeshores and seashores.
- National parks, and
- National wildlife areas

No areas meeting these Class II floor criteria were identified within 80 km (50 miles) of the Project site. Therefore, a quantitative visibility analysis is not required.

No visibility impairment at the local level is expected due to the types and quantities of emissions projected from the Plant sources. The opacity of combustion exhausts from the Plant will be minimal and will typically be at or approaching zero. Emissions of primary particulates and sulfur oxides due to combustion will also below due to the installation of advanced emissions controls. On the other hand, even if the Plant generates NOx, the potential local visibility impairment would be minimal due to its low opacity level. The contribution of emissions of VOC to the potential for haze formation in the area will be minimal given the low

VOCemission rate from the plant. The Plant will not affect the landscape aesthetic due to the prevailing industrial use in the area.

Plume Visibility Analysis:

A visibility analysis of the potential plume from the boiler stacks was conducted using VISCREEN model, approved by EPA. This is a conservative model for estimating visual impacts in accordance with the Workbook for Plume Visual Impact Screening and Analysis (EPA 1980). The findings of the VISCREEN analysis indicate that the plume will be below the opacity lemits (10%) required by the regulation.

Impacts on Soils, Vegetation and Wildlife:

Because of the controlled emission levels from the Plant and the soil type, vegetation and wildlife in the Project area no adverse impacts associated with its operation are anticipated. Nationally, the primary NAAQS were established to protect public health, while the secondary were implemented to protect the public welfare, property and ecological systems from adverse impacts. Being the concentration levels of air pollutants generated by the Plant, below the levels established in NAQQS, no impacts are expected detrimental to wildlife, flora, fauna and soils around or within the Project site.

Development Impact Analysis:

The purpose of the growth impact analysis is to quantify growth resulting from the construction and operation of the Project and to assess air quality impacts that would result from that growth. Impacts associated with construction of the Project will be minor and temporary. While not quantifiable, the temporary increase in vehicle miles traveled in the area would be insignificant, as would any temporary increase in vehicular emissions.

The existing infrastructure is adequate to accommodate the Project. The Facility will be constructed to meet general electric power demands and, therefore, no significant secondary growth effects are anticipated. Furthermore, any industrial development resulting from the construction and operation of the Project would be independently subjected to PSD review and to additional environmental reviews previous to their approval and installation.

3.5 Ecological Resources

3.5.1 Flora and Fauna

The development of the Project will have short and long term impacts over the terrestrial flora and fauna due to the location of the proposed structures where pastures and forested patches now reside. This project will be constructed on approximately 82 *cuerdas* of land that has been previously impacted. The main impact over the vegetation will be as a result of excavated material and removal of the earth crust for the installation of the buildings and structures for the Project. Even though the vegetation cover will be reduced within the Project area, changes in the floristic diversity is not expected as the flora is common on open and dispersed woodlands and composed of widely distributed within and outside the Site.

To reduce the impacts to the flora identified in the property and surrounding land during earth movement and construction of the Project, it is recommended to place barriers between the Project area and conservation zones, such as forested areas, set to remain in the Project zone. All construction activities must be maintained within the limits set for it. This measure should reduce any impacts to the areas found outside the limits of the construction.

To mitigate the effects of the loss of trees by the construction of the Project a tree inventory of the trees found within the Project area must be performed in compliance of Regulation #25 (Regulation for Planting, Cutting and Forestation for Puerto Rico, of November 24 1998, as amended) in those areas within the Project's footprint where trees will be impacted so these are reforested. The plan must include planting a percentage of native trees and palms in compliance with Regulation #25. The information gathered will be presented to the DNER as part of the permitting process with the different agencies. This inventory must be conducted by authorized personnel and certified arborists, as established by the DNER.

The impacts on the vegetation in the construction area of the Project may cause some of the fauna that use the habitats present in the Project area to be temporarily displaced during the construction phase. Even though the fauna observed in the Site and surrounding properties is common and of wide distribution and the fact that none are critical elements, threatened or endangered, it is possible that some of these species become established in neighboring habitats and return one the construction phase has been completed. Nonetheless, to minimize the impacts

to the fauna, previous to start construction work, buffer zones and the property areas which will not be directly impacted by the Project will be delimited. This way the fauna may remain in the Site area during the construction and operation phases.

3.5.2 Wetlands

As discussed in **Chapter 2**, the wetland delimitation conducted at the property determined that there are no wetlands at the Site, although it determined jurisdictional areas associated to old artificial canals from the cardboard manufacturing plant. The canals that run through the Site occupy a surface area of 1.52 *cuerdas*. This, added to terrain occupied by jurisdictional areas (0.97 *cuerda*), adds to around 2.49 *cuerdas* of jurisdictional areas within the Site. These areas will be modified by the construction of the Project; therefore the appropriate mitigation mechanism will be identified during the applicable permitting process. The DNER will be consulted to identify deteriorated areas within the Caño Tiburones Nature Reserve that may qualify for the mitigation described above.

Any authorization or permit required related to impacts, if any, to bodies of water and/or wetland areas will be obtained before te start of construction in compliance with federal or state applicable regulations.

3.5.3 Natural Systems

The natural systems present in the Project area are the *Río Grande de Arecibo* and the Caño Tiburones Nature Reserve. The *Río Grande de Arecibo* adjoins the Project site. To protect the *Río Grande de Arecibo* from direct impacts during construction of the Project it is necessary to implement an Erosion and Sediment Control Plan (ESC) that will prevent contaminants access to stormwater that will drain into the *Río Grande de Arecibo*, as well as protect the flora along the boundary of it from the effects of erosion and sedimentation. Areas that will remain with vegetation that may aid in the filtration of sediments shall be identified in the ESC plan.

Even though the proposed area (a) does not present any priority conservation species; (b) that it was previously impacted by agricultural uses and industrial during the operation of the paper mill; and (c) that no ecologically sensitive areas within the parcel under study and considered as Natural Habitat with Low Potential of becoming Essential, of High Value o of Ecological Value

(Category 6) under Law No. 241 of August 15, 1999, as amended, known as the New Wildlife Law, it is expected that to have a careful planning to assure that the important habitats for wildlife, such as the *Río Grande de Arecibo*, will not be altered and that any potential impact will be minimized and mitigated according to applicable regulation.

With respect to the Caño Tiburones Nature Reserve, it is located at a distance of 1.5 kilometers from the boundary of the Site. The Caño Tiburones Nature Reserve is an ecologically sensitive area administered by the DNER. The reserve, along with lands surrounding the *Río Grande de Arecibo* mouth in Arecibo's coast is designated as a Conservation Area. No direct impacts to natural resources for this area are expected. Implementing the necessary protection measures for the *Río Grande de Arecibo* and the Project's surrounding areas will avoid impacts to the region's natural resources.

3.5.4 Ecological Risk

A Screening Level Ecological Risk Assessment (SLERA) was conducted in order to analyze the emission data and ecological information of the Plant and provide an analysis of potential risks to ecological receptors within a 10 km radius from the Plant in Arecibo, Puerto Rico (see **Appendix L**). The Screening Level Ecological Risk Assessment integrated the four components as required by the EPA (1997, 1998) as described below. This analysis was conducted in compliance with Rule 253(A)(34)(f) of the RPPEPED, which indicated that the risk analysis be performed using a reference method approved by the USEPA or the EQB.

- **Problem Identification**: This first step in the Ecological Risk Assessment describes the location of the Site, the conceptual model (CSM) and the analyses to be performed (USEPA, 1998).

- **Evaluation of Exposure**: This step includes the process for estimating the magnitude of chemical exposure, the definition of Contaminants of Potential Ecological Concern (COPEC), the identity of potentially exposed ecological receptors, and the evaluation of exposure mechanisms. The process considers several conditions related to the Site, such as air dispersion and results from deposition models, proximity to environmentally sensitive areas (ESAs), and activity patterns of specific receptors. The concentrations in

the receptors are calculated based on results from air dispersion and deposition models.

- **Evaluation of Effects**: In this step, the calculated exposure-point COPECs in various media (*i.e.*, soil, superficial water (freshwater and salt water) and sediment) at the receptors locations are compared with the Ecologically Based Screening Level (EBSL) within a 10 km radius. The purpose of this comparison is to identify the potential for adverse effects to receptor populations.

- **Risk Characterization:** The potential risk level is estimated for ecological receptors with potential exposure mechanisms identified in the Problem Identification and Ecological Exposure Evaluation steps. Risks are estimated by comparing maximum calculated concentrations for each receptor at the identified ecological detection levels. The risk characterization integrates and evaluates the results of the data analysis and the nature of the ecological exposure in order to provide a potential ecological risk characterization based on the specific site conditions.

The metric used to evaluate potential risk of direct exposure and exposure through the food-chain is a comparison of site soil, surface water and sediment concentrations to EBSL. The risks are estimated by comparing the maximum modeled concentrations in each medium to the EBSLs identified in the effects evaluation. The objective of this comparison is to identify the potential adverse effects on receptor populations.

It is worth mentioning that exceeding the ecological detection levels does not necessarily indicate risk. The careful interpretation of these comparisons is critical for the evaluation process of the risk evaluation and for the decision making regarding the management of those risks.

Being consistent with a screening assessment, the comparisons were interpreted in following manner:

- When the concentrations of COPEC in the area of interest are below the lowest applicable parameter or benchmark there is high confidence in a finding of de minimis risk.

- When the concentrations of COPEC in the area of interest are above the lowest applicable parameter but lower than the highest applicable parameter the risk potential will be categorized as low.

- When the concentrations of COPEC in the area of interest are above the highest applicable parameter, risk is considered moderate. Within this category there is a possibility of risk and/or that a subsequent evaluation may be required.

For this assessment, when the available exposure and effects information was uncertain, conservative assumptions were made to reduce the possibility of underestimating the risks. These factors should be considered along with the magnitude and spatial distribution of any benchmark that is exceeded and the regional background levels of COPEC (if available), to provide context to any risk finding.

The activities for the Ecological Risk Evaluation in the Site can be summarized in the following manner:

- A review of the published scientific and technical information was conducted in addition to conversations with personnel of the concerning government agencies to identify the sensitive ecological areas and potential ecological receptors within a 10 km radius from the Site. As part of the analysis, 10 SLERAs where defined and presented as follows:

    - SLERA 1 - *Río Grande de Arecibo* (section adjacent to the Site)

    - SLERA 2 - *Río Grande de Arecibo* Estuary/Priority Conservation Area

    - SLERA 3 - Forested Wetland Areas

    - SLERA 4 – Forested Areas

    - SLERA 5 – Forested Areas of the Río Abajo State Forest

    - SLERA 6 – Forested and Emergent Wetlands

    - SLERA 7 - Forested Areas of the Cambalache State Forest

    - SLERA 8 - Caño Tiburones Nature Reserve

- Port of Arecibo

- The evaluation of soil, surface water, and sediments data indicated concentrations of COPEC that are typically orders-of-magnitude less than screening levels.

The following conclusions were reached with respect to the potential ecological risk associated to the Project:

- For all the ecological risk areas analyzed, it was determined that the concentrations of COPEC in the soil are several orders of magnitude below the screening levels. As a result, it is anticipated that potential risks to ecological receptors exposed to the soil are minimal.

- For all the ecological risk areas analyzed, it was determined that the concentration of COPEC in surface water and sediments are several orders of magnitude below the screening levels. As a result, it is anticipated that the potential risks to ecological receptors exposed to superficial water and sediments are minimal.

- Given that the maximum concentration of COPEC for each area were used in the preliminary data evaluation, the evaluation is considered as conservative and potential risks to ecological receptors are probably less than those discussed above.

- As a result of the soil, superficial water and sediment analysis, the concentration of COPEC are of lesser order of magnitude than the conservative levels of initial screening. Therefore, it is anticipated that potential risks to habitat areas within a radius of 10 km from the Site are minimal.

- The Ecological Risk evaluation determined that it is not necessary to conduct additional studies of potential ecological exposure related to the operation of the Plant.

Refer to **Appendix L** for more details regarding this analysis.

3.6 Land Use and Zoning

As mentioned in Chapter 2, according to the Sheet No. 20 of the Puerto Rico Planning Board

Zoning Map, the applicable zoning district on the southeastern portion of the Project site (location of the abandoned structures) is IL-2 district (Light Industrial 2) which, under the transitional clasuse of Regulation No. 4 of the PRPB, is equivalent to I-P district (Heavy Industrial). Regarding uses in I-P districts, Regulation No. 4 provides that the uses permitted in this district include energy recovery plants, among others.

The remaining Project site area (32.46 *cuerdas* western portion) is zoned R-0 (Residential 0). Its classification is considered UR for Developable Land (*terrenos urbanizables*) as provided in **Section 1.12** of the aforementioned Regulation. Under this classification, lands are established to facilitate the control or the urban growth, to optimize utilities infrastructure and to identify land classified as developable land. Given the above, the proposed use for this area of the Site is according to the Regulation, considering the extent ofdevelopment that these areas have been subjected to in the past. Since the original construction of the paper mill in 1959, past uses include the development of channels to manage stormwater runoff and water process surplus, and preparation and maintenance of internal tracks in the entire Site (81.30 *acres*). The alteration to these lands is even more ample when considering the extraction of earth material required to develop five water retention ponds and the periodic removal of vegetation or grassland areas for maintenance in the entire Site. The degree of alteration of the Site makes it suitable as developable land, because only exotic species of flora and fauna occur in the Site, which are typical of developed and urbanized land, so that the proposed development does not represent an adverse impact to the current land use and zoning.

Based on the above, it is noted that the proposed use of the Site is according with the existing regulatory zonining or the prevailing uses within and on several areas near the Site. Even the definition cited above for Developable (*Urbanización*) includes the development of facilities for industrial uses, which further support the proposed use for this Site.

Moreover, the proposed use for this portion of the Project site, previously impacted (48.84 *cuerdas* where buildings are located) by the industrial activity of the paper mill, fully complies with the parameters established in the aforementioned regulation. Thus, the proposed development will not have any adverse impact on the land use, because for all intents and purposes it has not changed.

As part of the preparation of the P-EIS the PRPB Land Use Plan office was consulted to verify the status of the Municipal Land Use Plan (POT) of Arecibo. It was informed that the Municipality of Arecibo is working on the fourth and final phase of the process and that recently filed the zoning maps in digital format. However, at present the PRPB has not approved the Arecibo Municipality POT.

Nevertheless, the entire Project site, according to sheets 058, 044, 034, 027, 057, 043, 033 and 026 of the Arecibo Municipality POT, which is under evaluation of the PRPB, is zoned as I-P .

Therefore, the proposed use of the Project site is in agreement with the proposed Arecibo Municipality POT and the applicable Land Use Plans and Public Policies.

The Project essentially complies with public policies, land use plans and regulations established by the PRPB, including:

- Puerto Rico Sustainable Strategic Development Comprehensive Plan
- Four Years Investment Plan (PICA, for its acronym in Spanish)
- Land Use Plan
- Municipal Land Use Plan (*Plan de Ordenación Territorial*)

Four Years Investment Plan

The PICA recommends capital improvements and infrastructure investments in the short and medium term in accordance with the public policies, goals and objectives of the Government of Puerto Rico. Projects recommended by the Program for the 2009-2010 period are intended to advance the priorities of the Government of Puerto Rico, economic development and job creation and to offer projects and programs that improve the well-being and quality life of Puerto Rican families. These projects include the following five program areas that constitute the PICA:

- **Government Management** - is responsible for guiding, directing and providing order to the people and government activity, with the purpose that citizens receive public services properly within a framework of equality and justice. This is achieved through the

establishment of government rules and regulation; social, physical and economic planning that promotes the development of the country, the efficient administration of fiscal and budget policies, and the management of all aspects related to human resources management.

- **Protection and safety of persons and property** – it improves the agencies in charge of ensuring the maximum protection and security to individuals and institutions. It includes the areas of Justice Administration, Law and Order, Custody and Rehabilitation of the Prison Population and Prevention and Relief of Disasters its Effects. These agencies coordinate the Programs that address order and public safety, crime prevention and citizens' protection against all types of disasters.

- **Social development** - Aims to promote a better quality of life for citizens. The conception of social development comprises the strengthening of the family, the comprehensive education of the individual, the guarantee of adequate housing, the health and environment improvement, the provision of employment opportunities, and the enjoyment of cultural values and accessibility to recreational and sports facilities. The scope of this objective entails limiting, solving, alleviating or eliminating those social, economic and cultural problems and unfavorable conditions that in some way reduces or may reduce the ability of the individual and family to be self-sufficient.

  In this area, the PICA mentions that SWMA aims to develop and implement appropriate strategies for the efficient management of solid waste. Among the most important objectives of the SWMA are to determine mechanisms to evaluate the efficiency of the programs, facilities and infrastructure and to establish intermediate infrastructure for the management of solid waste.

- **Economic Development** - Promotes the greatest possible expansion of a diversified economic base, with the aim of improving the quality of life and to achieve the aspirations of welfare for the people of Puerto Rico. Aims to achieve a geographically balanced development, with a fair and equitable distribution of the benefits of progress.

  The Public policy in this area emphasizes the continued growth in the development of the

economy driven sectors, based on a production process for its ability to generate income and jobs supported by industrial, energy and transportation sectors growth.

- **Technical and economic assistance to municipal governments** - Has as main objective to assist and advise municipalities to effectively participate in the process of development of Puerto Rico. Municipal Reform aims to encourage municipalities to take an active role in determining their future. The purpose of these efforts is to achieve decentralization of the government by transferring functions and resources to municipal governments. This area consists of the advisory and fiscal/technical assistance sector that serves the municipalities. This area includes the Office of the Commissioner of Municipal Affairs (OCMA) and contributions to the municipalities.

The PICA presents a total investment of $8,493.4 millions for this term. The funding sources for the recommended improvements require $1,314.5 millions from the public improvement fund, $3,769.2 millions loan and/or bond issues, $1,755.1 millions contribution from the federal government, $ 724.9 millions revenue from public corporations and $929.7 millions from other resources, such as funds transfers, municipal contributions or previous year's balances.

Puerto Rico Sustainable Strategic Development Comprehensive Plan

The PRPB Organic Law provides this agency to prepare and adopt a Comprehensive Development Plan (CDP), which will outline the policies and strategies of comprehensive development of Puerto Rico. The CDP should guide government agencies in the formulation of their plans, programs and projects, establishing the process to be followed in its preparation, which should be reviewed periodically, as established by law. The CDP is prepared to face the global magnitude challenges of contemporary society such as climate change, the energy crisis, food shortages and the financial and mortgage crisis.

These challenges are a reality within a complex global context that we have to face today. It is therefore imperative to develop integrated planning models that transcend traditional approaches to interpret, represent and intervene in our physical, social and economic environment, and to implement planning initiatives with a comprehensive understanding of society and its various activities. These planning processes should primarily introduce variables and considerations like

global trade and value chains, the interaction of the scales or geographic areas at international, national and local levels, the inclusion of the private sector and the voluntary sector (*tercer sector*) in the conception and implementation of strategies for economic and social development, and technologic strategies to maximize opportunities and produce economies of scale for a better management of public resources.

It is time to develop a new strategy implemented into new geographic scales, and founded in strategic partnerships with all sectors, making our society one of innovation, new knowledge, re-training, and training of the social capital. The planning process in Puerto Rico must transcend the traditional paradigms for integrating advanced technologies that will generate the intelligence necessary for the formation of economic development strategies to increase the competitiveness of Puerto Rico. Local planning should fully consider the environmental and energy issues as part of their overall and specific analysis of the consequences of local and global actions and investments in Puerto Rico. Environmental planning must integrate energy, environment and solid waste public policies in a sustainable strategy that allows the use of renewable energy production technologies, the use of waste to energy technologies and recycling at full capacity.

Industries and sectors that will drive sustained economic growth that is necessary in a new development model will require several management tools to support and facilitate its development. The new model of diversified strategies and actions should distribute the risk, reduce government and encouraging private sector growth to ensure dynamism, fiscal stability and management and implementation of public policy.

Land Use Plan

The goal of the Puerto Rico Land Use Plan of (PUTPR) is to develop the infrastructure to achieve the socio-economic expansion and strength that stimulate the harmonious relationship among the regions of the country and its projection abroad. It will be achieved using the programming and construction of infrastructure as one of the instruments that, along with land use planning, serves to order and promote the comprehensiver development of the country.

The PUTPR public policy is to promote the implementation of solid waste management and disposal systems that include a comprehensive and accurate inventory of the amount of solid

waste generated on the Island, and that include the following activities::

- To implement a plan of regional facilities.
- To develop integrated disposal systems that consider recycling, incineration and landfill, taking into account the effectiveness, costs and environmental impacts of these technologies.
- To construct transfer stations, strategically located, to facilitate and reduce the cost of waste collection, transportation, processing and disposal.
- Promote PPP to privatize the waste disposal as much as possible.
- Encourage material recovery through classification and separation of waste that can be used or recycled..

Law 550 known as the Law Commonwealth of Puerto Rico Land Use Plan was approved on October 3, 2004. This law requires the preparation of a Land Use Plan for the entire island. Also establishes as a public policy the preparation of a land use plan to be the main planning tool in such a way that support the sustainable development of our country and the appropriate use of the land, based on a comprehensive approach, in social justice and in the broadest participation of all sectors of the society. The Land Use Plan should be reviewed by the Planning Board every ten (10) years from its approval.

Law for the Protection and Conservation of karstic Physiography of Puerto Rico

Law No. 292 of August 21, 1999, as amended, known as the Law for the Protection and Conservation of Karstic Physiography of Puerto Rico, (Law 292) provides for the protection, conservation and the prohibition of the destruction of the karstic physiography, its formations and natural materials, such as flora, fauna, soil, rocks and minerals; and the avoidance of transportation and sale of natural materials without permission. This Law provides for the preparation of regulations necessary for its implementation and assigns the responsibility to the DNER Secretary to prepare a study to define the areas that deserve protection and therefore can not be used for the extraction of materials from the earth's crust with commercial purposes or for

commercial exploitation. This law also provides to incorporate the recommendations of this study in the Regulation for the Extraction, Removal and Dredging of Earth Crust Materials and in the regulations of the PRPB to zone areas of the karst region that shoul be preserved.

On June 6, 2008, the DNER finished the preparation of the Karst Study, based on the parameters of function and value established by Law 292. The Karst Study establishes and defines a conservation priority area of the karstic region of Puerto Rico. However, the DNER has not finished the amendment to the earth crust regulation to include the priority conservation area and the zoning designation has not been completed by the PRPB.

The project fully complies with the public policy established by Law 292 and the current rule of law, since, even though the Project lies within the Karstic Region of the Puerto Rico North Coast, it is located on the alluvial deposits of the RGA valley and not on typical features of karst physiography such as haystacks (*mogotes*) or sinks (*sumideros*). Moreover, the Plant is located about 1.3 miles (2 km) away and northeast and approximately 3.0 miles (5 km) away and northwest from the boundary of the priority conservation area established by the Karst Study.

Furthermore, as mentioned in **Chapter 2**, both the topography and geology within the Project site have been altered by the construction and the operation of the former Global Fibers Paper Mill, regarding this matter, the proposed Project is also in harmony with the existing public policy because the Site will not be used for extraction of earth crust materials for commercial purposes.

3.7 Infrastructure

This section discusses the impacts, if any, to the infrastructure of the Project site area.

3.7.1 Potable Water

It is estimated that during the construction phase, there will be up to 4,287 workers. Each worker consumes about 1.5 gal per day of potable water, representing a total of 6,500 gal per day. During construction, the water will be supplied through tank trucks. The construction of the Project will not impact PRASA's potable water pipelines.

The estimated potable water demand for the operation of the Project is 10,000 gal / day. The

water supply to the Plant will be provided through the existing 12-inches service line along road PR-2 east of the Site. PRASA's Dr. Santiago Vázquez Filtration Plant is approximately 4.8 miles southeast the Plant and it has 100 MGD water supply capacity, thus a negative or adverse impact to the existing drinking water infrastructure is not expected from the operation of the Project since there is ample potable water capacity.

In addition, the Project will not pose any additional impact to the existing potable water infrastructure since the Plant will be served from 106 MGD brackish water that is discharged into the Atlantic Ocean from El Vigía pump station at Caño Tiburones. A 1,250 pumping station and related pipeline will provide the necessary connection to the existing system. The raw water would be transported to the Plant by a 14-inch diameter flexible iron tubing running 3.4 kilometers along the right of way of roads PR-681 and PR-6681 up to PR-2. Therefore, a positive impact is expected due to the development of the Project since water that is currently discharged into the ocean will be managed without posing a potential adverse impact to the existing infrastructure.

3.7.2 Sanitary Sewer

The plant will discharge approximately 800,000 gal/day of wastewater during the operation of the Project. In general, waste water generated at the Plant consists of purging water from the cooling tower and boiler.

The Arecibo Regional Wastewater Treatment Plant is a primary treatment plant located at the Islote Ward, approximate 2 miles northeast of the Site, and has a 10 MGD capacity and an average flow of 4.3 MGD so there is enough capacity to serve the Project. The effluent of the Arecibo Regional Wastewater Treatment Plant is discharged into the Atlantic Ocean.

The existing 48-inch trunk on PR-2 will provide the connection point to the sanitary sewer system for the Plant's wastewater discharge.

3.7.3 Electric Power

The Plant will produce 80 MW of gross alternate and renewable electric power.

After PREPA analized the interconection route to determine the optimum route to the existing

transmission system the Agency determined that the prefferred electric interconnection point would be the Cambalache Transmission Center (CTC), which is located approximately 0.5 miles south from the Plant.

The interconection in the CTC will be at a 38 KV voltage. This voltage is derived from an existing 100 MVA 115KV/ 38KV transformer located in the facilities of the CTC. This 100 MVA transformer is feeded at 115 KV, from a direct line that comes from PREPA's Cambalache Electric Power Generation Plant.

Given the above, the power generation from the Plant will represent a positive impact to the electric power infrastructure since it will provide renewable and alternate energy to the electric system, diversifying the energy sources, at a low and competitive price, and contributing to stabilize the price of the energy on a long term basis.

3.7.4 Solid Wastes Management Construction during Construction Phase

The construction of the Project will generate non hazardous solid wastes consisting of rubble, construction materials residues and wastes generated by employees, which are estimated at approximately 100 cubic yards per month. Any material that can not be reused will be discarded in an authorized landfill. The residues will be transported by an authorized contractor and will dispose of according to an operation plan to be included in the EQB general consolidated permit. These activities will be conducted in accordance with applicable regulation. The landfills from Arecibo and Toa Alta have the capacity to manage the additional solid wastes from the Project.

3.8 Archaeological, Historical and Cultural Resources

The Archeological Phase IA and IB studies conducted at the Site identified no cultural resources within the Project's impact area. In addition, the *addendum* to the Phase IB study that was conducted at the offsite work locations, brackish water pipeline and electric lines to connect the Plant to the PREPA's electric system, neither identified cultural resources. Therefore, and based on these results, it is concluded that the Project will not impact cultural resources. However, if archaeological material is identified during the construction, the proponent will stop the works and will notify the corresponding agencies (Institute of Puerto Rican Culture and State Historic Preservation Office).

3.9 Visual/Aesthetical Resources and Odors

The existing visual resources in the general area of the Site are of mixed nature, industrial, isolated residential and rural, where as part of the existing visual environment predominates industrial elevated structures such as chimneys of the former Central Cambalache sugar Mill, fuel storage tanks and the PREPA Cambalache power generation plant's stack. Also protrudes into the visual setting the transmission lines and towers from PREPA that come from the Cambalache power generation plant heading south and crossing the landscape to the west, and then continuing south along road PR-2, where the lines cross west to reach the Cambalache electrical substation. In addition, the DTOP road network infrastructure crosses the territorial extension of the alluvial plain and is part of the existing visual setting.

Negative impacts to visual resources resulting from the proposed action could include on the short-term heavy equipment to be used during the construction phase, the movement of construction equipment and earth work that will take place to reach the final elevations of the Plant design. However, this impact will be temporary since once the construction phase ends, new modern structures would be located at the Site, which will have an integrated architectural landscaping that will enhance and improve the attractiveness of the existing visual environment which is currently impaired by abandoned industrial buildings and structures.

During the operation phase, the visual resources of the current setting will improve since the proposed Project's landscape includes a plan for reforestation and maintenance, which will

maintain the appeal of the external areas of the Plant. In addition, the Plant itself will add extra appeal because it will have a maintenance plan that will maintain its curb appeal. On the long term, the impact to visual resources as result of the Plant development will be positive because it will add attractiveness to the Project site and nearby areas, since currently they look abandoned and careless.

3.10 Safety and Health

3.10.1 Construction Phase

During the construction phase, standards and occupational safety programs applicable to construction will be implemented by the general contractor as required in 29 CFR 1926 including scaffolding safety, fall prevention, personal protective equipment, excavation safety, ladder safety, electrical safety, hand tools safety, crane safety, critical lifts, material handling, order and cleanliness, vehicles safety and contractors safety.

The operation of the Plant will comply with the regulations applicable to its operations and maintain a safety program aimed to prevent occupational injuries and diseases in all its processes. The program will include occupational safety trainings, accident research and prevention, first aid care, fire prevention and protection, emergency response, natural disasters, hazards communication, personal protective equipment, permit-required confined space, hazardous energy control, human resources, cutting and welding, laboratory safety, material handling, electrical safety, emergency response groups, respiratory and hearing protection and industrial hygiene but not limited to the above.

3.10.2 Human Health

ARCADIS completed a Human Health Risk Assessment (HHRA) for the Plant, which is included in **Appendix K**. The HHRA evaluates whether exposure to constituents emitted from the two proposed combustion units at the Plant has the potential to cause adverse health effects to human receptors living and working in the area surrounding the Plant. The following summarizes the approach used and the findings of the evaluation.

Approach

The HHRA was completed using approaches and methodologies that are consistent with the EPA risk assessment guidance and policies. This was in compliance with the Rule 253(A)(34)(f) of the RPPEPED that requires that the risk analyses be performed using a reference method approved by the EPA or the EQB. The available federal guidance for evaluating emissions from both municipal and hazardous waste combustion sources was consulted. However, EPA's final combustion guidance, Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities (HHRAP) was the primary source of approaches, assumptions, and parameters used in the assessment. The HHRAP describes in detail the recommended approach for assessing human health risks associated with hazardous waste combustion facilities, but the methodology is applicable to municipal waste combustion risk assessments as well.

The evaluation of risks and hazards associated with constituents emitted from a combustion source requires the following:

- Identification of contaminants of potential concern (COPCs) that may be emitted from the source.
- Estimation of the amount of COPCs that may be emitted from combustion units (*e.g.*, emission rates).
- Estimation of the concentration of COPCs in ambient air based on predictive dispersion and deposition modeling.
- Estimation of concentrations of COPCs in other environmental media (*e.g.*, soil, surface water, and sediment) and food items (*e.g.*, produce, beef) through which humans may be indirectly exposed.
- Identification of human receptor populations and potentially complete direct and indirect pathways through which exposure may occur.
- Quantification of potential exposure in the form of doses.
- Evaluation of potential excess lifetime cancer risks (ELCR)

- Evaluation of noncancer hazards (Hazard Index).

The cancer risk levels and hazard index are compared to benchmarks established by federal and state governments to determine whether potential exposures are acceptable. These benchmarks are commonly used in regulatory decisions and as the basis of standards, such as drinking water standards (maximum contaminant limits (MCLs).

EPA generally finds cancer risks levels between one-in-amillion (1E-06) and one-in-ten thousand (1E-04) and noncancer hazard indices of less than 1.0 acceptable.

As a background, in the United States, the natural background probability of a woman developing cancer is 0.33, or about 1 in 3 women, and for men is 0.5, or about 1 in 2 men (Altekruse 1975-2007).

Evaluation

The COPCs were idenfied based on stack test data generated from the Project reference facility (SEMASS). The emission rates were also based on data from the "SEMASS Unit 3", and in the limits established in the PSD.

Air dispersion and deposition modeling combine source emission rates and facility information (*i*,*e*., source parameters and building profile, etc.) with physical data from the area surrounding the Plant (*e*.g., meteorology, terrain, and land use information) to estimate unitary ambient air concentrations and deposition fluxes.

Potential emissions were modeled for risk assessment purposes using AERMOD, version 6.7.1 (EPA AERMOD 09292). AERMOD is the recommended model for air quality analysis in EPA's Guideline on Air Quality Models (40 CFR Part 51, Appendix W). The modeling was performed with a commercial version of AERMOD (Lakes version 6.7.1).

The COPCs emitted in the smoke from the combustion unit were modeled to be dispersed and deposited as either vapors or particulates (*e*.g., particles or particle bound). AERMOD was used to generate estimates of air concentrations and deposition fluxes for contaminants of concern in their vapor phase, particle phase, and particle bound.

Land near the proposed Plant includes the city of Arecibo northwest, surrounding suburban residential development, and rural areas that include large areas of croplands and dairy and cattle farms. Rural areas also include small residential areas and some industrial facilities. There are also extense wetlands northwest of the Plant and several surface water bodies. The land use within a two (2) kilometers radius is illustrated in the figures of Appendix K.

Receptors and Potentially Complete Pathways

The Receptors populations and complete exposure pathways were identified based on conditions in the surrrounding area of the Plant and the EPA combustion risk assessment guidance. The following Receptors populations were evaluated in the HHRA:

- Urban Residents (Adults and Children) who live in Arecibo and may be exposed to COPCs in air, soil, and local crops.
- Suburban Residents (Adults and Children) who live in suburban areas surrounding Arecibo and may be exposed to COPCs in air, soil, mil and local crops.
- Local Farmers (Adults and Children) who may be exposed to COPCs in air, soil, drinking water from surface water sources, local crops, local farm-raised animal products (*e.g.*, milk from dairy cows, beef, poultry, pork, and eggs).
- Fishers (Adults and Children) who, under this exposure scenario, rely on fish as the main source of protein in the diet. These receptors may be exposed to COPCs in air, soil, milk, products locally harvested and locally caught fish.
- Nursing Infants (*e.g.*, Urban Resident Infant, Suburban Resident Infant, Farmer Infant, and Fisher Infant) who are exposed to dioxins that may be biologically acumulated (bioacummulate) in human breast milk.

Potentially complete exposure pathways through which human exposure may ocurr were identified and their magnitude, frequency, and duration of exposure were evaluated. Estimated doses were then combined with chemical-specific toxicity information to estimate risk level or noncancer hazard.

The risk level and noncancer hazards were then evaluated by comparison to benchmarks identified by federal and state government as acceptable.

Risk Characterization and Conclusions

The cancer risk levels and Hazards Index were estimated for each receptor, for combined exposure to potential contaminants of concern. The cancer risk levels were considered acceptables and consistent with guidelines and policies of the EPA since they were below the acceptable parameters of $1x10^{-6}$ to $1x10^{-4}$ and less than 1 in the Hazard Index for non cancerigen substances. The results are shown in **Tables 3-6** to **3-7**.

Table 3-6: Preliminary Risk Levels

Human Receptors		Calculated Risk Level	USEPA Acceptable Parameters	Below Acceptable Parameters
Urban Resident	Adult	9.0×10^{-8}	$1x10^{-4}$ a $1x10^{-6}$	Yes
	Child	1.0×10^{-7}	$1x10^{-4}$ a $1x10^{-6}$	Yes
Suburban Resident	Adult	1.0×10^{-7}	$1x10^{-4}$ a $1x10^{-6}$	Yes
	Child	2.0×10^{-7}	$1x10^{-4}$ a $1x10^{-6}$	Yes
Farmer	Adult	3.0×10^{-7}	$1x10^{-4}$ a $1x10^{-6}$	Yes
	Child	4.0×10^{-7}	$1x10^{-4}$ a $1x10^{-6}$	Yes
Fisher	Adult	2.0×10^{-6}	$1x10^{-4}$ a $1x10^{-6}$	Yes
	Child	2.0×10^{-6}	$1x10^{-4}$ a $1x10^{-6}$	Yes

Table 3-7: Risk Indices

Human Receptors		Calculated Risk Level	USEPA Acceptable Parameters	Below Acceptable Parameters
Urban Resident	Adult	0.01	Less than 1	Yes
	Child	0.01	Less than 1	Yes
Suburban Resident	Adult	0.01	Less than 1	Yes
	Child	0.02	Less than 1	Yes
Farmer	Adult	0.02	Less than 1	Yes
	Child	0.05	Less than 1	Yes

Human Receptors		Calculated Risk Level	USEPA Acceptable Parameters	Below Acceptable Parameters
Fisher	Adult	0.2	Less than 1	Yes
	Child	0.5	Less than 1	Yes

Based on the assumptions and scenarios used to evaluate whether potential risks and hazards associated with emissions from the Plant exist, the HHRA has determined that it does not represent a hazard for human health.

3.11 Noise Levels

It is anticipated that noise levels in the areas near the Project will not significantly increase during the construction and operation of the Project. The noise impact that each receptor could receive may vary depending on the location of the receptor, type and number of construction equipment to be used and the location of the processing equipment, among other factors.

During the construction phase of the Project, no significant impacts are expected at Receptors 1, 2, 3, and 4 which are located at the Site's surrounding areas. It is anticipated that all the Receptors, except Receptor 2, could be subject to potential increases in the noise levels due to increases in trucks traffic along road PR-2 for the construction of the Project.

On the other hand, it is anticipated that pile driving will be the Porject construction activity with the highest noise.

3.11.1 Noise Levels Impacts During Construction

The sound level impact at each receptor during the pile driving activities was estimated following the formulas presented in the Noise Study (Appendix G). **Table 3-1** presents these values.

Noise levels were estimated for Receptors close to the Project site area. Receptor 5 was included in the calculation of the noise impact due to the presence of residential structures that could be impacted by the noise generated by the construction and operation of the Project. **Figure 3-1** illustrates the location of the Receptors (1 to 5) evaluated and the distance of the construction areas closer to the perimeter of the Project site.

The total sound level L_{10} presented in **Table 3-8** summarizes the existing sound level at each receptor and the L_{10} value expected by the pile driving activity.

The estimated L_{10} values during pile driving activity exceed permitted noise levels limits in Receptors 2 and 4. However, the pile driving activity did not significantly contribute to the existing noise in the area, because the background noise levels at these receptors exceed the limits set by the EQB. The increased levels of noise for the Receptors 1 to 5 for pile driving were between 0.1 to 1.3 dB (A) in comparison with the background noise level. Receptors 1, 3

and 5 did not exceed the noise limits promulgated by the EQB.

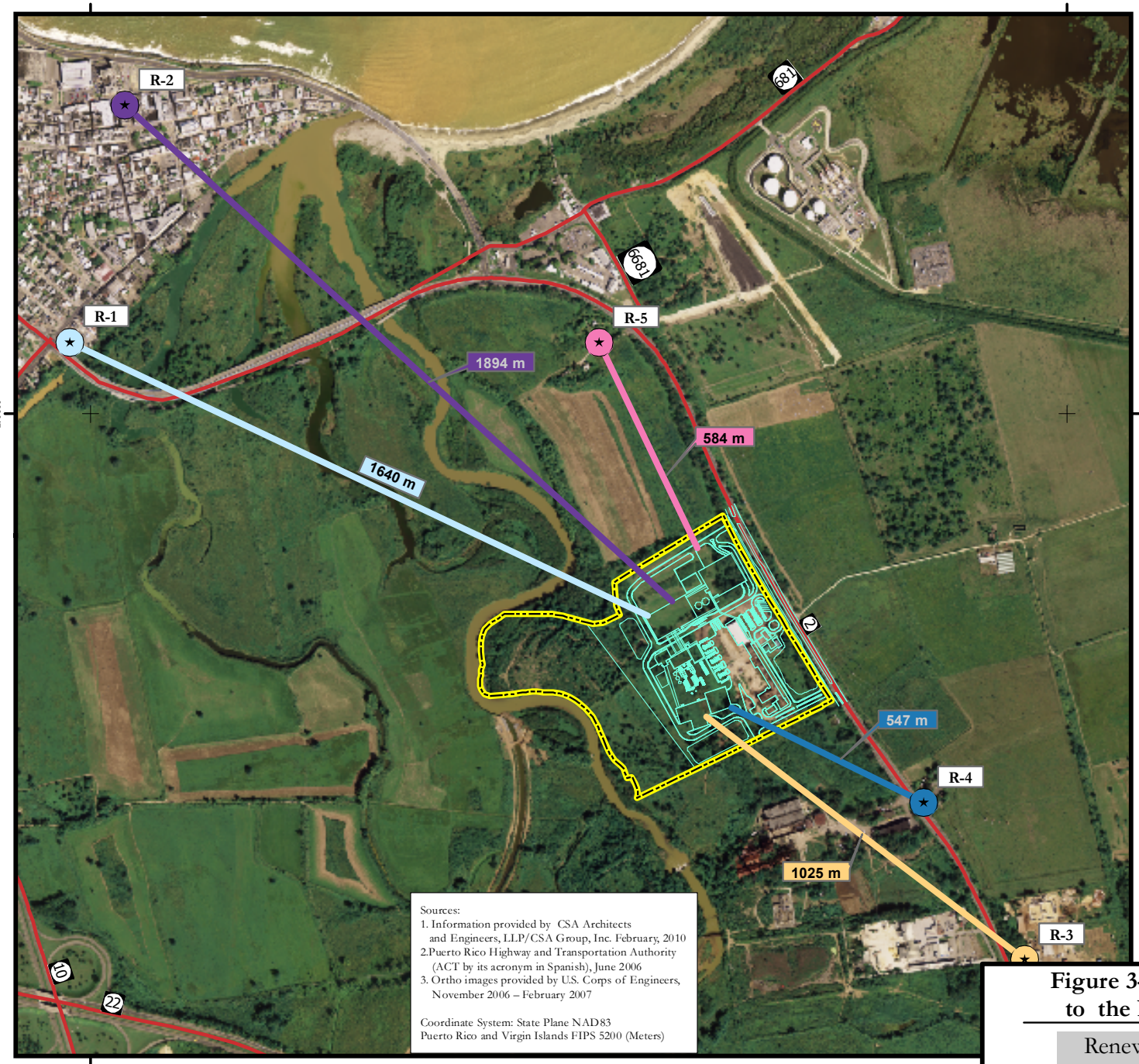
Table 3-8: Estimated Noise Level Impact during Pile Driving Activities

Receptor	Distance to Pile Driving Activity (meters)	Noise Level (dB(A))				
		Background L_{10}	Maximum Level Expected During Pile Driving	L_{10} due to Pile Driving	L_{10} Total	Daytime Regulation
1	1,640 2	68.1	54.4	50.4	68.2	70
2	1,894	68.8	53.1	49.1	68.9	55
3	1,025	78.3	58.4	54.5	78.3	80
4	547	74.9	63.9	59.9	75.1	70
5	584	64.0	63.3	59.3	65.3	70

The largest noise level increase during pile driving activities was at Receptor 5, with a background noise levels increase of 1.3 dB(A). Nonetheless, this result did not exceed the threshold noise limits established by the EPA. According to the FHW, this increase in noise levels is barely perceived by the human ear.

3.11.2 Noise Levels Impacts During Operation

The proposed project's operation is expected to slightly increase the noise levels at Receptors closest to the Project site. **Table 3-9** identifies most of the equipment that will be used within the Plant that could generate noise impacts on the Receptors closest to the Project site.



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Legend:

Receptors[1]

- R-1, Pharmacy *(Farmacia del Carmen)*, Commercial
- R-2, Dr Susoni, Hospital Quiet Zone
- R-3, Battery Recycling Center, Industrial
- R-4, Residential Properties
- R-5, Residential Properties

Site Plan

Roads[2]

Property Boundary

CSA Group

Figure 3-1: Distance of the Receptors to the Nearest Construction Areas

Renewable Power Generation and Resource Recovery Plant / Arecibo, PR

Table 3-9: Equipment Noise Sources

Potential Noise Sources	dB(A) (At 16,000 hz)
Trucking (Along Roads)	-
Truck Maneuver Area	75
Tipping Floor Activities	86
Shredders	-
Ash Processing Building	-
Conveyors	-
Shakers	55
Boilers	78
Cooling Tower	85*
Blowers	95*
ID Fans (Casings)	43
Building Vent System	63
Dust Collector System	70
Condensers	92
Transformers	60
Steam Generators	75
Deareators	100
Precipitators	96
Pumps	-
Stack	93

Notes:
1. Sound levels are for all three system modules combined without sound attenuation by silencers, buildings, barriers, and shielding.
2. Dashes represent noise potential sources with unsignificant contributions.
Source: Cavanaugh Tocci Associates (1981)
* Assumed value by CSA.

Most of the equipment described in **Table 3-9** will be located within the buildings of the Plant. Therefore, it is estimated that the noise generated from these equipment will be reduced from 10 to 15 dB (A).

Table **3-10** and **Table 3-11** describe the estimated noise levels generated by the equipment operation and the noise impacts to the Receptors closest to the Project site. The location of the equipment was estimated using the Project's facility plan. **Figure 3-2** shows the distance of the Receptors to the main noise source of the Plant during the operation.

Calculations were performed using the noise levels generated by the deareators operation (100 dB(A)), since it is estimated it will be the noisiest equipment in the facility. The walls of the buildings where deareators will be located will provide the necessary noise attenuation to the emission source and the Receptors under evaluation. Therefore, a reduction of 20 dB(A) in the noise emission by the equipment is estimated. A deaerator is a device that is used for the removal of air and other dissolved gases from the feedwater to steam-generating boilers.

Table 3-10: Estimated Noise Level Impact during Daytime Project Operation

Receptor	Closest Distance to Operational Sources (meters)	Noise Level (dB(A))				
		Background L_{10}	Maximum Level Expected (L_{max})	L_{10} Due to Operation	L_{10} Total	Daytime Regulation (for Operation)
1	1,749.55	68.1	38.8	41.8	68.1	70
2	2,019.60	68.8	37.6	40.6	68.8	55
3	1,109.78	78.3	42.8	45.8	78.3	80
4	679.70	74.9	47.0	50.0	74.9	70
5	849.78	64.0	45.1	48.1	64.2	68

Table 3-11: Estimated Noise Level Impact during Nighttime Project Operation

Receptor	Closest Distance to Operational Sources (meters)	Noise Level (dB(A))				
		Background L_{10}	Maximum Level Expected (L_{max})	L_{10} Due to Operation	L_{10} Total	Nighttime Regulation (for Operation)
1	1,749.55	66	38.8	41.8	66.0	70
2	2,019.60	68.8	37.6	40.6	68.8	50
3	1,109.78	73.9	42.8	45.8	73.9	78
4	679.70	70.3	47.0	50.0	70.4	55
5	849.78	63.5	45.1	48.1	63.7	55

The noise levels during the operation phase for the daytime period showed a slightly increase in background noise in Receptors 1, through 5, from 0.1 to 0.2 dB(A), respectively. Nonetheless, an increase in 0.2 dB (A) noise level is barely perceived by the human ear. Receptors 2 and 4 exceeded the EQB thresholds limits for quiet and residential zones, respectively. However, background noise levels of Receptors 2 and 4 already exceeded the EQB threshold limits for this zone.

Noise levels for the nighttime period due to the operation of the Plant also showed a minor increase at Receptor 5; of 0.2 dB(A). However, an increase of 0.2 dB (A) is barely perceptible to the human ear. Receptors 2, 4, and 5 exceeded the EQB threshold limits for the nighttime period. However, existing background noise levels for these Receptors already exceeded the EQB noise limits for the nighttime period.

An increase in vehicular traffic through the PR-2 is expected due to the operation of Project, specifically solid waste trucks that will unload waste into the Project. Trucks traffic could pose a moderate increase in noise levels to residential and commercial areas adjacent to PR-2. However, all receptors are currently affected by the noise generated by the trucks traffic through road PR-2, since the area is basically commercial and industrial. Therefore, noise increase in the zone due to the operation of the Project is estimated as a non significant impact.

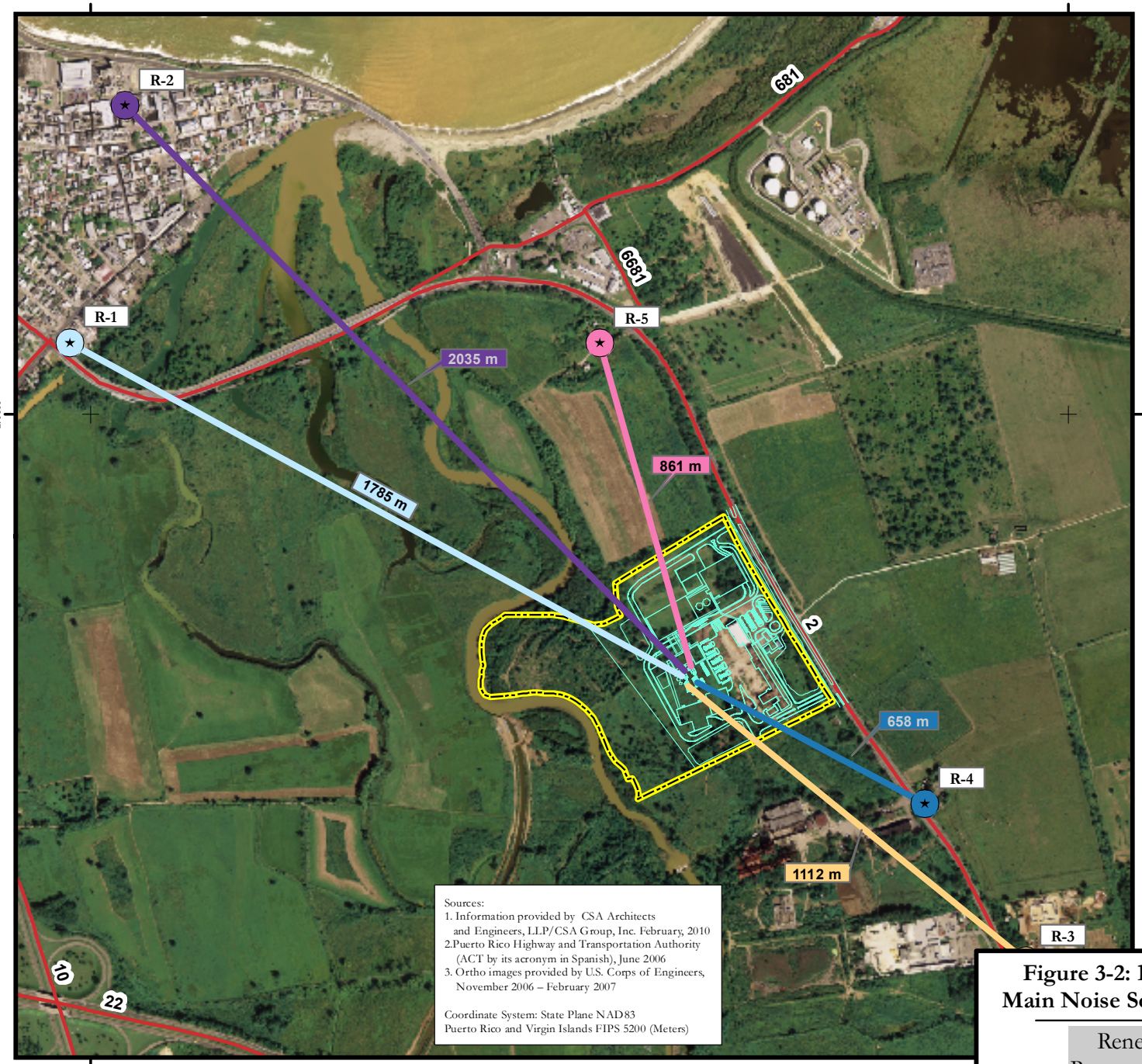

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Figure 3-2: Distance of the Receptors to the Main Noise Source during the Operation Phase

Renewable Power Generation and Resource Recovery Plant / Arecibo, PR

3.11.3 Mitigation Measures

It is recommended to implement noise control measures to minimize the increase of background noise levels in the area during the construction and operation phases of the Project. The measures should include controls at the noise source (as buffers or sound mufflers) and controls in the noise trajectory, such as barriers and other attenuation structures. The following noise control measures are recommended:

- Planning of construction activities during the diurnal period;
- Monitoring and maintenance plan to ensure that the construction equipment is in good conditions and have noise mufflers;
- Position the noisiest equipment as far away as possible from the most sensitive receptors areas;
- Reduce the operation time of the equipment that is closest to the most sensitive areas; and
- Incorporate the use of mufflers, permanent barriers, and/or attenuating elements to the equipment to be used during the operation of the proposed project.

3.12 Traffic

A traffic study (Appendix H) was conducted in March 2010 to assess the capacity and operation of the current traffic conditions and determine the future potential impact on major intersections around the Project site and establish mitigation measures as a result of the operation of the Plant.

To this end, several field inspections were conducted at the following intersections to observe the traffic pattern in the area:

- Intersection 1: Road PR-2 with road PR-10 and Juan Rosado Avenue
- Intersection 2: PR-2 with Victor Rojas Avenue
- Projects's north entrance, located in road PR-2, Km. 73.1; and
- Projects's south entrance, located in road PR-2, Km. 73.6.

The levels of service (LOS) were used as the main criteria to describe the traffic conditions of the road network. This evaluation criterion includes different types of roads and its associated components, such as ramps, intersections, etc. The designation of categories varies according to the conditions of the roads, the type of roads, associated components, etc. All referrences related to roads levels of service are from the Highway Capacity Manual and the Puerto Rico Guidelines for the Preparation of Traffic Access of the Department of Transportation and Public Works.

The LOS "A" represents excellent and ideal traffic conditions, while the LOS "F" represents the worst conditions and heavy vehicular congestion. The LOS is based on average delays experienced by vehicles crossing intersections, both signalized and unsignalized.

The categories for each LOS are described below:

- LOS – A: This condition represents an excelent road condition with low traffic and high speeds.
- LOS – B: Very good condition with certain traffic restrictions;
- LOS - C: Good condition with controlled speed due to high traffic volumes.
- LOS - D: Acceptable condition with unstable flow and tolerable operation speeds
- LOS - E: Traffic flow becomes unstable and frequent stops occur, with considerably delays increase and vehicular congestion.
- NS- F: Vehicular congestion with frequent lockstep

TeLPEG, a traffic counting specialists engineering company, performed traffic data collection during a 24 hour period. (See **Appendices A**, **B** and **C** of the **Traffic Study** in the **Appendix H** of the P-EIS)

As part of the Traffic Study it was projected that the traffic volume to be generated by the Project would be approximately 453 trips (227 vehicles) in a 24 hours period. The summary of incomming and outgoing vehicles from the Project is presented in **Table 3-12**. Thirty percent (30%) of the Project incoming and outgoing vehicles are cars and 70% are trucks, as presented.

Table 3-12: Summary of Incoming and Outgoing Vehicles from the Project

Vehicles in 24 Hours	Enter Peak Hour Volume (AM).	Exit Peak Hour Volume (AM).	Enter Peak Hour Volume (PM).	Exit Peak Hour Volume (PM).
453	56	11	14	50

Table 3-13: Vehicle Type Distribution

Vehicle Type	Enter Peak Hour Volume (AM).	Exit Peak Hour Volume (AM).	Enter Peak Hour Volume (PM).	Exit Peak Hour Volume (PM).
Cars	17	3	4	15
Heavy Vehicles	39	8	10	35
Total	56	11	14	50

The conclusions of the study point out that the vehicular flow resulting from the Project development will not adversely affect existing traffic patterns in the area. However, the following recommendations should be considered:

Intersection #1: PR-2, PR-10, and Juan Rosado Avenue

At present, drivers are using the PR-10 shoulder as an exclusive right turning lane. It is recommended that the shoulder pavement marking be erased and instead a right-only lane with a storage length of 18.3 m (60 ft) be marked. Traffic signs indicating this is a right-only lane should also be installed. The traffic signals should be changed according to the recommendations from the Traffic Study in the Appendix.

Intersection #2: PR-2 and Victor Rojas Avenue

At present, drivers are using the road westbound shoulder as an exclusive right turning lane. It is recommended that the shoulder pavement marking be erased and replaced by a right-only lane with a storage length of 122 m (400 ft) marked. Traffic signs indicating the new right-only lane use should also be installed to guide the traffic. The traffic light time should also be adapted according to the recommendations from the Traffic Study in the **Appendix H**.

Intersection #3: PR-2 and Access #1 to the Project

The Project design proposes a 122 m (400 ft) deceleration lane and a 107 m (350 ft) acceleration lane to enter and exit the Project for southbound traffic. Besides, a 107 m (350 ft) left turning lane is proposed for northbound traffic. The installation of the necessary devices is recommended as well to alert that a truck crossing is ahead. The traffic devices should be installed according to the Manual of Uniform Devices for Traffic Control on Public Roads, DTPW 2009 Edition (*Manual de Dispositivos Uniformes para el Control del Tránsito en las Vías Públicas*). Finally, the installation of a traffic light it is recommended based on the times defined in the **Appendix H**.

Intersection #4: PR-2 and Access #2

The project proposes a 122 m (400 ft) deceleration lane and a 107 m (350 ft) acceleration lane to enter and exit the Project site for southbound traffic. Additionally a 107 m (350 ft) left turning lane is proposed for northbound traffic. The necessary devices to alert that a truck crossing will be encountered ahead should be installed as well. The traffic devices should be installed according to the Manual of Uniform Devices for Traffic Control on Public Roads, DTPW 2009 Edition.

During the Project construction, a Maintenance of Traffic plan shall be prepared and implementend in compliance with the DTPW guidelines. Once the project is completed, pavement markings and traffic signing shall be placed according to the aformentioned Manual of Uniform Devices.

It is anticipated that the construction phase of the Project will generate an impact that will be reflected in an increase of the traffic flow from trucks hauling aggregates. This is because it is necessary to modify the topography of the Site by placing approximately 382.000 cubic meters of fill material to build the Project. Aggregates hauling trucks and heavy equipment will have access to the Project site by roads PR-2, PR-10, PR-22, PR-8861 and PR-861. It was assumed an estimated 10 miles trip (round trip) by 20 hauling trucks with capacities of 20 and 3 each for hauling aggregates (material). This activity will generate 480 daily trips for an estimated time of 228 days. The travel time will be set from 6:00 AM to 10 PM. The estimated travel during

Project construction phase is a daily average may vary during construction due to weather conditions, etc.

According to the Highways Performance Classification System -2008 – of the DTPW Highways Office (*Sistema de Clasificacion de Rendimiento de Carreteras -2008 de la Oficina de Sistemas de Carreteras de DTOP*), the average daily traffic in 2005 for the PR-2 in the Project area was between 17,600 and 30,100 vehicles per day. In summary, the trips that will be generated during the construction of the Plant represent an increase of 1.59% to 2.73% in traffic volume.

However, the impact on traffic by the construction of the Project will be short term (about 8 months) and not significant, since the road network system in the area was designed with the capacity for the estimated increase.

3.13 Socioeconomic Impacts

An Economic Analysis and Economic Impact Study was conducted to determine the economic impacts of the Project. **See Appendix I**. The economic impact of a Project is measured by the consideration of direct investment needed to develop it and the impact this investment will have on the rest of the economy.

Based on cost estimates, construction of the project requires a total investment of $ 480 million dollars in 2010 dollars. **Table 3-14** reflects the total investment directly associated with the construction of the Project, which is estimated to last two (2) years.

Table 3-14: Total Investment in Construction

Total Investment in Construction			
Million Dollars ($mill)	**2011**	**2012**	**Total**
Investment in Construction	$236.67	$243.53	$480.20

Source: Energy Answer , Inc.

This section presents the estimated impact that the Project will have on economic activity which is reflected not only in Arecibo but in the rest of Puerto Rico. This includes the economic impact of the investment, direct employment, indirect and induced jobs, aggregate economic activity and revenues for the treasury.

To calculate the number of jobs that the investment of $480 million will generate, a ratio of 10.49 jobs per million dollars of investment in construction was used. This value is obtained by dividing the total construction investment in Puerto Rico by the total employment in this sector in 2006. To apply this ratio to the total investment of other years, it must be reduced due to the level of inflation.

To calculate indirect jobs (generated from direct employment needs), the number of direct jobs is multiplied by the Type I multiplier of indirect jobs in construction. The induced jobs are those generated by consumption expenditure made by the direct jobs. For this calculation those direct jobs were multiplied by multiplier type II, computed by the PRPB and updated by Technical Studies. **Table 3-15** illustrates the Coefficients of Employment Generation and Income Multipliers for Construction.

Table 3-15: Employment Coefficients and Income Multipliers for Construction

Employment Coefficients & Income Multipliers for Construction	
Employment Coefficients (Jobs per Million $ in Investment, 2006 Dollars)	
Coefficient of Direct Employment	10.49
Coefficient of Direct & Indirect Employment	16.09
Coefficient of Direct, Indirect & Induced Employment	20.29
Year of Employment Coefficient Construction	2006
Income Multipliers for Construction	
Direct & Indirect Income Multiplier (Type I)	1.73
Direct, Indirect & Induced Income Multiplier (Type II)	2.14

Source: Estudios Técnicos, Inc.

Construction of the plant will generate 4,300 direct jobs and 4,000 indirect and induced jobs during the two-year construction phase (**Table 3-16**). For the purpose of this analysis, employment means "full time equivalent job," meaning 2,200 hours of paid work either to one or more persons. These jobs may be located on the construction site or elsewhere.

Table 3-16: Employment Generated During Construction Phase

Employment Generated During Construction Phase			
Number of Annual Employment	**2011**	**2012**	**Total**
Employment from Construction, Total	4,145	4,142	8,287
Construction- Direct Employment (#)	2,142	2,140	4,283
Construction- Indirect & Induced Employment	2,003	2,001	4,004

Source: Estudios Técnicos, Inc.

In general terms, income generated by the construction add to a total of $139.97 million dollars (See **Table 3-17**). On the other hand, indirect and induced total income would be $159.22 million dollars.

Table 3-17: Income Generated During Construction Phase

Income Generated During Construction Phase			
Million Dollars ($mill)	**2011**	**2012**	**Total**
Direct Income	$92.41	$47.55	$139.97
Indirect and Induced Income	$105.12	$54.09	$159.22
Income from Contruction Activity	$197.54	$101.65	$299.18

Source: Estudios Técnicos, Inc.

Several assumptions were made for projected inflation of 3.0% and 2.9% for inflation for construction. In addition, it was assumed an average salary of $ 21.570 for construction jobs during the first year of construction.

The direct and indirect impact on the local economy during the operation phase of the Plant was estimated based on the assumption that the Plant will begin start up in 2013 and will be fully operational in 2014. According to data provided by Energy Answers the operation of the plant would require one hundred fifty (150) direct jobs would generate an average of $20 million of personal income from wages. Furthermore, the operational phase of the plant would generate an annual average of 722 direct, indirect and induced jobs (see **Table 3-18).**

Table 3-18: Employment Generated by Operations

Employment Generated by Operations								
Number of Annual Employment	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**
Direct Employment for Arecibo RRF	75	150	150	150	150	150	150	125
Indirec and Induced Employment for Arecibo RRF	338	675	675	675	675	675	675	591
Arecibo RRF - Total Operations Employment	413	825	825	825	825	825	825	722

Source: Estudios Técnicos, Inc.

This translates into the following personal income projections. Corporate profits are not taken into account; only personal income derived from salary is included. These average $20 million a year, $6million of which consists of direct income paid to direct employees.

Table 3-19: Personal Income Generated during Operations

Personal Income Generated During Operations								
Million Dollars ($mill)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**
Arecibo RRF - Direct Income	$ 2.74	$ 5.64	$ 5.81	$ 5.99	$ 6.17	$ 6.35	$ 6.54	$ 5.71
Arecibo RRF - Indirect and Induced	$ 6.73	$ 13.86	$ 14.28	$ 14.71	$ 15.15	$ 15.60	$ 16.07	$ 15.42
Arecibo RRF Personal Income Generated	$ 9.47	$ 19.51	$ 20.09	$ 20.70	$ 21.32	$ 21.96	$ 22.62	$ 19.73

Source: Estudios Técnicos, Inc.

Fiscal Impact

According to this, the construction of the project would generate $ 49 million in tax revenue of which $ 30 million would go to the central treasury $ 19 million municipal, mainly to Arecibo.

Table 3-20: Fiscal Revenue

Fiscal Revenue			
Million Dollars ($mill)	**2011**	**2012**	**Total**
State Construction Permit	$1.19	$1.23	$2.42
Municipal Construction Taxes	$0.83	$0.86	$1.69
Municipal Excise Tax	$8.34	$8.59	$16.93
Personal Income Taxes from Construction	$13.59	$6.99	$20.59
Corporate Taxes from Contractors	$3.58	$3.68	$7.26
Government Revenues from Construction	$27.54	$21.35	$48.89
Fiscal Revenue to Municipal Government	$9.18	$9.45	$18.62
Fiscal Revenue to State Government	$18.36	$11.9	$30.26

Source: Estudios Técnicos, Inc.

Ignoring the fiscal exemptions that may apply, the facility would generate an annual fiscal revenue of $1.98 million. This mostly consists of income taxes paid by employees, both direct and indirect.

Table 3-21: Fiscal Impact During Operations

Fiscal Impact During Operations								
Million Dollars ($mill)	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**Average**
Municipal Excise Tax	$0.01	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02	$0.02
Real Property Tax		$0.16	$0.15	$0.14	$0.13	$0.12	$0.12	$0.1
Personal Income Taxes (from employees)	$0.78	$1.6	$1.65	$1.7	$1.75	$1.8	$1.86	$1.98
Arecibo RRF - Corporate Income Taxes	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01	$0.01
Arecibo RRF - Total Fiscal Revenues	$0.79	$1.79	$1.83	$1.87	$1.91	$1.96	$2.01	$1.98

3.14 Environmental Justice

The Environmental Justice analysis was conducted in compliance with state and federal statutes which require that all agencies of the U.S. government involved in the evaluation of projects, verify that their location do not impose a disproportionate environmental impact on minorities or economically disadvantaged populations.

To this effect, a socioeconomic index was developed that included all nineteen (19) wards that form the Municipality of Arecibo. Cambalache Ward was chosen as the Reference Area because it is the ward where the plant will be located. It has a per capita income substantially higher than

the municipality, the region and Puerto Rico with $ 28.726. Cambalache also has the lowest proportion of people under 17 and the highest 65 or older according to the 1999 Census. Based on this fact, the project will not worsen the economic situation of Cambalache, not lead to the displacement of the community.

Nevertheless, Cambalache Ward is in a better economic condition when compared to the other districts of Arecibo, Puerto Rico and the region. However, it is understood that it is necessary to implement strategies for citizen participation and the inclusion of citizenship. This will ensure that the community knows and understands the scope of the project and be involved at an early stage.

Compared to other areas studied, Cambalache has a sparse population. It presents a favorable economic situation vis a vis the other wards of Arecibo, Puerto Rico and the region. Meanwhile, other wards of Arecibo have a similar economic situation between them, as with the region and Puerto Rico.

For this purpose, outreach activities were proposed and carried out to promote public participation in various sectors, which include:

- June 10, 2010 - Presentation of the project to the members of the municipal assembly convened by the Arecibo Municipal Legislature, held in the City Hall of Arecibo.

- July 12, 2010 - Meeting convened by the Special Committee of the Municipal Legislature Arecibo, which is evaluating the project. (See copy of public notice on Chapter 10).

- September 17, 2010 - Public meeting convened by Energy Answers proposing entity, in order to present and review the preliminary draft of Materials Management Plan (MSP) in compliance with the requirements of 40 CFR Part 60.57b. (See copy of public notice on Chapter 10).

3.15 Public Services

The project will not cause a negative impact on public services in Arecibo or adjacent municipalities. The number of plant employees in the construction phase and operation will be less than 5% and 0.01% of the Arecibo population, respectively. Therefore, it is concluded that the impact on the demand for public services will not be substantial.

4 ALTERNATIVES TO THE PROPOSED ACTION AND LOCATION

The RPPEPED requires, as part of the EIS, the identification and evaluation of alternatives to the proposed action and location. The analysis of alternatives has reasonable options for the development and location of a Renewable Power Generation and Resource Recovery Plant, as defined in this P-EIS, while substantially acomplishing the goals and objectives of the Project.

Pursuant to Rule 253 (C) of RPPEPED, this Chapter discusses several reasonable alternatives to the Project and the no action alternative. Those alternatives that present reasonable options to achieve the goals and objectives of the Project were examined to determine what actions would be reasonable alternatives to the selected alternative.

The goals and main objectives of the proposed action are:

- To develop a renewable energy generation source or facility with capacity to produce power on a continuous basis (base load) and in an environmentally sustainable manner;
- To develop an alternate renewable energy facility, to help stabilize the cost of electricity in Puerto Rico, in compliance with the public policy of the Government of Puerto Rico Energy Reform;
- To provide a real and effective alternative for the management of solid waste in Puerto Rico, in harmony with the SWMA Itinerary and a significant solid waste processing capacity;
- To provide an alternative to real and effectively contribute to the goals of increasing recycling, recovery and reuse in Puerto Rico; and
- To provide an alternative that is operational and environmentally proven at the proposed scale.

The evaluation of alternatives is divided into three parts: (a) Alternatives to the Proposed Action, including the No Action Alternative and other renewable energy alternatives, (b) Technology Alternatives, and (c) Alternatives to the Proposed Location. The Preferred

Alternative is described at the end of each section.

4.1 Alternatives to the Selected Action

4.1.1 No Action Alternative

Alternative Description:

Under the "No Action" alternative it is assumed that the Renewable Power Generation and Resource Recovery Plant, as described in this P-EIS, is not developed.

Advantages:

- The current condition of the Project site (topography, vegetative cover, etc.) is not altered.
- The existing traffic in the area is maintained.
- No resources or materials are used for the construction of the Plant.
- No temporary noise associated to the construction phase is generated. No noise associated to Project operation is generated.
- No limited and controlled air emissions associated with the construction and operation of the Project.

Disadvantages:

- The municipality of Arecibo losses the opportunity to re-use a site previously impacted by industrial uses, which is contemplated for heavy industrial use by the Arecibo POT that is under consideration by the PRPB.
- Lost opportunity to use energy produced by alternate renewable and sustainable sources in compliance with the Government of Puerto Rico Energy Reform perpetuating Puerto Rico's dependence on petroleum-based fuels;
- Lost opportunity to generate 80 MW of electricity using alternate renewable energy,

according to the Energy Reform and to increase the generation of electricity in the North Area of Puerto Rico;

- About 110,000 gallons of petroleum derved fuel oil per day or the equivalent of 365,000 tons of coal per year continue being burned;

- Lost opportunity to meet a key aspect of the SWMA Itinerary, which was created with the objective of developing the adequate infrastructure, including waste-to-energy and recycling facilities for the Northwest Region, to manage solid wastes in Puerto Rico for the next twenty-five (25) years;

- Continue current practice of burying approximately 2,100 tons per day of solid waste in landfills that do not meet the requirements of federal and local regulations.

- The current system of landfill disposal, according to data compiled by the SWMA, will run out of capacity by 2018, approximately. Additionally, the projections indicate that the cost of garbage disposal will be dramatically more expensive in the next 2-4 years, as landfills that still exist in the North continue closing. This will adversely affect the municipalities, among others, by the high costs of providing solid waste disposal service to its citizens, businesses and industries;

- The Caño Tiburones Landfill in Arecibo continues being used as the alternative for disposal of solid waste, with known adverse environmental consequences to soils, air and water bodies;

- The municipality of Arecibo and other municipalities have nowhere to dispose of their solid waste in a cost effective manner since the closure of its landfill is projected in the next years, like most other landfills in the North area;

- Lost opportunity to: (a) recover more than 280 tons per day of valuable recyclable and reusable materials, and (b) increase by 50% the recycling rate of participating communities;

- Contamination of air, soil and water bodies (surface and groundwater) in Puerto Rico

continues as a result of the disposal of solid waste in landfills that do not have the necessary controls to manage, among others, leachate and air emissions generated by that landfills;

- Lost opportunity to create approximately 3,800 jobs during the estimated two years that would take the construction of the plant. In addition, thousands of indirect jobs are lost as well as the potential expansion of regional commerce associated with the construction;

- Lost opportunity to create approximately 150 direct jobs during the plant operation. These jobs represent approximately an average annual payroll and benefits of more than $15 million. In addition, hundreds of indirect and induced jobs are lost as well as it impacts as business expansion in the area such as restaurants, services, sales, banking, construction and others;

- The potential for environmental and administrative fines to landfills from the Northern Region, due to failure to comply with local and federal statutes, remains;

- It does not promote the generation of the so-called "green jobs";

- Lost opportunity for an investment of $500 Millions from private funds that do not impact municipal or state public funds in the construction or operation of the Plant.

- About $40 Millions, associated the purchase of materials and services required by the operation of the Plant, are lost annually, and

- The municipality of Arecibo losses the opportunity to receive revenue of about $2.4 millions per year for over 20 years from property taxes and municipal fees.

The advantages of the No Action alternative is essentially reduced to keeping a *status quo* that does not result in a net positive effect, particularly when it is reasonably compared with the disadvantages of this alternative.

The feasibility analysis of the No Action alternative shows that it does not help to achieve the goals and objectives of the Project, that is (a) to develop a renewable energy generation source or facility with capacity to produce power on a continuous basis (base load) on a sustainable

manner; (b) to develop an alternate renewable energy source or facility, to help stabilize the cost of electricity in Puerto Rico, in compliance with the public policy of the Government of Puerto Rico Energy Reform; (c) to provide a real and effective alternative for the management of solid waste in Puerto Rico, in harmony with the SWMA Itinerary and to real and effectively achieve the goal of increasing recycling, recovery and reuse in Puerto Rico.

According to the provisions of the above discussion, the No Action alternative is eliminated from further analysis.

4.1.2 Eolic Energy and Solar Energy

Eolic Energy

The wind energy or eolic energy is essentially generated by the effect of air currents. Wind energy can be transformed into another form of energy for its use in practical ways, such as electricity. The operation of a wind turbine can be easily explained if it is viewed as equipment that works the opposite to an electric fan: while the fan uses electricity to produce wind, turbine uses wind to produce electricity. The wind turbine captures the kinetic energy (energy of motion) from the wind which moves the turbine blades. The rotational energy of the turbine blades is transferred through a shaft of a generator located on the back of the blades, which converts the rotational energy into electricity.

Solar Energy

Solar energy is formed in the sun when hydrogen atoms combine to form heavier helium atoms. Upon completion of this transformation, some becomes final helium and another disappears into light radiation. This light radiation is emitted by the Sun in all directions. Less than 1% of this radiation reaches the Earth. Solar energy is one of the cleanest, since when it is being used does not produce pollution or adverse environmental effects such as noise and toxic emissions. The use of the sun or direct solar energy can be divided into three branches or basic technologies: solar passive, solar photovoltaic and solar thermal.

Some of the advantages of solar energy are that it can be used to run household appliances, space stations, power plants, remote facilities and residences, lighting and solar street lighting,

communications, emergency generators, vehicle batteries recharge, warning signs, such as the ones for traffic, aviation and navigation, among others. However, some disadvantages are that it only produces energy as long as sun is present and its production fluctuates with the intensity of the light and the cost of equipment to produce and store energy can be high.

Wind and solar energy, are sustainable renewable energy sources that can help stabilize the cost of electricity in Puerto Rico and to diversify it in compliance with the public policy of the Energy Reform and are proven alternatives, from the operational and environmental perspective. However, wind and solar energy are not: (a) sources of renewable energy generation with capacity to produce sustained energy (*e.g.*, base load), because they are intermittent sources, (b) provide a real and effective alternative for the management of solid waste in Puerto Rico, in harmony with the SWMA Itinerary, and, (c) real and effectively achieve the goals of increasing recycling, recovery and reuse in Puerto Rico.

Because these are not reasonable alternatives to achieve the main goals and objectives of the Project, wind power and solar power are eliminated as alternatives to the Project.

4.1.3 Municipal Solid Wastes Conversion – Alternate Renewable Energy

Description of the Alternative

It is a system which energy source are the solid wastes which are processed to produce steam. The energy source can also be converted into intermediates gas or converted into residue derived fuel (RDF), oil or gas. The use of solid waste is increasingly recognized as a source for the production of electricity. It not only provides power but also significantly reduces the volume of solid waste that is disposed in landfills. A variety of technologies has been developed or is under development for different scales of solid wastes volume.

Advantages

The advantages of this alternative are summarized below:

- Energy recovery from solid waste, which would otherwise be buried in landfills;
- Recovery and reuse of ferrous and non-ferrous metals;

- Reduction of up to 90% in the volume of solid waste;
- Prevents emissions of methane gas generated by wastes disposed in landfills;
- Methane is about 20 times more effective than carbon dioxide (CO2) in trapping heat in the atmosphere;
- Conservation of land to prevent its use as landfills;
- Avoid multiple negative impacts to the environment and public health (environmental footprint) by avoiding landfilling; eliminating toxic and uncontrolled leachate to soils, surface water and groundwater; preventing landfill fires and uncontrolled and no monitored air emissions; and avoiding unpleasant odors, visual pollution and the conditions that encourage rodents and vectors;
- Allow the orderly closure of those landfills that do not meet minimum standards of environmental protection and public health which have reached their useful life, and,
- Some plants are designed to reuse bottom ash as aggregates and other building materials.

Disadvantages

- Generation of controlled and limited emissions in accordance with local and federal requirements.
- Traffic generation by trucks hauling solid wastes to the facility.
- Increased demand for infrastructure (water, wastewater disposal, roads)
- Generation of noise by processing equipment and trucks

From the discussion presented above, it can be observed that the development of a Project that converts municipal solid waste as alternative renewable energy stands out as the best alternative to meet the Project goals and objetives. The technology alternatives for solid waste conversion are discussed below.

4.2 Municipal Solid Wastes to Energy Conversion Technology Alternatives

There are several technologies that apply to the production of energy from municipal solid wastes. Below is a brief discussion of alternative thermal conversion technologies for municipal solid wastes. Thermal energy is referred to as the energy that derives from the application of heat to generate power either as electricity or steam. At the end of this section, these alternatives are compared and it is determined which one is the most viable, if any to achieve the goals and objectives of the Project.

4.2.1 Gasification

Gasification is a method for extracting energy from organic materials such as wood, biomass, or even plastic waste. Also, fossil fuels are gasified to generate electricity. This technology is a process that converts carbon materials, such as organic fuel, petroleum, coal, or biomass, into carbon monoxide and hydrogen by reacting the raw material at high temperatures with a controlled amount of oxygen and/or steam. The resulting gas mixture is called synthesis gas or syngas. Syngas may be used directly in internal combustion engines, used to produce methanol and hydrogen, or converted into synthetic fuel.

In the process, a limited amount of oxygen or air is introduced into a reactor to oxidize some of the organic material to produce carbon monoxide and energy, which drives a second reaction that converts further organic material to hydrogen and carbon dioxide. A third reaction occurs from the previous one when residual water from the organic material mixtures with the carbon monoxide to produce methane and carbon dioxide excess.

Gasification can be seen as between pyrolysis and combustion in that it involves the oxidation of a substance. This means that the oxygen that is added is not enough to allow the fuel to be completely oxidized and full combustion to occur. The temperatures employed are typically above 650°C. One of the main products produced by gasification is an ash with low carbon content. The calorific value of syngas from gasification and pyrolysis is far lower than natural gas.

It is worth to mention that during gasification, part of the fuel (organic material) is burned to

provide the temperature necessary to heat the remaining organic material.

4.2.2 Pyrolysis

Pyrolysis is the thermal degradation of a substance in the absence of oxygen. This process requires an external heat source to maintain the temperature required. Typically, temperatures between 300ºC to 850ºC are used during pyrolysis of materials such as municipal solid wastes. The products produced from pyrolysing are a solid residue known as char which is formed by carbon and non-combustible materials and synthetic gas (syngas). The syngas is a mixture of flammable constituents such as carbon monoxide, hydrogen, methane and VOCs. A proportion of these can be condensed to produce oils, waxes and others. It has a calorific value that is lower than the value of natural gas. Pyrolysis differs from combustion in that it does not involve reactions with oxygen, water, or any other reagents. The difference from hydrous pyrolysis is that the latter consist of decompositon of organic material in the presence of superheated water or steam.

The pyrolysis on the other hand, consists of indirect heating of the organic material in an oxygen free environment to produce hot gases that are used to produce electricity and heat.

4.2.3 Plasma Arc

Plasma arc gasification is a waste treatment technology that uses electrical energy and high temperatures created by an electrical arc gasifier. The arc breaks down waste primarily into elemental gas and solid waste, in a device called a plasma converter. The process has been intended to be a net generator of electricity, depending upon the composition of input wastes, and to reduce the volumes of waste being sent to landfill sites.

This technology consists of a relatively high voltage electic current that is passed between two electrodes, spaced apart, that creates an electrical arc. Inert gas under pressure is passed through the arc into a sealed container of waste material, reaching temperatures as high as 25,000 °F (13,900 °C) in the arc column. The temperature a few feet from the torch can be as high as 5,000–8,000 °F (2,760–4,427 °C). At these temperatures, most types of waste are broken into a gaseous form, and complex molecules are separated into individual atoms.

Regularly, the reactor operates at a relatively negative pressure, meaning that the feed system is supported by a gaseous removal system, and then by a solids removal system. Depending on the input waste (plastics tend to be high in oxygen and carbon), gas from the plasma can be removed as synthetic gas, which may be converted into alternate fuels at later stages.

4.2.4 Incineration Technology or Mass Burn

The mass burn technology uses municipal wastes without separating recyclables from non-recyclables, without prior waste processing.

In this type of combustion, municipal wastes are fed directly into a furnace and it generally requires the removal of large items and potential hazardous materials.

The mass burning plants use smaller units with capacity to process from 25 to 300 tons per day of municipal solid wastes. The units are usually manufactured in specialized workshops to eventually install them on the facility where the production of energy will take place.

In typical large-scale operations, the waste is transported in dump trucks to a pit inside a building where front loaders move the waste to the boiler. In some facilities tires from vehicles, appliances and larger wastes are removed previously to send them to a landfill. Furniture and boxes are often crushed by front loaders using their buckets or passing over them. Subsequently, the solid residues are transported through a feed hopper to the boiler.

The boilers are usually constructed *in situ* and their designs are diverse for conveying the waste on grates through the boiler as it burns. The grate moves below residues continuously or in a bent and gyratory cylinder form. The system blows air through the boiler to promote the burning process.

Because solid wastes are untreated, they are burned in a moving grate in the same condition as they were received. In some facilities, large residues often get stuck in the feeding hopper and in the ash exhaust where available space is reduced, resulting in a waste burning and recoverable energy efficiency decrease. On the other hand, the energy released in or near the grate causes its temperature to be high enough to melt glass and metal, making its subsequent recovery difficult and expensive. In addition, the high temperature of the ash and burned residual materials require

the ash to be quenched in water, further complicating the process to recover valuable materials.

4.2.5 PRF Technology

EAI has developed innovative technologies based on the principle of zero disposal and zero carbon emissions. This technology involves the preparation of municipal solid waste, which partially consists of the separation of recyclable from non-recyclable materials, previous to trituration of non-recyclable waste to convert them to PRF.

PRF is produced by shredding municipal solid waste from selected domestic, commercial and industrial origin into particles or pieces with a thickness of less than four (4) inches and by removing a portion of the ferrous materials from municipal solid waste. This technology incorporates certain systems and equipment patented by EAI. In part it consists of a semi-suspended combustion boiler instead of the traditional incinerator boiler. The spreader-stoker type boiler used in PRF technology, evolved from a power plant that originated in the 1930s to improve coal combustion. The slide grate in the boiler is designed to accumulate a maximum thickness of material between eight (8) and ten (10) inches so that it can not be used to process raw material. The heat recovery systems were subsequently added to reduce the volume of waste.

The technology has been refined to address the needs of each operation or plant, which has resulted in a reduction of emissions and in a significant increase in the production of electricity and steam per ton of waste than the traditional incineration.

Regarding the management of solid wastes, Energy Answers philosophy is to treat the ashes as raw material for commercial products and not as a residue that must be disposed. Efforts in scientific research and in the development of this technology have been at the vanguard, resulting in a more effective utilization and in the beneficial reuse of ash. There has been a decrease in the production of ash because of PRF technology. Fly ashes and bottom ashes can be collected and processed together or separately. The bottom ash is processed by a technology owned by EAI that recovers ferrous and non-ferrous metals and produces lightweight aggregate (Aggregate Boiler ™). It has been effectively used as a material that allows ventilation of landfill gas, for paving roads and in the manufacture of concrete blocks.

EAI's goal is to continue improving the technology by achieving new applications for these

products, from the resource recovery process to meet the ultimate goal of zero waste. **Table 4-1** below lists different parameters of the PRF technology, resulting in environmental and operational advantages.

Table 4-1: Environmental and Operational Parameters of the PRF Technology

Environmental Parameter	Economic Parameter
Reduces the volumen of residues to be disposed in landfills, including the reduction in the volumen of ashes.	Efficient cost of transportation and managment of PRF.
Increases the diversion rate	Lower total operation costs.
Increases the recovered energy eficiency/ energy generation per ton of PRF	Higher production of electricity and steam.
Almost total combustion/production of cleaner gases to be processed by the Air Emissions Control system, which results in the reduction of such emissions.	Production of *Boiler Aggregate*™ for sale.
Significant increases in the materials recovery rate, such as ferrous and non-ferrous metals, etc.	Generation of recyclable materials to supply recycling plants.
Increases in combustion efficiency reduce the size of the equipment that is used by three times.	
Reduces the emission of hot air by the reduction of the stack dimensions.	
Demostrated reliability, since enough information available to confirm its operational efectivity and it has ben reproduced on a large scale.	
Uses municipal solid waste to the scale of the Project for the production of electric power.	

4.2.6 Selection of Preferred Technology Alternative

The technologies of gasification, pyrolysis and plasma arc described above do not constitute reasonable alternatives to the Project because of the following disadvantages:

- Do not help to achieve the goals and objectives of the Project; and
- None of the technologies described above uses RSM to the scale of the Project for the production of electricity.

Consequently, the mass burn and PRF alternatives were compared in more detail. **Figure 4-1** shows an illustration of the mass burn and the PRF systems.

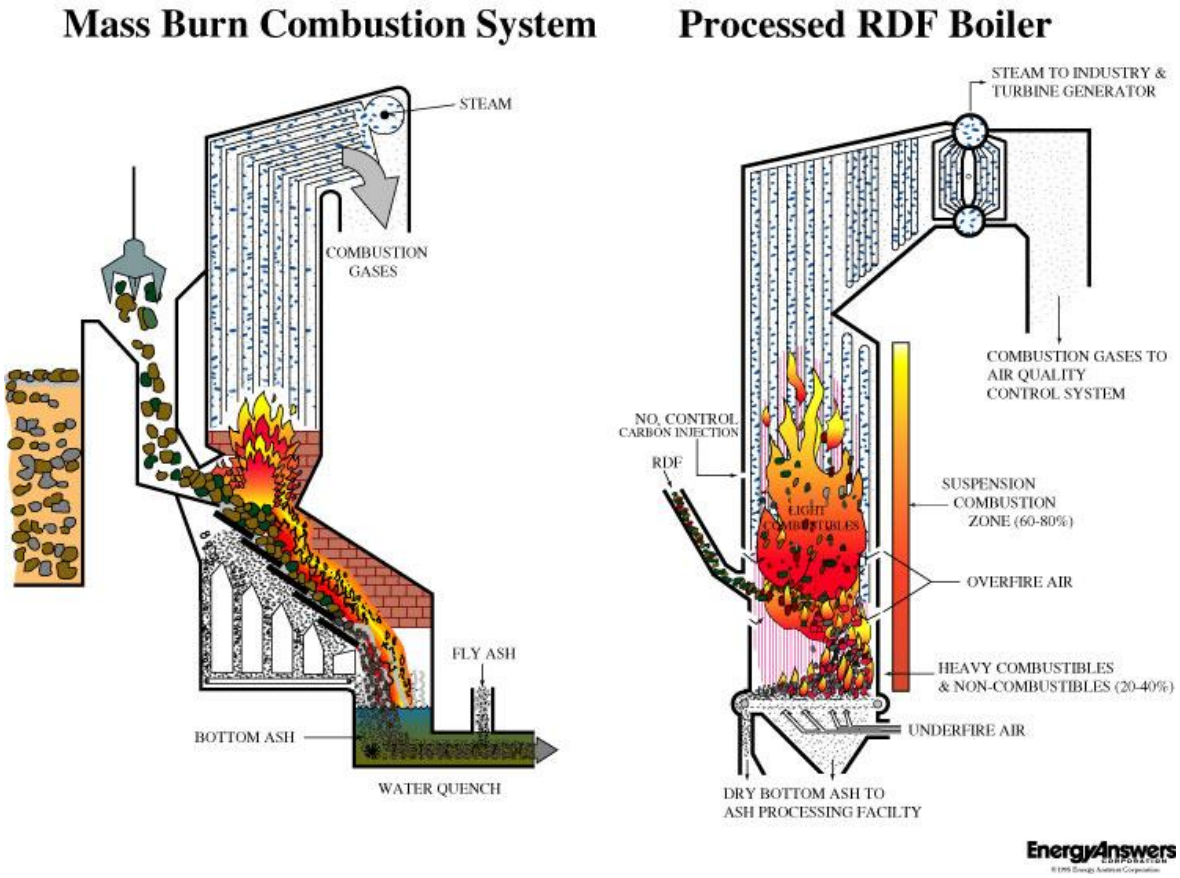

Figure 4-1: Illustration of the Mass Burn and PRF Systems

The major advantage of shreding waste is the almost complete combustion of the PRF, due to the increased surface area, which increases power generation and efficiency. Moreover suspended combustion and the fine ash thickness in the boiler grate ensure the virtual elimination of any combustible material in the waste. Because most of the fuel is consumed in suspension, less heat is released in the boiler grate. Thus, temperature can be more effectively controlled in the grate so that it remains low and does not melt the glass and the metals. This facilitates the removal of ash from the boiler in a dry state and also facilitates its recycling in the form of recovered metals or as construction aggregates.

From the point of view of material handling and combustion, the PRF technology has other additional advantages relative to mass burn:

- PRF, like other solid fuels, can be easily transported on conveyors at a lower cost.

- Because of shredding, the characteristics of PRF are more homogenous than raw material that has not been shredded. This is because shredding produces a mixed fuel that is proportional in terms of its chemical characteristics and its moisture content. As a result, the combustion process is more controlled than mass burn, where, for instance, a dry load can be followed by a wet load. This allows PRF technology to provide a better operation of the air emission control equipment than mass burn.

- The material which burns in suspension is subject to a more effective interaccion with the combustion air because the more volatile material in the PRF is floating in the air. Thus, the amount of excess air required is less than that required for mass burn. Therefore, lower excess air ratio results in smaller ducts, smaller air pollution control equipment, smaller induced draft fans and smaller stacks, which also reduces the amount of hot air leaving the stack.

- Because most of the PRF burns in suspension, the design criterion for grate size is based on a heat release of 750,000 Btu/square foot / hour. This value favorably compares with the usual 250,000 Btu / square foot / hour used in mass burn systems. Hence, mass burn grates used in this system are larger, resulting in a larger boiler size.

Other advantages of PRF are the elimination of unpleasant odors that are usually emitted by waste or garbage, replacing it with a wet leaves like odor, which is not attractive to bugs and can be stored for extended periods (months) without losing its combustion properties. The PRF preparation usually takes 16 hours daily to maintain a constant power generation.

In summary, based on previous discussion, it was determined that the PRF is the preferred technology alternative to meet the goals and objectives of the Project. The preferred alternative represents, on balance, the lowest environmental impact in light of all the legitimate factors that are relevant to reasonable alternatives. The following facts are among the benefits of this technology:

- It reduces the overuse of petroleum based energy sources which contribute to climate change phenomenon;

- It reduces energy costs and prices variability associated to the dependence on fossil fuels

for energy production;

- PRF technology is environmental and operationally proven because it has been in operation over two decades;
- The Plant has the capacity to continuously produce renewable power (base load);
- It provides an alternative for the management of solid wastes in an environmentally responsible manner, minimizing air, soil, surface water and groundwater pollution associated to their disposal in landfills that fail to comply with environmental protection regulations, and
- It provides alternatives to make feasible the orderly and environmentally responsible closure of landfills which impact the health and the environment of surrounding communities.

The analysis of alternatives to the Project location is discussed in more detail in the following section.

4.3 Alternatives to the Proposed Site Location

The site location alternatives show a reasonable variety of options to the proposed site. The analysis compares the potential impact under alternate approaches to meet the Project objectives and goals.

EAI participated, in late 1990s and early 2000s, in a partnership to promote and establish an industrial resource recovery park. The industrial Park would have included several energy and materials recovery satellite industries, including a resources recovery facility for power generation, similar the proposed facility.

As part of the initial planning phase of the industrial park a selection study was conducted to identify a site for its location. One of the philosophical guiding principles of the site selection was the identification of inactive industrial sites or previously impacted properties (brownfields), eliminating from consideration undisturbed properties or green fields.

The original site selection study, dated 2001, is entitled "A Comprehensive Site Selection

Process for an Eco-Industrial Park in Puerto Rico". The methodology used included four (4) phases that consist of an Islandwide search, detailed assessment of top rated locations, refined assessment of identified sites and selection of a site for Project location.

To search potential sites for the Industrial Park, a list of requirements that should be met by the sites to be selected was formulated. Some of the factors considered were the mínimum lot size to accomodate a Project of this nature, nearby comunities, USGS maps, field inspections of sites, among others.

Based on the above, thirty three (33) sites were idenfied for evaluation of which a list was formulated, including the following properties, for a more detailed analysis: Aguada – Old Coloso Sugar Mill, Arecibo – Old Cambalache Sugar Mill and Paper Mill, Vega Baja – Old San Vicente Sugar Mill, and Yabucoa-Humacao – Roig Sugar Mill, Sun Oil Refinery Site and Union Carbide.

A numerical scoring was also developed to classify the sites, which was distributed to stakeholders and local multidisciplinary experts to choose the preferred site and an alternate location. The Old Cambalache Sugar Mill and Paper Mill - "Global Fibers Paper Mill" in Arecibo was selected from the analysis and the evalutarion that was performed by both groups.

The Project consists of a renewable power generation and resources recovery facility.

The location of the site for a Project like this has several requirements that are project driven such as the need for a greater separation or distance to urban settlement areas, the less possible distance to a water supply for process, connection to the electric system, among others.

To this end, an update to the original site selection study was conducted and the original thirty-three (33) potential alternative sites were re-analyzed. This study is included in the **Appendix M** of this P-EIS. The thirty-three (33) potential alternative sites that were originally identified are listed below:

Table 4-2: Sites that were studied for the Site Location

	Name	Municipality
1	San Juan Landfill and Vicinity, San Juan	San Juan
2	Puerto Nuevo Pier Arena, San Juan	San Juan
3	Caribbean Oil	Bayamon
4	Old Paper Mill/Bottling Factory	Guaynabo
5	Guaynabo Landfill	Guaynabo
6	Old Canóvanas Sugar Mill	Canovanas
7	Old Fajardo Sugar Mill	Fajardo
8	Naval Reserve Roosevelt Roads Base	Ceiba
9	Humacao Landfill	Humacao
10	Roig and Sugar Mill and vicinity	Yabucoa
11	Sun Oil Refinery and vicinity	Yabucoa
12	Union Caribe abandoned site	Yabucoa
13	Arroyo Sugar Mill	Arroyo
14	Phillips Petroleum plant area	Guayama
15	Aguirre Sugar Mill, Jobos Power Plant	Salinas
16	USA Camp Santiago Reserve	Salinas
17	Fort Allen US Naval Base	Juana Díaz
18	Mercedita Sugar Mill	Ponce
19	Ponce Cement, Spent Quarries	Ponce
20	Ponce Landfill	Ponce
21	Commonwealth Oil Refining Company	Peñuelas-Guayanilla
22	Guánica Sugar Mill	Guánica
23	Coloso Sugar Mill and vicinity	Aguada
24	Carrizal USA Naval Reserve	Aguada
25	Central La Plata	San Sebastián
26	Old Ramey Air Base - Pta Borinquen Site,	Aguadilla
27	ALCO site	Hatillo
28	Old Granado Rum Distillery	Arecibo
29	Old Camuy Sugar Mill	Camuy
30	Old Plazuela Sugar Mill	Barceloneta
31	Old Monserrate Sugar Mill	Manatí
32	Old San Vicente Central Azucarera and vicinity	Vega Baja
33	Old Cambalache Central Azucarera / Global Fibers Paper Mill	Arecibo

For the Site Selection Study Update a tiered four (4) phases analysis was used (see **Figure 4-1**) which included an Exclusion Analysis, an Inclusion Analysis, a Suitability Analysis and a Comparative Assessment.

A Geographic Information System (GIS) was used as the main analytical tool to conduct this analysis. The location criteria are detailed later for the corresponding phases of this Study.

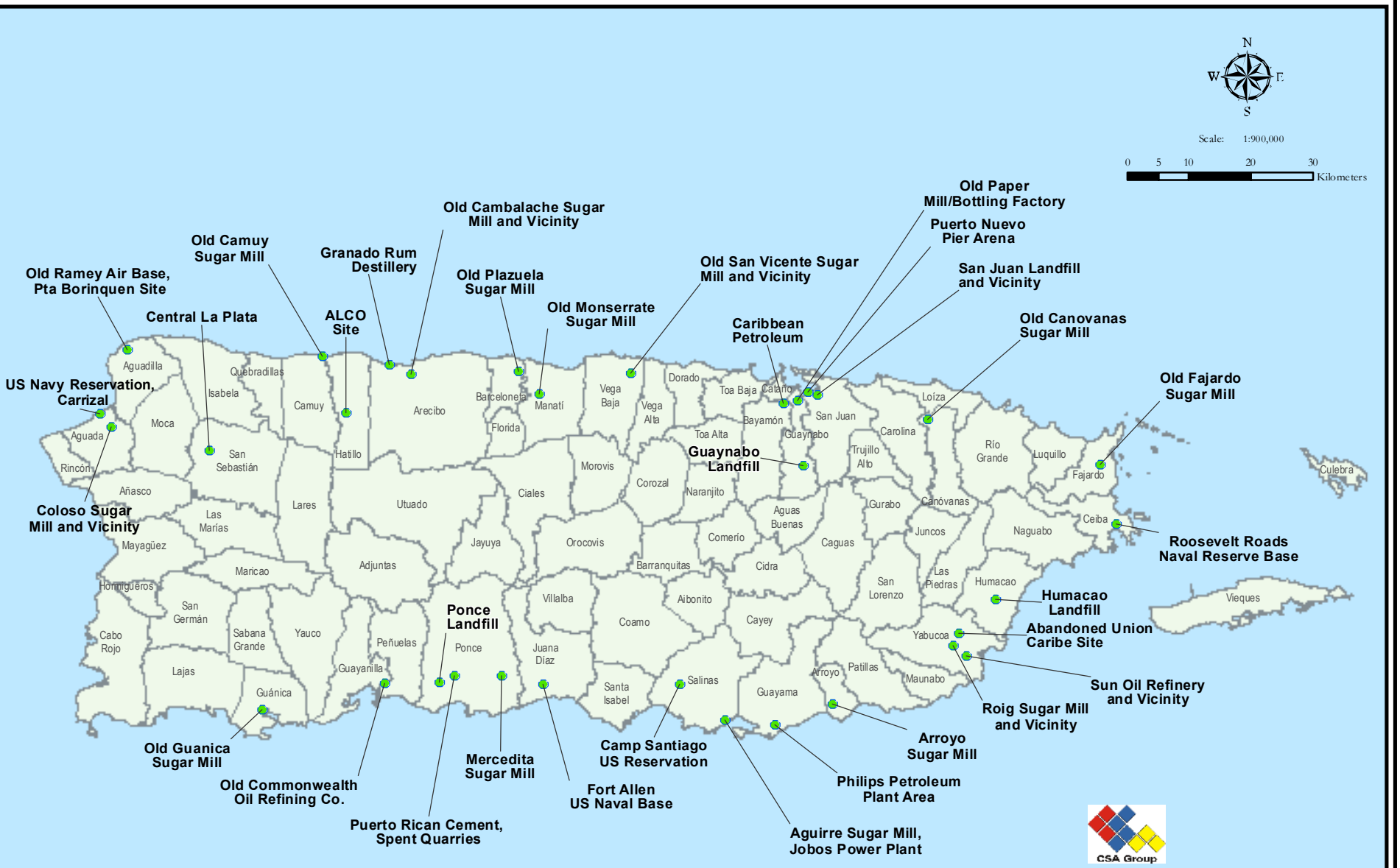

Figure 4-2: Map Showing Sites Considered for the location of the Renewable Power Generation and Resource Recovery Plant

Renewable Power Generation and Resource Recovery Plant / Arecibo, PR

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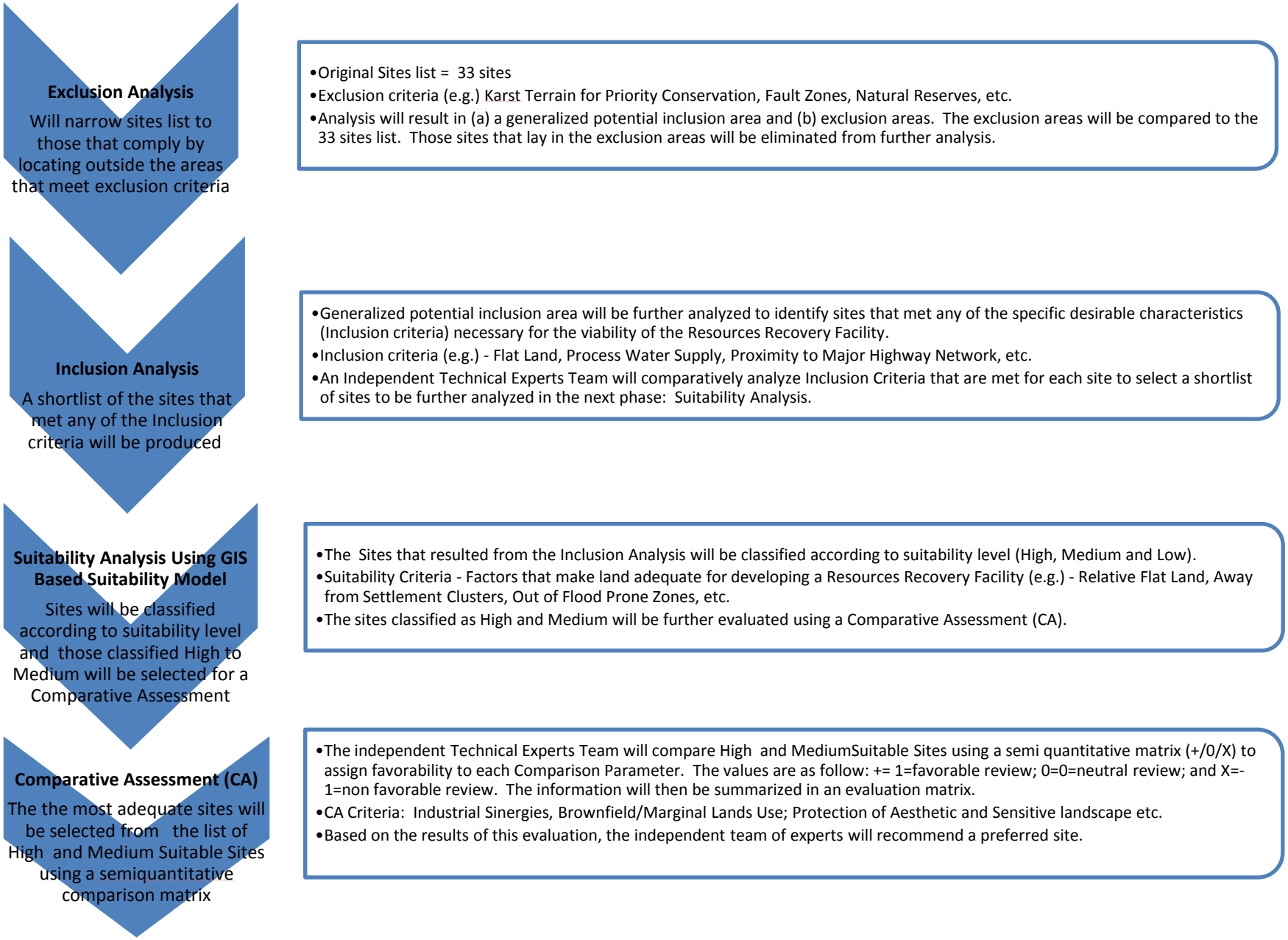

Exclusion Analysis
Will narrow sites list to those that comply by locating outside the areas that meet exclusion criteria
•Original Sites list = 33 sites
•Exclusion criteria (e.g.) Karst Terrain for Priority Conservation, Fault Zones, Natural Reserves, etc.
•Analysis will result in (a) a generalized potential inclusion area and (b) exclusion areas. The exclusion areas will be compared to the 33 sites list. Those sites that lay in the exclusion areas will be eliminated from further analysis.
Inclusion Analysis
A shortlist of the sites that met any of the Inclusion criteria will be produced
•Generalized potential inclusion area will be further analyzed to identify sites that met any of the specific desirable characteristics (Inclusion criteria) necessary for the viability of the Resources Recovery Facility.
•Inclusion criteria (e.g.) - Flat Land, Process Water Supply, Proximity to Major Highway Network, etc.
•An Independent Technical Experts Team will comparatively analyze Inclusion Criteria that are met for each site to select a shortlist of sites to be further analyzed in the next phase: Suitability Analysis.
Suitability Analysis Using GIS Based Suitability Model
Sites will be classified according to suitability level and those classified High to Medium will be selected for a Comparative Assessment
•The Sites that resulted from the Inclusion Analysis will be classified according to suitability level (High, Medium and Low).
•Suitability Criteria - Factors that make land adequate for developing a Resources Recovery Facility (e.g.) - Relative Flat Land, Away from Settlement Clusters, Out of Flood Prone Zones, etc.
•The sites classified as High and Medium will be further evaluated using a Comparative Assessment (CA).
Comparative Assessment (CA)
The the most adequate sites will be selected from the list of High and Medium Suitable Sites using a semiquantitative comparison matrix
•The independent Technical Experts Team will compare High and MediumSuitable Sites using a semi quantitative matrix (+/0/X) to assign favorability to each Comparison Parameter. The values are as follow: += 1=favorable review; 0=0=neutral review; and X=-1=non favorable review. The information will then be summarized in an evaluation matrix.
•CA Criteria: Industrial Sinergies, Brownfield/Marginal Lands Use; Protection of Aesthetic and Sensitive landscape etc.
•Based on the results of this evaluation, the independent team of experts will recommend a preferred site.

4.3.1 Phases 1 and 2: Exclusion and Inclusion Analysis

The exclusion criteria analysis constitutes those location characteristics that are protected by precautionary policies and regulations from environmental and the land use perspective.

The exclusion analysis narrows the sites original list to those that comply by locating outside areas that meet the following exclusion criteria:

Table 4-3: Exclusion Criteria

	Criteria
1	Karst Terrain - Priority Conservation Area – Karst Study
2	Priority Conservation Areas - Natural Heritage Program (*Programa Patrimonio Natural*) - DNER
3	Fault Zones
4	Historical and Archeological Sites
5	Wetlands
6	Landslide prone areas
7	Federal Lands
8	Natural Reserves
9	Soils of agricultural significance
10	Coastal Barriers
11	Schools

The flood zones were not included in the analysis since development on these zones is feasible when effective regulatory rules are incorporated in the design. Likewise, earthquake risk parameter was excluded since the entire Island is in Seismic Zone 3 according to the Puerto Rico Uniform Building Code dated 1999. Therefore the building code will be applied for wind load and seismic activity during Project structural design.

Also, after the review of the applicable regulations, buffer zones were incorporate as an additional exclusion criterion. As result, a new table of exclusion criteria was formulated.

After completing the Exclusion Analysis, two types of (2) areas were defined: exclusion areas

and Generalized Potential Inclusion areas. The following sites were not found among the areas defined by the exclusion criteria.

Table 4-4: Exclusion Analysis Result: Sites that were not Included

	Nombre	**Municipio**
1	San Juan Landfill and Vicinity	San Juan
2	Puerto Nuevo Pier Arena	San Juan
3	Caribbean Petroleum	Bayamon
4	Paper Mill/Bottling Factory	Guaynabo
5	Old Fajardo Sugar Mill	Fajardo
6	Humacao Landfill	Humacao
7	Roig Sugar Mill and Vicinity	Yabucoa
8	Sun Oil Refinery and Vicinity	Yabucoa
9	Abandoned Union Caribe Site	Yabucoa
10	Arroyo Sugar Mill	Arroyo
11	Philips Petroleum Plant Area	Guayama
12	Aguirre Sugar Mill; Jobos Power Plant	Salinas
13	Ponce Cement	Ponce
14	Ponce Landfill	Ponce
15	Commonwealth Oil Refining Co.	Peñuelas-Guayanilla
16	Old Guánica Sugar Mill	Guánica
17	Coloso Sugar Mill and Vicinity	Aguada
18	Old Granado Rum Distillery	Arecibo
19	Old Camuy Sugar Mill	Camuy
20	Old Plazuela Sugar Mill	Barceloneta
21	Old Monserrate Sugar Mill	Manatí
22	Old San Vicente Sugar Mill and Vicinity	Vega Baja
23	Old Cambalache Sugar Mill, Global Fibers	Arecibo

For additional information refer to the Site Selection Study, in **Appendix M**.

After completing the Exclusion Analysis a Generalized Potential Inclusion area was defined.

Such area was further analyzed to identify sites with specific desirable characteristics for the viability and practical execution of a Renewable Power Generation and Resources Recovery Facility. Therefore, those location characteristics that are Project driven and considered desirable for the Project feasibility were added to the analysis as tnclusion criteria. Sites that did not fulfill some inclusion criteria were eliminated from analysis. The following table shows the inclusion criteria.

Table 4-5: Inclusion Criteria

Parameter	
1	Flat Land
2	Process Water Supply (effluent from wastewater treatment plants, surface water, or potable water main with minimum 12 inches diameter)
3	Accesible to Island Highway Network
4	Accessibility to a 115KV or 230 KV substation for power production and connection to PREPA system
5	Accessibility to an electric power source (38 KV substation) for minimum electrical consumption
6	Proximity to Sanitary Sewer Line with minimum 12 inches diameter with adequate capacity
7	Proximity to a Wastewater Treatment Plant with adequate capacity

Subsequently, a team of multidisciplinary experts verified the table with the inclusion criteria to select a shortlist of sites. This approach would allow not eliminating the sites that don't meet the inclusion criteria if such criteria could be overcome by implementing reasonable engineering measures. The following sites were selected by the team of multidisciplinary experts to continue with the next phase of the analysis.

Table 4-6: Inclusion Analysis Results

	Name	Municipality
1	Old Cambalache Sugar Mill, Global Fibers and Vicinity	Arecibo
2	Coloso Sugar Mill and Vicinity	Aguada
3	Philips Petroleum Plant Area	Guayama
4	San Juan Landfill and Vicinity	San Juan
5	Sun Oil Refinery and Vicinity	Yabucoa
6	Old Paper Mill/Bottling Factory	Guaynabo

4.3.2 Phases 3 and 4: Suitability Analysis and Comparative Evaluation

The sites selected by the team of experts were further analyzed using a GIS based Suitability Model (Suitablility Model), to identify the highest suitable sites for the Project development. The ArcGIS Spatial Analyst was used for suitability modeling and to create information layers of these parameters for the model. The following table lists the criteria used for the suitability model:

Table 4-7: Criteria Utilized in the Suitability Analysis Phase

	Parameter
1	Relative Flat Land
2	Longer distance to Settlement Clusters
3	Flood prone zones
4	Shorter distance to PREPA's major electrical substations (115 KV and 38 KV)
5	Shorter distance to water supplies for processing water
6	Longer distance to settlements to where prevailing wind blows. Located in open areas.
7	Longer distance to proposed non industrial Projects
8	Shorter distance to Solid Wastes Transfer Station
9	Longer distance to nearest household
10	Longer distance to Recreational Facilities
11	Prevailing Land Use in a 1,000 meters radius
12	Shorter distance to ocean cargo Port
13	Shorter distance to airports

The Suitability Analysis made possible the consideration of appropriate sites for the location of the power generation and resources recovery Plant using criteria such as flat land, proximity to communities, among others. The following range or classification system was incorporated to this analysis: 3=high or highly suitability site, 2= medium or suitable site and 1=low or least suitable site; for suitability criteria of the sites in the mentioned table. A range was assigned to these factors, according to its influence and its relative importance, as follows: 3=extremely important, 2=very important and 1=important.

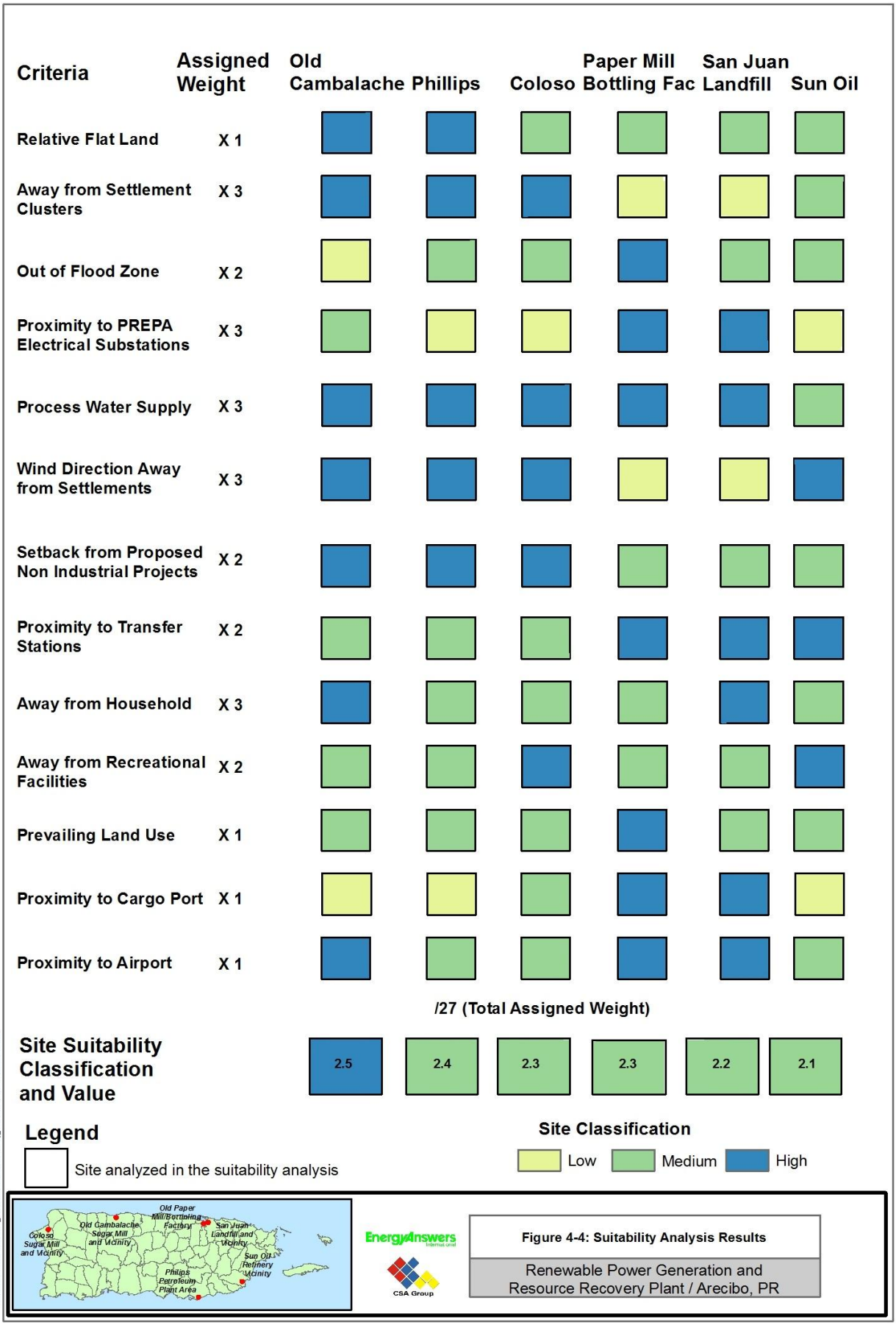
The steps and operations used in this analysis consisted of four (4) general steps: buffer zones distance, conversion data from Vector to Raster, reclassifying values and weighting data. For more details about this analysis, refer to the Site Selection Study in **Appendix J** of the P-EIS.

The Suitability Analysis identified the sites in order of suitability:

Table 4-8: Suitability Analysis Results

Name		Classification	Score
1	Old Cambalache Sugar Mill, Global Fibers and Vicinity	High Suitable	2.5
2	Philips Petroleum Plant Area	Suitable	2.4
3	Coloso Sugar Mill and Vicinity	Suitable	2.3
4	Paper Mill/Bottling Factory	Suitable	2.3
5	San Juan Landfill and Vicinity	Suitable	2.2
6	Sun Oil Refinery and Vicinity	Suitable	2.1

Later the team of experts conducted a comparative assessment of the sites with medium to high ranges using a matrix to assign a score. The areas that were outside the 3 reclassified groups were reclassified as No data. In this scoring process specific Project parameters would be evaluated such as philosophic objectives, Project parameters, regional and community considerations, time to complete the Project and feasibility.


Criteria
Assigned Weight
Old Cambalache
Phillips
Coloso
Paper Mill Bottling Fac
San Juan Landfill
Sun Oil
Relative Flat Land
X 1
Away from Settlement Clusters
X 3
Out of Flood Zone
X 2
Proximity to PREPA Electrical Substations
X 3
Process Water Supply
X 3
Wind Direction Away from Settlements
X 3
Setback from Proposed Non Industrial Projects
X 2
Proximity to Transfer Stations
X 2
Away from Household
X 3
Away from Recreational Facilities
X 2
Prevailing Land Use
X 1
Proximity to Cargo Port
X 1
Proximity to Airport
X 1
/27 (Total Assigned Weight)
Site Suitability Classification and Value
2.5
2.4
2.3
2.3
2.2
2.1
Legend
Site analyzed in the suitability analysis
Site Classification
Low
Medium
High
Old Paper Mill/Bottling Factory
Old Cambalache
San Juan Landfill and Vicinity
Coloso Sugar Mill and Vicinity
Sun Oil Refinery Vicinity
Philips Petroleum Plant Area
EnergyAnswers
CSA Group
Figure 4-4: Suitability Analysis Results
Renewable Power Generation and Resource Recovery Plant / Arecibo, PR
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The three (3) top ranked sites in this comparative analysis represent the most suitable sites for the proposed RFF:

1. Old Cambalache Sugar Mill/Global Fibers and vicinity, Arecibo;

2. Phillips Petroleum Plant Area, Guayama; and

3. Old paper mill/bottling factory, Guaynabo.

Notice that the identification of the most suitable site is not an absolute recommendation since no site fully complies with all the criteria described in the inclusion, suitability and comparative analyses. The implementation of engineering and design measures, construction practices and Project operation become crucial to compensate those criteria not met by the sites.

The Old Global Fibers, Inc. was the site location alternative selected as preferred alternative because it was the one that resulted with the highest score from the analysis.

For more details about the suitability analysis refer to Appendix M.

After evaluating the advantages and disadvantages of the alternatives, according to the criteria previously specified, the following is concluded:

- The alternative of a project for waste conversion as alternate renewable energy complies with the goals and objectives of the Project.
- The PRF technology alternative complies with the goals and objectives of the Project.
- After a detailed location analysys, the preferred site location alternative is the Old Global Fibers Paper Mill site in Arecibo.

The alternative that is proposed in this P-EIS complies with the objectives and needs of the Project and its benefits surpass the environmental impacts that were discussed.

5 CUMULATIVE IMPACTS ANALYSIS

The Regulation for the Process of Presentation, Evaluation and Processing of Environmental Documents issued by EQB defines cumulative impact as the overall effect on the environment resulting from a series of actions past, present or future, independent or with a common origin. Meanwhile, Resolution R-02-21-1 of EQB notes on this subject that the analysis should consider the proposed action, its alternatives and the effects of each alternative. Cumulative impacts should be evaluated together with the direct and indirect impacts of each alternative. The alternatives should include no action, which should serve as a basis or benchmark for assessing the cumulative impacts of other alternatives. The actions that should be considered include not only the proposed action, but also all connected or related actions and similar actions that may contribute to cumulative impacts.

The consideration of cumulative impacts in relation to the Project depends on the sharing of a particular resource (eg watershed, airshed, visual field) with other (s) project (s) proposed (s) in a foreseeable time horizon. This is based on each resource physical or social nature that has a limit that can be identified.

The cumulative impacts on resources were evaluated taking into account the projects that have been filed with the PRPB from 2005 to 2010 (August) which are located within different limits identified, including the Rio Grande de Arecibo watershed. Selected projects were those that have requested siting approvals, excluding projects that have been denied or have been dismissed for lack of interest, as well as cases that involve government land transactions. It is assumed that all selected projects have the potential to obtain approval from the PRPB. Figure 5.1 shows the location of the projects evaluated, including the Project, in relation to the boundary of the Rio Grande de Arecibo watershed and other physiographic resources and infrastructure.

The Via Verde Project (*Vía Verde*), a 92-mile 24-inch diameter steel pipeline propose to transfer natural gas from Peñuelas to San Juan, was considered in the analysis. It is expected that the proposed aligment for *Vía Verde* will run west of the Site crossing the RGA at a location northwest of the Site. Likewise, the USACE Flood Control project on the RGA watershed was included in the analysis.

The cumulative impact analysis considers all resources included in the direct and indirect impact evaluation for the P-EIS, and excluding from consideration those resources where significant cumulative impact are not expected. The basis for the exclusion is that the Project will not contribute significantly to cumulative impacts on certain resources. Listed below are all resources considered:

- Topography, Geology and Soils
- Soil Zoning and Land Use
- Air Quality
- Water Resources
- Bilogical Resources
- Hydrology and Water Resources
- Cultural resources
- Aesthetic and Visual Resources
- Traffic
- Infrastructure and Public Services
- Health and Safety
- Socioeconomic Aspects

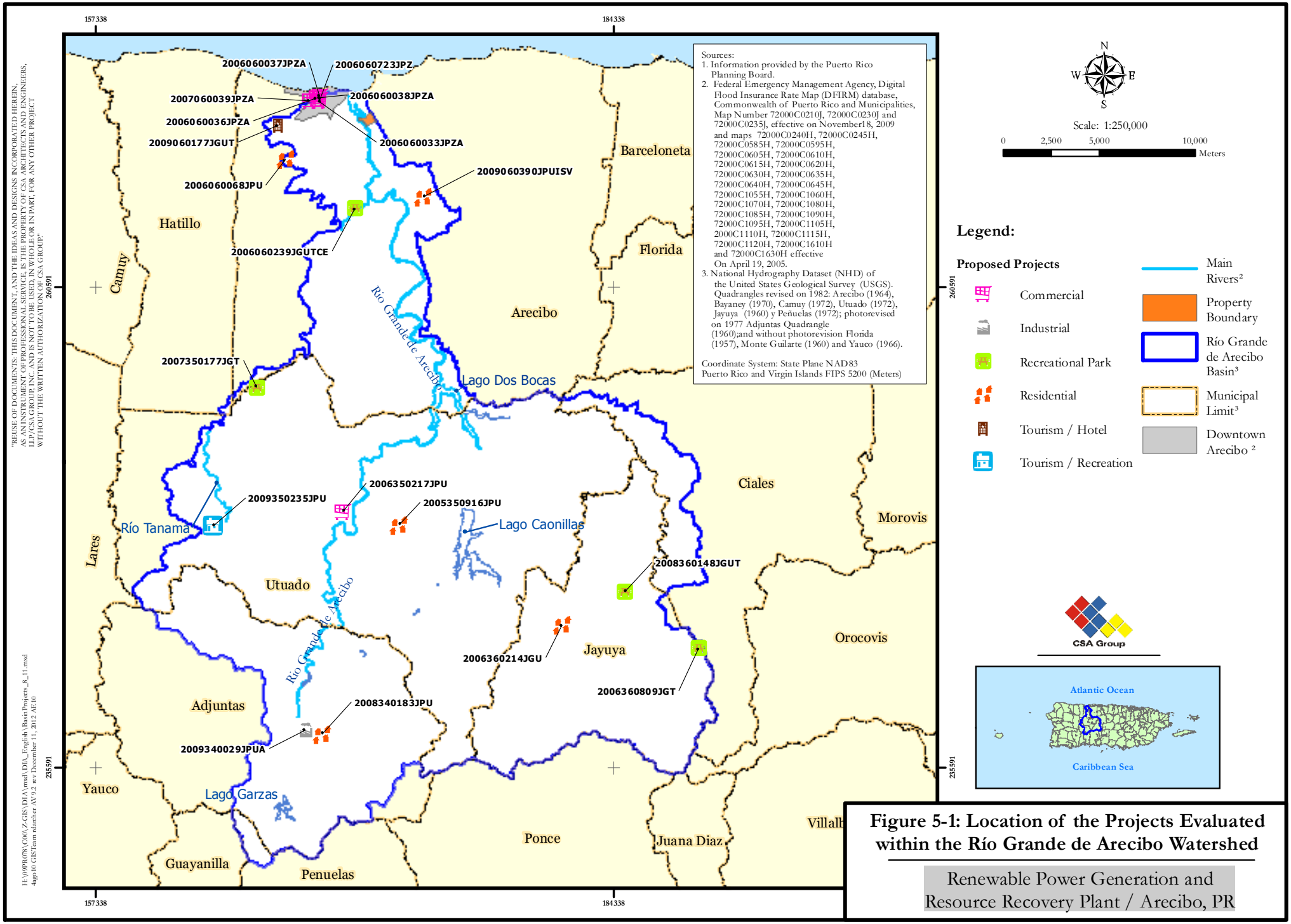

Figure 5-1: Location of the Projects Evaluated within the Río Grande de Arecibo Watershed

Renewable Power Generation and Resource Recovery Plant / Arecibo, PR

After the exclusion where it was determined that the Project will not contribute significantly to cumulative impacts on certain resources, the following resources were considered:

- Air Quality
- Water Resources
- Topography, Geology and Soils
- Biological Resources
- Socioeconomic Aspects
- Traffic
- Aesthetic and Visual Resources
- Infrastructure (Electric Power)

No cumulative impacts are expected to occur between the Project and *Vía Verde* Project in relation to health and safety due to the following: (1) the alignment of the pipeline is far removed from the site, and (2) the gas pipeline is not a source of emission. The geographic scope for the analysis of cumulative impacts associated with the proposed projects in a foreseeable time horizon, including the Project, was defined based on the scope or boundary of the resource, as indicated above. In turn, for those resources for which specific studies that by definition have a cumulative approach was taken given the geographic scope for the study itself (eg. Air Analysis, Visual Resources and Noise Study).

A discussion about the limits and scope of resources evaluated follow, as discussed in **Chapters 2 and 3**:

- Air Quality - The scope for this resource was defined according to the guidelines for Air Quality Models EPA (40 CFR Part 51) and the selected model AERMOD (09292).
- Water Resources - The inclusion criteria selected space was the watershed of the RGA because it is at this scale where natural processes operate that control the structure and

function of rivers and estuaries.

- Topography, Geology and Soils - The evaluation framework of soil resources includes the potential impact of proposed projects in the alluvial valley of the RGA.

- Biological Resources - The evaluation framework of biological resources include the potential impact of proposed projects on the flora and fauna of the watershed of the RGA and Caño Tiburones.

- Socio-economic - The cumulative impacts analysis in the socioeconomic context discusses those socioeconomic components in which the project may have cumulative effects such as: socioeconomy, population and public services.

- Traffic - The capacity and current traffic operation was evaluated and the potential impact on future major intersections around the project site was determined. At the same time the potential impacts of other proposed projects in the area also considered.

- Aesthetic and visual resources - Impacts to aesthetic and visual resources of the project were evaluated in the area surrounding the Project.

- Infrastructure and Utilities - The Project does not represent a significant demand for water resources infrastructure, sewage or solid waste. However, cumulatively it contributes to the generation of electrical power in Puerto Rico.

The results of the cumulative impact assessment follow:

5.1 Air Quality

In the Air Quality Study for the Plant (see **Appendix C**), it was determined necessary to conduct a cumulative impact analysis to demonstrate that the NAAQS for SO_2 and NO_2 would not be exceeded. A cumulative impact analysis requires that emissions from other major and adjacent sources of SO_2 and NO_2 be analyzed together with emissions from the Plant. As part of the analysis, and with the assistance of the EQB, data was collected from emission sources near the Plant and found that the nearest source that probably would have a greater influence on the analysis of cumulative impacts would be PREPA's Cambalache Power Plant. The analysis

modeled the highest rate permitted emissions by the Cambalache Power Plant, alongside stack parameters and location (coordinates). The results of this analysis are shown in the following table.

Table 5-1: Model Results – Cumulative Impact Levels Operation Scenario at 110%

Parameter	Averaging Period		Maximum Concentration (µg/m^3)	Background Ambient Concentration (µg/m^3)	Total Ambient Concentration (µg/m^3)	NAAQS (µg/m^3)
SO2	1	High	41.3	86.5	128	195
NO2	1	High	101[1]	72	173	188

1.--NO_2 concentration estimated as 75% of the NOx predicted by modeling based on EPA Guidance for the Tier II NO2 calculation method (EPA, 2010). 1 hour NO2 Concentration reported is the 8th highest, representing the 98th percentile of the annual daily maximum 1 hour concentrations to show compliance with the NAAQS.

Based on these results, Project emissions will result in ambient air concentrations below NAAQS NO_2 and SO_2. Therefore, it is concluded that the Plant does not have an adverse cumulative impact on air quality.

5.2 Water Resources

The analysis of cumulative impacts on water resources was divided in surface water and groundwater resources. The inclusion of the spatial criteria selected was the watershed because it is at this level where natural processes operate that control the structure and function of rivers and estuaries (Figure 5-1). For example, a project that impacts the hydrology of a water body, such as a water or pipe line, will have indirect effects upstream and downstream of the area of direct impact due to the ecological connection that has been documented in many rivers under the Continuous River Concept. The watershed allows the study of these impacts as this spatial unit defined on a strictly hydrological and topographical base which embodies the connection between landscape and drainage patterns.

The project area is within the watershed of the RGA. **Table 5-1** shows a list of projects that fall within the watershed in which the Site is located.

The cumulative impacts of these projects in its operational phase, along with the Project, are associated with increasingly converting permeable soil to impervious ones at the basin which could result in increased runoff downstream. To avoid negative cumulative impacts downstream

project developers must implement structural storm water runoff management in compliance with Regulation No. 3 of the PRPB.

Other foreseeable cumulative impact is an increase in the risk of contamination of streams in the watershed due to dispersed sources of contamination. The removal of natural vegetation in river valleys reduces the strip of riparian vegetation to the minimum of five (5) meters allowed by law. The ability of vegetation to absorb nutrients and pollutants will be reduced to what the vegetation can absorb in a stretch of five meters. If these projects, do not implement pollution control programs for dispersed sources of contamination and solid waste collection, an increase could occur in the amount of pollutants that reach streams and rivers eventually representing potential cumulative impacts in their respective estuaries.

Table 5-2: Summary of Assessed Projects Located within Río Grande de Arecibo Basin where the Project Site is Located

Inclusion in Hydrographic Watershed	Case Number	Description	Area of the site where the Project object of Site approval (*consulta*) is proposed
RGA Basin	2008340183JPU	Vistas del Gigante Apartments-154 units- In parcel of 6.28 *cuerdas* (R-1)	24,718.7827 square meters
	2009340029JPUA	Relocation of concrete block and cement plant. From UR-1 (from Low density residential to Heavy Industrial I-2)	Not available
	2006360214JGU	A nine unit Single Family Residential and a remainder in a 2.65 *cuerdas* parcel (R-2)	900-1,620 square meters
	2008360148JGUT	Mix touristic commercial from (A-4 to DTS) in a parcel of 247 *cuerdas*	14 *cuerdas* y 21,000 square meters
	2009350235JPU	Eco-tourism farm of 189 *cuerdas*, recreational not zoned	186 *cuerdas*
	2005350916JPU	Single family residential Camino Real 150 units in remainder of parcel of 127.88 *cuerdas*- not zoned	350 square meters
	2006350217JPU	Shopping center commercial -zoned R-1, in parcel of 18.84 *cuerdas*.	187,000 square meters

Inclusion in Hydrographic Watershed	Case Number	Description	Area of the site where the Project object of Site approval (*consulta*) is proposed
	2009060390JPUISV	Development *Estancias de Arenalejos*-153 low income units in parcel of 54 *cuerdas* (Not zoned to R-4).	125 square meters per unit
	2006060068JPU	Development *Urbanización Úcares* 370 units residencial. (Not zoned to R-1)	450-900 meters per unit
	2006060033JPZA	Construction of Professional Offices. From (R-5 to C-1)	887.80 square meters
	2006060723JPZ	Construction of Professional Offices in two lots. From (R-5 to CO-1, C-1)	875 y 400 square meters
	2006060036JPZA	Professional Offices .From (R-5 to C-1 or C-L)	600 square meters
	2006060037JPZA	Professional Offices in vacant lot. From (R-5 to C-1)	1,447.69 square meters
	2006060038JPZA	Professional Offices In two parcels From (R-5 to C-1 or C-L)	500 and 928.25 square meters
RGA Basin	2007060039JPZA	Amend Zoning Map in parcel. From (R-3 to C-1, C-2, C-L)	1,540 square meters
	2008-06-0255-JPU	Apartaments Edsel Residential Project 4-unit multi-family residencial (R-1)	908.05 square meters
	2008-06-0288-JPU	Multi-family residencial 4 apartment building in parcel of 0.11 *cuerdas* (R-1)	410 square meters

Due to the nature of the Project, it is not expected to generate additional significant cumulative impacts caused by nonpoint source pollution in the basin of the RGA. The Project does not represent an additional impact to water bodies by precise sources of pollution as it does not involve the discharge of pollutants.

A foreseeable impact caused by the proposed projects is their contribution to soil impermeabilization and the consequent reduction in infiltration area. Considering the projects that share the watershed with the Project, together they will occupy a total area of 0.01 square miles. This is a worst case scenario since the total parcel area was considered in the calculation. This calculated area only represents 0.04 percent of the extension of the North Coast Karst Aquifer.

Those project areas that are not developed as well as buffer areas and open space areas will still be providing infiltration. The implementation of structural measures will be important to maximize water infiltration such as partially permeable pavements, underground chambers to retain stormwater runoff to discharge into existing systems or others.

From a review of the list of projects, it appears that these consist of residential, commercial and industrial. The implementation of measures to prevent contamination of the subsoil and stormwater as Spill Prevention Control and Countermeasure Plans (SPCC), Stormwater Pollution Prevention Plans (SWPPP), and Erosion and Sedimentation Control Plan (ESC) will be important to manage potential cumulative impact these projects may have due to degradation of groundwater or water supplies associated with nonpoint source pollution or precise point of contamination.

As discussed in Section 3.2, the Project will not have significant impacts on groundwater, based on the following criteria (a) interference with recharge areas (b) resource depletion (c) potential degradation of groundwater and (d) contamination of a public water supply. This statement was framed within the context of the conditions prevailing in the area of the Site.

Groundwater extraction is not proposed to supply the water needs of the Project for any of its stages, nor is water extraction contemplated from rivers and streams that also function as aquifer recharge areas. Therefore, it is not expected that the Project will have additional impacts on the potential degradation of groundwater and pollution of a public water supply associated with source pollution considering material handling and the nature of the Plant operations.

At the same time, the construction of the Project will not result in a significant impact on the flow regime pattern of the Rio Grande de Arecibo, which is located on the western boundary of

the site, even with the modification to the topography recommended by the H-H Study, as there are no plans to alter the hydraulic section of the channel of the RGA. Cuts to the topography are recommended to provide additional flow in the floodway sector of the Site where currently four (4) retention ponds are located. Cumulatively, along with other projects located within the watershed of the RGA, the projected impact for the development of these projects (see Table 5-2) will not be adverse due to the aquifer large area (257 square miles) versus the reduced impact footprint (0.57 square miles) of the mentioned projects.

As mentioned in Section 3.2, the Project's impacts on surface water resources will be limited to an increase in the generation of stormwater runoff and local precipitation runoff and to their diversion works through engineering designs. However, the necessary mitigation measures will be taken during the construction of the Project, and therefore, it is not expected that the proposed action will cause an adverse impact on superficial water resources, particularly the RGA. As for the quality of surface water, it is not expected that temporary impacts associated to the removal of earth crust material during Project construction will degrade it since Best Management Practices (BMP) like the ESC Plan will be implemented, after it is presented and approved by EQB.

It is not expected that the construction of temporary and permanent improvements result in an impact on recharge patterns and availability of groundwater supplies in the area due to the limited footprint of the Project and the presence of large permeable surfaces in the valley of the RGA. In addition, the application of BMPs will prevent contaminant spills to gain access to the subsurface during the Project's construction and operation activities.

5.3 Topography, Geology and Soils

Secondary or cumulative impacts to topography, geology and soils were considered as a resource. The inclusion criterion used was the RGA watershed. The impacts considered are specifically soil erosion and contamination by the proposed projects within the watershed in which the Project will be located. The impacts due to changes in land use were considered separately and are discussed in the next section

Any construction activity involves the loss of some amount of soil by erosion and sedimentation. However, there are engineering practices that can reduce this loss substantially. Erosion affects

the quality of the soil resource and limits the potential uses that can be given to it. In addition, erosion has secondary impacts on water quality and aquatic ecosystems welfare.

The construction activities necessary for the development of the Plant will require soil disturbance activities that will not significantly alter the topography, geological formations and soils that predominate in the area, including the Site where construction is proposed for the Plant and surrounding properties. This is mainly due to the small footprint and because the area's topography, geological formations and soils have been impacted in the past by the construction and operation of the former paper mill, the former Central Cambalache Power Plant and construction of Road PR-2, to name a few impacts caused by anthropogenic actions evident in the area under discussion.

Although earth works for site pre-construction involves the deposit of approximately 382,000 cubic meters of earth crust material, cutting and removal of alluvium on the western sector in the remainder of the Site, final Project elevations will harmonize with the existing flat topographic relief of the Site and its surroundings.

During the operation phase, no impacts are expected to occur in addition to those identified during the construction phase in terms of soil erosion since the latter will not culminate in the production of changes in terrestrial landforms or topography (significant changes to the geomorphic cycle), once stabilized due to the compacting of soils and planting vegetation in green areas designated by the Project design. In addition, a planting plan will be implemented that will include native species typical of the environment of the project area that will provide filtration and sediment retention and improve the quality of wildlife habitat in the area

Due to these potential effects, the EQB requires that construction projects implement measures to control sedimentation and erosion. It shall also mitigate for the removal of trees in compliance with DNER's and PRPB's Cutting, Planting and Reforestation Regulation. These requirements apply to all projects. The Project will strictly implement the required ESC Plan. Other projects must also comply with the corresponding ESC Plans. Therefore no significant cumulative impacts are expected due the development of these projects. The contribution of cumulative impacts on the soil resource by *Vía Verde* Project, on the basin of RGA will not be significant due to the reduced footprint of the area that will be impacted as a result of the project.

The required permits will be obtained from DNER for removal of the earth crust and suggested measures by the agency will be implemented. In addition, a SWPP Plan will be implemented during the construction stages.

5.4 Biological Resources

As discussed in **Section 3.5.2**, the development of the Project will have long-term impacts on 2.49 *cuerdas* that comprise jurisdictional areas of the United States. These areas will be modified by the construction of the Project, so during the permitting process applicable mitigation measures to be used will be identified. This will also be consulted with DNER to identify impact areas in Caño Tiburones that could qualify for compliance with the mitigation measures described above. Because impacts to jurisdictional areas require mitigation at a ratio of at least 1:1, a cumulative impact on this resource is not expected if even other projects impact jurisdictional areas since there will be clearly an increase in jurisdictional areas after the mitigation is completed.

The property was previously impacted by present industrial uses and at present is not being used for these purposes, as noted in **Chapter 1**. This fact, along with the location of the Site and environmental protection measures that will be implemented, leads us to conclude that it is not anticipated that any species of interest for conservation and valuable ecological habitats will be significantly affected or that the project will contribute cumulatively impacts the resource.

The Project along with the rest of the projects, will comply with the requirements of Regulation No. 6765 from DNER will be important as a means of mitigating natural systems and the species they harbor, in the particular analysis area. It will also be important that these projects comply with Cutting, Planting, and Forestation Regulation for Puerto Rico, Regulation Number 25 of the PRPB. The vision of regulatory agencies is important in determining the required mitigation for habitats that are affected by the various projects proposed in the area of analysis. Especially the DNER, due to the ministerial powers conferred by the Wildlife Act and its Regulations, on these and any other development project in the island

5.5 Socioeconomic Aspects

The cumulative impacts analysis in the socioeconomic context discusses those components in

which the project may have cumulative effects such as: socioeconomics, population and public services. The analysis is limited to the statistical region of reference which consists of the municipalities of Arecibo, Barceloneta, Camuy, Florida, Hatillo, Manatee, Quebradillas and Utuado. In addition, current conditions of the Cambalache Ward were evaluated and compared with the other socioeconomic characteristics of wards that comprise the municipality of Arecibo (see **Appendix I**).

The impact of the project in the construction phase in revenues to state and municipal treasury is estimated at $49 million. For the operational phase is estimated that revenues to the Treasury will be approximately greater than 2 million dollars a year (see table in **Section 3.14**).

The number of jobs generated by the project supposes an increase in the labor mobility of employees to fill those jobs. It would not be expected that this supposes an increase in housing demand near the Project. This based on the behavior that has been observed in terms of labor mobility in Puerto Rico.

On the other hand, it would be expected that labor mobility could have effects on the provision of public services in the area, namely fire stations, police stations, hospitals and schools. However, providing agencies are the ones which have knowledge of the needs in particular areas and for this purpose may require contributions from the proponents. For example, the Police Department considers the territorial area of the municipalities, the crime rate, the floating population, among other criteria for determining the facilities that are needed. Likewise, the Department of Education, and the Department of Recreation and Sports, among other agencies have specific criteria for determining the need for additional facilities.

In terms of cumulative impacts it should be noted that considering the potential proposed projects in the area and their magnitude, together with the Project, it would generate a positive economic impact due to the socio economic activity that would be generated in the area. These effects would be reflected in the area of new direct, indirect and induced jobs as new business as well as commercial activity. It is estimated that the project will generate $19.3 million in direct and indirect labor income.

The projected increase in direct jobs during the construction phase will be 4,283 and 4,004 indirect and induced jobs. During the operational phase it is estimated that 150 direct jobs will be generated. The facility will maintain an average of 722 direct and indirect jobs during its

regular operations. (See methodology in **Appendix I**).

5.6 Tráffic

The Guidelines of Highway and Transportation Authority of Puerto Rico (HTA) require considering in the Process of Generation of Travel any project in the region of influence. Other proposed projects were investigated in the Access Control Office of the HTA, the Planning Board of Puerto Rico (PRPB) and the Administration of Regulations and Permits (*ARPE*). As part of this research, we identified a residential project in the database of the PRPB. A field visit confirmed that the project was built and is in use. No other proposed project that has construction permits or is under construction was identified.

However, in the Traffic Study conducted for the Plant existing traffic volumes were projected for the years 2013 and 2018 using the annual growth and concluded that it would not cause adverse impacts at the studied intersections (Intersection # 1-PR-2, PR-10 and Juan Rosado Avenue, and Intersection # 2. PR-2 and Victor Rojas Avenue). Therefore, no adverse cumulative impacts are expected in traffic.

5.7 Aesthetic and Visual Resources

The site where the project is proposed was used for decades as a paper mill. The historically industrial use has marked the footprint from the standpoint of aesthetic impact. There will only be a temporary loss of aesthetic value in the area during construction activities. After this stage the aesthetic value of the area will increase because of modern building structures integrated into landscaped environment (see **Chapter 2**).

On short term, the visual framework could generate an impact since earth work construction activities will be carried out using heavy equipment and scaffolding while construction of the Project lasts. Subsequently, the temporal visual framework (during construction) will be removed permanently once the Project is built. It is expected that shadow effects resulting from the height of the buildings do not significantly affect the surrounding open space.

In conclusion, the visual environment will be affected at a short term for construction activities. On long term, the development of this Project in the industrial zone will improve the visual

environment. Cumulatively, other projects that impact the visual environment were not identify, so it is concluded that a cumulative impact is not presented to visual and aesthetic resource.

5.8 Infrastructure (Electric Power)

As indicated above, the electrical system of Puerto Rico, operated by the PREPA, is an integrated system, in which the energy produced by the different generating stations is fed into the system and distributed to the centers according to load demand. So the energy that will be produced by the Renewable Power Generation and Resources Recovery Plant will have a cumulative effect, along with the rest of the electrical power facilities, public and private, when injecting power into the PREPA system. The Project will contribute to achieving the goals of renewable energy production as defined in the Energy Reform.

5.9 Cummulative Impacts related to the Evaluated Alternatives

Chapter 4.0 presents an analysis of alternatives that were evaluated for this project, including (a) Alternative to the Proposed Action, including the No Action Alternative and other renewable energy alternatives, (b) Technology Alternatives, and (c) Alternatives to the Proposed Location.

The no action alternative would result in no cumulative impacts to the evaluated resources. However, as noted in **Chapter 4.0** this alternative was discarded because it would not meet the goals and objectives of the Project. Meanwhile, the PRF technology alternative for the process of recovery of energy and materials maximizes the ability to recover recyclable materials from solid waste and dispose efficiently of non-recyclable waste. Such non-recyclable waste is converted to PRF which is the raw material for the conversion of energy.

In as far as the alternative to the proposed location, it contemplates the best use for a site that has been previously impacted by industrial use. In turn, the site is removed from residential areas and has the necessary infrastructure for the operation of power generation and solid waste management.

6 REQUIRED PERMITS AND ENDORSEMENTS

Prior to the approval of the construction and eventual operation of the Project, it is necessary to obtain a number of authorizations, endorsements and permits from local and federal regulatory agencies, related to environmental issues, zoning, pre-construction, and operational infrastructure. These permits and endorsements are summarized in **Table 6-1**, including a description of the permit or endorsement and the agency responsible for issuing it.

Table 6-1: Required Permits and Endorsements by Regulatory Agencies

Permit/Endorsement	Regulatory Agency	Description
Process of Environmental Review: Environmental Documents and Studies		
Environmental Impact Statement	PRIDCO	Environmental document presented by a lead agency to comply with Public Environmental Policy Act Article 4(B)(3)
Air Quality Impact Analysis / New Major Emission Source	EQB & EPA	Shows compliance of a major new source with Air Quality Standards and the use of BACT & MACT.
Human Health Risk Assessment	EQB & EPA	Evaluates health risks of stack emissions using a reference method approved by EPA & EQB.
Ecological Risk Assessment	EQB & EPA	Evaluates ecological risks of stack emissions.
Archaeological/Historic Assessment, Phase IA-IB	Institute of Puertorican Culture/Historical Preservation State Office	Determines the probable presence of archeological/historical resources at the Project site
Terrestrial Flora y Fauna Study	DNER	Evaluates the flora and fauna and potential impacts on identified species and habitats.
Wetland Jurisdictional Determination	USACE	Determines the presence or absence of jurisdictional wetlands.
Traffic Study	PRHTA	Determines the current level of service and the impact of the Project on existing and adjacent roads.
Socioeconomic Study	EQB & PRPB	Determines the current socioeconomic conditions and the impacts of the Project on adjacent communities.
Environmental Justice	EQB	Assesses whether the community under analysis is subject to environmental justice based on its socioeconomic or racial status.
Noise Study	EQB	Determines the existing noise conditions and potential impacts of the Project on adjacent communities.
Site Approval Process and Preliminary Endorsements		

Permit/Endorsement	Regulatory Agency	Description
Site Approval	PRPB	Application to build a project in an area where the existing zoning district is not fully consistent with the proposed use
Preliminary Endorsements	DNER, SWMA, PRHTA, PREPA, PRASA, other environmental and infrastructure agencies	Endorsements/comments to the Project
FIRM Amendment Process		
Conditional Letter of Map Amendment Request (CLOMAR)	FEMA/PRPB	Process to authorize the FIRM amendment after the presentation of an H-H study and its acceptance by FEMA.
H-H Study	FEMA /PRPB	Provides technical justification for the FIRM amendment, as established in PRPB Regulation #13.
Location of New Major Stationary Emission Source		
Approval of New Major Stationary Emission Source	EQB & EPA	Reduces the impact of new major stationary sources through the implementation of the permitting process.
New Source Review		
Air Quality Prevention of Significant Deterioration	EPA & EQB	Assessment of compliance of a new major stationary emission source with the National Standards for Air Quality.
Certifications, Notifications and Pre-Construction **Permits**		
Emission Source Construction Permit	EQB	Permit to build any air emission source in Puerto Rico
Permit for the Construction of a Solid Waste Management Facility (DS-2)	EQB	Permit to build any non-hazardous solid waste management facility in Puerto Rico.
NPDES General Permit for Stormwater during Construction Activities	EPA	Requires the preparation of a Pollution Prevention Plan for stormwater runoff and filing of a Notice of Intent (NOI)
Endorsement for proposed construction with potential to affect airspace	US FAA	Notification is required for any construction that may impact airspace.
Incidental Earth Movement Permit for Work Authorized by the Regulations and Permits Administration (RPA) or the Permits Management Office (PMO)	DNER	Authorization to perform necessary earth crust moving activities for RPA authorized works.
Section 404 Permit for Dredged / Fill/ Material Extraction	USACE	Regulates the discharge of dredge and fill materials in waters under the jurisdiction of the United States, including wetlands. As part of the process, the USACE consults with several federal agencies.

Permit/Endorsement	Regulatory Agency	Description
Water Quality Certificate	EQB	Certificate that ensures that established water quality standards will not be exceeded due to the Project operation.
Consistency Certification with the Coastal Zone Management Program	PRPB	Determination that the Project is consistent with established public policies and planning for the coastal zone.
Authorization for Tree Removal, Planting and Reforestation - Regulation Number 25	DNER	Requires a tree inventory to be conducted.
General Consolidated Permit	EQB	Groups the following activities that require construction permits: Non-Hazardous Solid Waste Generating Activity Permit, Fugitive Dust Emission Control Permit, and Erosion Control and Sedimentation Prevention Permit.
Final Endorsements and Construction Permits		
Fire Department (PRFD) Endorsement	Puerto Rico Fire Department	Compliance with existing regulations related to fire prevention and fire risks in the Project
Permit for the installation of fuel tanks	Puerto Rico Fire Department	
Permit for the construction of a wastewater treatment system without discharge to water bodies	EQB	During the design process the need for this permit will evaluated after considering the characteristics of the discharge and PRASA requirements for wastewater pre-treatment.
Puerto Rico Health Department Endorsement	Puerto Rico Health Department	Compliance with buffer zone regulations for treatment plants and pumping stations. Issuing of the Health Certificate for common use areas.
Other Final Endorsements	PREPA, PRASA, PRHTA and DTPW	Required for the presentation of certified permits to RPA
Preliminary Development Approval and Preliminary Construction Permit	RPA/PMO	Required prior to certification of construction permit to determine if the Project complies with applicable laws and regulations and to award variations or exceptions to these laws and regulations, if necessary.
Land Development Permit	RPA/PMO	Required for construction work associated to land development, such as the installation of infrastructure (storm water, sanitary sewer, water, electric), earth moving works, and generally those inherent to land development.
Demolition Permit	RPA/PMO	Total or partial demolition of structures or

Permit/Endorsement	Regulatory Agency	Description
		infrastructure.
Construction Permit	RPA/PMO	Construction of structures
Operation Permits and Endorsements		
Title V Air Emission Source Operating Permit	EQB & EPA	Required for Major Sources under the Regulation for the Control of Atmospheric Pollution.
Solid Waste Management Facility Operating Permit (DS-2)	EQB	Required for facilities that manage non-hazardous solid waste.
Wastewater treatment system operating permit with no discharge into water bodies	EQB	During the design process the need for this permit will be evaluated after considering the characteristics of the discharge and PRASA wastewater pre-treatment requirements.
Pre-treatment permit for discharge into PRASA plants	PRASA	Required to discharge wastewater in PRASA's sewer system
NPDES Multisector Permit for the Discharge of Stormwater during operation	EPA	Required for industrial installations to prevent pollutants in stormwater.
Water Extraction Franchise Operation Permit	DNER	Water extraction permit that establishes sampling and analysis requirements, among others.
Endorsement for Use Permit RPA / PMO	Puerto Rico Fire Department	Endorsement to inspections and compliance with fire safety requirements.
Endorsement for Use Permit	Health Departament	Endorsement to inspections and compliance with the facilitiy health requirements (cafeteria, bathrooms, etc.).
Use Permit	RPA/PMO	Required for the use of the facility

7 IRREVERSABLE OR IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irrevocable and irreversible commitment of a resource is one that makes a natural resource unrecoverable for future use and which status can not be altered afterwards to restore its original value. It is anticipated that as a result of the construction and operation of the Project some irrevocable and irreversible commitments will take place such as:

- Alteration of the topography of the Site, as part of the construction of the Project. Changes should occur to the topography as part of the construction phase of the Project. Specifically, the Project requires the placement of approximately 382,000 cubic meters of artificial fill in a portion of the proposed development area, using the material extracted at the same site;

- Construction materials, including sand, steel and wood are irrevocably committed. Leftovers can be used under existing conditions of their individual market;

- The fuel used by the construction equipment is an irreversibly committed resource;

- Ground movement within the areas that will be disturbed during the construction phase of the Project. These changes will be permanent but they will be made according to the best management and engineering practices and in compliance with environmental regulations. Erosion control will be in strict compliance with the best practices for prevention and control of erosion and soil sedimentation, set forth in the ESC Plan and the SWPP that will be prepared and implemented for the Project;

- Concentrations of fugitive dust during the construction phase will increase due to the handling of earth crust material and the movement of heavy equipment. However, these activities will be temporary and will be adequately controlled by using the best available control mechanisms;

- As a result of the operation of the Project and the associated traffic, there will be an increase in certain air emissions in the area. However, federal and local regulations

are strict and demanding in terms of the effective use of emission controls for these types of projects. Moreover, Energy Answers' PRF technology has demonstrated its ability to consistently and strictly comply with EPA and EQB emission standards for the regulation, minimization, documentation and reporting of emissions. The emission control system to be implemented by the Project will constitute MACT and BACT under the Federal Clean Air Act. Therefore, based on the studies that have been conducted and data for the SEMASS Plant operation, air emissions must not present risks to human health or the environment.

- Changes in vegetation on areas not previously impacted at the Site, as part of the construction of the Project. Once construction is completed, disturbed areas not occupied by structures or pavement will be landscaped. Thus, the Site will be replanted in an orderly and planned manner as an integral part of the Project. Plants species to be used for landscaping shall be specified in the Planting Plan that will be prepared as part of the development of the Project.

Some positive irreversible and irretrievable commitments are anticipated as a result of the operation of the Project, such as:

- Reduction in the generation of methane gas produced by landfills as a result of the decrease of approximately 2,100 tpd that will be handled by the Plant instead of going to a traditional landfill;

- Reduction of leachate produced by the landfill operation;

- Recovery for reuse of significant amounts of recyclable material, approximately 30,000 tons of ferrous and non-ferrous materials.

- Decreased use of earth crust materials for construction-related uses, since Boiler Aggregate™ generated by the Project will be available and marketed;

- Maximization of the useful life of certain landfills in Puerto Rico, that would otherwise receive the solid waste that now would be processed at the Plant; and

- A shift in the use of fossil fuels, including petroleum derived products that would be used to generate 80 MW of electricity, and the corresponding reduction of air emissions that this use generates.

8 DISCUSSION OF THE RELATIONSHIP BETWEEN THE PROPOSED USE OF LOCAL SHORT-TERM AND LONG-TERM COMMITMENT

The Project will require the irreversible commitment of the limited resources discussed in the previous Chapter. However, the use and commitment of these resources will be favorably counterbalanced by the economic, environmental and infrastructure benefits for the Municipality of Arecibo, Puerto Rico and the Region.

In the long term, the construction and operation of the Project will commit the following resources:

- The topography of the Site, which will be altered as part of the construction phase of the Project, and limited air emissions will be added and controlled as part of the construction and operation of the Project;

- The resources that are used to manufacture the materials that will be used during the construction of the Project;

- The resources that are used to manufacture the fuel that will be used by the construction equipment;

- As a result of the operation of the project and associated traffic there will be an increase in certain air emissions in the area. However, federal and local regulations are strict and demanding in terms of the effective use of emission controls for these types of projects. Moreover, Energy Answers' PRF technology has demonstrated its ability to consistently and strictly comply with EPA and EQB emission standards for the regulation, minimization, documentation and reporting of emissions. The emission control system to be implemented by the Project will constitute MACT and BACT under the Federal Clean Air Act. Therefore, based on the studies that have been conducted and data for the SEMASS Plant operation, air emissions must not present risks to human health or the environment.

In the short and long term, the Project will be a positive commitment, as it:

- Contributes to meet the need for reliable and safe infrastructure for power generation from renewable sources, in compliance with the Energy Reform promulgated by the Government of Puerto Rico;

- Contributes to meet the need for reliable and safe infrastructure for the management of solid waste in compliance with SWMA's Dynamic Itinerary for Infrastructure Projects;

- Creates direct, indirect and induced jobs during the construction and operational phases;

- Will result in a reduction in the generation of methane gas produced by landfills as a result of the decrease of approximately 2,100 tpd that will be handled in the Plant and which will not go to a traditional landfill;

- Will result in the reduction of leachate produced by landfill operation;

- Will result in the recovery for reuse of significant amounts of recyclable material, approximately 30,000 tons of ferrous and non-ferrous materials;

- Will result in a decreased use of earth crust materials for construction-related uses, since Boiler Aggregate™ generated by the Project will be available and marketed;

- Will result in the maximization of the useful life of certain landfills in Puerto Rico, that would otherwise receive the solid waste that now would be processed at the Plant;

- Will result in the a shift in the use of fossil fuels, including petroleum derived products that would be used to generate 80 MW of electricity, and the corresponding reduction of air emissions that this use generates;

- Will cause an increase in the economic activity of the area. This will result in larger economic contributions to the Municipality of Arecibo because of

construction excise and income to the State treasury from taxes.

- Will diversify the sources for power production and lower its costs for Puerto Rico's consumers.

If the Project is not developed, the short term productivity of the Site would be virtually none. Therefore, the development of the Project is deemed as the most appropriate, necessary and logical use of the Site area, thus improving its long-term productivity.

9 CONSULTED AGENCIES COMMENTS AND RECOMMENDATIONS

During the past year, the Project has been discussed with various agencies. Energy Answers and its consultants made presentations, had meetings and held field visits with technical and scientific personnel of various regulatory agencies at the local and federal level with the purpose of receiving comments about the Project.

Agencies visited are listed below:

- Solid Waste Management Authority
- Environmental Quality Board
- Department of Natural and Environmental Resources
- Environmental Protection Agency, Caribbean Office.
- Energy Affairs Administration;
- Puerto Rico Planning Board;
- Puerto Rico Highway and Transportation Authority;
- Department of Transportation and Public Works
- Puerto Rico Aqueduct and Sewer Authority;
- Puerto Rico Electric Power Authority
- Institute of Puerto Rican Culture;
- Us Army Corps of Engineers; and
- Environmental Protection Agency

10 PUBLIC PARTICIPATION

The P-EIS is submitted pursuant to the provisions of Article 4(B)(3) of Law Number 416 of September 22, 2004 as amended. In light of the Project and its nature, this P-EIS qualifies to be processed under the provisions of: (a) Law Number 76 (b) Executive Order EO-2010-034; (c) Article 4(B)(3) of Law Number 416 of September 22, 2004 as amended, (d) Resolution R-10-26-1, and RPPETDA (2002), in that it is not inconsistent with the aforementioned.

The public participation process to be observed as part of the evaluation of the P-EIS will be set forth in the Resolution. Public activities include:

- Notification to the community, government agencies and/or stakeholders of the intent by the proponent agency to begin the process of evaluating the P-EIS before the Interagency Environmental Compliance Sub-Committee by the Expedited Process and the EQB, with one (1) public notice in two (2) general circulation newspapers, in accordance with the provisions of Part II (E) of the Resolution;

- Availability of an electronic copy of the P-EIS on EQB's web page and a hard copy at the city hall of the municipality where the Project will be located;

- Comment period on the P-EIS for the community, stakeholders, and government agencies, which can promote the review process of the P-EIS; and

- Participation in investigative hearings, which may be called at the discretion of the EQB. The date, place and time that would be held the same shall be notified by publication of one (1) public notice in two (2) newspapers of general circulation prior to the date of the hearing, in accordance with the provisions of Part III of the Resolution;

- Publication of environmental compliance determination, by public notice, within a two (2) day period of issuance of the Board's decision, in two (2) daily newspapers of general circulation for a period of one (1) day. The public notice will (a) indicate that the Board issued a Resolution determining environmental compliance,

(b) notification of the availability of the F-EIS on the lead agency's website, and an available printed copy at the city hall of the municipallity where the Project will be located, and (c) notification in regards to the terms to initiate judicial review pursuant to the provisions of Act 76.

As part of the P-EIS, and as described in the Executive Summary the following procedures were performed as required by the above mentioned legal provisions

- The P-EIS was circulated among the government agencies specified in **Chapter 12** for evaluation and comments.

- On October 25, 2010, PRIDCO filed with the Board, for its evaluation, the draft P-EIS for the Project. That same day the document was available on the EQB webpage, PRIDCO, EQB library, EQB Regional Office in Arecibo, and the Arecibo Town Hall.

- PRIDCO filed a request for a public hearing with EQB, which issued the R-10-38-1 on October 25, 2010, granting PRIDCO's request regarding the draft P-EIS, as well as an extension to the deadline for comments until the date of the investigative public hearing

- On October 25, 20l0, the draft P-EIS was circulated to multiple government agencies for evaluation and comment.

- On October 26, 2010, PRIDCO published in two (2) newspapers of general circulation, *El Vocero* and *Primera Hora*, a Notice of Intent to Begin the Process of Evaluation of an Environmental Document for the Project.

- On October 27, 2010, EQB published in two (2) newspapers of general circulation, *El Vocero and Primera Hora*, a Notice of Investigative Public Hearing regarding the Evaluation of an Environmental Document for the Project.

- On November 8, 2010, the Investigative Public Hearing for the Project was held in the Municipality of Arecibo. The Examiner in charge of the procedures accepted

until November 9, 2010 the filing of written comments on the proposed action, to be admitted into the official record for the investigative process.

- On November 15, 2010, in accordance with Part III of R-10-26-1, the Examiner assigned to conduct the Investigative Public Hearing procedures for the Project presented the corresponding Report to the Board.

- On November 19, 2010, EQB's Honorable Governing Board issued Resolution R-10-43-1, which adopted the Report and issued several recommendations that had to be part of the revised P-EIS to be submitted in accordance with R-10-26-1.

10.1 Informative Meetings and Public Hearings

Energy Answers has established a robust communications program aimed at disseminating information about the project and encourage public participation. Said program includes informative meetings, participation in public hearings, radio programs, and community involvement. It is worth noting that within community participation, members of various universities and professional organizations, environmental and members from the media have participated and have had the opportunity to exchange ideas and questions with members of the Project's technical and scientific support team:

- On November 19, 2010-EQB's Honorable Governing Board issued Resolution R-10-43-1, which adopted the Report and issued several recommendations that should be made part of the revised P-EIS to be submitted in comliance with the R-10-26-1.

- June 10, 2010-convened meeting by the Arecibo Municipal Legislature to evaluate the Project. The meeting was held before the Municipal Assembly, Arecibo City Hall.

- July 12, 2010-public hearing organized by the Municipal Legislature of Arecibo and its Special Committee to evaluate the project.

- August 27, 2010-Informative briefing about the Project. This meeting took place at the Municipality of Hatillo.

- September 9, 2010-Informative briefing regarding the Project. This meeting took place at the Arecibo Country Club. Items discussed at the meeting were business and employment opportunities that the Project will bring to the Region.

- September 17, 2010 - Public meeting convened by Energy Answers in order to present and review the preliminary draft for the Materials Management Plan (MSP) in compliance with the requirements of Title 40 CFR Part 60.57b, held at the Pontifical Catholic University - Arecibo Campus.

Energy Answers will continue with efforts to disseminate information about the Project and to inform the public of all aspects related thereto.

11 P-EIS TECHNICAL STAFF

The P-EIS was prepared by a professional team of engineers, scientists, economists, and other technical staff in coordination with the Puerto Rico Industrial Development Company. **Table 10-1** lists the people who participated in the preparation and review of the P-EIS, the organization to which they belong, and their role in the preparation of the P-EIS.

Table 11-1: Staff that Participated in the Preparation of the P-EIS

Name	Organization	Responsibility	Academic Background
Joel Meléndez Rodríguez	PRIDCO	Permitting, Environmental and Infrastrucure Consultant	BS Civil Engineering
Mark Green	Energy Answers	Project Manager	M.B.A. B.S. Aerospace Engineering
Michael W. McNerney, P.E.	Energy Answers	Engineering and Technical Support	BS Civil Engineering
Steve Myrvang	Energy Answers	Technical and Engineering Support	B.A. Architecture
Roberto León	CSA Architects and Engineers, LLP	Environmental and Civil Engineering Unit Manager	B.S.C.E. Environmental and Civil Engineering, M.S. Environmental Engineering and Water Quality Licensed Engineer
Raquel Cortés	CSA Architects and Engineers, LLP	Project Manager	B.S. Chemical Engineer Certified by the North America Solid Waste Association
Lionel Vega	CSA Architects and Engineers, LLP	Technical Leader Environmental Permitting and Compliance Division – EIS Coordination and Revision	B.S. Chemical Engineering
María C. Berio	CSA Architects and Engineers, LLP	Environmental	B.S Environmetal Science, Juris Doctor, Master in Environmental Law and Public Policy; Certified by the North America Solid Waste Association
María Coronado	CSA Architects and Engineers, LLP	EIS Preparation	B.S. Geology Licensed Geologist
Brenda Guzmán	CSA Architects and Engineers, LLP	Environmental Discipline Manager	M.S. Marine Biolgy
José Salguero	CSA Architects and Engineers, LLP	Flora and Fauna Study; Jurisdictional Wetland Study; EIS Preparation	M.S. Biology

Name	Organization	Responsibility	Academic Background
Lymarie Urbina	CSA Architects and Engineers, LLP	Site Selection Study Update	M.S. Environmental Health
María Luisa Rivera	CSA Architects and Engineers, LLP	Flora and Fauna Study, Wetland Study	BS Biology MS Biology
Wilson Ortiz	CSA Architects and Engineers, LLP	Water Source Alternative Study; Water and Wastewater Infrastructure	M.S.C.E. Civil and Environmental Engineering, Licensed Engineer
Arturo Galleti	CSA Architects and Engineers, LLP	Electrical Infrastructure	B.S E.E. Licensed Engineer
José Prats	CSA Architects and Engineers, LLP	Electrical Infrastructure	B.S E.E. Licensed Engineer
Alexis Ocasio	CSA Architects and Engineers, LLP	Surveying	Licensed Surveyor
Eduardo Questell Rodríguez	Investigaciones Arqueológicas del Sur	Phase IA-IB Archeological Study	Certified Archeologist
Greg Morris	GMA	H-H Study	PhD Licensed Engineer
José D. Miranda	GMA	H-H Study	B.S. Civil Engineering Licensed Engineer
Luan M. Esteban,	GMA	H-H Study	M.E. Civil Engineering Licensed Engineer
Juan Portalatín	GMA	H-H Study	M.E. Civil Engineering Licensed Engineer
Agnes Ayuso	CSA Architects and Engineers, LLP	Revision of H-H Study	M.S. Civil Engineering Licensed Engineer
Andrea Rayner	ARCADIS-US	Estudio de Impacto a la Calidad del Aire	B.S. Salud Ambiental y Química MS Sistemas de Información Global
Catherine Bukowy	ARCADIS-US	Air Quality Impact Study	B.S. Environmental Science Master Public Administration Master Natural Resources
Keven Duerr	ARCADIS-US	Air Quality Impact Study	BS Biology
Kevin R. Scott	ARCADIS US	Air Quality Impact Study	BS Civil Engineering Licensed Engineer
Julie Conklin	ARCADIS US	Human Health Risk Study	MS Environmental Policy Studies BS Natural Resources Management
Jeanine Smith	ARCADIS US	Human Health Risk Study	M.S. Environmental Science M.S. Public Policy B.S. Chemistry
Kris D. Hallinger	ARCADIS US	Ecological Systems Risk Study	M.S. Environmental Sciene B.S. Ecology
Laura Harrington	ARCADIS US	Ecological Systems Risk Study	MA Geoscience BS Chemistry
Betty Locey	ARCADIS US	Ecological Systems and Human Health Risk Study	Ph.D. and MS Toxicology Licensed Toxicologist
Ruth Vargas	CSA Architects and	Transit Study	B.S. Civil Engineering

Name	Organization	Responsibility	Academic Background
	Engineers, LLP		Licensed Engineer
Ariel Pérez	CSA Architects and Engineers, LLP	Transit Study	M.S. Civil Engineering Licensed Engineer
Jairo Castillo		Noise Study	B.S Environmental Engineering; Licensed Engineer
Graham Castillo	*Estudios Técnicos*	Socioeconomic Study; Environmental Justice Study	Juris Doctor
Wanda Crespo	*Estudios Técnicos*	Socioeconomic Study; Environmental Justice Study	BS Environmental Science MS Planning
Eldris Ferrer	CSA Architects and Engineers, LLP	GIS	M.S. Environmental Science
Elena Vázquez	CSA Architects and Engineers, LLP	GIS	B.S. Environmental Science
Rosa Archer	CSA Architects and Engineers, LLP	GIS	B.S. Environmental Science

12 ENTITIES AND AGENCIES WHO WERE DISTRIBUTED THE P-EIS

The draft P-EIS was extensively circulated to a number of agencies and organizations involved in local and federal approval processes or endorsement for the project. It was also circulated to other agencies and entities with public interest in the development of public infrastructure. The organizations to which the draft P-EIS was circulated are indicated below:

- Environmental Quality Board
- Environmental Protection Agency, Caribbean Office
- Puerto Rico Planning Board
- Energy Affairs Administration
- Solid Waste Management Authority
- Puerto Rico Electric Power Authority
- Puerto Rico Aqueduct and Sewer Authority
- Department of Natural and Environmental Resources
- Department of Agriculture
- Municipality of Arecibo
- US Corpos of Engineers
- Department of Transportation and Public Works/Puerto Rico Highway and Transportation Authority
- Institute of Puerto Rican Culture
- State Historic Preservation Office
- Department of Health
- Fire Department
- Puerto Rico Ports Authority
- Department of Labor and Human Resources
- Federal Aviation Administration

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14 GLOSSARY

Activated Carbon - A coal derivative treated and changed into an extremely porous material, with a high surface area that increases the efficiency of adsorption or chemical reactions. Because of its high micro-porosity, one gram of activated carbon has a surface area of approximately 500 m^2.

Aquifer – Groundwater layer that serves as a reservoir. The largest amount of water in aquifers is contained in sand or gravel chambers or other material, and can be pumped to the surface. Aquifers are formed by rainwater that seeps through the soil until it is collected at a point where the soil is no longer permeable. The springs and wells are supplied by aquifers.

Boiler – Boilers or steam generators are industrial installations that vaporize water for industrial applications using heat from a solid, liquid or gas combustible material.

Clay – Soil containing sand, sediments and mud in almost equal proportions**.**

Composting – A technique that imitates nature to more quickly transform all types of organic remains into a material called compost, which after application to the soil surface is incorporated into soil as an organic and homogeneous product that is well assimilated by soil.

Cumulative Impact – Includes the impact of the projects and existing conditions as well as those of other proposed developments that are realistically defined at the time of the preparation of the EIS.

Daytime – According to the Environmental Quality Board Regulation for the Prevention and Control of Noise Pollution, is the period of a day between 7:01 a.m. and 10:00 pm.

Decibel – Unit of measurement of sound intensity, from zero for the average less perceptible sound, up to 130 for the average level which causes pain, equal to 20 times the logarithm to base 10 of the ratio of the sound pressure measured in relation to the reference pressure, which is 20 micro Pascal.

Deionazed or Demineralized Water – Is obtained through a process that uses specially manufactured ion exchange resins to eliminate ionized water salts. Typically the term is restricted to ion exchange processes that can theoretically eliminate 100% of dissolved salts. Due to its high purity, some physical properties of this type of water are significantly different from water for the daily consumption; demineralized water conductivity is almost zero.

Drinking Water Standard – Drinking water quality standard measured in terms of suspended solids, bad taste and microbes harmful to human health. The water quality standards are included in the drinking water quality regulations from EPA and the Puerto Rico Department of Health.

Earth Crust – Earth's comparatively thin, outermost rocky layer, which has a thickness ranging betweem 7 km in the ocean floor, up to 70 km in the mountain areas of the continents. The most abundant elements of this layer are silicon, oxygen, aluminum and magnesium. The Earth's crust has been generated by igneous processes, and these crusts are richer in incompatible elements

than their respective mantles.

Ecosystem – **N**atural system that consists of a set of living organisms and the physical environment in which they interact. An ecosystem is a unit composed of interdependent organisms which share the same habitat. Ecosystems usually form chains that show the interdependence of organisms within the system.

Environmental Impact – The direct, indirect and/or cumulative effects of a proposed action on the environment, including factors or conditions such as: land use, air, water, minerals, flora, fauna, noise, objects or areas of historical, archaeological or aesthetic value, and economic, social, cultural or public health aspects.

Estuarine - Concerning the estuary or species of river mouths where sea water is mixed fresh and salt water, in what is called the interface or mixing zone. Estuaries are characterized by biological productivity and provide habitat for species of fresh water and salt water at different stages of their life cycle.

Fauna – The set of animal species living in a geographic region, which are characteristic of a geological period or can be found within a given ecosystem.

FEMA – On March 1, 2003, the Federal Emergency Management Agency (FEMA) became part of the Department of Homeland Security (DHS). The primary mission of the Federal Emergency Management is to reduce the loss of life and property and protect the nation from all hazards including natural disasters, acts of terrorism and other man-made disasters, directing and supporting the country in a comprehensive emergency management system regarding risk preparedness, protection, response, recovery and mitigation.

Ferrous – Applies to all metal or substances containing the element iron.

Ferrous Metals – Ferrous metals are composed mainly of iron and feature high tensile strength and hardness. The main alloys are achieved with tin, silver, platinum, manganese, vanadium and titanium. Its melting temperature ranges from 1360 ° C to 1425 º C and one of its main issues is corrosion.

Fill – Soil used as fill or embankement. Fill is soil used to fill a trench or excavation around a construction area, bridge spurs or others.

Flora – Refers to all the plants that inhabit a region, period or special environment, their descriptions, their abundance, flowering periods, etc.

Groudwater Table – The position of groundwater or depth of excavation needed to reach it. Water levels can range from a few feet to hundreds of feet.

Groundwater – Water found beneath the earth, which occupies pores and cracks in rocks and soil below the earth surface and over a layer of impermeable material. Groundwater is free to move by gravity, either downwards towards impermeable layers or along a gradient, usually into a river, lake or ocean.

Habitat – The specific area or environment in which a particular type of plant or animal lives. The habitat of an organism has to provide all the basic requirements for living, including foraging, nesting and reproduction

Hydraulics – Application of fluid mechanics engineering, using liquid-operated devices, usually water or oil.

Hydrology – The scientific study of water on the surface of the earth and below, including chemical composition and movement, particularly irrigation, drainage, erosion, flood control, etc.

Infiltration – Movement of water through the soil surface towards the ground.

Marine – Referring to the sea or sea species.

Native Species – Species belonging to a certain region or ecosystem. Their presence within a region is the result of natural phenomena with no human intervention.

Nocturnal – According to the Environmental Quality Board Regulation for the Prevention and Control of Noise Pollution is the period of a day between 10:01 pm and 7:00 am.

Noise – (1) Sound unwanted by the receptor that causes interference with reception of the wanted sound (2) Annoying or unwanted noise that can psychologically or physically affect human beings or exceeds established regulatory levels.

Non-ferrous Metals – Metals that do not contain iron (Fe) and have a lower tensile strength and hardness when compared to ferrous metals, but have superior corrosion resistance. The main non-ferrous metals used in manufacturing are: aluminum, copper, magnesium, nickel, lead, titanium, zinc.

Osmosis: Basic natural phenomena, by which animal and vegetal cells provide themselves of water.

Per Capita Income – Relation between the Gross Domestic Product (GDP) of a country and its population. To calculate it, the GDP is divided by the total population.

Phreatic level – Mantle surface elevation or top of underground water in the saturated zones of a confined aquifer at one atmosphere of pressure.

Pond – Natural body of water, generally enclosed, smaller than a lake.

Raw Water – Term used to describe a water source that has not been treated or filtrated.

Recharge – Movement of water into the soil through rain or melting snow. Water from streams and temporary flows also infiltrate into the subsoil.

Retention Pond – Man-made body of water, smaller than a lake, built to acumulate wastewater.

Reverse Osmosis – Process in which certain substances from a fluid are not allowed to pass through a membrane. In this procedure a semi-permeable membrane is used for filtration that allows cleaning of total solids, and bacterial purification of up to 99%. In this reverse osmosis process it is necessary to force and pressure the fluid, so the pressure forces the water through the membrane, with impurities exiting through another conduit.

Riparian – Refers to a river or species that are found around riverbanks or another water way.

Sediment – Fine particles of soil suspended or deposited in water and water currents, usually derived from higher ground erosion. Semi-solid residue from any air or water treatment processes.

Sedimentation – Process by which a solid is transported by a current and is deposited at the bottom of a lake, pond, river, dam, channel or other water bodies.

Standards – Rules governing the actions and limits of produced pollutants or emissions. The Environmental Protection Agency sets a minimum standard. Usually, states and Puerto Rico are allowed to be stricter.

Stormwater – Water that accumulates by rain.

Surface Water – All water bodies on the earth surface.

Switchyard – Power distribution system (also known as substation) composed by towers and large switches, usually located near the plant. This system allows a plant to receive or send electrical power.

Topography – General configuration of the surface land.

Transfer Station – Intermediate station for storage, compaction, processing or handling of solid waste for transfer into another facility.

Underground Water Recharge – Movement or percolation (normally downwards) of surface water through soil or a rock zone into an underground water body (underground saturation zone).

Water Runoff – Water flowing as a result of rain on a watershed or drainage area.

Wetland – Areas inundated or saturated by groundwater or surface water at a frequency and time enough to sustain, and in normal conditions maintain, the prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, swamps, and similar areas.

Zone AE Floodway – A river, stream, creek, or natural stormwater drainage and those portions on adjacent land that should be reserved for the encroachment of the base flood level without increasing the level of the surface water elevation more than 0.30 meters.

Zoning Qualification - The designation of areas of land as regulated or reserved for different uses under a land use plan.