CLIMATE RESILIENCE OF THE WATER SECTOR IN THE BAHAMAS PROJECT

ANNEX 6: ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

Prepared for: Caribbean Development Bank

Prepared by: Environmental Solutions Ltd.

EXECUTIVE SUMMARY

Project Scope

The proposed project, Climate Resilience of the Water Sector in The Bahamas, aims to enhance the resilience of the water sector by (i) strengthening the foundations for more evidence-based policy- and decision-making on climate change and the water sector; (ii) supporting relevant stakeholders (including different groups of women and men of all ages) to apply this knowledge to the development and implementation of a more coordinated and coherent policy and governance framework; and (iii) conducting upgrades to water infrastructure across seven islands: New Providence, Andros, Abaco, Acklins, Eleuthera, Exuma, and San Salvador. Infrastructure upgrades include wellfield expansion, pipeline replacement, increased water storage, and risk reduction measures at wellfields and pumping stations. The project is coordinated by the Caribbean Development Bank (CDB) and executed by the Water and Sewerage Corporation (WSC), with funding sought from the Green Climate Fund (GCF).

Baseline Conditions

Groundwater is the primary source of potable water in The Bahamas, with over 90% located within 1.5 meters of the surface. The islands of The Bahamas face significant climate-related vulnerabilities, including sea-level rise, saltwater intrusion, droughts, and intensified storms. Infrastructure is often outdated, with limited storage capacity and exposure to flooding and fire risks. Socially, women, children, and persons with disabilities (PWDs) are disproportionately affected by water insecurity due to caregiving roles and limited mobility. Educational and economic disparities also exist, particularly in the Family Islands.

Environmental and Social Risk Categorization

The project is classified as Category B under CDB's Environmental and Social Safeguards Policy, indicating moderate risk. It aligns with IFC Performance Standards 1–6, with de minimis risks under PS5 (land acquisition), PS7 (Indigenous Peoples), and PS8 (Cultural Heritage). Risks are primarily associated with construction-phase activities and operational impacts on water quality, ecosystems, and community health and safety.

Key Environmental and Social Impacts and Mitigation Measures

Construction Phase Risks:

- Environmental degradation from land clearing and excavation.
- Air and noise pollution affecting workers and nearby communities.
- Utility disruptions and traffic congestion.
- Health and safety risks to workers and vulnerable populations.
- Gender-based violence (GBV) and SEAH risks due to labor influx.

Operational Phase Risks:

- Groundwater depletion and aquifer stress from increased extraction.
- Water quality deterioration due to stagnation or contamination.
- Energy consumption from expanded infrastructure.
- Socioeconomic disruptions if water access is compromised.

Mitigation Measures:

- Implementation of a robust Environmental and Social Management Plan (ESMP) with site-specific management plans.
- Daily monitoring of water quality, noise, and air emissions.
- Use of corrosion-resistant materials (e.g., PVC pipes).
- Gender-sensitive hiring and training practices.
- Emergency response protocols and biodiversity protection measures.
- Stakeholder engagement and grievance redress mechanisms.

Stakeholder Engagement Outcomes

A comprehensive Stakeholder Engagement Plan (SEP) was developed, identifying critical, important, and interested stakeholders. Engagement activities included consultations with affected communities, NGOs, government agencies, and vulnerable groups. Key outcomes include:

- Strong support for infrastructure upgrades.
- Concerns about water quality, affordability, and service reliability.
- Emphasis on gender equity, inclusion of PWDs, and youth engagement.
- Recommendations for transparent communication and community liaison officers (CLOs).

Institutional Arrangements

- Executing Agency: Water and Sewerage Corporation (WSC), responsible for ESMP implementation.
- Project Management Unit (PMU): Includes safeguards specialists overseeing compliance.
- Contractor: Required to prepare and implement Contractor's Environmental and Social Management Plan (CESMP) or Contractor's Environmental and Social, Health and Safety Management Plan (CESHSMP).
- Design Review & Construction Supervision Consultant: Monitors contractor compliance with IFC and CDB's performance standards on environmental and social risks and impacts.
- CDB: Provides oversight and ensures alignment with GCF and CDB safeguards policies.

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LIST OF ABBREVIATIONS AND ACRONYMS

BMCs	Borrowing Member Countries
CARICOM	Caribbean Community
CBOs	Community Based Organizations
CBTUC	Commonwealth of the Bahamas Trade Union Congress
CDB	Caribbean Development Bank
CESHSMP	Construction Environmental and Social Health and Safety Management Plan
CESMP	Construction Environmental and Social Management Plan
CLO	Community Liaison Officer
CoC	Code of Conduct
COPD	Chronic obstructive pulmonary disease
CRS	Climate Resilience Strategy
CWCO	Consolidated Waters Company Limited
DEHS	Department of Environmental Health and Safety
DEPP	Department of Environmental Planning and Protection
EHS	Environmental Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
GBV	Gender Based Violence
GHG	Greenhouse Gas
GCF	Green Climate Fund
GRM	Grievance Redress Mechanism
HIV	Human Immunodeficiency Virus
ICA	Office of Integrity, Compliance and Accountability
MENR	Ministry of Environment and Natural Resources
NCD	Non-communicable Disease
NDC	Nationally Determined Contribution
NGO	Non-governmental Organization
NPDC	New Providence Development Company
PAPs	Project Affected Persons
PCM	Projects Complaints Mechanism
PMU	Project Management Unit
PVC	Polyvinyl Chloride
PWD	Persons with Disabilities
RBPF	Royal Bahamas Police Force
RO	Reverse Osmosis
SDG	Sustainable Development Goal
SEAH	Sexual Exploitation, Abuse and Harassment
SEP	Stakeholder Engagement Plan
SGSS	Social and Gender Safeguarding Specialist
SIDS	Small Island Developing State
STI	Sexually Transmitted Infection
UNFCCC	United Nations Framework Convention on Climate Change
UWI	The University of the West Indies
WHO	World Health Organization
WSC	Water and Sewerage Corporation

WWT	Wastewater Treatment

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1 INTRODUCTION

1.1 Background

1.1.1 Climate Change and the Water Sector in Bahamas

Access to water is a human right. Water, globally, is at the core of sustainable development and is critical for socio-economic development, energy and food production, healthy ecosystems and for health, dignity and human survival. Its versatility, thus, suggests that dependence on this resource varies based on different social categorisations, socioeconomic characteristics, and professions, and hence different groups in The Bahamas would be impacted differently by the issue of scarcity. For example, women who are charged with the responsibility of conducting the majority of household chores (i.e., doing the laundry, cooking, general cleaning, caring for dependents) and childcare tasks require water for specific related activities as opposed to males who may use water for cleaning vehicles, plumbing or general home/outdoor maintenance. In a domestic context, a lack of water risks increasing the burden of care. This could be due to the mental and physical strain that is as a result of the lengthened time taken to complete household chores including but not limited to the abovementioned, or due to the inability to meet not just personal hygienic and sanitation requirements, but also those of any dependents (children, elderly or persons with disabilities, PWDs). Water access also influences the productivity and efficiency of different economic sectors. For example, challenges may arise in the fishing sector who require water for vessel and equipment maintenance. Additionally, different groups are differently influenced by the reliability and quality of water sources for health and sanitation – the risk of water-borne diseases is dependent on the quality and maintenance of a water supply. Regardless, the importance of the availability and accessibility to a reliable source of water cannot be understated.

Groundwater supplies are the principal source of potable water for human consumption in The Bahamas, with over 90% of all freshwater resources located within 1.5 meters of the surface (Roebuck, Pochatila and Ortiz 2004), but with the strain that is placed on this resource due to the national demand of water for domestic purposes, energy generation, industry and other economic activities, primarily agriculture and tourism that fuels the nation's economy, there has been a notable increase in the pressures applied to the sector. As well, climate change is recognized as a severe threat to the water sector in The Bahamas, which is already vulnerable to climate impacts and is likely to become increasingly so since projections suggest that temperatures in The Bahamas are likely to increase, rainfall is likely to decrease on average, storms may potentially increase in intensity and sea levels are likely to rise.

As such, this project aims to strengthen the climate resilience of the water sector in The Bahamas in order to adapt to future changes in climate. The project will be coordinated by the Caribbean Development Bank and its national executing agencies.

Climate resilience in the water sector underpins wider sustainable development objectives in The Bahamas, as recognised in CARICOM's Regional Framework for Achieving Development Resilient to a Changing Climate. A reliable water supply will support development of important economic sectors across the country, including Tourism and Finance, which are the major contributors to The Bahamas economy. The outcomes of the project will, therefore, deliver the foundation for progress towards achieving not only the sixth Sustainable Development Goal on water, but also the other SDGs, accounting for gender and social justice considerations - addressing inequalities and promoting fairness across genders, as well as social and vulnerable groups (i.e., women, children, the elderly, PWDs, persons of different sexual orientation, different religious groups).

The water sector in The Bahamas has been identified as a national priority for climate adaptation in The Bahamas Nationally Determined Contribution (NDC) and previously in the National Policy for the Adaptation to Climate Change. Ensuring long term reliable access to water and sanitation is integrated within Goals seven and nine of the Draft National Development Plan of The Bahamas. In response to

the vulnerability of Caribbean SIDS to the impacts of climate change, the heads of government of the Caribbean Community, CARICOM, in July 2009 approved a "Regional Framework for Achieving Development Resilient to a Changing Climate". Three years later, in 2012, the heads of government of the CARICOM region approved an implementation plan for the Regional Framework. This implementation plan identified water as the most important cross-cutting issue for climate-compatible development in the Caribbean.

1.1.2 The Green Climate Fund (GCF)

The Green Climate Fund (GCF) is an operating entity of the United Nations Framework Convention on Climate Change (UNFCCC), which was established to contribute to the collective efforts of the international community to combat climate change. With the purpose of assisting developing nations in raising and achieving their Nationally Determined Contributions (NDC) goals toward low-emission, climate-resilient pathways, the GCF stands as the largest climate fund in the world - as outlined in the terms of reference, with over USD10.3 billion (bn) pledged as part of its Initial Resource Mobilisation (IRM) in 2014, and its first replenishment process underway. Of this, USD 9.3 billion was confirmed. Designed to be an important part of the effort to mobilise USD100 bn in climate finance per year by 2020, the GCF has a central role to play in addressing the pressing mitigation and adaptation needs of developing countries.

The GCF aims to support developing countries in achieving a paradigm shift to low-emission and climate-resilient pathways. This is to be achieved by funding innovative and transformative mitigation and adaptation projects and programmes developed by the public and private sectors to contribute to the implementation of national climate change priorities in developing countries. Furthermore, The GCF is the first climate finance mechanism to incorporate gender considerations into its decision-making process. It has placed gender as a key element of its programming architecture, and its commitment to gender equality centres on gender-responsive climate action programmes and projects that benefit both women and men, and boys and girls including those from socially excluded and vulnerable communities. GCF's gender-responsive approach is captured in the GCF Gender Policy, which was adopted by the Fund's governing body in 2015 and updated in 2019.

The Caribbean Development Bank (CDB) was accredited to the GCF in 2016 and signed its Accreditation Master Agreement (AMA) in 2018. CDB now aims to scale up its support to Borrowing Member Countries (BMCs) to access and utilize GCF funding to scale up investment in climate change adaptation and mitigation. This is aligned with key CDB policies and strategies, including its Climate Resilience Strategy (CRS), two central pillars of which are to mobilise concessional resources and build technical capacity to support BMCs' climate action ambitions and work programmes.

1.2 Project Description

Building on the above-mentioned priorities, needs and opportunities, CDB and the Water and Sewerage Corporation (WSC) in The Bahamas have been working together to develop a GCF project aimed at safeguarding water security in The Bahamas in a changing climate. A Concept Note was prepared and submitted to the GCF Secretariat in July 2019. This project aims to enhance the resilience of the water sector in The Bahamas to safeguard the country's water security in a changing climate. The project will accomplish this by: (i) strengthening the foundations for more evidence-based policy- and decision-making on climate change and the water sector; (ii) supporting relevant stakeholders (including different groups of women and men of all ages) to apply this knowledge to the development and implementation of a more coordinated and coherent policy and governance framework; and (iii) scaling up investment on highly vulnerable islands to enhance the resilience of the water system and services. In so doing, the project will deliver tangible climate change adaptation benefits while also equipping government and non-government stakeholders to work together to continue strengthening the resilience of the water sector beyond project closure. These adaptation benefits will extend to different social groups, ensuring each is appropriately accounted for in the reinforcement of these policies – the emphasis on climate change resilience via a reliable, effective water sector is expected

to generate tangible social benefits, such as the provision of employment opportunities for the local labour force, an equal and fair access to water resources, and improved communication and collaboration between all stakeholders.

The Project prioritized "Integrated Climate Risk Reduction (Weather and Surge Proofing) to Wellfields and Distribution Stations on Small Systems" as the most effective of the fourteen (14) adaptation options proposed to achieve the aforementioned objectives. This adaptation option would include:

- the upgrade of up to thirty-four (34) groundwater systems and twenty-three (23) wellfields existing in WSC's asset base;
- the raising of WSC's existing assets of (i) elevation less than 3.5m by 1.5m, (ii) elevation less than 4m by 1m, and (iii) elevation over 5m by 0.5m;
- the burial of any existing and new pipework to reduce wind/debris damage risk;
- the burial and ducting of all existing powerlines from the substation to reduce wind/debris damage risk;
- the installation of security measures and weatherproofing of existing elevated wellfield pump houses;
- construction of an elevated storage tank secured to base with a shut-off valve;
- elevating an existing distribution/chlorination station and installing hurricane proof doors and windows;
- installing an elevated backup generator;
- installing an elevated pressure tank;
- installing a flow meter in secure chamber; and
- placing firebreaks around all existing pumping stations in Andros and Abaco with a 20m standoff.

1.3 The Consultant's Mandate

The objective of the consultancy is to support and provide environmental and social advice to the Bank's Project Team in the preparation and analysis of the Climate Resilience of the Water Sector Project, through the execution of an Environmental and Social Impact Assessment (ESIA) and the preparation of an Environmental and Social Management Plan (ESMP) of the Project, to be complied with at all sites of potential construction and operations under the scope of this Project.

The ESIA and ESMP comprises of an analysis of existing environmental and social conditions and include gender analysis of the seven (7) selected islands in the Bahamian archipelago:

1. Abaco
2. Andros (North, Central, South, and Mangrove Cay)
3. Acklins
4. New Providence
5. Eleuthera
6. San Salvador
7. Exuma

All the above islands, with the exception of New Providence, are constituent of what are known as the ***Family Islands***, and hence are referenced as such throughout the report.

To achieve the objective, the consultant visited all relevant Project areas and met with the various technical groups involved, as well as with some of the beneficiaries and Project-affected persons (PAPs). In addition, the consultant conducted a Stakeholder Engagement process by:

- conducting stakeholder analysis and mapping exercises during which the relevant stakeholders are identified

- developing engagement strategies for different stakeholder outlined in a Stakeholder Engagement Plan (SEP)
- producing any necessary reports as a result of this engagement.

1.4 The Study Area

The Bahamas is an archipelagic state with more than 3,000 islands and cays predominantly in the Atlantic Ocean, with only thirty (30) of the islands currently inhabited. According to the 2022 Population and Housing Census, these islands accommodate just under 400,000 (399, 314) persons; females outnumber males: there are 206,770 females and 192,544 males).

The state is situated north of Cuba, northwest of Hispaniola and southeast of the state of Florida in the United States of America. The landscape of the Bahamas is generally flat with minimal natural water resources. The Caribbean state, however, is known for the prevalence of blue holes.

The project's scope encompasses an assessment of seven of the islands in the Bahamian archipelago (see Figure 1-1), albeit only four (4) were ultimately selected for works to be undertaken. The seven islands for assessment were:

- New Providence (**Populations Size: 296, 522** - 142,979 M; 153,543 F)
- Eleuthera (**Population Size: 9,247** - 4,459 M; 4,788 F)
- Andros (**Population Size: 7,780** - 3,751 M; 4,029 F)
- Exuma (**Population Size: 7,293** - 3,517 M; 3,776 F)
- Abaco (**Population Size: 16,587** - 7,998 M; 8,589 F)
- San Salvador (**Population Size: 824 -** 398 M; 427 F)
- Acklins (**Population Size: 692** - 334 M; 358 F)

**Population sizes as reported in the 2010 Population Census*

The aforementioned are similar in their geography, boasting consistent low-lying, flat lands and similar climatic conditions. The majority of the nation's population is concentrated in the urban centre of Nassau, the nation capital, situated on the island of New Providence. The population density is approximately 25 persons per square kilometre, one of the lowest on the global scale. This is due to the widespread distribution of the population across the many different islands, cays and islets in the archipelago. The Bahamas are representative of the Caribbean's cultural diversity, with many of its different islands serving as major destinations and hubs for tourism activities.

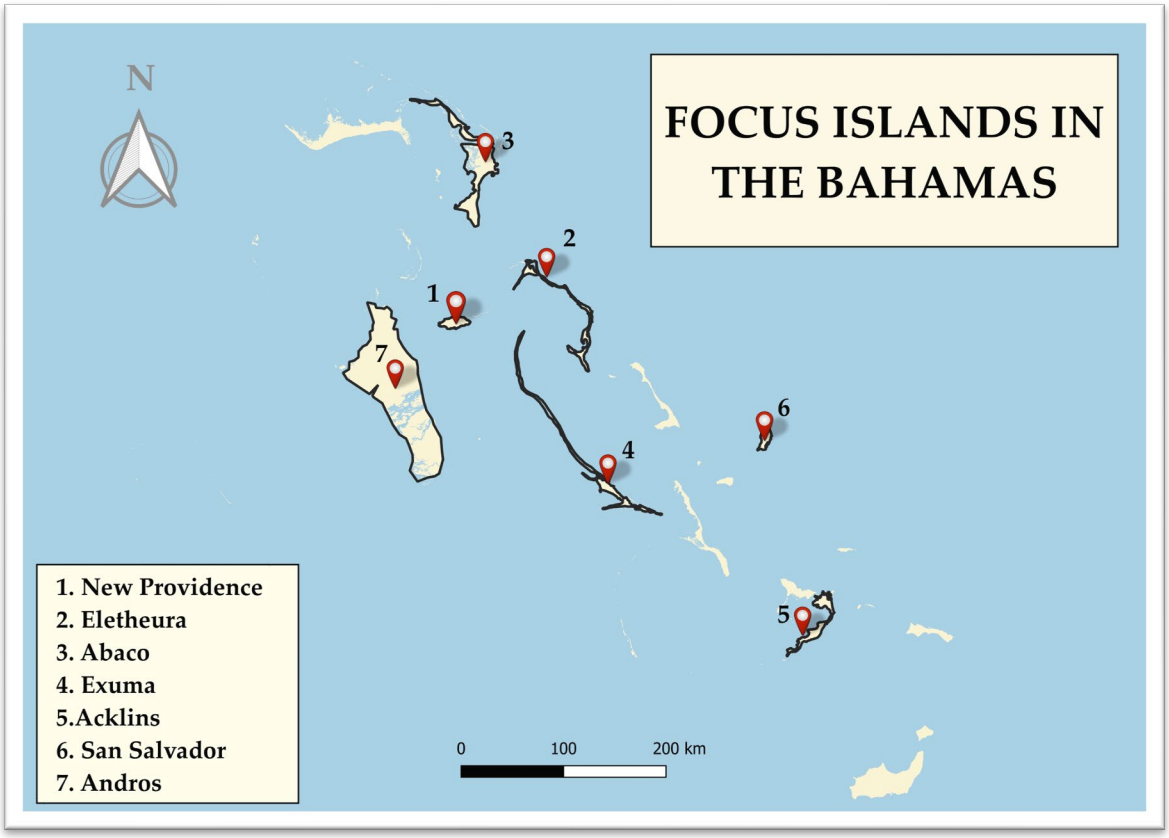

Figure 1-1: The Study Area - Islands of Focus in the Bahamian Archipelago

The islands encompassed within the project's scope represent some of the recognized major islands in the archipelago, determined by their population and significance to the nation's key environmental (physical and ecological) composition.

1.5 Relevant Legislative Requirements

Relevant legislation, policies or acts related to climate resilience, the water sector, gender and social issues in the Bahamas include:

1.5.1 National Policy for the Adaptation to Climate Change (2005)

This policy acknowledges the high vulnerability of The Bahamas to the projected impacts of global Climate Change largely due to its low elevations. It is expected that climate change will result in the depletion and pollution of potable ground water supplies in the island. On many islands especially those primarily comprised of a limestone carbonate geology such as the islands of The Bahamas, groundwater resources such as aquifers are the main source of drinking water due to inadequate surface water sources (Welsh and Bowleg 2022). The availability of groundwater resources for water supply are dependent on various factors including precipitation recharge and saltwater intrusion. Climate change is anticipated to cause sea level rise which is expected to contaminate groundwater aquifers through the intrusion of salt water. Additionally, climate variabilities are expected to change the seasonal availability and spatial distribution of freshwater resources, with influences from extreme weather events such as hurricanes and droughts.

1.5.2 National Energy Policy (2013-2033)

The Bahamas National Energy Policy provides a framework for the country to achieve its energy goals, which includes the use of alternative energy sources, renewable energy and promoting energy efficiency and conservation measures while reducing oil imports, as well as lowering greenhouse gas emissions. The Bahamian government with the assistance of the Inter-American Development Bank

(IDB) and the Global Environment Facility (GEF), was able to undertake a project which provided the installation of solar water heaters in Bahamian homes. Through consultations with various stakeholders including the Water and Sewerage Corporation (WSC), revealed that solar energy could be used to power solar water heaters considering the country's significant solar resources which average 5.3 kWh/m^2/day on the Global Horizontal Irradiation (GHI) scale. Goal 1 of the National Energy Policy seeks to improve the awareness of the importance of energy conservation, using energy wisely and continuously pursue opportunities for improving energy efficiencies. Within this goal the production and dissemination of water is a key area where the efficiency of the energy sector is concerned.

1.5.3 The Water and Sewerage Corporation Act, 1993

The Water and Sewerage Corporation Act stipulates that water is considered to be a national resource of the Commonwealth of the Bahamas. The establishment of the Water and Sewerage Corporation is governed by this Act which outlines the functions and powers of the corporation. The Act also outlines the governance and maintenance of water supply across the country, including the corporation's discretion to supply, connectivity to new or existing premises and the power to cut off water supply access. The Act also highlights offences which can result in the liability of fines of $1,000 and/or imprisonment of up to 6 months due to the use of water for restrictive purposes, as well as the damages to meters and fraudulent connections.

1.5.4 Employment Act, 2001

This Act outlines the legislation regarding employment within The Bahamas. It states that no employer or person acting on behalf of an employer should discriminate against an employee or applicant for employment on the basis of race, creed, sex, marital status, political opinion, age or HIV/AIDS by refusing an offer to employment. It also explains that prohibiting an employee access to opportunities for promotion, training or benefits is unacceptable. The Act also calls for equal pay for equal work in that employees should not be paid at a rate less than the rate of other employees for the same kind of work or for work of equal value, work that requires the same skill, effort, responsibility and which is performed under similar working conditions with the exception of seniority, merit or earnings by quantity or quality of production.

1.5.5 Environmental Planning and Protection Act, 2019

The Environmental Planning and Protection Act establishes the Department of Environmental Planning and Protection which is tasked with providing and ensuring the integrated protection of The Bahamas environment, ensuring the sustainable management of its natural resources. In relation to water supply and management, the Act states that the Department is to develop objectives and quality standards to be implemented in conjunction with the input from other stakeholders and agencies. Additionally, a plan should be developed for the conservation of surface waters and ground water resources.

1.5.6 Disaster Preparedness and Response Act, 2008

This Act concerns the response to disaster emergency planning, preparedness and management in the country. The Act stipulates the designation of specially vulnerable areas for the purposes of the mitigation of, preparedness for, response to and recovery from emergencies and disasters by delimiting such areas. Considering the projected impacts of climate change such as extreme weather events such as hurricanes and intense precipitation some areas, especially those inhabited by citizens in vulnerable areas and as such would require the need for special area precautionary plans.

1.5.7 Sexual Offences and Domestic Violence, 2006

The Sexual Offences and Domestic Violence Act recognizes rape as an offence in which the act of any person above the age of 14 having intercourse with another person who is not his spouse. This definition does not criminalize the concept of marital rape or recognize it as a possibility. It also acknowledges trafficking or procuration attempts for the purpose of intercourse, prostitution, failure

to disclose status regarding AIDS and intercourse with children or the mentally impaired as sexual offences.

As it relates to discrimination, The Constitution of The Commonwealth of the Bahamas Chapter III Article 26 speaks to the Protection from discrimination on grounds of race, etc.

2 APPROACH AND METHODOLOGY

2.1 General Approach

The multi-disciplinary team conducted data gathering and analysis together to determine the ecological, physical and socioeconomic baseline conditions of the seven different islands relevant to the proposed project. This was done through a site visit conducted in May 2023 where key interviews and observations were made as well as via a detailed review of secondary data used to inform the assessment. This process commenced in the early months of 2023 and continued into the later months of the year when consultations with subject-matter experts were held mainly to gather additional information on gender and social issues. Among the key activities conducted were:

- Site visits of target islands
- Desktop research
- Analysis of maps and plans
- Review of reports and background documents
- Stakeholder consultations

Other proposed developments and surrounding land use were also reviewed in the context of compatibility with the proposed project including potential positive, negative and cumulative impacts.

The following subsections describe the approach for assessing the physical, ecological and socio-economic environment.

2.2 Physical Assessment

This section describes the methods associated with conducting the topographical, geological, climate, hydrological and natural hazard assessments of each of the selected islands in The Bahamas. The secondary data used when determining the baseline conditions of the physical characteristics of the islands were supported by images captured during the Consultant's visit to the project sites – the seven different islands.

2.2.1 Climate

The climate of the area was determined through a review of data from the Bahamas Department of Meteorology and other published literature. Climate change projections from the State of the Caribbean Climate, 2020 prepared by the Climate Studies Group at UWI were also reviewed and referenced.

2.2.2 Topography and Relief

The relief of each island was determined through a review of data presented in published literature that was also supplemented by topographical maps of The Bahamas.

2.2.3 Geology and Soils

The geology of the Bahamian islands was determined from a report that compared the physical characteristics of the different major islands in the archipelago in an overall assessment of the water resources of the islands. This was supplemented by other published literature.

2.2.4 Natural Hazards and Vulnerability

Desktop review of past events was used to inform the section on natural hazards. This included literature on flooding, earthquakes, hurricanes and climate change.

2.2.5 Water Resources

The water resources assessment conducted and published by the engineering arm of the US Military was primarily consulted when determining the status of water resources in the Bahamas.

2.3 Ecological Assessment

The ecological assessment was primarily done by consulting the Bahamas National Trust's website that lists all the nature reserves, protected areas and national parks. Previous ecological studies of the different islands, as well as imagery captured during the Consultant's visit to the islands were also used as supplementary material to conduct a more holistic assessment of the ecological conditions on the different conditions.

2.4 Socioeconomic Assessment

The proposed project will likely affect the surrounding community and vice versa. As such, the main purpose of the socioeconomic analysis was to place the proposed project within the context of the local human environment so as to understand the existing socioeconomic setting and determine the potential impacts discerning negative and positive influences.

Secondary data was heavily relied on to produce this report and was primarily retrieved from the 2010 Population and Housing Census Report as well as the 2022 Preliminary Census Report. This data was analysed and discussed to present demographic information. Qualitative data was also gathered to complete this assessment and was primarily retrieved from interviews conducted with stakeholders identified as potential sources of key socioeconomic information. These stakeholders were identified based on the results of a cursory stakeholder analysis process that categorised stakeholders based on their attributes and functions (primary and secondary) that were deemed relevant in relation to the Project.

The socioeconomic assessment also included a gender assessment that was informed by key informant interviews with social and gender experts representing the different Family Islands. This assessment was supplemented with data retrieved from the 2010 Population and Housing Census Report as well as the 2022 Preliminary Census Report which provided sex-disaggregated data for housing, household headship, education, and income generation. The 2023 Labour Force Survey was also relied upon for sex disaggregated data related to employment. These were used to aid in the determination of any instances of gender disparity.

2.5 Assessment of the Water Sector

Information regarding the state of the water sector on each island was primarily ascertained through consultations held with key stakeholders as well as through observations made during the Consultant's field visit to the project sites.

2.6 Assessment of Impacts and Risks

The main goal is to identify the direct, indirect and cumulative environmental and social impacts associated with the project at and around the site, focusing on both positive and negative impacts and risks as well as bio-physical, chemical, social, economic and cultural components of the environment including, but not limited to:

- Effects on wildlife, terrestrial and marine biodiversity
- Effects on existing or proposed protected areas or other sites of conservation or special management interest
- Effects on surrounding communities (residential and commercial activities)
- Effects on livelihoods

Table 2-1: Defining the nature of the potential impacts

Term	Definition
Positive Impact (Benefit)	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Negative Impact	An impact that is considered to represent an adverse change from the baseline or introduces a new undesirable factor.
Direct Impact	Impacts that result from a direct interaction between a planned project activity and the receiving environment/receptors (*e.g.* between occupation of a site and the pre-existing habitats or between an effluent discharge and receiving water quality).
Indirect Impact	Impacts that result from other activities that are encouraged to happen as a consequence of the Project (*e.g.* in-migration for employment placing a demand on resources).
Cumulative Impact	Impacts that act together with other impacts (including those from concurrent or planned future third-party activities) to affect the same resources and/or receptors as the Project.

Table 2-2: Impact Rating Table

Criteria used for impact rating	
Extent	• On-site – Limited to within the site boundaries (plus a 6m buffer to each side of the pipe's centreline); • Local – impacts that affect an area in a radius of 2km around the site; • Regional – impacts that affect regionally important resources or are experienced at traditional authority or district scale; • National – impacts that affect nationally important resources or affect an area that is nationally important/ or have macro-economic consequences; • Transboundary/International – impacts that extend beyond country borders or affect internationally important resources.
Duration	• Temporary – impacts are predicted to be of short duration and intermittent/occasional; • Short-term – impacts that are predicted to last only for the duration of the construction period; • Long-term – impacts that will continue for the life of the Project, but ceases when the Project stops operating; • Permanent – impacts that cause a permanent change in the affected receptor or resource (*e.g.* removal or destruction of ecological habitat) that endures substantially beyond the Project lifetime.
Likelihood	• Unlikely – The impact is unlikely to occur. • Likely – The impact is likely to occur under most conditions. • Definite – The impact will occur.

Criteria used for impact rating	
Magnitude	• Biophysical environment – magnitude can be considered in terms of the sensitivity of the receptor: o Negligible – the impact is not detectable; o Low – the impact affects the environment in such a way that natural functions and processes are not affected; o Moderate – where the affected environment is altered but natural functions and processes continue, albeit in a modified way; o High – where natural functions or processes are altered to the extent that it will temporarily or permanently cease.

Table 2-3: Impact Significance or Severity Criteria

Significance criteria	
Negligible significance	An impact of negligible significance is where a resource or receptor will not be affected in any way by a particular activity, or the predicted effect is deemed to be imperceptible or is indistinguishable from natural background levels.
Low significance	An impact of low significance is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value.
Moderate significance	An impact of moderate significance is one within accepted limits and standards. The emphasis for moderate impacts is on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that "moderate" impacts have to be reduced to "minor" impacts, but that moderate impacts are being managed effectively and efficiently.
High Significance	An impact of high significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. A goal of the ESIA process is to get to a position where the Project does not have any major residual negative impacts, certainly not ones that would endure into the long term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a development. It is then the function of regulators and stakeholders to weigh such negative factors against the positive factors, such as employment, in coming to a decision on the Project.

2.7 Limitations to the Study

The assessment of the Socioeconomic Environment was hindered primarily by the fact that the most recent complete publication of the national census is representative of the year 2011. Only the preliminary results from the 2023 census activity could be used as an accurate representation of existing conditions. However, the preliminary report only provides information on population size.

The Consultant had to assume that whatever claims regarding gender roles, responsibilities and disparities made by stakeholders consulted during key informant interviews were accurate. As well, the Consultant had to assume that the literature reviewed are accurate.

SECTION I
THE ESIA

3 THE EXISTING ENVIRONMENT

3.1 New Providence

3.1.1 The Ecological Environment

This remains the most populous island in the Bahamian archipelago and hosts a variety of coastal and inland ecosystems – ranging from wetlands to tropical forests in the relatively flat interior. These systems serve as habitats to the island's wildlife, specifically the unique plant and avian populations that are housed in the different protected areas scattered around the island.

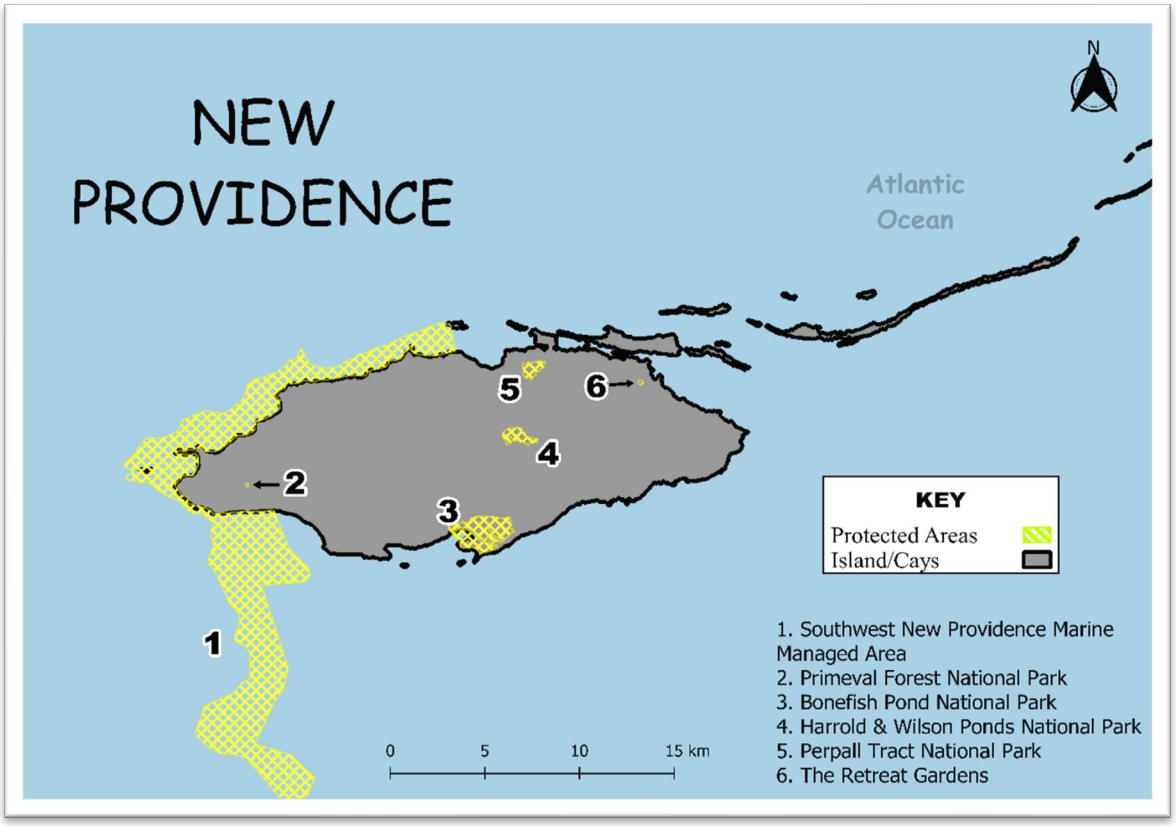

Figure 3-1: Protected Areas on New Providence

The southern region of New Providence is marked by the presence of the island's singular mangrove system, found in the Bonefish Pond National Park, an area of coastal wetlands spanning over one thousand (1000) acres. The park is populated by scores of different species of birds and marine life, including the bonefish, barracuda and queen conch. The Bonefish Pond stands above muddy underlayers as just one example of nearshore marine habitats found on the island, with others being seagrass meadows and sandy shores.

Other wetlands distributed around the island are considered important 'bird areas' due to their capacity to house a diverse range of birds such as egrets, ibises and cormorants. The Harrold and Wilson Ponds National Park are especially noteworthy for the sheer concentration and variety of birds that their carrying capacity can withstand, and as such serves as home to the largest colonies of these different species on the island.

Pine forests, primarily consisting of the Caribbean Pine or Yellow Pine (*Pinus caribaea var. bahamensis*), characterized by needle-like leaves and scaly barks, dominate the different wetlands of New Providence. The Bushy Beard Grass (*Andropogon glomeratus*), Southern Bracken Fern (*Pteridium aquilinum var. caudatum)* and the Pink Poui "Five fingers" (*Tabebuia bahamensis*) are also found in abundance in Bahamian coniferous forests that mainly populate the southwestern region of the island.

The Primeval Forest National Park is located in this region and remains one of the last places on the island where the old blackland coppice forests can still be seen. The blackland coppice is a thick and dense cluster of heavily diverse trees said to don a dark appearance that grows tall enough to allow for the development of shade-providing canopies and is comprised of trees like cedar and mahogany. Within these forests are a variety of insects, reptiles and mammals many of which are endemic to the Caribbean isles, such as the Bahama Boa Constrictor (*Epicrates sp.*), the Zebra Longwing (*Heliconius charitonius*), the Bahama Green Anole (*Anolis smaragdinus*) and the Blue-tailed Lizard "Lion lizard" (*Ameiva auberi*).

This island is also unique for its blend of native and exotic plants ranging from palms and seed-bearing cycads to hardwood dicots and flowering trees found in the Retreat Garden oasis in the heart of the nation's capital, Nassau. The Retreat Garden is one of the country's most popular botanical gardens with a biodiverse ecosystem that often sees both resident and migratory birds feeding on the plant-produced berries and nectar.

3.1.2 The Physical Environment

3.1.2.1 Climate

Figure 3-2: Pinelands in New Providence

New Providence has been documented by residents and visitors alike as being subject to relatively mild conditions. Summers tend to be hot and cloudy while Winters prove dry and windy. Diurnal temperature fluctuations remain at a minimal, seldom exceeding 3 degrees Celsius. Likewise, seasonal variations in temperatures are also at a minimum with the mild conditions typically persisting throughout the year.

New Providence is characterized by a bimodal weather pattern, having both a wet and dry season. The wet season typically runs from May to October with September having the greatest levels of precipitation. It is also the wettest island in the archipelago, receiving over 50 inches of rainfall annually.

3.1.2.2 Topography and Relief

The island of New Providence consists of approximately 208 sq. km. of land. Like most islands of The Bahamas, New Providence is relatively low lying and flat with elevations reaching up to 37 metres above sea level. New Providence consists of elevated marine sandflats and lagoon deposits. Waters surrounding the island are relatively shallow, reaching depths no greater than 25 metres.

New Providence is populated by different bodies of freshwater, such as shallow lakes and ponds that dominate the north-central region of the island. No rivers can be found on the island, but instead tidal creeks are etched into the landscape along the southern and north-western sections of the coastline. The Harrold and Wilson Ponds found on the island are most notable for their role as natural parks that

protect the island's ecosystems and ecological balance. The largest body of water found on the island is Lake Killarney, sat in the central region of the island and reaches depths of just 3 metres.

The island is connected to its smaller neighbour to the north-east, Paradise Island, by a pair of bridges that run across the Nassau Harbour.

3.1.2.3 Geology and Soils

New Providence is situated within the Great Bahama Banks – carbonate platforms that are over 4.5 km thick and have been submerged. When exposed, the carbonate platforms that make up the Great Bahama Banks are subject to chemical weathering, leading to the formation of blue holes, caves and sinkholes. Limestone developed as weathered remains from oolitic limestone parent material is the predominant makeup of the soil found on this island.

3.1.2.4 Natural Hazards and Vulnerability

New Providence has been affected by multiple hurricanes and storms that pass through the Caribbean. Hurricane Dorian and Hurricane Matthew are among examples of such tropical cyclones that exposed the island's vulnerability. Storm surges and strong winds from these tropical cyclones damaged infrastructure in the most vulnerable areas of the island. Damages were felt particularly in the housing sector, with losses exceeding $200 million. The development of low-lying wetlands and seasonal ponds via urbanization decreases the natural runoff capacity and infiltration rate, resulting in an increase in the likelihood of flooding in these areas, especially due to precipitative events. Being one of the most populous islands in the archipelago, the impacts of these hazards would be exacerbated by the sheer losses that would be experienced in New Providence where most of the nation's population and administrative structures are located.

Flooding stands as one of the most threatening hazards to the infrastructure of the water sector in New Providence. Flooding in areas such as Blue Hill, where it is acknowledged that upgrades to the pump station are needed, and South Pond pose a problem. In South Pond, the pumps are typically emersed when it floods.

3.1.2.5 Air and Noise Quality

The Bahamas, in general, exhibits good air quality with its low-lying topography and near constant ocean breezes. However, air quality across the islands is sometimes affected by Saharan dusts that cross the Atlantic and are deposited in the Caribbean region. Not only does this potentially have adverse effects on coral reefs and soil composition but is also considered a serious threat to public health, particularly for those with underlying respiratory complications. New Providence, being the most urbanized and densely populated island in the Bahamian archipelago, can be described as exhibiting good air quality. The island, although the centralized region of the nation's main industrial and other economic activities, cannot be faulted with excessive emissions. It, however, still should be noted that with the highest urban population across the nation, emissions on New Providence are likely also augmented by motoring activities.

This is also the rationale behind the noise quality of the island with noise likely only generated from vehicular traffic, aviation and other economic activities. Naturally, it is expected that any construction activities undertaken would increase noise levels in the area of Works and may also increase emissions due to excavation activities and the use of heavy machinery.

3.1.3 The Socioeconomic Environment[1]

3.1.3.1 Demography

New Providence is the most populous island in the Bahamian archipelago. According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total

[1] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report.

population of the island is 296,522, comprising of 142,979 males (~48%) and 153,543 females (~52%). When compared to the Census report published in 2010, the male population experienced a growth of 21.26%, while the female population experienced a growth of 19.56%.

Figure 3-3 shows the population pyramid of New Providence in 2010, when the last final census report was published. The figure shows that the bulk of the New Providence's population consists of individuals under the age of 25. There are typically more females than males in the differing age groups, with the exception of the youngest groups (14 and younger) where there is only a slight difference in the number of males and number of females. The elderly (of age 65 and over) were the least numerically represented on the island, accounting for 17.5% of the total population.

The Census report also shows that approximately 91% of the population was Black, with the remaining 9% being comprised of mixed races, Whites, Asians and East Indians.

Determining the age and gender structure of the island's population aided in indicating the main uses of water, as different age groups and genders tend to use water differently (for employment or social roles). This would, therefore, help to identify who would be most affected by the impacts to the water sector by climate change. This is discussed further in Chapter 4.

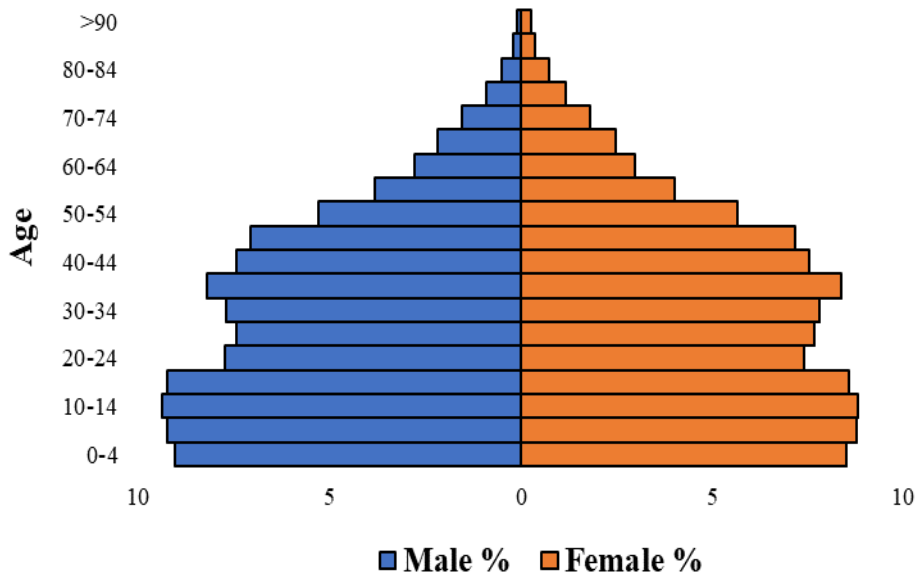

Figure 3-3: New Providence Population Pyramid – 2010; Source: Bahamas National Statistical Institute

3.1.3.2 Housing and Households

Of the 118,221 households across the nation recorded in the 2022 Preliminary Census, New Providence accounted for 79,660 (~67%) with an average household size of 3.72, which was found to be higher than that of the national average of 3.38. Table 3-1 below shows the state of housing tenure in New Providence as recorded in the 2010 Census Report.

Table 3-1: Housing Tenure in New Providence in 2010

TENURE	NUMBER OF HOUSEHOLDS	PERCENTAGE OF TOTAL
Fully owned	21776	31.0%
Owned (Mortgage)	17518	25.0%
Rent	27417	39.1%
Rent-free	2893	4.1%

TENURE	NUMBER OF HOUSEHOLDS	PERCENTAGE OF TOTAL
Lease	374	0.5%
Other	188	0.3%

Of the total private dwellings in 2010, 41,275 were headed by a male (~59%) while 28,891 (41%) were headed by a female. However, it was found that the highest earning households, earning annual incomes greater than BSD$80,000 were headed by males, with the exception of households containing more than 10 members. The trends in household economics and characteristics showed that the larger households with at least 10 members tend to be headed by females. This was also true for the low-earning households, earning no more than BSD$40,000 annually. The highest earning households, on average, consisted of 2-5 members while the majority of the lowest earning households were comprised of those with a sole member.

There were 9,089 vacant dwelling units on the island, which was more than the vacant units found on all the other target islands combined. Housing architecture on New Providence is influenced by the climate, the exposure to natural hazards and by the emergence of more eco-friendly, energy efficient designs as a direct response to climate change. Materials used for the construction of houses on the island are the conventional wood, limestone, concrete, polystyrene and reinforced steel.

3.1.3.3 Education

For the purposes assessing educational attainment in New Providence and the Family Islands, the population was considered from the age range of 15 and above (consistent with what is presented in the 2010 Population Census). Of the 180,715 residents of New Providence who met this criterion, approximately 29% did not achieve any form of official educational qualification. This proportion of the population included 27,302 males (~52%) and 24,807 females (~48%). Education in the Bahamas is compulsory from age 5 through to 16. Despite education being compulsory, there are still barriers to educational attainment, which are discussed in Chapter 4.1.5.

There were fifty-six recognized educational institutions on the island of New Providence in 2020. Table 3-2 below indicates enrolment in each educational level offered on the island.

Table 3-2: Enrolment in New Providence (2020)

LEVEL OF EDUCATION	ENROLLED (2020)
Preschool	491
Primary	14966
Secondary	11749
Post-secondary/Tertiary	3790
Other	345

3.1.3.4 *Economics*

The most recent comprehensively reliable data was compiled in the Household Expenditure Survey 2013 Report[2], produced by the Bahamas National Statistical Institute. Therefore, this data on household expenditure produced in The Bahamas is dated. The 2013 report states, *"The poverty line indicates the minimum amount of money required for households to afford a balanced, low-cost diet, to which a provision is added to meet essential non-food needs."* Based on this claim, one out of every eight Bahamian resident was considered to be living in poverty in 2013. The poverty level of New Providence was found to be 12.4%, which slightly differed from the national rate of 12.5%. Although

[2] Bahamas Household Expenditure Survey 2013 Report – Version 2

women comprised the majority of the poor (51.8 percent), poverty rates were higher for males (13.2 percent) than for females (12.4 percent).

New Providence contributes up to 74% of the national gross domestic product (GDP). This is according to the Department of Statistics Gross Domestic Product (GDP) by Island for 2015 to 2019 press release[3]. The primary economic activities on the island relate to the tourism and the construction industries, with minor contributors including agriculture and industry.

Chapter 4 discusses further how employment in the different sectors differ based on gender.

3.1.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. As the public sector's tertiary level referral hospital, Princess Margaret Hospital is located on the island of New Providence. As such, it serves as the hub for public sector referrals from all other islands, including Grand Bahama and Abaco. Other health facilities on the island include:

- Adolescent Health Centre
- Anne's Town Clinic
- Blue Hill Road Clinic
- Coconut Grove Clinic
- Elizabeth Estates Clinic
- Flamingo Gardens Clinic
- Fleming Street Clinic
- Fox Hill Clinic
- Gambier Clinic
- South Beach Health Centre

The Bahamas has seen high rates of chronic non-communicable diseases (NCDs) such as diabetes, hypertension, chronic respiratory disease, heart disease and cancer. For example, 45% of deaths in 2003 were due to chronic non-communicable diseases. A survey conducted in New Providence showed that a sedentary lifestyle and unhealthy diets were the leading reasons for the high rates of obesity, diabetes and hypertension measured in the island since the start of the Century. The ministry responsible for health and wellness has since taken the initiative to promote a healthier lifestyle in the island to reduce the prevalence of these chronic non-communicable diseases. However, the health sector is also challenged with handling the issue of Human Immunodeficiency Virus (HIV).

As of 2017, 1.3% of the nation's population was living with HIV, with 81% of these cases residing in New Providence. Although this was found to be a 55% decrease in HIV prevalence when compared to the rates measured in 2008, HIV still poses a threat on the island with over 1,000 persons succumbing to the virus between 2008 and 2017. This also represented a decrease in HIV-related deaths, serving as a testament to the efforts being undertaken by the island's health sector.

3.1.3.6 Land Use

Figure 3-4 visualizes the land use patterns present on the island of New Providence. The eastern section of the island is the most densely populated, with built residential and commercial areas. The western section is not as dense, with lands zoned for agricultural purposes and as green spaces. There are notable surface water sources in the north-central and south-central regions of the island with the presence of lakes and ponds. The southern coast in particular was characterized by the presence of several ponds.

[3] Gross Domestic Product of The Bahamas by Islands [New Providence, Grand Bahama and Other Family Islands]

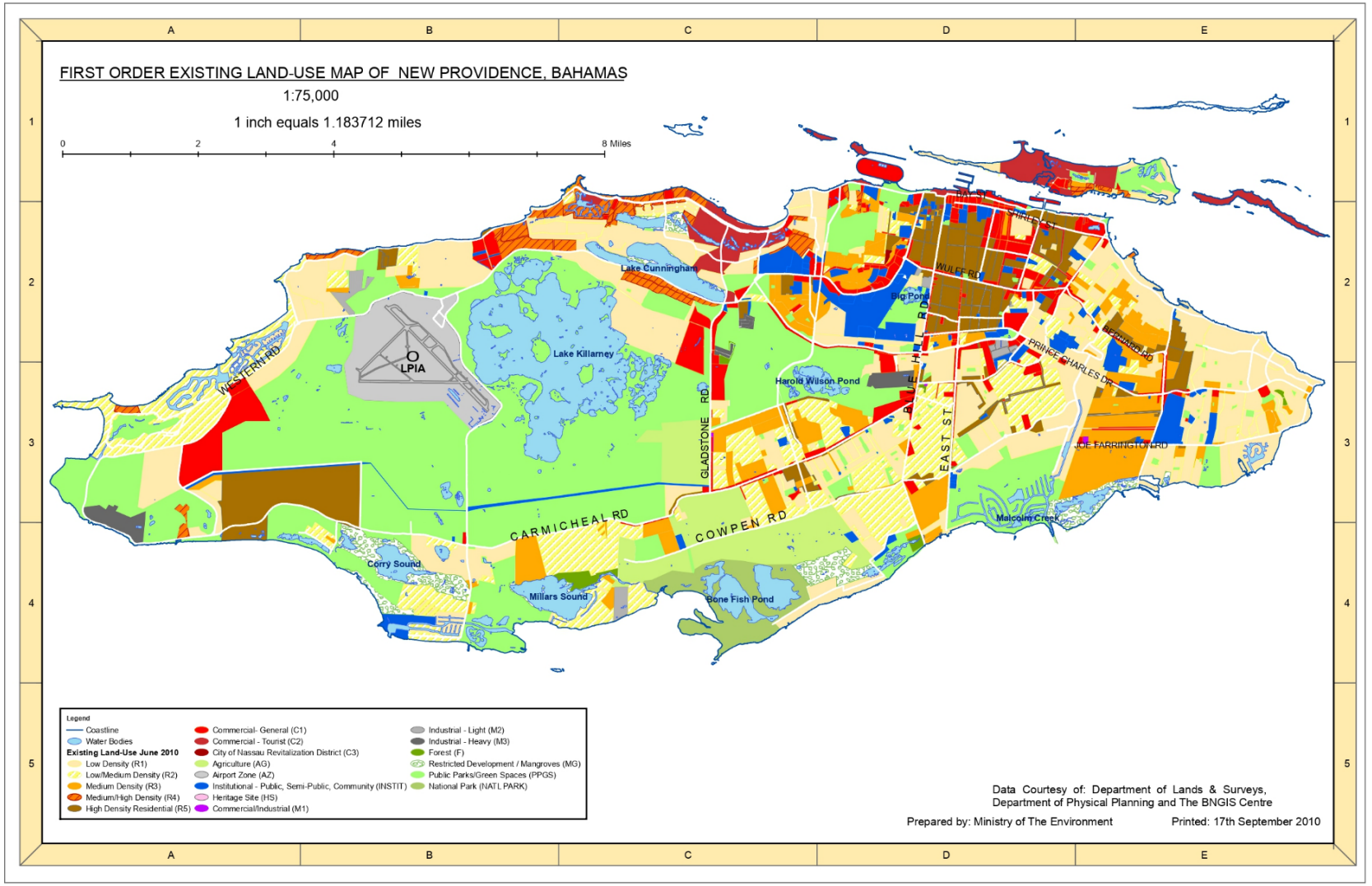

Figure 3-4: Land Use Map of New Providence
Sourced from the Department of Lands & Surveys, Department of Physical Planning and The BNGIS Centre

3.2 Eleuthera

3.2.1 The Ecological Environment

Home of up to thirteen native amphibian and reptilian species, this island's natural features range from reef outcrops and caves to undulating beaches of sand. Winchell (2015) reported sightings of all four species of the Anole iguanian lizards native to the Americas: *Anolis angusticeps*, *Anolis distichus*, *Anolis sagrei*, and *Anolis smaragdinus*. These reptiles were mainly found in the southernmost region of Eleuthera in beach scrub habitats and coppice forests. Other native species, such as the Bahamian boa (*Chilobothrus striatus*) and the Bahamian racer (*Alsophis voodoo*), are also known to populate that region of the island.

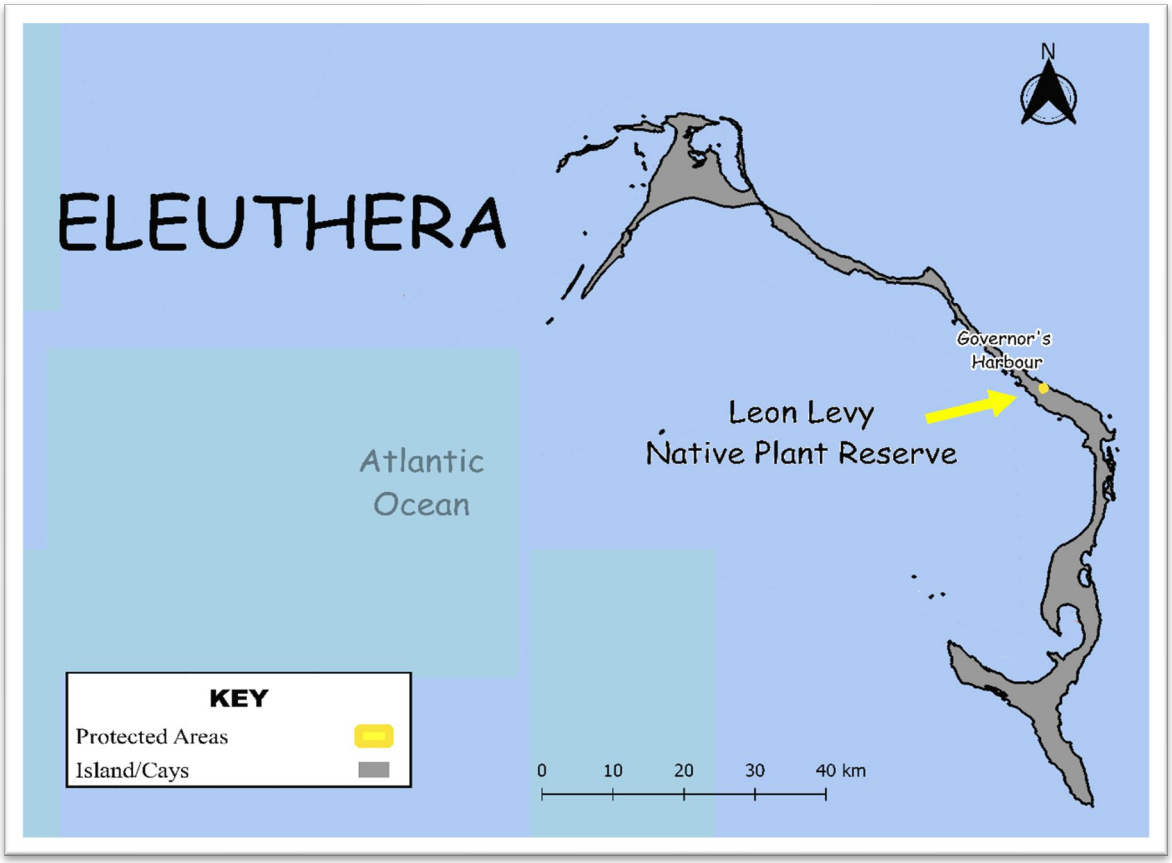

Figure 3-5: Location of the Leon Levy Native Plant Reserve in Eleuthera

Like most islands in the Bahamian archipelago, wetlands and pinelands that are habitats to a variety of bird and marine life, are abundantly present. But the real diverse nature of the wildlife population is best observed in the thirty-acre Leon Levy nature preserve located in Governor's Harbor. The preserve is home to flowering plants, medicinal herbs and towering hardwood trees that act as both a breeding and feeding ground to attracted insects and avian life native to the Bahamian Isles.

Traditional bush medicine is a notable constituent of the Bahamian culture, and the island of Eleuthera acts as provider to some of the sources of this form of medicine. The slave bush (*Solanum verascif olium*), banana (*Musa acuminata*) leaves, breadfruit (*Artocarpus altilis*) leaves and the milk or sap of the green papaya (Carica papaya) are all harvested from the island's nature preserve (Gibson, 2015). Medicinal herbs found and used throughout the Caribbean region are also consistently found throughout the Bahamian isles. Herbs such as the white sage (*Lantana involucrate*), aloe vera (*Aloe barbadensis miller*) and cerasee (*Momordica charantia*) are widely used, along with the strong back (Bourreria ovate), jackmadar (*Eupatorium villosum*) and yellow elder (Tecoma stans), whose practical uses have been exported and adapted in Europe (Wilmanowicz, 2010).

The Bahama Woodstar (*Nesophlox evelynae*), endemic to the Caribbean nation, is famously sighted in Eleuthera, where it capitalizes on the abundance of flowering trees that provide nectar for feeding. Marine life ranges from the lemon shark (*Negaprion brevirostris*) and bonefish (*Albula vulpes*) found in coastal waters and estuaries (Murchie et al., 2010; Nowell et al., 2015) to the native Caribbean reef octopus (*Octopus briareus*) found in saltwater lakes, most notably the Sweeting Pond in the heart of Eleuthera Island (Aronson, 1986). Shallow mangrove creeks and seagrass meadows found around shores of the Bahamian isles act as nurseries for the sea turtles commonly found in the Bahamas – the leather back (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green turtle (*Chelonia mydas*) and hawksbill (*Eretochelys imbricata*). The Cat Island Slider (*Trachemys terrapen*) is also commonly sighted in Eleuthera and is one of the species of freshwater turtles native to the Bahamas.

Figure 3-6: Diverse vegetation typically found on the Eleuthera Island

3.2.2 The Physical Environment[4]

3.2.2.1 Climate

Climatic conditions in Eleuthera are favourable, with temperature variations remaining consistent throughout the year. The island experiences its highest levels of precipitation in October and its lowest levels of precipitation in March, with total annual precipitation averaging over 43 inches. Eleuthera experiences a tropical climate with both a wet (May to October) and a dry season.

3.2.2.2 Topography and Relief

Eleuthera stands as the longest island in the Bahamian archipelago. The main island, along with its associated islands, are widest at some points with widths of approximately 1.5 kilometres and is just over 177 kilometres in combined length. Along the coasts of Eleuthera are sandy beaches, sheltered bays, harbours, bluffs and cliffs. Rocky shorelines and cliffs are predominantly found in the northern regions of the island where both the North Atlantic Ocean and the Caribbean Sea wash the island's shores. The central region of the island is relatively hillier while the southern region features more lush vegetation on flat lands. The island is generally flat and low-lying, occupying approximately 512 sq. km.

[4] Information in this chapter was retrieved from the Water Resources Assessment of the Bahamas (2004) as well as the United Nations Common Country Analysis of the Bahamas (2020).

of land area with elevations reaching up to 60 metres in height. Freshwater bodies are very sparsely distributed across the island, as exemplified by the lack of any major fluvial or lacustrine systems unique to the island.

Figure 3-7: Rocky shoreline on Eleuthera's coasts

3.2.2.3 Geology and Soils

The island falls along the most eastern ridges of the Bahamian archipelago and the Great Bahamas Bank. The carbonate nature of the rocks that dominate the island's geological makeup gives rise to karst features like caverns, blue holes and sink holes. The karst topography of the island is dotted with thousands of sinkholes carved into the landscape via the process of carbonation. Via this process, many caves are also developed. The most extensive cave system found in Eleuthera is the Hatchet Bay Cave that extends over 1 km underground. Other caves like the Preacher's Cave and Smuggler's Cave, and deep karst features are home to small-scaled karst features. Stalagmites, stalactites and columns are some of the common karst features found within the deep karst features of the island.

The Glass Window Bridge serves not only as a popular attraction on Eleuthera but also as a key geological formation. The Bridge is a rock formation located in the north of Eleuthera and separates the Atlantic Ocean to the east from the Caribbean Sea to the west. It represents where the island narrows to the north to an isthmus as wide as the Bridge itself. It is susceptible to high intensity wave action from the Atlantic that could rise to as high as 100 feet.

One scientific study on the island have shown that the soils on Eleuthera are generally considered to be 'agriculturally poor and devoid of many nutrients'[5]. The study further states that the red soil found in the north and central regions of the island originate from West African nations, possibly being deposited as Saharan dust from across the Atlantic. The poor quality of the soil on the island is accredited to the large quantity of limestone that is found across the islands.

3.2.2.4 Natural Hazards and Vulnerability

The impacts of natural hazards in Eleuthera are exacerbated by environmental stressors, primarily the degradation of natural resources[6]. The low-lying and flat nature of the island renders it susceptible to

[5] Permaculture Research Team: Soil Amendments
[6] NDPBA The Bahamas Island Risk Profiles Subnational Assessment Results

different hazards, mainly tropical cyclones, storm surges, landslides and flooding. Eleuthera's vulnerability to hazards that would affect coastal environments in particular is influenced by the reduced capacity of surrounding reefs to provide the ecosystem service of natural protection against coastal hazards. This is likely due to climate change and anthropogenic factors such as improper fishing, tourism (diving, snorkeling and boating) and development activities (pollution and sedimentation) that have either lead to the bleaching of the corals or their physical degradation Extreme wave action not associated with tropical cyclone activity are also potential threats to the island. This type of wave action is typically due to winds altering wave heights.

Eleuthera was not majorly affected by Hurricane Dorian, one of the most severe Atlantic hurricanes to have struck the Bahamas. The last hurricane to have had significant effects on Eleuthera was Hurricane Allen in 1992. Spanish Wells, the offshore island northwest of the main island of Eleuthera, still is vulnerable to storms due to its low-lying nature. Not only is there the threat of flooding, but also the disruption to access routes as the main method of access is via the ferry system.

3.2.2.5 Air and Noise Quality

Like New Providence, Eleuthera is also affected by the Saharan dust from across the Atlantic. The effect of the dust deposited is notable in Eleuthera where the alteration of soil composition could influence agricultural activities. For example, the red loams of Eleuthera have been historically used for pineapple farming in North and Central Eleuthera. With primary economic activities (fishing and agriculture), along with tourism-related activities, constituting the bulk of activities on the island, there is no significant source of mass emissions that would reduce the air quality of the island to an alarming level. This is also true for noise levels, with the most notable source of noise generation being aircraft departing and arriving at the island.

3.2.3 The Socioeconomic Environment[7]

3.2.3.1 Demography

Along its 110-mile length, Eleuthera is home to fishing villages and colonial communities. North Eleuthera and South Eleuthera make up its two halves. The social structure of Eleuthera consists of a notable number of settlements and is also notable for the presence of Haitians that, in some cases, settle with the island's locals. With the presence of illegal settlements, there is a clear disparity in water supply and poverty on the island of Eleuthera (see Chapter 3.2.3.4 and Chapter 3.2.3.5).

According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total population of the island is 9,247, comprising of 4,459 males (~48%) and 4,788 females (~52%). When compared to the Census report published in 2010, the male population experienced a growth of 9.88%, while the female population experienced a growth of 15.54%.

The female population in Eleuthera is evidently greater than that of the male's and this is kept consistent at the constituent level as both North Eleuthera (males: 1,892; females: 2,031) and South Eleuthera (males: 2,567; females: 2,757) have a population made up of more females than males.

Figure 3-8 shows the population pyramid of Eleuthera in 2010, when the last final census report was published.

[7] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report.

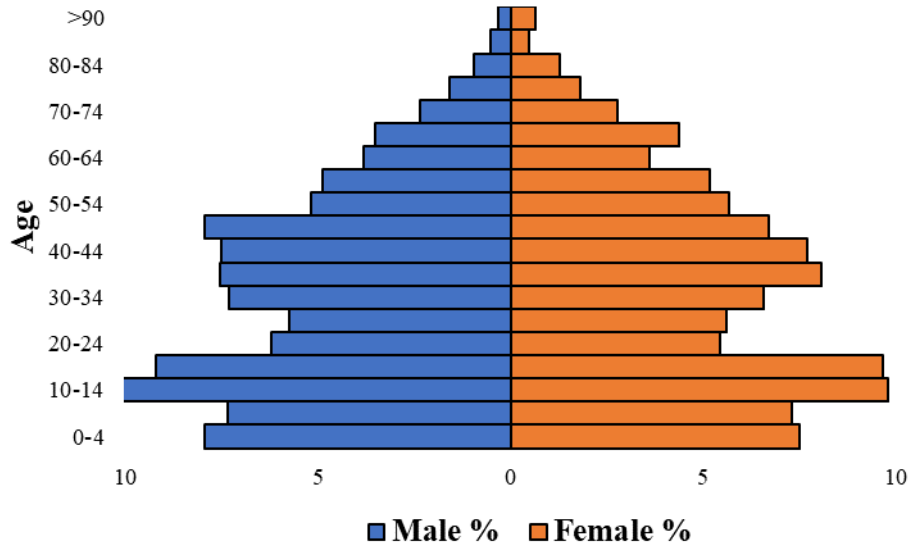

Figure 3-6: Eleuthera Population Pyramid – 2010; Source: Bahamas National Statistical Institute

3.2.3.2 Housing and Households

According to the 2022 Preliminary Census Report, there are 3,668 recorded households on the island, an increase from the 2,718 recorded in 2010. Despite the increase in the number of households, there was a decrease in the average size of households, from 3.02 in 2010 to 2.52 in 2022. Table 3-3 below shows the state of housing tenure in Eleuthera as recorded in the 2010 Census Report.

Table 3-3: Housing Tenure in Eleuthera in 2010

TENURE	NUMBER OF HOUSEHOLDS
Fully owned	1648
Owned (Mortgage)	212
Rent	602
Rent-free	251
Lease	1
Other	3

Of the recorded households in 2010, 1,770 were found to be headed by a male while 947 were headed by a female. While these values do not indicate a clear gender disparity, considerations should be made for females who have to assume the responsibilities of being the head of their households in addition to the responsibilities they stereotypically hold as females. Chapter 4.1.2 discusses further this issue.

3.2.3.3 Education

Of the total population in 2010 (8,202), 6,163 (75%) were recognized as having achieved some form of educational attainment (having completed at least primary school). Furthermore, this percentage consisted of slightly more females than males (~51% were females). This small difference indicates that there is no clear gender disparities in educational attainment on the island, using this metric.

The O level certification was also used as the baseline to represent the successful completion of secondary education. The number of males who at least received O-Level certification was recorded at 651, less than the 1,014 females recorded for receiving the same level of certification (females accounted for 61% of persons with their highest level of educational attainment being at least the O-level certification). This gender disparity was also evident as it relates to educational attainment

measured at the tertiary level. A bachelor's degree was used as the baseline for educational attainment at the tertiary level, and this was at least achieved by 240 females and 198 males.

Some of the recognized educational institutions on the island of Eleuthera are listed below:

- Island School
- North Eleuthera All Age
- Central Eleuthera High School
- Deep Creek Primary School
- Gracewood Christian Academy
- North Eleuthera High School
- Rock Sound Primary School
- Samuel Guy Pinder All Age School
- P. A. Gibson Primary School
- Windermere High School
- Lauren L Anderson Primary School
- Emma E Cooper Primary School
- Preston H. Albury High School
- Governor's Harbour Primary School
- CEI Wet Lab School
- Kish Kids Preschool
- Green Castle Primary School
- Emily G. Petty Primary
- George Town Primary School
- Harbour Island
- James Cistern Primary
- Tarpum Bay Primary
- Wemyss Bright Primary

In some communities, the wealth of the residents is sufficient for the funding of projects to provide a safe and reliable water supply to schools. However, there are still schools across the island that are reliant on the public water supply.

3.2.3.4 Economics

Fishing is the main economic activity on this island, concentrated on the Spanish Wells beach located on one of Eleuthera's most northwestern cays. Along with fishing, small-scale farming can also be observed – goat rearing and banana cultivation are two of the most popular agricultural practices of the island, with pineapple cultivation being moderately practised. Tourism is also considered a significant economic driver with the ongoing construction of Disney's Lighthouse Point Development and the increase in associated employment opportunities during the construction and operation phases. Hospitality services are also offered in major tourist hubs such as Harbour Island. It is expected that tourism will play an even more significant role in the economic development of Eleuthera with the expansion of the island's airport as well as the expansion of docks in Spanish Wells and Harbour Island, and the growth of the Airbnb business in the community which will enhance the island's tourism product.

Table 3-4 shows the household income of both female-headed and male headed households in Eleuthera

Table 3-4: Annual Income of Male-Headed and Female-Headed Households in Eleuthera, 2010

ANNUAL HOUSEHOLD INCOME RANGE	NUMBER OF MALE HEADED HOUSE HOLDS	NUMBER OF FEMALE-HEADED HOUSEHOLDS
0-5000	167	144
5,001-10,000	223	146
10,001-15,000	192	113
15001-20000	161	100
20001-40000	445	251
40001-60000	226	63
60001-80000	87	20
80001-100000	54	8
100001 and over	31	7
Not stated	184	95

More male-headed households were found to generate the highest ranges of annual household incomes. The poverty rate for the Family Islands recorded in 2013 was 17.2% which was higher than that of New Providence. However, only 12.9% of the total Bahamian population below the poverty line resided in the Family Islands. As with the entire nation, although women comprised the majority of the poor, poverty rates were higher for males than for females. The data presented in the Bahamas 2013 Household Expenditure Survey was not disaggregated to allow for comparisons between Family Islands.

3.2.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. The Princess Margaret Hospital is located on the island of New Providence, but it serves as the hub for public sector referrals from all other islands. Other health facilities on the island include:

- Bahamas Wellness (Eleuthera Medical)
- Health Clinic- Governor's Harbour
- Tarpum Bay Clinic
- Hatchet Bay Clinic
- South Eleuthera Emergency Partners (SEEPS)
- Rock sound Clinic
- Spanish Wells Medical Center
- WB Clinic
- Gentle Hands Concierge Nursing Services
- Family Medicine Center
- Briland Premier Medical Center

There are no specific data that detail the rate of NCDs across the Family Islands. However, the World Health Organization (WHO) reports that NCDs are the leading causes of morbidity and mortality in The Bahamas. As with New Providence, these NCDs include diabetes, hypertension, chronic respiratory disease, heart disease and cancer. Water-borne illnesses are not prevalent across the Family Islands. However, consequent to Hurricane Dorian, there was a notable increase in these water-borne illnesses and this was accredited to the lack of water for sanitation and hygiene due to the disrupted water supply.

3.3 Abaco

3.3.1 The Ecological Environment

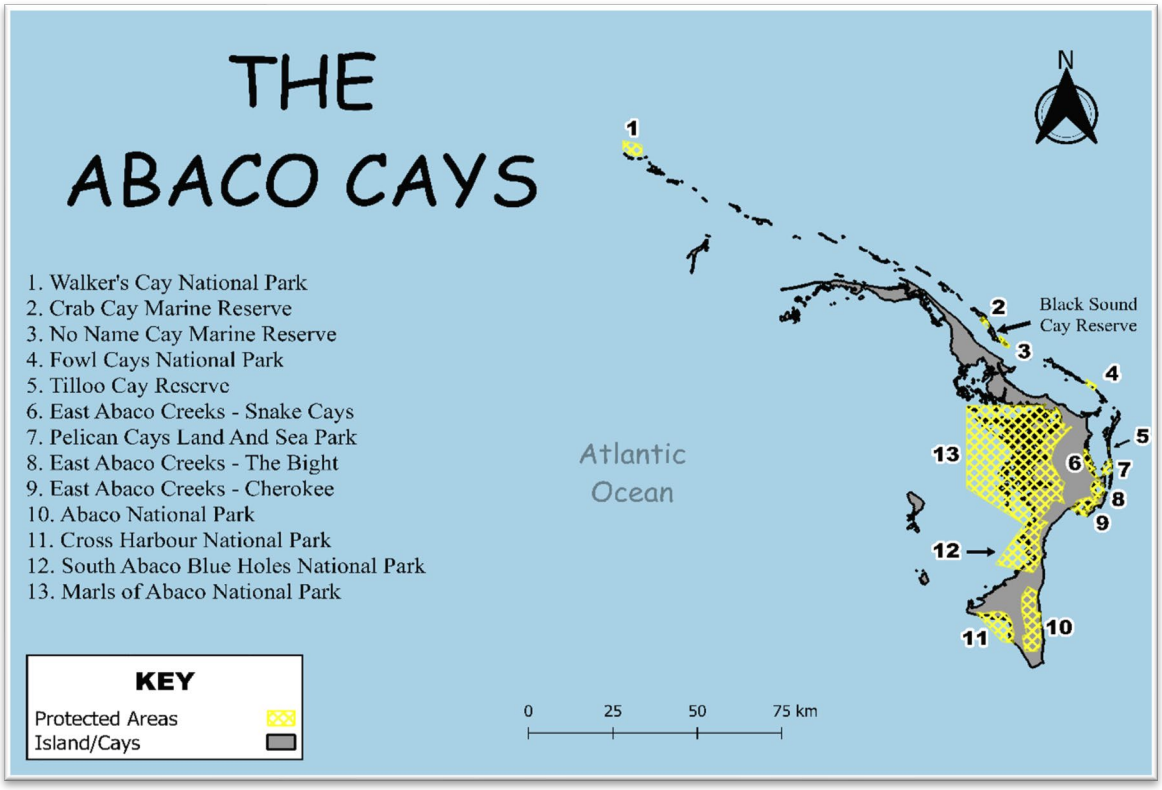

Figure 3-7: Protected Areas in the Abacos

Located in the northern tip of the archipelago, Abaco is characterized mainly by cays, underwater caves and coral reefs in addition to the customary Bahamian wetlands and pinelands. Its many protected areas are home to the diverse plant and animal life, some of which are endemic or native to the Bahamas. The reefs of Abaco are populated by rays, reef sharks and turtles that navigate the northwestern coastal regions. Pine and coppice forests of the Abaco National Park are noteworthy for being the breeding grounds of the Bahama Parrot (*Amazona leucocephala bahamensis*), unique for ground nesting.

The Caribbean Pine and Coppice forests that make up the Abaco National Park are home to 4 of Bahamas' endemic bird species: the Bahama Warbler (*Setophaga flavescens*), the Bahama Yellowthroat (*Geothlypis rostrata*), Bahama Swallow (*Tachycineta cyaneoviridis*), and Bahama Woodstar (*Calliphlox evelynae*). They are also home to a variety of reptiles and insects, such as the Curly Tailed Lizard (*Leiocephalus carnitus).*

Figure 3-8: Curly-tailed lizard

*The **Bahama Parrot** is endangered due to the threat of flood rains and predatory animals, such as feral cats, boars and snakes that exploit their habit of nesting in small cavities in forest grounds.*

Figure 3-9: The Bahama Parrot

Image retrieved from The Bahamas National Trust Field Guide to the Pine Forests of the Bahamas

Abaco is surrounded by numerous cays on which most of the natural parks and reserves are located. The Black Sound Cay Reserve is located on the Green Turtle Cay and features patches of mangrove forests that surround the coppice forests found on the small island. These mangrove forests can be found near reefs and serve as nurseries for different species of fish, as well as provide habitation for a variety of waterfowl and endangered ducks, such as the White Cheeked Pintail (*Anas bahamensis*) and the West Indian Whistling Duck (*Dendrocygna arborea*).

The Fowl Cays National Park mainly features rocky shores, beds of seagrass and seaward protrusions of lands of sand, silt and clay that favour burrowing animals capable of withstanding changes in the substrate. The Pelican Cays Land and Sea Park, Tilloo Cay National Reserve and Walker's Cay National Park are all protected regions of reefs and beaches that serve as nursing and nesting grounds for hundreds of species of animal life, including the queen conch (*Strombus gigas*), the Caribbean Spiny Lobster (*Panulirus argus*), the Nassau Grouper (*Epinephelus striatus*), the Yellow-crowned night heron (*Nyctanassa violacea*), along with other sea and tropic birds. The Pelican Cays Land and Sea Park in particular are refuge sites for green sea turtles.

Only four mangrove species are predominantly found on this cay and across the Bahamian archipelago: the Red Mangrove (*Rhizophora mangle*), Black Mangrove (*Avicennia germinans*), White Mangrove (*Laguncularia racemosa*) and Buttonwood (*Conocarpus erectus*) and differ according to their resilience to different environmental conditions. Red Mangrove, also called 'true' mangrove, is a flowering plant that derives its name from the reddish colour that is produced due to the chemicals found in its notably dense wood. This type of mangrove has roots that anchor the trees, making them especially capable of surviving in the salt water of the surrounding sea. Leaves from the Red Mangrove eventually accumulate in water until the threshold is reached where Black Mangrove, which characteristically settles in the mud of wetlands, can be sufficiently supported. While Black Mangrove has developed to reside in mud, White Mangrove is more capable of surviving further inshore. Buttonwood is the only category of mangrove capable of surviving in dry, salty conditions.

Figure 3-10: Seabirds observed close to rocky shorelines of the Abaco Cays

Figure 3-13 below shows Caribbean seagrass (*Halophila decipiens*) that is located off the coast of Abaco. The seagrass serves as a habitat to a variety of marine life, including turtles, fish, squid, seahorses, anemones and crabs. It is estimated that the Caribbean holds up to half the world's seagrass meadows by surface area, and it contains about one-third of the carbon stored in seagrasses worldwide (Shayka, et al., 2023). This is important for SIDS that continue to experience the detrimental effects of a changing climate as having this large area of such a valuable ecological resource capable of siphoning carbon has the capacity to offset the human contributions to climate change. This highlights the significance of the ecosystem services provided by the seagrass which are threatened by coastal development, chemical pollution, recreation, shipping and climate change. Although the figure shows the seagrass located in the region of the Abaco island, it is important to note that this significant resource can likely be found throughout the Bahamian marine and coastal environments, including that of New Providence and the other Family Islands.

Figure 3-11: Caribbean seagrass off the coast of Abaco

3.3.2 The Physical Environment[8]

3.3.2.1 Climate

Abaco's climate is similar to that of the entire Bahamian archipelago in that it can be divided into a wet and a dry season. Rainfall in Abaco is seldom extreme, except in the case of storm activity. Temperature variations are minimal and are kept relatively consistent throughout the year, with average temperatures fluctuating about 30 degrees Celsius. Average annual precipitation in Abaco reaches up to 40 inches.

3.3.2.2 Topography and Relief

The second largest island in the archipelago, Abaco and its associated cays occupy just over 2000 sq. km. of land area located in the northern region of the Bahamas. Its two major islands, Great and Little Abaco, features a multitude of small cays, such as Walker's Cay and the Grand Cays, that surround the mainland and house small settlements. Elevations stretch up to 154 metres in the southernmost region of the island. The Abaco islands are protected by the third largest barrier reef in the world, known as the Florida Keys Reef Tract.

Abaco is largely flat and rocky with minimal surface water body coverage. The islands consist of blue holes, man-made lakes and ponds. One of the most unique geographic features of the Abaco Islands is the extensive mangrove and mud flat systems found along the western shores of the Great Abaco Island – a region populated by quantities of small islands fraught with dense vegetation. South of the main island is the Cherokee Sound, a shallow water lagoon that doubles as an isolated coastal community. Great Abaco Island, being the largest of the Abaco chain of islands, runs up to 193 kilometres in length. The Sea of Abaco is demarcated by small, offshore islands to the west of Great Abaco and features many sand beaches.

3.3.2.3 Geology and Soils

Abaco mainly consists of limestone rocks that have been carved out into different karst features, most notably caves. The cave systems found beneath the pine forests in South Abaco extend up to 14.5 kilometres in length and covers 15.5 sq. km. of land. The four main cave systems in South Abaco are Dan's Cave, Ralph's Cave, Nancy's Cave, and Sawmill Sink. Many of the unexplored cavern systems found on the Abaco Islands can be accessed via the different unique blue holes that are also features of the geography of the islands.

3.3.2.4 Natural Hazards and Vulnerability

Climate change is considered to be one of the main driving forces behind the vulnerability of the Abaco Island. The increase in the frequency of storm activity, as well as increases in global temperatures, influence Abaco's exposure to extreme storm activities with the potential to cause inundation and landslides. Increase in global temperatures correlates to an increase in sea level rise which threatens the submergence of coastal environments in many small islands, such as the ones that populate the Bahamian archipelago.

Hurricane Dorian in 2019 was one of the most impactful Atlantic storms to have affected the Bahamas in recent years, and in particular, Abaco and its associated cays. Not only did it lead to the uprooting of pine and cedar trees, the loss of life, the displacement of populations and increased pressure on social services, it also had a notable impact on the water supply infrastructure. The hurricane led to the saline intrusion of the wellfields in the north of the Abacos and disrupted access to the wellfields and some pumping stations.

[8] Information in this chapter retrieved from the Water Resources Assessment of the Bahamas (2004) as well as the United Nations Common Country Analysis of the Bahamas (2020).

Forest fires are also common occurrences in the Abacos, especially during the summer. Forest fires are often accredited to anthropogenic factors. One such activity is the hunting of wild hogs which involves the strategy of lighting fires as a form of trapping the prey. Fires can prove a significant hazard as some settlements are not equipped with the necessary amenities to respond to such a hazardous event (i.e., fire hydrants). Generally, debushing is done three times per year to reduce the likelihood of these fires.

3.3.2.5 Air and Noise Quality

As with the other Family Islands, and New Providence, the air quality of Abaco can be considered of good quality. This is due to the low density of industrial activities and relatively low population density. The emission of greenhouse gases (GHG) is primarily due to the electricity of generation through the burning of fossil fuels and the transportation sector (vehicular traffic, etc.). The transportation sector is likely also the main contributor to noise levels on the island, with vehicular traffic and aviation being the two most likely sources of increased noise levels.

3.3.3 The Socioeconomic Environment[9]

3.3.3.1 Demography

Great Abaco and Little Abaco serve as the mainlands of the Abacos with a string of barrier islands separating them from the Atlantic. The Abacos are the third most populous islands of the Bahamas, behind only to New Providence and Grand Bahama. A notable proportion of the population is made up of Haitians who have been integrated into the society.

According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total population of the island is 16,587, comprising of 7,998 males (~48%) and 8,589 females (~52%). The Abacos are one of the few islands of the Bahamian archipelago that experienced a decrease in population. The change in total population between the years 2022 and 2010 was recorded at -3.7%. When compared to the Census report published in 2010, the male population experienced a change of -10.16%, while the female population experienced a growth of 3.21%. This population decrease is likely due to emigration driven by persons seeking higher education or better employment opportunities.

Figure 3-14 shows the population pyramid of the Abacos in 2010, when the last final census report was published.

[9] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report.

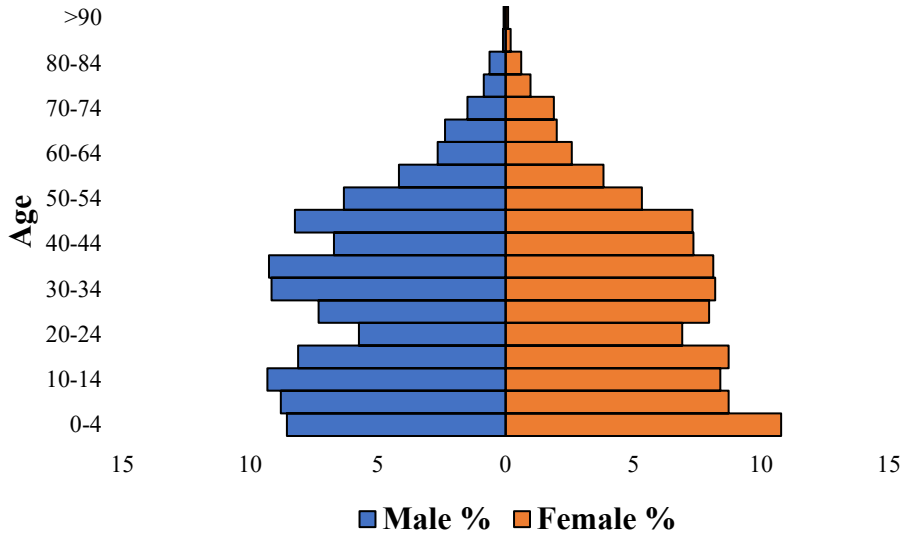

Figure 3-12: The Abacos Population Pyramid – 2010; Source: Bahamas National Statistical Institute

3.3.3.2 Housing and Households

Despite the decrease in the total population of the Abacos, according to the 2022 Preliminary Census Report there has been an increase in the number of households in the Abacos. The number of households increased from 5,197 in 2010 to 6,192 in 2022. However, the average household size decreased from 3.31 to 2.68. Table 3-5 below shows the state of housing tenure in the Abacos as recorded in the 2010 Census Report.

Table 3-5: Housing Tenure in the Abacos in 2010

TENURE	NUMBER OF HOUSEHOLDS
Fully owned	2486
Owned (Mortgage)	826
Rent	1348
Rent-free	521
Lease	9
Other	5

Of the recorded households in 2010, 3,811 were found to be headed by a male while 1,384 were headed by a female. While these values do not indicate a clear gender disparity, considerations should be made for females who have to assume the responsibilities of being the head of their households in addition to the responsibilities they stereotypically hold as females. Chapter 4.1.2 discusses further this issue.

3.3.3.3 Education

Of the total population in 2010 (17,224), 12,546 (~73%) were recognized as having achieved some form of educational attainment. Furthermore, this percentage consisted of more males than females (include figures/percentages).

The O level certification was also used as the baseline to represent the successful completion of secondary education. The number of males who at least received O-Level certification was recorded at 1,331, less than the 1,750 females recorded for receiving the same level of certification. This gender disparity was also evident as it relates to educational attainment measured at the tertiary level. A

bachelor's degree was used as the baseline for educational attainment at the tertiary level, and this was at least achieved by 462 females and 315 males.

The recognized educational institutions on the Abacos include:

- Mary Star of the Sea Catholic Academy
- Sunland Baptist Academy
- Treasure Cay Primary
- Central Abaco Primary School
- Long Bay School
- Little Darlings Academy
- Abaco Central High
- Forest Heights Academy
- Agape Christian School
- St. Francis De Sales Catholic School
- Every Child Counts School
- Wesley College High Schools
- Little Learners Preschool
- Alpha Institute
- LifeWay Academy
- Change Preparatory School
- Crossing Rocks Primary
- Amy Roberts Primary
- Coopers Town Primary
- Fox Town Primary
- Great Guana Cay Primary
- Hope Town Primary
- James A.Pinder Primary School
- Moore's Island School
- Patrick J Bethel High school
- Man-O-War cay Primary
- Sherlin C. Bootle High

All schools on the island are served by the WSC and in the event that there is some disruption to the water supply, schools may be advised to close for that day. This has occurred at different schools, such as at the Sherlin C. Bootle High School.

3.3.3.4 Economics

Carpentry and fishing are two of the main economic activities in the Abacos – the labour force survey conducted showed that these activities are mainly undertaken by males. However, women still play an important role in the fishing sector, in particular, as they tend to act as fish processors and vendors. Before Hurricane Dorian (see Chapter 3.3.2.4), farming was a more prominent economic activity. As of 2023, those with agriculture as their main livelihood/source of income were considered to be in a state of rebuild – rebuild to at least where the sector was prior to the impact of the hurricane. The lack of government support provided to the farming community also serves as a reason why farming has been replaced as one of the most significant economic activities practiced.

Table 3-6 shows the household income of both female-headed and male-headed households in the Abacos.

Table 3-6: Annual Income of Male-Headed and Female-Headed Households in the Abacos, 2010

ANNUAL HOUSEHOLD INCOME RANGE	NUMBER OF MALE HEADED HOUSE HOLDS	NUMBER OF FEMALE-HEADED HOUSEHOLDS
0-5000	319	232
5,001-10,000	376	157
10,001-15,000	323	149
15001-20000	304	140
20001-40000	980	361
40001-60000	601	135
60001-80000	332	60
80001-100000	172	25
100001 and over	119	14
Not stated	285	111

The poverty rate for the Family Islands recorded in 2013 was 17.2% which was higher than that of New Providence. However, only 12.9% of the total Bahamian population below the poverty line resided in the Family Islands. As with the entire nation, although women comprised the majority of the poor, poverty rates were higher for males than for females. The data presented in the Bahamas 2013 Household Expenditure Survey was not disaggregated to allow for comparisons amongst Family Islands.

3.3.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. The Princess Margaret Hospital is located on the island of New Providence, but it serves as the hub for public sector referrals from all other islands. Other health facilities on the island include:

- Abaco Medi Centre
- Abaco Pines Medical Centre
- Austell Advanced Medical Clinic
- Marsh Harbour Healthcare
- Marsh Harbour Hospital
- Integrated Medical Centre
- Auskell Medical Center
- Abaco Family Medicine
- Coopers Town Community Clinic
- PhysioWorks Abaco
- The Kidney Center
- Agape Family Dental Centre
- Abaco Island Pharmacy
- Diamante Dental
- Government Clinic
- Hope Town Clinic
- Man O War Clinic
- Wood House Hospital

There are no specific data that detail the rate of NCDs across the Family Islands. However, the World Health Organization (WHO) reports that NCDs are the leading causes of morbidity and mortality in The Bahamas. As with New Providence, these NCDs include diabetes, hypertension, chronic respiratory

disease, heart disease and cancer. Water-borne illnesses are not prevalent across the Family Islands. However, consequent to Hurricane Dorian, there was a notable increase in these water-borne illnesses and this was accredited to the lack of water for sanitation and hygiene due to the disrupted water supply.

3.4 Exuma

3.4.1 The Ecological Environment

The Exumas are a group of 325 cays that are dominated by reefs, sandy shores, beds of seagrass, coppice forests, hardwoods, palm forests and mangrove creeks. These cays are home to populations of endemic and endangered species such as the Queen conch, groupers, lobsters, iguanas, sea turtles and sharks. The unique biodiversity of the island is sheltered within the different protected areas scattered around the cays.

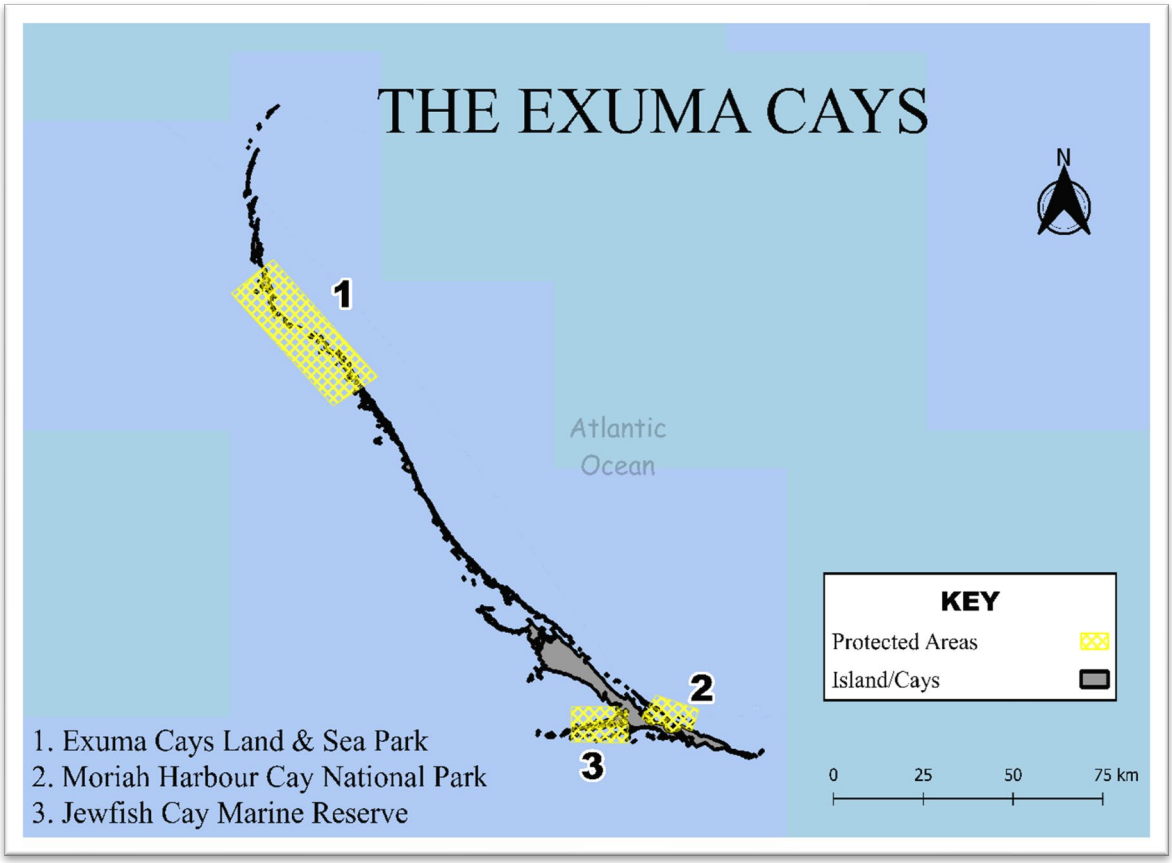

Figure 3-13: Protected areas in the Exumas

The Exuma Cays Land and Sea Park features mangrove forests that dominate the coastlines of the Exuma chain of cays. They provide protection and food for other flora and fauna, with several species of algae, fish, molluscs, crustaceans and birds using these ecosystems as nursing and feeding grounds. The white-crowned pigeon (*Columba leucocephala*), the gray kingbird (*Tyrannus dominicensis*) and the green heron (*Butorides virescens*) are three of the most abundant species of birds found in these mangrove forests (Wilcox et al., 1976). The Exumas cays are recognized Bird Areas due to the many species of seabirds that nest in mangrove wetlands and is habitat to the largest colony of Audibon's shearwater (*Puffinus lherminieri*) remaining in the West Indies.

The Moriah Harbour Cay National Park includes a diverse coastal environment with beaches, sand dunes, blue holes, mangrove creeks and seagrass meadows. Reefs of this and other Exuma cays are crowded with grouper (*Epinephelinae*), snapper (*Lutjanidae*) and the queen triggerfish (*Balistes vetula*) and other species of fish used to feed the local population. Tropical rays and spiny crustaceans also populate the underwater ecosystems, with sea snails covering underwater grass beds. Mangrove forests, reefs and seagrass meadows are all protected ecosystems as they serve as critical habitats for threatened species found in the Bahamas. These species include the hawksbill turtle (*Eretmochelys imbricata*), the Nassau grouper (*Epinephelus striatus*) and the queen conch (*Strombus gigas*).

The Bahama Strongbark (*Bourreria succulenta*) is also commonly found in the Exuma cays. Butterflies, like the Bahamian Swallowtail (*Papilio andraemon*), the Giant Swallowtail (*Papilio cresphontes*) and the Mangrove Skipper (*Phocides pigmalion*), are attracted to this plant because of the fruit and nectar that it produces. Different epiphytic flowering plants, orchids and bromeliads such as the Correll's Encyclia (*Encyclia correllii)* and the Silver Top Palm (*Coccothrinax argentata*) make up the vegetative cover on the Exuma cays, along with fruit bearing trees like the native anon or sugar apple (*Annona squamosa*) and gumbo limbo (*Bursera simaruba*).

Figure 3-14: Forested region with plant diversity typically found on the Exumas

3.4.2 The Physical Environment[10]

3.4.2.1 Climate

The cays are notably warm and experience minimal fluctuations in temperatures about 28 degrees Celsius. Temperatures and humidity tend to increase during the summer season while winters are relatively drier. The climate of the cays, like that of the other Bahamian islands, is dictated by trade winds that blow throughout the Caribbean region. The Exumas are characterized by a subtropical climate with heavy rainfall mainly in June, September and October. The driest period typically runs from December through to March. Annual precipitation in the Exumas averages approximately 40 inches.

[10] Information regarding the physical characteristics of the island was retrieved from the Water Resources Assessment of the Bahamas (2004) as well as the United Nations Common Country Analysis of the Bahamas (2020)

3.4.2.2 Topography and Relief

The Exuma islands and associated cays are small islands that span approximately 186 sq. km. of land area and mainly consist of hilly ridges along the islands' eastern shores. Other than these ridges, the lands of the Exuma islands are predominantly low-lying and flat, and the western coast features wetlands and brackish ponds. The Exuma chain is also characterized by underwater limestone and reefs, as well as blue holes and caves that are characteristic of most of the islands and cays found in the Bahamian archipelago.

3.4.2.3 Geology and Soils

According to the Bahamas Information Service, The Exumas is home to the oldest rocks in the Bahamian chain of islands. The geological makeup of the Exumas consists predominantly of limestone rocks as parent material. Holocene sands and coastal limestone made up of carbonate sediments line the coastal environments of the cays. The limestone makeup of the islands justifies the presence of the many karst features, including caves, aquifers and limestone outcrops, found on the cays.

3.4.2.4 Natural Hazards and Vulnerability

The Exumas are primarily vulnerable to winds and storm surges from tropical cyclones. The Exumas' coastal population is especially vulnerable to different coastal hazards due to the majority of the islands' coastal environment lying along the shallow regions of the Bahamas Banks. This orientation allows for high storm surge potential.

There have been no major storm that has directly affected the coastal infrastructure on the island, including the coastal road pipelines, since Hurricane Noel in 2007. Droughts are frequent occurrences on the island, particularly during the summer months when the RO plant is heavily relied upon for irrigation purposes. Wastewater and rainwater are also used for irrigation during periods of drought.

3.4.2.5 Air and Noise Quality

There is near negligible risk of air pollution or noise pollution with the general air quality on the island being considered satisfactory due to low emission rates and high levels of noise being sourced from the motoring public.

3.4.3 The Socioeconomic Environment[11]

3.4.3.1 Demography

According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total population of the Exumas is 7,293, comprising of 3,517 males (~48%) and 3,776 females (~52%). The Exumas, like most islands of the Bahamian archipelago, experienced a growth in population between 2010 and 2022. The increase in total population between the years 2010 and 2022 was recorded at 5.27%. When compared to the Census report published in 2010, the male population experienced an increase of 1.97%, while the female population experienced a growth of 1.83%.

Figure 3-17 shows the population pyramid of the Exumas in 2010, when the last final census report was published.

[11] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report.

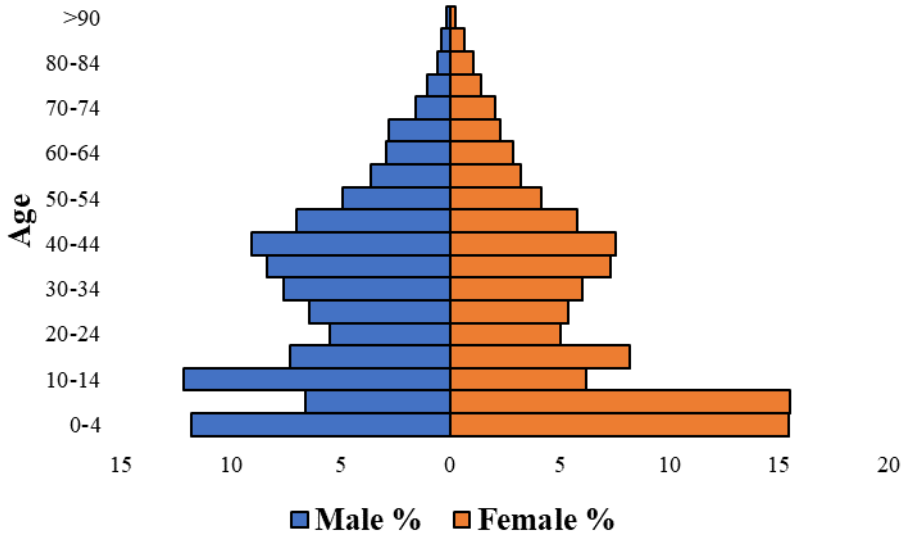

Figure 3-15: The Exumas Population Pyramid – 2010; Source: Bahamas National Statistical Institute

3.4.3.2 Housing and Households

According to the 2022 Preliminary Census Report there has been an increase in the number of households in the Exumas, from 2,028 in 2010 to 2,348 in 2022. However, there was a corresponding slight decrease in the average household size, from 3.42 in 2010 to 3.11 in 2022. Table 3-7 below shows the state of housing tenure in the Exumas as recorded in the 2010 Census Report.

Table 3-7: Housing Tenure in the Exumas in 2010

TENURE	NUMBER OF HOUSEHOLDS
Fully owned	977
Owned (Mortgage)	210
Rent	464
Rent-free	367
Lease	3
Other	6

Of the recorded households in 2010, 1,409 were found to be headed by a male while 618 were headed by a female. While these values do not indicate a clear gender disparity, considerations should be made for females who have to assume the responsibilities of being the head of their households in addition to the responsibilities they stereotypically hold as females. Chapter 4.1.2 discusses further this issue.

3.4.3.3 Education

For the purposes of this assessment, the adult population was considered from the age range of 15 and above. Of the total population in 2010 (6,928), 4,592 (~66%) were recognized as having achieved some form of educational attainment. Furthermore, this percentage consisted of more males than females.

The O level certification was also used as the baseline to represent the successful completion of secondary education. The number of males who received at least O-Level certification was recorded at 761 (~32% of the male population that at least attained a high school diploma), less than the 880 females (~40% of the female population that at least attained a high school diploma) recorded for receiving the same level of certification. This gender disparity was also evident as it relates to

educational attainment measured at the tertiary level. A bachelor's degree was used as the baseline for educational attainment at the tertiary level, and this was at least achieved by 236 females (~7% of the total female population) and 171 males (~5% of the total male population).

The recognized educational institutions on the Exumas include:

- Exuma Christian Academy
- L. N. Coakley High School
- Roker's Point Primary
- Moss Town Primary School
- St. Andrews School
- Stuart Manor Primary
- Black Point School
- Exuma School for Exceptional Special Learners
- Farmer Cays School
- Forest Primary
- George Town Primary
- Mount Thompson Primary
- Rolleville Primary
- Staniel Cay COmprehensive
- Williams Town Primary

Both private and government schools on the island are directly impacted by water supply disruptions. Schools are reportedly advised to close in the event that there is no water supply by the time allotted for lunch.

3.4.3.4 Economics

Both fishing and farming activities have decreased in the Exumas while construction and tourism activities have increased - water sports and water taxi tours are common events experienced on the island. With the shift to more tourism activities, the number of hotels on the island has increased, which in turn has influenced the nature of water supply and distribution on the island (see Chapter 3.4.3.4).

Table 3-3 shows the household income of both female-headed and male-headed households in the Exumas.

Table 3-3: Annual Income of Male-Headed and Female-Headed Households in the Exumas, 2010

ANNUAL HOUSEHOLD INCOME RANGE	NUMBER OF MALE HEADED HOUSE HOLDS	NUMBER OF FEMALE-HEADED HOUSEHOLDS
0-5000	102	74
5,001-10,000	124	48
10,001-15,000	100	59
15001-20000	128	48
20001-40000	403	222
40001-60000	236	95
60001-80000	121	35
80001-100000	62	7
100001 and over	66	12
Not stated	67	18

The poverty rate for the Family Islands recorded in 2013 was 17.2% which was higher than that of New Providence. However, only 12.9% of the total Bahamian population below the poverty line resided in the Family Islands. As with the entire nation, although women comprised the majority of the poor, poverty rates were higher for males than for females. The data presented in the Bahamas 2013 Household Expenditure Survey was not disaggregated to allow for comparisons between Family Islands.

3.4.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. The Princess Margaret Hospital is located on the island of New Providence, but it serves as the hub for public sector referrals from all other islands. Other health facilities on the island include:

- Black Point community Clinic
- Forbes Hill Community Clinic
- George Town Community Clinic
- Steventon Community Clinic
- Exuma Family Clinic
- Exuma Community Mini-Hospital
- Diara Medical Clinic Bahamas
- Easy Dental Care

There are no specific data that details the rate of NCDs across the Family Islands. However, the World Health Organization (WHO) reports that NCDs are the leading causes of morbidity and mortality in The Bahamas. As with New Providence, these NCDs include diabetes, hypertension, chronic respiratory disease, heart disease and cancer. Water-borne illnesses are not prevalent across the Family Islands. However, consequent to Hurricane Dorian, there was a notable increase in these water-borne illnesses and this was accredited to the lack of water for sanitation and hygiene due to the disrupted water supply.

3.5 Acklins

3.5.1 The Ecological Environment

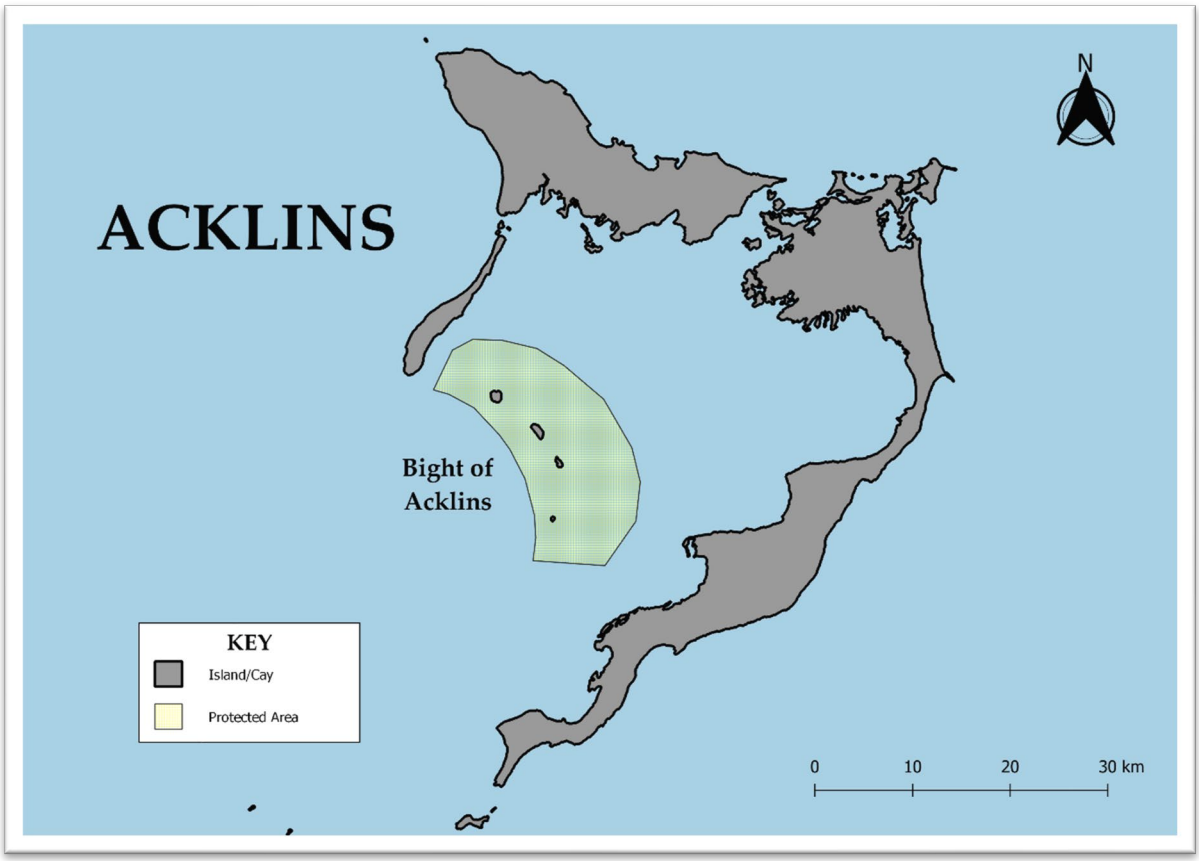

Figure 3-16: Protected Area in Acklins

This island is arranged along the Bight of Acklins, a shallow lagoon that is home to a variety of marine life. The island's features include tidal creeks, mangroves and seagrass meadows that act as nursery habitats. Surrounding reefs are populated by stingrays, lobsters, conch, sharks and predatory fish. The island's coastlines are characterized by large, shallow flats that are conducive to the survival of different species of marine and amphibious life, particularly the bonefish, with occasional sightings of the swamp turtle. Acklins is also home to the endangered Acklins ground iguana (*Cyclura rileyi nuchalis*) and rare Bahamian Hutia (*Geocapromys ingrahami*), Bahama's only native mammal.

Vegetation found in Acklins is varied and includes flowering plants such as the native cascarilla (*Croton eluteria*) and the night-blooming jasmine (*Cestrum nocturnum*). Orchids and cacti are also constituents of the vegetative population.

3.5.2 The Physical Environment[12]

3.5.2.1 Climate

Annual rainfall in Acklins is recorded at less than 80 cm/yr, averaging just 30 inches. Trade winds help to regulate surface temperatures that vary only slightly throughout the year. Acklins is characterized by a bimodal precipitation pattern – a wet and dry period – as well as experiences only the Summer and Winter seasons. The dry period persists during the Winter (from the late months of the year to the early months of a new year).

[12] Information in this chapter was retrieved from the Water Resources Assessment of the Bahamas (2004) as well as the United Nations Common Country Analysis of the Bahamas (2020)

3.5.2.2 Topography and Relief

One of the southernmost of the Bahamian islands, Acklins makes up one of the group of islands that is found within the Bight of Acklins, a large, shallow lagoon, as well as one of the four island constituents of an atoll. It is a long, narrow island spanning approximately 390 sq. km. of land located on the Crooked/Acklins carbonate platform. The coasts of Acklins are populated with bays, caves, extensive sand flats and mangrove ecosystems characteristic of the Bahamian archipelago. The island is generally flat, with its highest point just mere metres above sea level.

Figure 3-17: Aerial view of the flat relief of Acklins

3.5.2.3 Geology and Soils

There is little known about the surface geology of the southernmost islands of the Bahamian archipelago. Acklins is situated on the Crooked-Acklins platform, which differs slightly from the geology of the northern Bahamian islands and cays. The Crooked-Acklins platform is a carbonate platform within close proximity to a moderately active strike slip fault that runs across southern Cuba. Despite its proximity to an active tectonic zone, the platform is considered to be slowly subsiding due to sediment loading. Acklins makes up one of three islands that enclose the Bight of Acklins shallow lagoon (the other two being Crooked Island and Long Cay). With Acklins being located on a carbonate platform, karst features have been found to be prominent on the island. As with the entire archipelago, calcareous Rockland soils are one of the most notable soil types on the island.

3.5.2.4 Natural Hazards and Vulnerability

Acklins is one of the many Bahamian islands that are notably impacted by tropical storms and storm surges. Being one of the smallest islands in the archipelago, developing infrastructure is paramount priority to ensure that the impact of hazards, like tropical storms and flooding, is mitigated. Hurricane Joaquin, a Category 4 hurricane, had severe consequences on the island, causing the destruction of the island's main bridge and leading to widespread flooding. The northern seawall at Lovely Bay along the coast also suffered damage from prevailing waters.

3.5.2.5 Air and Noise Quality

Being one of the smaller, less developed, and least populated islands in the southernmost part of the Bahamian archipelago, there is negligible risk of air and noise pollution. Primary activities encouraged

on the island include fishing, birdwatching, hiking, and boating as tourism-related activities, none of which threaten alarming rates of GHG emissions. Noise, however, is more of a concern (albeit still minimal) due to high tourism activities and the transport sector.

3.5.3 The Socioeconomic Environment[13]

3.5.3.1 Demography

According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total population of Acklins is 692, comprising of 334 males (~48%) and 358 females (~52%). Acklins is one of the least populated islands in the Bahamian archipelago and, like most of its neighbouring islands, experienced a growth in population between 2010 and 2022. The increase in total population between the years 2010 and 2022 was recorded at 22.48%. When compared to the Census report published in 2010, the male population experienced an increase of 4.38%, while the female population experienced a significant growth of 46.12%.

Figure 3-20 shows the population pyramid of Acklins in 2010, when the last final census report was published.

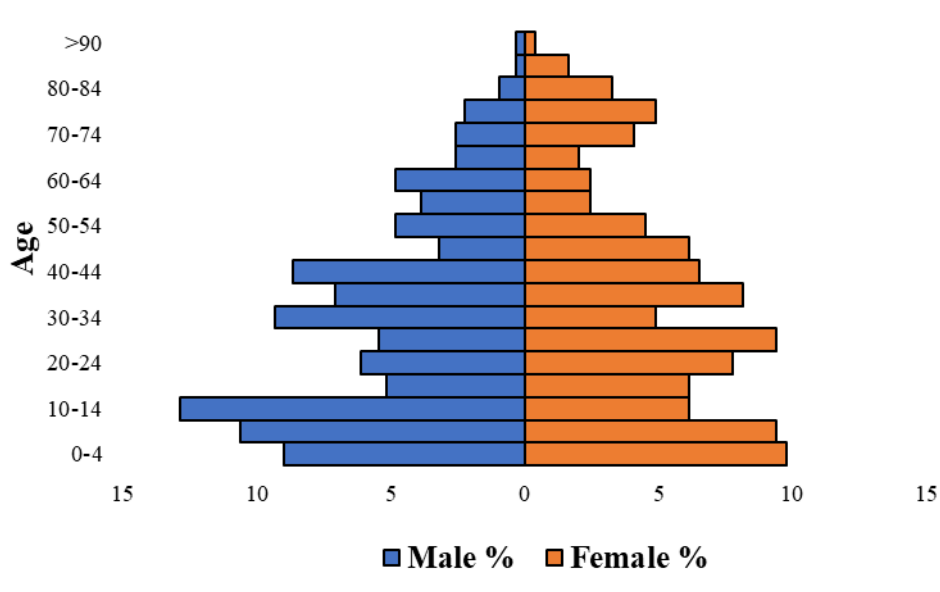

Figure 3-18: Acklins Population Pyramid – 2010; Source: Bahamas National Statistical Institute

3.5.3.2 Housing and Households

According to the 2022 Preliminary Census Report there has been an increase in the number of households in Acklins, from 209 in 2010 to 232 in 2022. With the increase in the total population and an increase in the number of households, there was a corresponding increase in the average household size, from 2.70 in 2010 to 2.98 in 2022. Table 3-4 below shows the state of housing tenure in Acklins as recorded in the 2010 Census Report.

Table 3-4: Housing Tenure in Acklins in 2010

TENURE	NUMBER OF HOUSEHOLDS
Fully owned	144
Owned (Mortgage)	1
Rent	27
Rent-free	36

[13] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report

Lease	0
Other	1

Of the recorded households in 2010, 149 were found to be headed by a male while 60 were headed by a female. While these values do not indicate a clear gender disparity, considerations should be made for females who have to assume the responsibilities of being the head of their households in addition to the responsibilities they stereotypically hold as females. Chapter 4.1.2 discusses further this issue.

3.5.3.3 Education

Of the total population in 2010 (565), 402 (~71%) were recognized as having achieved some form of educational attainment. Furthermore, this percentage consisted of more males than females.

The O level certification was also used as the baseline to represent the successful completion of secondary education. The number of males who received at least O-Level certification was recorded at 33, less than the 39 females recorded for receiving the same level of certification. A bachelor's degree was used as the baseline for educational attainment at the tertiary level, and this was at least achieved by 8 females and 9 males. This small difference in numbers is inadequate to accurately derive any gender inequalities on the island related to educational access and attainment. Chapter 4.1.5 provides a more detailed analysis of the educational gender disparities in this and across the other Bahamian islands.

There were four recognized educational institutions on the island of Acklins in 2020, listed below in Table 3-5.

Table 3-5: Educational Institutions in Acklins

NAME OF INSTITUTION	ENROLMENT (2020)
Acklins High	47
Lovely Bay Primary	16
Salina Point Primary	36
Snug Corner Primary	36

3.5.3.4 Economics

The main economic activity in Acklins is fishing, followed by tourism. Table 3-6 shows the household income of both female-headed and male headed households in Acklins.

Table 3-6: Annual Income of Male-Headed and Female-Headed Households in Acklins, 2010

ANNUAL HOUSEHOLD INCOME RANGE	NUMBER OF MALE HEADED HOUSE HOLDS	NUMBER OF FEMALE-HEADED HOUSEHOLDS
0-5000	21	20
5,001-10,000	15	10
10,001-15,000	18	8
15,001-20,000	13	3
20,001-40,000	32	14
40,001-60,000	19	3
60,001-80,000	10	1
80,001-100,000	3	0
100,001 and over	4	1
Not stated	14	0

The poverty rate for the Family Islands recorded in 2013 was 17.2% which was higher than that of New Providence. However, only 12.9% of the total Bahamian population below the poverty line resided in the Family Islands. As with the entire nation, although women comprised the majority of the poor, poverty rates were higher for males than for females. The data presented in the Bahamas 2013 Household Expenditure Survey was not disaggregated to allow for comparisons between Family Islands.

3.5.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. The Princess Margaret Hospital is located on the island of New Providence, but it serves as the hub for public sector referrals from all other islands. Other health facilities on the island include:

- Spring Point Community Clinic
- Mason Bay Community Clinic

There are no specific data that details the rate of NCDs across the Family Islands. However, the World Health Organization (WHO) reports that NCDs are the leading causes of morbidity and mortality in The Bahamas. As with New Providence, these NCDs include diabetes, hypertension, chronic respiratory disease, heart disease and cancer. Water-borne illnesses are not prevalent across the Family Islands. However, consequent to Hurricane Dorian, there was a notable increase in these water-borne illnesses and this was accredited to the lack of water for sanitation and hygiene due to the disrupted water supply.

3.6 San Salvador

3.6.1 The Ecological Environment

Figure 3-19: Protected Areas in San Salvador

San Salvador is one of the smallest inhabited islands in the Bahamas, its features include a lone tidal creek in the Pigeon Creek and Snow Bay National Park. Located in the southeastern region, the park houses the island's largest population of sea urchins and are recognized nursery areas for the Nassau Grouper (*Epinephelus striatus*), spiny lobster (*Palinuridae*) and other types of reef fish.

The Southern Great Lake National Park in the central region of the island features an extensive mangrove system where many species of bird treat as their nesting grounds. This region is also home to the endangered San Salvador rock iguana (*Cyclura rileyi*) preyed upon by black rats, raccoons, feral dogs, mongoose, hogs, and cats that were introduced into the island's ecosystems (Carter & Hayes, 1996). The prickly-pear cacti (*Opuntia*), that act as the primary source of food for these iguanas, also suffered from the introduction of the Cactus moth (*Cactoblastis cactorum*) to act as a form of biological control on the cacti population. The Green's Bay National Park and the Graham's Harbour Iguana and Seabird National Park are also dedicated to the protection of the Rock Iguana.

Figure 3-20: The Endangered Rock Iguana

Image retrieved from The Bahamas National Trust Field Guide to the Pine Forests of the Bahamas

San Salvador further serves as a protective region for up to 14 different species of seabirds with seasonal migratory patterns and a preference to reside near rocky shorelines of deep waters where vegetation cover is minimal. Birds such as the frigatebird and different species of booby, terns and tropicbirds find sanctuary along the shorelines of San Salvador.

Smith (1993) categorizes the vegetation found in San Salvador as constituents of different ecological communities: coastal rock community, sand strand community, coastal coppice community, mangrove community, whiteland community and blackland community. The coastal rock community had sparse vegetative cover, with plants growing up to only one meter and adapting thick cuticles. Vegetation in this type of community includes the Sea grape (*Coccoloba uvifera*), Bay lavender (*Mallotonia gnaphalodes*) and Coast spurge (*Euphoria mesembryanthemifolia*). These are also found in the different sand strand communities strewn across the island where vegetation cover is slightly higher. Further inland are taller grasses and pine, like the Bush Beard-grass and flowering trees. The mangrove communities mainly consist of the Red, Black and Buttonwood mangroves that line mangrove swamps, flats and brackish lakes.

The Blackland coppice found in higher inland areas are documented as the most extensive plant communities on the island. Here vegetation is dense, and a wide variety of plant species is exhibited. Common plants in these communities include the torchwood (*Nectandra* coriacea) and the wild tamarind (*Lysiloma latisiliqua*).

3.6.2 The Physical Environment[14]

3.6.2.1 Climate

San Salvador is one of the wettest of the northern Bahamian islands, averaging 35 inches of annual precipitation. Temperature ranges are consistent with other islands of the archipelago, but trade winds are more notable features that help to dissipate heat around the island. Seasons alternate between hot, humid Summers with temperatures reaching up to 33 degrees Celsius and cool, dry Winters with temperatures reaching as little as 20 degrees Celsius.

3.6.2.2 Topography and Relief

Being only 19 kilometres in length and 8 kilometres in width, San Salvador stands as one of the smallest inhabited islands in the Bahamian archipelago being just 163 square kilometres. It is located on its own

[14] Information in this chapter was retrieved from the Water Resources Assessment of the Bahamas (2004) as well as the United Nations Common Country Analysis of the Bahamas (2020)

isolated carbonate platform and is surrounded by fringing reefs and features coastal environments primarily characterized by rocky shorelines. It is the most easterly of the central Bahamian islands and consists of many curved ridges that extend up to 30 metres in altitude. These ridges enclose many of the island's water bodies. The east coast is a continuous stretch of beach and make up some of the flatter regions of the island.

3.6.2.3 Geology and Soils

The surface bedrock geology of San Salvador consists entirely of Pleistocene and Holocene limestones. Due to the extent of vegetation coverage in most of the island's interior (apart from inland lakes), the most easily accessible rock outcrops are along the island's shorelines. San Salvador's surface bedrock can be divided into two broad lithologic categories: limestones and paleosols. The island is underlain by the San Salvador carbonate platform that is often partly flooded during periods of higher sea levels. During these periods, carbonated sediment grains are generated in abundance by shallow water organisms, and this leads to the abundance of carbonate sedimentary rocks on the island.

The soil types on San Salvador are rather distinctive. The coastal areas consist of various sandy soils and the interior consists of the principal soil known as black loam found in crevices and pockets of limestone rock.

3.6.2.4 Natural Hazards and Vulnerability

Due to the fragile ecosystems and the suboptimal capacity of the exposed population, San Salvador is vulnerable to the impacts of climate change – the increased frequency of storm activities, rising sea levels and higher than average surface temperatures. These extreme climatic changes all impact the crucial socioeconomic and environmental assets of the island.

3.6.2.5 Air and Noise Quality

San Salvador remains consistent with the other Family Islands in that there is negligible risk of excessive air and noise pollution with these being threatened primarily by the transportation sector and the generation of electricity through the burning of fossil fuels. There is no economic activity undertaken on the island that would result in a greater risk of air and/or noise pollution than other islands. Still, it is expected that any construction or excavation activities would increase emissions of dust particles and noise levels.

3.6.3 The Socioeconomic Environment[15]

3.6.3.1 Demography

According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total population of San Salvador is 824, comprising of 398 males (~48%) and 427 females (~52%). Despite a small population, San Salvador has experienced a decrease in population between 2010 and 2022, likely due to emigration. The decrease in total population between the years 2010 and 2022 was recorded at 12.34%. When compared to the Census report published in 2010, the male population experienced a decrease of 15.14%, while the female population experienced a decrease of 9.34%.

Figure 3-23 shows the population pyramid of San Salvador in 2010, when the last final census report was published.

[15] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report

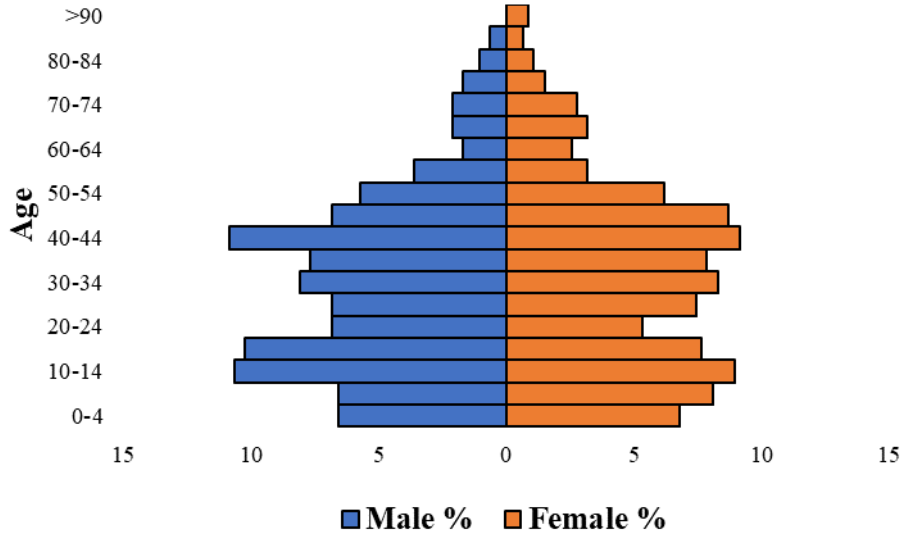

Figure 3-21: San Salvador Population Pyramid – 2010; Source: Bahamas National Statistical Institute

3.6.3.2 Housing and Households

According to the 2022 Preliminary Census Report there has been a significant decrease in the number of households in San Salvador, from 342 in 2010 to 220 in 2022. However, while there was an overall decrease in both the total population and the number of households on the island, there was a stark increase in the average household size, from 2.75 in 2010 to 3.75 in 2022. Table 3-7 below shows the state of housing tenure in San Salvador as recorded in the 2010 Census Report.

Table 3-7: Housing Tenure in San Salvador, 2010

TENURE	NUMBER OF HOUSEHOLDS
Fully owned	201
Owned (Mortgage)	26
Rent	83
Rent-free	69
Lease	1
Other	3

Of the recorded households in 2010, 226 were found to be headed by a male while 156 were headed by a female. While these values do not indicate a clear gender disparity, considerations should be made for females who have to assume the responsibilities of being the head of their households in addition to the responsibilities they stereotypically hold as females. Chapter 4.1.2 discusses further this issue.

There are eight recognized settlements on the island, according to the 2010 Population Census:

- Sugar Loaf
- Long Bays
- Hall's Landings
- Cockburn Town
- Bonefish Bay
- North Victoria Hill
- United Estates
- Sandy Point

United Estates, Sandy Point and Victoria Hill are all located on hills and, hence, would be affected by low pressure issues from the plant. There are no shanty towns (illegal/unauthorised settlements) in San Salvador. Pigeon Creek and a section of Sandy Point are not supplied with water, as such, they have their own fresh water.

3.6.3.3 Education

Of the total population in 2010 (940), 796 (~85%) were recognized as having achieved some form of educational attainment. Furthermore, this percentage consisted of only just two more males than females, indicating no clear disparity when it comes to gender and educational attainment.

The O level certification was also used as the baseline to represent the successful completion of secondary education. The number of males who received at least O-Level certification was recorded at 125, less than the 139 females recorded for receiving the same level of certification. A bachelor's degree was used as the baseline for educational attainment at the tertiary level, and this was at least achieved by 34 females and 21 males.

There were three recognized educational institutions on the island of San Salvador in 2020, listed below:

- San Salvador Secondary School
- Bahamas Kitesurfing School Center
- United Estates Primary

The schools on the island all rely on water from the public supply line due to their lack of any form of storage unit. Previous disruptions in the supply have resulted in the closure of the schools.

3.6.3.4 Economics

Tourism is the major economic activity in San Salvador, with Club Med, the island's largest all-inclusive hotel also serving as the island's largest user of water. This hotel relies strictly on water from the RO plant due to its aversion to blended water from other supply lines.

Table 3-8 shows the household income of both female-headed and male headed households in San Salvador.

Table 3-8: Annual Income of Male-Headed and Female-Headed Households in San Salvador, 2010

ANNUAL HOUSEHOLD INCOME RANGE	NUMBER OF MALE HEADED HOUSE HOLDS	NUMBER OF FEMALE-HEADED HOUSEHOLDS
0-5000	12	10
5,001-10,000	16	18
10,001-15,000	36	16
15001-20000	24	18
20001-40000	77	61
40001-60000	35	16
60001-80000	15	11
80001-100000	3	2
100001 and over	5	4
Not stated	3	0

The poverty rate for the Family Islands recorded in 2013 was 17.2% which was higher than that of New Providence. However, only 12.9% of the total Bahamian population below the poverty line resided in the Family Islands. As with the entire nation, although women comprised the majority of the poor, poverty rates were higher for males than for females. The data presented in the Bahamas 2013 Household Expenditure Survey was not disaggregated to allow for comparisons between Family Islands.

3.6.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. The Princess Margaret Hospital is located on the island of New Providence, but it serves as the hub for public sector referrals from all other islands. Other health facilities on the island include:

- Port Nelson Community Clinic
- Cockburn Town community Clinic
- United Estates Community Clinic

There are no specific data that details the rate of NCDs across the Family Islands. However, the World Health Organization (WHO) reports that NCDs are the leading causes of morbidity and mortality in The Bahamas. As with New Providence, these NCDs include diabetes, hypertension, chronic respiratory disease, heart disease and cancer. Water-borne illnesses are not prevalent across the Family Islands. However, consequent to Hurricane Dorian, there was a notable increase in these water-borne illnesses and this was accredited to the lack of water for sanitation and hygiene due to the disrupted water supply.

3.7 Andros

3.7.1 The Ecological Environment

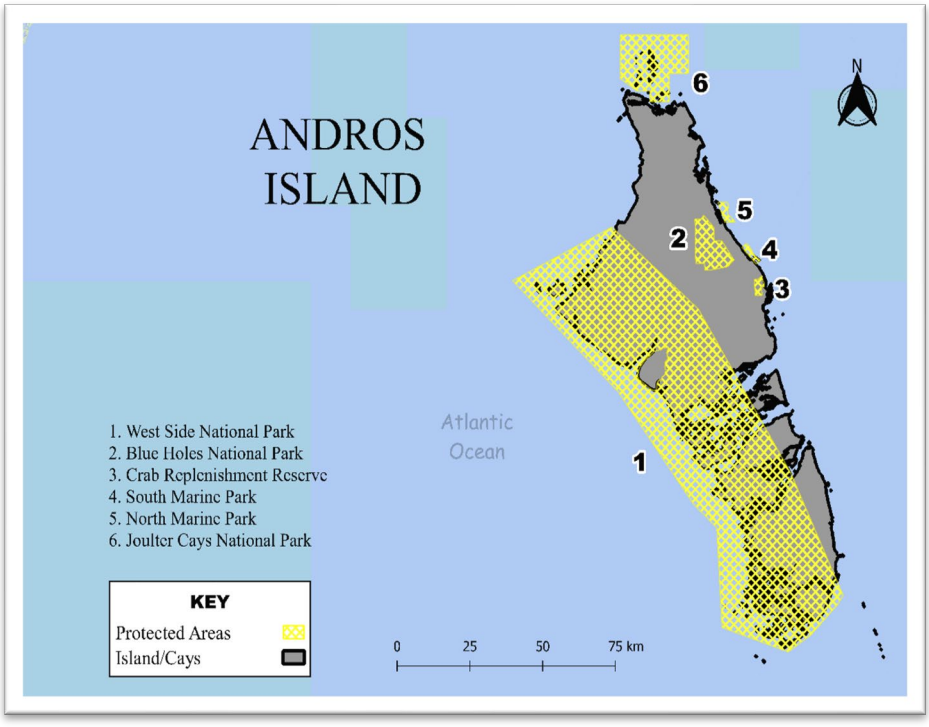

Figure 3-22: Protected Areas in Andros Island

Andros Island is famous for having the highest concentration of blue holes, around which are coppice and pine forests. The Blue Holes National Park where most of these natural features are located is home to a diversity of underwater marine life considered to be found exclusively in the isle's underwater cave systems. Nurse sharks, reef sharks, angelfish, snapper, amberjacks, rays, moray eels, and turtles are all said to be examples of marine life that inhabits the Andros Island's blue holes. The surrounding coppice forests serve as habitats for a variety of wildlife including the endemic Bahama Oriole (*Icterus northropi*) and the Great Lizard-Cuckoo (*Coccyzus Merlini*).

The North and South Marine Parks protect thousands of acres of the barrier reef surrounding the Andros islands. This reef is the third largest, and longest, barrier reef in the world and a lagoon system found along the island's shore support over 165 different species of corals and fish, and serve as protection to threatened marine life that are commonly found in the Bahamian archipelago such as the grouper, queen conch and the spiny lobster. Sea whips (*Gorgonacea*), fans (*Ctenocella pectinate*) and algae are also found dwelling in abundance in the reefs surrounding the island.

The West Side National Park is one of the most biodiverse regions in the Andros islands. Coastal wetlands that dominate the western region of the island act as fish nurseries and as a feeding ground for the West Indian Flamingo (*Phoenicopterus ruber*). Mudflats and mangrove creeks that make up the coastal wetlands serve as nurseries for tarpon and bonefish. The western region is also home to some of the endemic and endangered species found in the Bahamas such as Andros Rock Iguana (*Cyclura cychlura cychlura*), Atala Hairstreak Butterfly (*Eumaeus atala*), Smalltooth Sawfish (Pristis pectinate), and sea turtles. The White (*Cardisoma guanhumi*) and Black (*Gecarcinus ruricola*) Land Crabs of the Andros Islands are found in both the western and the central regions, in the Crab Replenishment Reserve. These crabs reside mainly in wetlands, coppice forests and mangrove thickets and are prey to some species of birds.

Figure 3-23: Wetlands in Central Andros

The Pine forests of North Andros with extensive coverage of thatch palm (*Thrinax Morrisii*) in the forest understories are home to most of the region's endemic bird species such as the Bahama Mockingbird (*Mimus gundlachii*), Bahama Yellowthroat (*Geothlypis rostrata*), Bahama Swallow (*Tachycineta cyaneoviridis*), and Bahama Woodstar (*Calliphlox evelynae*). These pine forests are a rich source of nesting sites for endemic birds, including those who nest in tree cavities, and for birds who rely on understory vegetation for nesting, such as the Thick-billed Vireo (*Vireo crassirostris*) and Greater Antillean Bullfinch (*Loxigilla violacea*). The pine forests of South Andros are especially conducive to the assemblance of endemic bird species, specifically the Bahama Swallow that relies on the standing dead trees as an important habitat (Lloyd & Slater, 2010). Coppice forests on the Andros island are also hubs of biodiversity with broadleaf evergreens and tall canopies.

3.7.2 The Physical Environment[16]

3.7.2.1 Climate

Andros experiences a moderate temperature range and hence, experiences only two seasons: Summer and Winter. Summers are typically hot and humid and range from May to November while Winters ae

[16] Information regarding the physical characteristics of the island was retrieved from the Water Resources Assessment of the Bahamas (2004) as well as the United Nations Common Country Analysis of the Bahamas (2020).

typically cool and dry and range from December to April. Excessive heating of inland areas leads to increased rates of convection-induced thunderstorms which contribute to the average ~ 60 inches of rainfall experienced per year.

3.7.2.2 Topography and Relief

This is the largest island in the Bahamas, spanning 167 kilometres in length and 64 kilometres in width. The total area covered by this island proves more than the combined area of all other islands in the archipelago. It consists of many small islands (islets and cays) that are connected by mangrove creeks and tidal swamplands. The main islands found within this region are North Andros, Central Andros, South Andros and Mangrove Cay. These islands are all connected by bights – curved recessions in the coastline.

Figure 3-24: Dense, high canopy forests found in North and Central Andros

Andros is separated from New Providence by a flat-bottomed depression referred to as the Tongue of the Ocean and features the sixth largest barrier reef in the world. The carbonate flats of the Great Bahamas Bank lie in the western and southern regions of the island, where most of the island's large population of blue holes can be found. Most blue holes are found in North Andros, while just half of the number found in North Andros can be found in South Andros and Mangrove Cay.

North Andros features a well-defined coastal ridge that stretches up to 30 metres. The interior regions of the island are mostly flat and forested, with hardly any area exceeding 6 metres in altitude. The relief of South Andros is similar, featuring a well-defined coastal ridge and a flat interior. South Andros receives notably less water from precipitation than North Andros so is drier with less wetlands.

3.7.2.3 Geology and Soils

Sedimentary rocks and carbonate rocks are products of deposition and diagenesis that characterize the geology of the Andros island. The late Pleistocene rocks of the island contain a vertical sequence of lithologies which is the result of a depositional succession of sediments followed by a paleosol. Essentially, the island is primarily underlain by limestone rock that is young and pure. The breakdown of these underlying rocks have given rise to calcareous rockland soils, protosols and eventual red soils, with the latter being the most conducive to agricultural activity.

3.7.2.4 Natural Hazards and Vulnerability

Andros is exposed to many tropical cyclones with the west coast especially exposed to high storm surge potential. Being extremely low-lying and with a lack of connectivity within the island, Andros' multi-hazard exposure indicates its level of vulnerability demands effective planning and development. However, the natural ecosystems, such as mangroves and forests, that dominate the landscape of the

island and provide the ecosystem service of natural protection against hazards also serves as a barrier to improving the island's capacity to deal with hazards through infrastructural development that would impact forests and reduce their capability to provide unique ecosystem services.

Because there is no official fire station or functioning fire truck on the island, Andros is susceptible to fires. In the event of fires, the WSC is called on for assistance.

3.7.2.5 Air and Noise Quality

Andros is one of the largest islands of the Bahamas as it relates to land size. Despite this, the population density of the island as well as the density of industrial activities remain minimal. This suggests that there is also a negligible risk of excessive emissions and generation of high noise levels, outside of what would be generated by electricity generation and the transportation sector. Economic activities would also be an influence on air and noise quality but not to the extent that the level of air and noise pollution would be considered significant or detrimental to public health and comfort.

3.7.3 The Socioeconomic Environment[17]

3.7.3.1 Demography

According to the 2022 Population Preliminary Census Report published by the Bahamas National Statistical Institute, the total population of Andros is 7,780, comprising of 3,751 males (~48%) and 4,029 females (~52%). Andros has experienced an increase in population between 2010 and 2022. The increase in total population between the years 2010 and 2022 was recorded at 3.87%. When compared to the Census report published in 2010, the male population experienced a slight decrease of 0.48%, while the female population experienced an increase of 8.28%.

Figure 3-27 shows the population pyramid of Andros in 2010, when the last final census report was published.

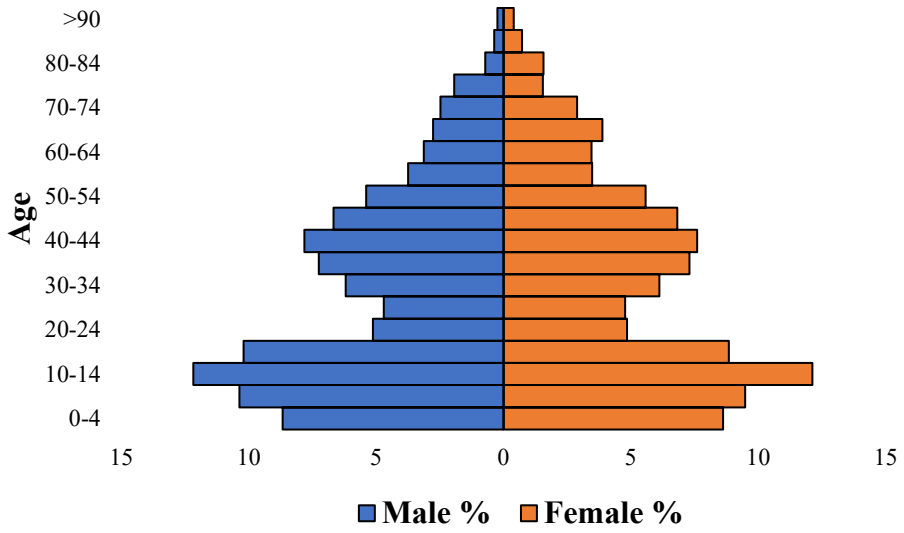

Figure 3-25: Andros Population Pyramid – 2010; Source: Bahamas National Statistical Institute

[17] All information in this chapter was retrieved from the Bahamas National Statistical Institute's 2010 Population and Housing Census Report and the 2022 Preliminary Census Report

3.7.3.2 Housing and Households

According to the 2022 Preliminary Census Report there has been a significant decrease in the number of households in Andros, from 2,373 in 2010 to 2,723 in 2022. The increase in both the total population and the number of households on the island corresponded with a decrease in the average household size, from 3.16 in 2010 to 2.86 in 2022. It is expected that the Andros population will continue to increase as residents from Nassau and Grand Bahama return home. This would suggest a need for more housing infrastructure.

Table 3-9 below shows the state of housing tenure in Andros as recorded in the 2010 Census Report.

Table 3-9: Housing Tenure in Andros, 2010

TENURE	NUMBER OF HOUSEHOLDS
Fully owned	1650
Owned (Mortgage)	59
Rent	329
Rent-free	319
Lease	3
Other	12

Of the recorded households in 2010, 1,487 were found to be headed by a male while 885 were headed by a female. While these values do not indicate a clear gender disparity, considerations should be made for females who have to assume the responsibilities of being the head of their households in addition to the responsibilities they stereotypically hold as females. Chapter 4.1.2 discusses further this issue.

3.7.3.3 Education

For the purposes of this assessment, the adult population was considered from the age range of 15 and above. Of the total population in 2010 (7,490), 5,194 (~69%) were recognized as having achieved some form of educational attainment. Furthermore, this percentage consisted of only just four more females than males, indicating no clear disparity when it comes to gender and educational attainment.

The O level certification was also used as the baseline to represent the successful completion of secondary education. The number of males who received at least O-Level certification was recorded at 511, less than the 688 females recorded for receiving the same level of certification. A bachelor's degree was used as the baseline for educational attainment at the tertiary level, and this was at least achieved by 197 females and 107 males.

The following lists the recognized educational institutions on the island of Andros in 2020:

- B. A. Newton Primary
- The Bahamas Agriculture and Marine Science Institute
- Behring Point Primary
- Bowen Sound Primary
- Central Andros High
- Clara E. Evans Primary
- Fresh Creek Primary
- Huntley P. Christie High
- Lowe Sound Primary
- Mastic Point Primary
- Ungraded Primary (Stafford Creek)
- Ungraded Primary (Staniard Creek)
- South Andros High School

- High Rock Primary
- Deep Creek Primary
- Mangrove Cay High school (Mangrove Cay)
- Burnt Rock Primary (Mangrove Cay)
- Victoria Point Pre-School (Mangrove Cay)

3.7.3.4 Economics

Fishing is one of the most prominent economic activities, particularly in South Andros. Bonefishing is widely practised, with bonefishers being supplied with water from four different companies and the island boasting all-inclusive bonefish lodges. Tourism is not prioritized on the island although there is an airport to accommodate international tourism as well as the Careola Mar and Survla Mar Hotel in South Andros.

Table 3-10 shows the household income of both female-headed and male headed households in Andros.

Table 3-10: Annual Income of Male-Headed and Female-Headed Households in Andros, 2010

ANNUAL HOUSEHOLD INCOME RANGE	NUMBER OF MALE-HEADED HOUSE HOLDS	NUMBER OF FEMALE-HEADED HOUSEHOLDS
0-5000	246	198
5,001-10,000	221	140
10,001-15,000	154	117
15001-20000	110	85
20001-40000	377	220
40001-60000	142	51
60001-80000	64	10
80001-100000	21	5
100001 and over	19	1
Not stated	133	58

More male-headed households were found to generate the highest ranges of annual household incomes. Approximately 30% of the population falls below the poverty line, evidenced by the above table that shows the majority of the households are relative low earners. The poverty rate for the Family Islands recorded in 2013 was 17.2% which was higher than that of New Providence. However, only 12.9% of the total Bahamian population below the poverty line resided in the Family Islands. As with the entire nation, although women comprised the majority of the poor, poverty rates were higher for males than for females. The data presented in the Bahamas 2013 Household Expenditure Survey was not disaggregated to allow for comparisons between Family Islands.

3.7.3.5 Healthcare

The Bahamas' public and private healthcare systems are interconnected. All major islands have access to public health care via a network of main and satellite clinics. The Princess Margaret Hospital is located on the island of New Providence, but it serves as the hub for public sector referrals from all other islands. Other health facilities on the island include:

- Fresh Creek Clinic
- Nicholl's Town Clinic
- Oliver's Prescription Centre

- Andros Wellness Pharmacy

There are no specific data that details the rate of NCDs across the Family Islands. However, the World Health Organization (WHO) reports that NCDs are the leading causes of morbidity and mortality in The Bahamas. As with New Providence, these NCDs include diabetes, hypertension, chronic respiratory disease, heart disease and cancer. Water-borne illnesses are not prevalent across the Family Islands. However, consequent to Hurricane Dorian, there was a notable increase in these water-borne illnesses, and this was accredited to the lack of water for sanitation and hygiene due to the disrupted water supply.

3.8 The Water Sector

3.8.1 New Providence

3.8.1.1 Water, Sewerage and Waste Services

Groundwater serves as the primary source of drinking water on many islands, particularly on predominantly limestone carbonate islands where surface waters are lacking. There is a notable lack of rivers on New Providence, with the only sources of freshwater being deep lakes and ponds. With the water table being close to surface, ground water is rendered vulnerable to contamination from sewage, waste or saltwater intrusion induced by storm surges or the over-extraction of groundwater aquifers. Freshwater sources may also be at risk of contamination as the over-pumping of aquifers can lead to upcoming or lateral saltwater intrusion, due to the saline water underlying freshwater sources. There is an acknowledgement that both groundwater and freshwater resources are at risk of contamination which has led to the targeted interventions which will allow for the supply of good quality water to be used for domestic, agricultural and industrial purposes. The WSC's 2015 Annual Report[18] shows that the water supplied in New Providence is of good quality - of the over 200 samples taken at pumping stations in New Providence, all were E.coli free, 98.6% had residual chlorine present, and 90.9% were clear. However, the 291mg/L of Chlorine measured in the samples indicated that the water supplied would likely have a 'salty' nature.

There are two recognized wellfields on the island, the Windsor Wellfield and the southwestern wellfield, which is no longer functional due to dumping and housing. These wellfields are not located close to any residential areas on the island, which are concentrated mainly in the central and eastern regions. There is also a water storage and treatment plant in the Windsor area in the northwest of the island. Other wastewater treatment plants in the island include the Gladstone WWT Plant, the Yellow Elder WWT Plant and the Malcolm Park WWT Plant. There is also an old sewage treatment plant in Pinewood. It is acknowledged that infrastructural upgrades are needed for the water sector infrastructure. There have already been improvements to the infrastructure at the Malcolm Park WWT where clay pipes have been replaced with PVC pipes. This was done to mitigate against the potential of flooding as experienced in the Pinewood community where clay pipes are still being utilized. Infrastructural upgrades are also required at the pump stations in Blue Hill and South Pond where flooding occurs. In Blue Hills, in particular, there is a risk of pipe bursts and losses due to the built up pressure. Upgrades in this area, therefore, include plans to remove old tanks and introduce new, larger tanks that will help to reduce that pressure.

The Water and Sewerage Corporation (WSC) stands as the chief party responsible for national water supply and wastewater management. However, the drinking water distributed by WSC is supplied by the Consolidated Water (Bahamas) Ltd (CWCO). The corporation primarily utilizes a RO plant to turn salt water into fresh, potable water. This RO plant provides 90% of the water used in New Providence. The WSC had set a goal that would see it supply 90% of households on New Providence by 2020, increasing from the 56% household water coverage in 2015. However, due to a long history of publicly supplied poor-quality water, private companies have become a prominent agent in the island's water

[18] https://wsc.com.bs/wp-content/uploads/2020/01/WSC-2015-AnnualReport-web.pdf

sector with the majority of Bahamians relying on bottled drinking water sourced from private reverse osmosis plants (Muralidharan, 2012). The New Providence Development Company (NPDC) is one such private company that supplies water to its own developments in the western regions of the island. As of 2022, the WSC's water coverage on the island of New Providence was measured at 49%, lower than he expected increase. This was accredited to the proclivity of many households siphoning water from private wells. Although private well use is largely considered a traditional right that predates network water systems and is only controlled in certain private developments like the Port Authority Area in Grand Bahama, there are concerns of the risk of contamination of groundwater resources from various activities carried out by humans. These include contamination from septic tank effluents, landscaping and agricultural fertilizers and pesticides, activity of roadside mechanics, leakages from underground fuel tanks and transmission lines, among others.

In addition to RO plants, the groundwater extraction from shallow excavations or depressions (in areas where the water table was close to the surface) was a method implemented to supply water, but due to flooding, this method was rendered unreliable. However, it is anticipated that this method will be revived.

Table 3-11 below shows the different sources of water used in New Providence as recorded in 2010.

Table 3-11: Water Supply for Households in New Providence

MAIN SOURCE OF WATER	TOTAL NUMBER OF HOUSEHOLDS	
Public piped into dwelling	38129	***(54.3%)***
Public piped into yard	1357	***(1.9%)***
Private piped into dwelling	26907	***(38.3%)***
Private not piped	2419	***(3.4%)***
Public standpipe	801	***(1.1%)***
Public well or tank	14	***(0.02%)***
Rainwater system	152	***(0.22%)***
Other	387	***(0.55%)***

As of 2022, it was estimated that 47,084 of the 77,474 residential households in the WSC service area were recorded customers. That is, there was an estimated 61% water coverage in the service area. This is after adjusting for the fact that there are active WSC residential water customers with multiple households.

In comparison to residential water coverage, wastewater coverage on New Providence is relatively minimal being recorded at 13.5%. This as there are different methods implemented on New Providence as it relates to wastewater disposal. Table 3-12 shows the methods mainly used in the island as recorded in 2010.

Table 3-12: Methods of Wastewater Disposal in New Providence

SOLID WASTE DISPOSAL METHOD	TOTAL NUMBER OF HOUSEHOLDS	
Sewerage	11411	***(16.26%)***
Septic	56120	***(79.98%)***
Pit Latrine	1621	***(2.31%)***
Other	917	***(1.31%)***
None	97	***(0.14%)***

Piped sewerage connections to households in the service area is estimated to be around 13.5% for New Providence. The island houses two RO plants: the Windsor and the Blue Hill RO Plants (see Chapter 3.8.1.2). The above table shows that there is an overwhelming preference for septic systems. Studies also show that to avoid disposal of wastewater into the sea, the subsurface has been used for wastewater disposal and dilution (Cant, 2012). However, it should be highlighted that the majority of urban sewage collected by the WSC is acceptable for a marine environment theoretically as it is too salty to be utilized again for irrigation or similar practices. Wastewater can be recycled in a controlled collection system, such as one found in a private development, as long as it is still fresh. There are hundreds of disposal wells in operation throughout the numerous islands, and the WSC sets strict rules and specifications for each one. Blue Holes are places that should be avoided.

As it relates to solid waste disposal, like other SIDS, the Bahamas have been proven reliant on landfills to facilitate this practice. The New Providence landfill, now known as the New Providence Ecology Park (NPEP), served as the primary landfill on the island. There was an estimated 264,000 tons of solid waste generated annually in the nation, and with the island of New Providence housing the highest proportion of the population and urban environment, it is justified to assume that this island in particular contributes the bulk of this statistic. The NPEP, recognizing the volume of solid waste disposal and the risks of fires, pollution and health issues that accompany open landfills, have since initiated a recycling program to establish some form of control over solid waste disposal on the island. Waste disposal and collection on the island tend to be done by approved contractors that include:

- Bahamas Waste Limited
- Hornet Waste Disposal LLC
- New Providence Ecology Park
- Direct Waste Limited
- Waste Not Bahamas Ltd

It is difficult to declare with certainty the preferred contractor and which is responsible for the bulk of waste collection and disposal.

3.8.1.2 Existing Infrastructure and Proposed Upgrades on New Providence

The Water Supply Zone on the island of New Providence covers approximately 95% of the island's total land area. The areas excluded are Lyford Cay, Old Fort Bay and the community of Serenity. The supply zone on the island includes the wellfield, production wells, pumping stations, treatment and storage facilities, as well as the water supply mains and control valves. The dense network of supply mains is situated in the eastern half of the island, with the network less strained north and south of Lake Killarney in the center of the island. This is also true for the control valves where the majority are located in the eastern half of the island where most of the population resides. As stated previously, the island also houses a pair of RO plants. See the figure below showing the location of the key infrastructure on the island.

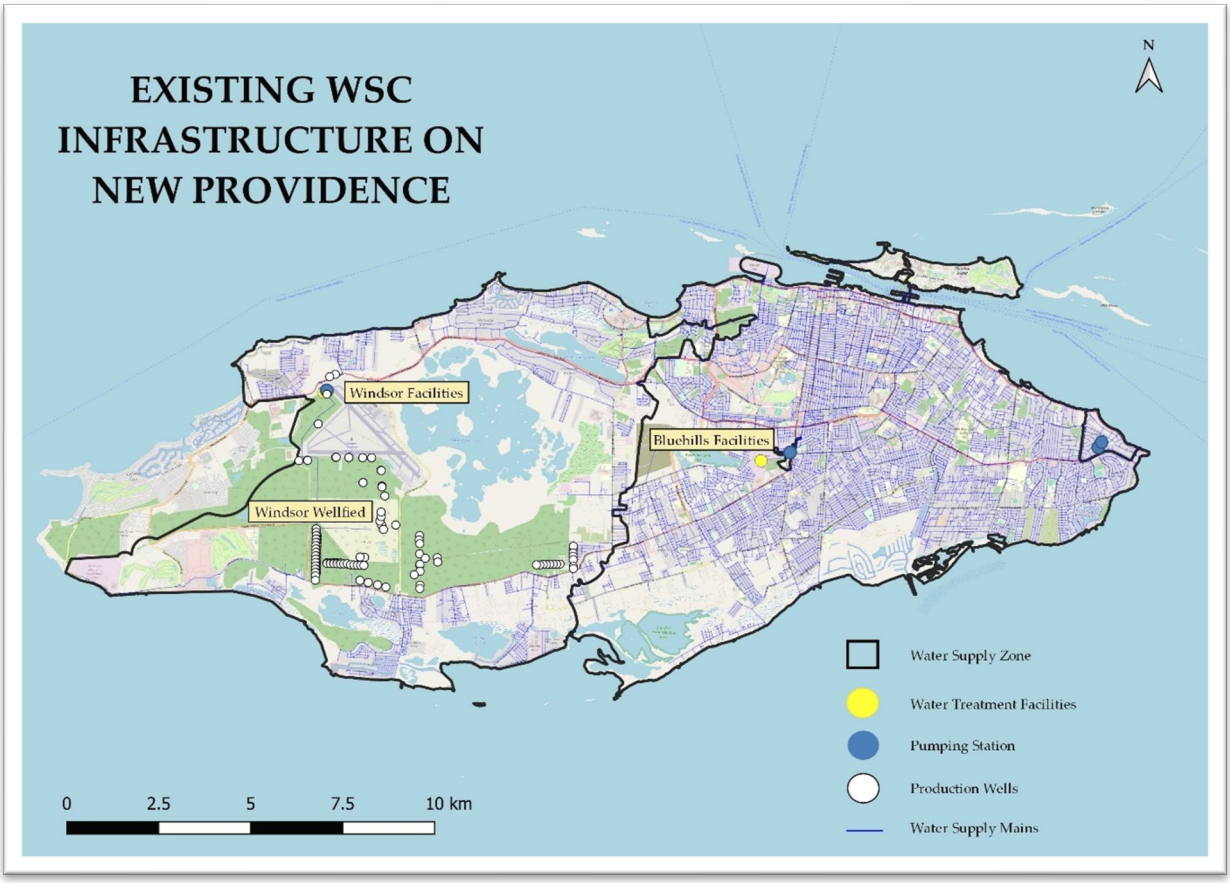

Figure 3-26: Key WSC Infrastructure on New Providence

It is important to note that there are two storage facilities on the island, in Bluehills and at the Windsor Wellfield. These currently have the capacity for 15 million kGal and 10 million kGal, respectively. For reference, the daily demand in these areas is approximately 9 million KGal and 3.5 million kGal, respectively. The storage capacity, particularly at the Windsor Wellfield, is deemed insufficient and so the proposed upgrades to the system would be such that the storage capacity can last a minimum of 3 days and in cases where systems are isolated, the storage capacity is intended to last ideally up to 2 or 3 weeks. There is also a recognized need for a new pumping station at the Windsor Wellfield fitted with an effective exhaust and ventilation system to prevent heat from being trapped in the station. The pump house would be elevated to 4.5 feet and would be equipped with steel-bar hurricane proof windows with shutters and a lockable door. The station would also facilitate a chlorine dosing and storage system. The proposed specifications for the pumps at the station are 200 horsepower and 480 Volts. Two 60 horsepower submersible pumps are also proposed. And lastly, the pumping station would be retrofitted with a 800 Amp backup generator, as well as a fuel store and fire extinguishers.

3.8.2 The Family Islands

3.8.2.1 Water, Sewerage and Waste Services

Water coverage by the WSC in the Family Islands is estimated at 70%. This suggests that there is a greater reliance of water supplied by the WSC in these islands than in New Providence. This also suggests that there is a lesser reliance on private wells on these islands than there is in New Providence. Across all the islands in the Bahamas, however, is that there is an overarching reliance on groundwater resources for water supply. As with the case of New Providence, groundwater resources are prone to contamination from different sources; either from sewage, waste or saltwater intrusion induced by storm surges or the over-extraction of groundwater aquifers. Another similarity shown was the tendency of these groundwater resources to be of high salinity – chloride concentrations across the islands were all above the limit of 250 mg/L. Groundwater testing in Andros showed that salinity

levels at the Love Hill testing site were as high as 657 mg/L, more than double that of the limit. In the most extreme of cases, chloride levels rise to as high 1877 mg/L, as measured in North Eleuthera. Yeast and mould are also parameters used to determine the quality of water being supplied. In some cases, the yeast measured at sampling sites were considered too numerous to count. The table below shows the most used sources of water across the Family Islands.

Table 3-13: Water Supply for Households in the Family Islands

Main Source of Water	TOTAL NUMBER OF HOUSEHOLDS					
	Eleuthera	Abaco	Exuma	Acklins	San Salvador	Andros
Public piped into dwelling	2247 (85.9%)	3809 (81.39%)	1169 (59.25%)	147 (71.71%)	201 (53.60%)	1770 (74.6%)
Public piped into yard	47 (1.8%)	49 (1.05%)	22 (1.12%)	9 (4.39%)	1 (0.27%)	36 (1.52%)
Private piped into dwelling	237 (9.07%)	553 (11.82%)	719 (36.44%)	43 (20.98%)	167 (44.53%)	439 (18.5%)
Private not piped	16 (0.61%)	189 (4.04%)	20 (1.01%)	5 (2.44%)	6 (1.60%)	51 (2.15%)
Public standpipe	66 (2.53%)	80 (1.71%)	43 (2.18%)	1 (0.49%)	0 (0.0%)	24 (1.01%)
Public well or tank	1 (0.04%)	12 (0.26%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	7 (0.3%)
Rainwater System	86 (3.29%)	447 (9.55%)	16 (0.81%)	2 (0.98%)	4 (1.07%)	8 (0.33%)
Other	17 (0.65%)	56 (1.20%)	38 (1.93%)	2 (0.98%)	3 (0.80%)	37 (1.56%)

More than half of the population in each of the islands rely on the public supply as their primary water source. The next most preferred option is the private supply, most likely sourced from wells located across the islands. Another significant observation to be made is that there is minimal reliance on public wells and storage systems, as well as rainwater systems.

As it relates to waste disposal, the following table shows the most prevalent methods of waste disposal practiced by households across the Family Islands. Septic systems are the overwhelmingly favoured method of waste disposal across the islands, with Abaco representing the only to have a proportion of that island's population that rely on some sewerage system. This is likely accredited to the fact that Abaco remains the sole Family Island with a wastewater treatment facility owned and operated by the WSC. This facility is located in Treasure Cay.

Table 3-14: Different Methods of Waste Disposal Implemented by Different Households across the Family Islands

Waste Disposal Method	TOTAL NUMBER OF HOUSEHOLDS					
	Eleuthera	Abaco	Exuma	Acklins	San Salvador	Andros
Sewerage	0 (0.0%)	334 (6.43%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
Septic	2242 (95.89%)	4549 (87.56%)	1958 (96.6%)	199 (95.22%)	368 (96.34%)	2277 (95.99%)
Pit Latrine	64 (2.74%)	175 (3.7%)	29 (1.43%)	10 (4.78%)	1 (0.26%)	95 (4.0%)

Waste Disposal Method	TOTAL NUMBER OF HOUSEHOLDS					
	Eleuthera	Abaco	Exuma	Acklins	San Salvador	Andros
Other	32 (1.37%)	111 (2.14%)	1 (0.05%)	0 (0.0%)	9 (2.36%)	0 (0.0%)
None	0 (0.0%)	26 (0.50%)	39 (1.92%)	0 (0.0%)	4 (1.05%)	0 (0.0%)

3.8.2.2 Overview of the Water and Waste Sector in the Family Islands

Eleuthera

Ponds and lakes in Eleuthera are hypersaline as the rate of evaporation exceeds rainfall. Surface water bodies found in Eleuthera include man-made lakes and ponds, as well as lagoons and blue holes. Man-made water bodies are in areas where the water table has been exposed to the surface, leaving most of the water bodies saline and brackish.

Eleuthera reportedly uses 35 million gallons of water per month. The island's water sector consists primarily of groundwater systems (wellfields) and RO systems. The main operational wellfields on the island are the Lower Bogue Wellfield in North Eleuthera and the Wellfield located at the Naval Base. The Lower Bogue Wellfield is the larger of the two with 35 of the 110 total wells on location being operational while only two of three wells at the Naval Base are operational. The storage capacity and daily demands on these wellfields are equivalent to the storage capacity and demand of the RO systems at these locations. The main RO systems on the island are located in:

- Tarpum Bay, in the southeast between Green Castle and Rock Sound; this facility's storage capacity is 626 kGal to meet the daily demand of 170 kGal
- Deep Creek, located 90 miles north of the wellfield in the Bogue area; this facility's storage capacity is 650 kGal to meet the daily demand of 475 kGal
- The Naval Base RO Plant, just south of the Governors Harbour Airport; this facility's storage capacity is 500 kGal to meet the daily demand of 670 kGal – there is insufficient storage capacity at this facility
- The Waterford RO Plant; this facility's storage capacity is 225 kGal to meet the daily demand of 150 kGal

These RO systems are independent, and the water produced are channelled into the WSC's storage system. RO systems are the main sources of water supply in Eleuthera; wellfields are only utilized as a secondary source or in the event that the RO systems are incapable of meeting public demands.

Underwater mains are used to supply water to offshore islands, such as underwater pipelines in Upper Bogue supplying Harbour Island and the Bogue Metre in Apple Hole, north of the Bluff Settlement, that supplies water to Spanish Wells. Water from the mainland is collected in a storage tank in Spanish Wells, which serves about 900 persons (~56% of the total population: 1608). To prevent the overflow of the tank, the water supply would have to be manually stopped from the mainland and constantly monitored.

Pipes on the mainland are predominantly PVC by nature and is considered to be superior to the thin, grey pipes located on the offshore islands. Due to the low quality of these pipes, there have been frequent leakages that have warranted the recommendation of overhauling the piping infrastructure, which would include a change in the piping material as well as the introduction of isolation valves. Leakages lead to the shutdown of the water supply to accommodate the efforts to locate and remedy the source of the leaking issue.

The main water supply on Eleuthera is from RO plants scattered across the island. These plants are managed by independent operators which treat water that are then stored and distributed by the WSC. In the event that the RO plants are incapable of supplying water to the island's population, wellfields are utilized as the next most relied upon source. In some areas, only wellfields are utilized, such as in the Bogue area where wellfield pumps from the water system are said to have experienced severe wear and tear rendering them unreliable. The issues of water supply and storage on Eleuthera include storage tanks overflowing due to the lack of working locking valves, and the lack of backup generators to ensure consistent water supply during power outages.

The transition of water supply and usage in Eleuthera went from residents utilizing pipe water, to then using bottled water and now some residents are in possession of their own private wells. However, in some communities, residents are still reliant, particularly the Haitians, on standpipes, . The methods of water supply are listed below in Table 3-13.

On Eleuthera, official sites close to major settlements are the usual location for solid waste disposal such as at Palmetto Point and between Alice Town and Rainbow Bay. There has also been the expansion of the dump site on Russel Island, where the dump is maintained locally by the Department of Environmental Health Services and both waste burial and burning is done. There is no concrete data that outlines the volume of waste that is generated at these disposal sites but there have been concerns that the waste being generated by the growing population is gradually outweighing the capacity of the disposal sites. This issue has been reported at Palmetto Point where there has been calls for considering alternative disposal methods to surface dumping.

As it relates to sewage waste, the different disposal methods implemented on the island are listed in Table 3-19. Septic systems are the overwhelmingly favoured method of waste disposal across Eleuthera with no sewerage system available to the population. There is also no wastewater treatment plant on the island and so no centralized method of handling and disposing of wastewater. This, therefore, suggests that there is no definitive data to the volume of wastewater that is generated by the population.

Abaco

Abaco has one of the largest freshwater reserves in the Bahamian archipelago. Most of the water systems found on the island are of a good quality. However, there are areas on the island, like Treasure Cay, where water systems have suffered from salinity and odor problems. The water systems that cover the surface of Abaco include blue holes, man-made lakes and ponds.

There are three RO plants that are located on remote cays, the largest of which supplies up to 43,000 gallons of water, as well as seven wellfields. With these systems, approximately 90% of the population is supplied with water. The lack of supply is experienced in some parts of Bakers Creek, an independent new settlement, and in Bahama Palm Shores, that relies on a private well. There are also no pipelines along the S.C. Bootle Highway as persons in that area rely on private wells and bottled water.

The Marsh Harbor, Blackwood and Cedar Harbor wellfields have, in the past, been affected by storm surges that have led to seawater intrusion. Cedar Harbor is notorious for requiring a more prolonged period of time to return to a level of normalcy. Subsurface systems are in place to channel the cays, such as Green Turtle Cay and Treasure Cay, with water. Both submersible and above ground pumps are utilized in the sector, but both are plagued by a series of challenges. Pumping stations are located at Sandy Point, Crossing Rocks, Marsh Harbour and Treasure Cay. It is anticipated that improvements will be made to the sector by the introduction of back up submersible and above ground pumps and to transition to a system where water is fully piped to all households, removing the need for standpipes.

The Water and Sewerage Corporation (WSC) is the responsible party for water supply in the Abacos. As with most other islands in the archipelago, RO plants and wellfields have replaced rainwater

collection as the main source of water. There are ten wellfields distributed across the Abacos, in each of the locations listed below:

- Sandy point; stores 100 kGal to meet a daily demand of 33 kGal,
- Crossing Rocks; stores 22 kGal to meet a daily demand of 8 kGal,
- Casuarina Point; stores 22 kGal to meet a daily demand of 10 kGal,
- Marsh Harbor; stores 1500 kGal to meet a daily demand of 445 kGal,
- Treasure Cay; stores 800 kGal to meet a daily demand of 196 kGal,
- Blackwood; stores 50 kGal to meet a daily demand of 29 kGal,
- Cedar Harbor; stores 30 kGal to meet a daily demand of 31 kGal and so has insufficient storage capacity,
- Green Turtle Cay; stores 120 kGal for an unstated daily demand,
- Cherokee Sound; has no storage tank but the Winding Bay RO plant supplies 30 kGal to meet a 7 kGal daily demand,
- Moore's Island; stores 150 kGal to meet a daily demand of 8 kGal. Although having sufficient storage capacity, major leaks at the top and bottom of the storage tank has been reported for years.

A press release by the WSC in January, 2023 has acknowledged the challenges the corporation faces in supplying potable water to the islands, especially subsequent to the effects of Hurricane Dorian, which caused the saline intrusion of the northern wellfields. The WSC reported undertaking efforts to ensure staffing and operational matters are addressed on the Abacos to ensure reliable water supply. Table 3-13 shows the main sources of water in the Abacos, with the public supply being the most relied upon source. Although there are miles of pipelines that extend throughout the different cays, there is an observed growing preference for bottled water. This is in no part due to the color or taste as there have been no significant complaints. However, there have been complaints about the smell of the water piped throughout the island.

There is a single central disposal station located at Marsh Harbour – the Marsh Harbour landfill. Solid waste pickup is reportedly done twice a week without issue. Disposal sites are located in Cooper's Town, Central Harbour, Sandy Point and Casuarina. The primary form of waste disposal on the island is open dump burning with the top three forms of waste produced being plastics, organics, and glass. It is difficult to pinpoint the volume of waste generated and disposed of on the island due to the reported prevalence of unauthorized disposal and waste burning/burial.

As it relates to sewage waste, Table 3-14 highlights the methods implemented by different households. Not only does Abaco remain consistent with the other Family Islands with the vast majority of its population relying on septic systems but it is the only of the Family Islands with a wastewater treatment facility operated by the WSC.

Exuma

The western region of the island features wetlands that are typically brackish due to their proximity to the sea. Other bodies of freshwater, such as lakes and ponds, are found further inland and become brackish when evaporation exceeds precipitation. Chemical and biological contamination is not an issue that surface water on Exuma suffers from. However, only a small portion of the island's groundwater supply is fresh enough to be extracted for use.

Figure 3-27: Brackish pond found in low-lying region of the island

The Exumas rely heavily on RO plants for a steady water supply. The hotels on the island that accommodate the increase in tourism activity have directly influenced the water supply in Exuma. The Sandals Hotel (formerly the Four Seasons Hotel) have contributed to the development of wellfields as well as have assumed ownership of the RO plant on the island. This plant supplies the hotels as well as the communities – the distribution pump is sourced from the hotel and supply utilizes the WSC line. Water provided to communities are produced by the desalination process of reverse osmosis. The supply is supplemented also by the different wellfields across the island. These wellfields in Rolleville, Ramsey, George Town and Moss Town are all considered old and in need of upgrade, particularly to increase their storage capacity. The primary RO plants operated by the WSC are located in:

- Emerald Bay; stores 250 kGal to meet the daily demand of 56 kGal,
- George Town; stores 1100 kGal to meet the daily demand of 221 kGal,
- Williams Town, stores 30 kGal to meet an unstated daily demand.

Other methods of water supply practiced by the public include siphoning water from karst features such as sinkholes, wells and rainwater collection. The prevalence of these and other sources of water in the Exumas are listed in Table 3-13.

There is a sewer network but no longer an official operational treatment plant. The majority of the population (96.6%) uses septic systems for wastewater disposal. Outside of the desalination and wastewater reuse services offered to private resorts and conducted on-site, wastewater is often discharged directly into the environment. Still, even the on-site wastewater treatment for resorts is typically done through the use of septic systems.

A study in 2014[19] showed that approximately 5000 tonnes of solid waste is generated on the island annually. Of this total, 36% was contributed to by the Sandals Emerald Bay Hotel operations. This indicates that a significant proportion of the solid waste generated on the island is a by-product of tourism activities. The increase in solid waste generation is also accompanied by the increased likelihood of pest proliferation and the incidence of fires associated with unburied solid waste. Exuma Waste Management and Recycle Exuma are both privately-held Bahamian businesses that exemplify the contractors tasked with improving solid waste disposal and collection practices.

[19] (https://www.sciencedirect.com/science/article/pii/S0921344914001773)

Acklins

Due to the low levels of precipitation and accompanying high levels of evaporation experienced on the island, most of the freshwater bodies on the island are brackish and hypersaline. There is minimal evidence of contamination and pollution from human activity. The water table is found, on average, just 2 metres below ground surface level.

Water supply on Acklins is augmented by the use of both RO systems and wellfields. The RO plant located at Snug Corner supplies water only to that community and Mason Bay. Water supply is also supported by trucks transporting 1600 gallons of water multiple times per day. Like the other Family Islands, other methods of water supply for residential used include siphoning water from karst features such as sinkholes, wellfields and rainwater collection. The Lovely Bay wellfield is an example of a wellfield in Acklins, however due to its brackish nature, up to 70 households source their water from the RO plant in Snug Corner, the largest settlement in Acklins. This plant only supplies the communities of Snug Corner and Mason Bay. In the event of a power outage, water is gravity fed to these communities. In communities not serviced by the RO plant, residents and businesses utilize private wells. Public and private storage tanks have also enabled reliability of the island' water supply. The 5000 gallon storage tank in Hard Hill is supplied with water from Spring Point and private tanks in Pinefield are filled by trucks sent by the WSC.

As it relates to sewage waste, the different disposal methods implemented on the island are listed in Table 3-19. The majority of households rely on septic tanks for sewage waste disposal. The lack of a treatment facility on the island suggests that there is also a lack of a centralized method of wastewater handling. It can, therefore, be assumed that wastewater on the island is discharged into the environment.

It can be assumed that solid waste disposal practices in Acklins is similar to that of most of the other Family Islands in that landfills are utilized for surface dumping. Unauthorized burning and burial of waste would, therefore, likely be a challenge to a controlled waste disposal system. Due to the decentralized nature of the island, there is no concrete data to show the volume of waste generated and the exact methods of waste disposal and collection implemented.

San Salvador

Approximately 40% of the island's total land area is covered by landlocked salt lakes and wetlands containing saline and brackish water. Otherwise, the island features no stream flow. Generally, there is little documentation of any biological or chemical contamination of these water sources.

The island utilizes an RO plant system as the main source of water supply. Water has also been sourced from wells located at Cockburn Town, where the RO plant is also located. Of the 50 wells at this wellfield, only 4 are currently operational. However, while there are wells that may be deemed operational, the wellfield is currently not in use due to the less than ideal working conditions of the pumping station at the wellfield. However, both wells at the RO plant are operational and have the capacity to store 294 kGal to meet the daily consumption demand of 117 kGal. Pigeon Creek and a section of Sandy Point are where private sources of fresh water are located as those residing in these are not recipient to the public water supply. The demand placed on the RO plant is estimated at 98,000 imperial gallons, which is less than the estimated 100,000 gallons that is supplied daily. The storage capacity of the plant is estimated at 294,000 gallons.

The main complaints surrounding the RO plant tend to highlight pump failures and shutdowns to facilitate pump repairs. Communities such as United Estates, Sandy Point and Victoria Hill that are located in hilly regions are often affected by instances of low pressure. The operational capacity of the RO plant is heavily dependent on a constant power supply – during power outage events, the plant remains down until the power supply is resumed. Outages last between hours and days. This, however, is not a common occurrence.

Table 3-19 shows that the most implemented method of wastewater disposal on the island is the use of septic systems. Being one of the Family Islands without a wastewater treatment facility, there is no centralized location for wastewater management or method of wastewater disposal. There is, therefore, limited data on the volume of wastewater generated. As septic systems are the preferred method of wastewater disposal, it is safe to assume that the island is similar to the rest of the Family Island in that wastewater is discharged directly into the environment. The issue of limited data on waste remains true for solid waste disposal on the island. Landfills likely serve as the primary sites of waste disposal but this poses a threat of environmental contamination, uncontrolled fires and general health concerns. It should also be noted that solid waste disposal methods first differ on a household basis, with some resorting to burning or burying waste, as opposed to relying on a scheduled pickups by approved contractors.

Andros

There is a great abundance of freshwater bodies found on the island in remote and forested regions. Andros also remains one of the few Bahamian islands with a groundwater reserve capable of supplying the needs of the population. Because Andros is relatively low-lying and of low relief, large areas of the island have been converted to wetlands via inundation. Because of this, the general water quality is considered to be below standard.

Mangrove Cay and South Andros

The RO system in South Andros siphons groundwater sources then distributes after processing. This system is located in Kemps Bay. Wells are also utilized but primarily for domestic purposes and by farmers. Low water pressure is the primary issue associated with water supply in South Andros. Furthermore, due to the high demand on the RO plant (approximately 30,000 gallons per day), the pressure is often low and as a result, the storage tank is seldom filled to maximum capacity – the existing storage capacity at the Kemps Bay RO plant is approximately 107 kGal. There are two pumps that are built into this RO system and are managed by a private company. The wellfields in this region are located on Mangrove Cay as well as in the Bluff and Congo Town. All the wells in these fields are currently operational and serve approximately 47.7% of the population of Andros, as of 2022. A total of 157 kGal is supplied by the RO system and the wellfields. This surpasses the average daily consumption demand of this area measured at 131 kGal.

North and Central Andros

There are currently at least 52 wells in North and Central Andros, two pumping stations (at Cargill Creek and Stafford Creek) and an open creek used for rainwater collection. These systems serve approximately 52.3% of the population of Andros. Wellfields in this region are located in:

- Nichols Town; producing 148 kGal to meet a daily consumption demand of 79 kGal,
- Red Bays; producing 7.2 kGal to meet an unstated daily consumption demand,
- Mastic Point, producing 51 kGal to meet a daily consumption demand of 20 kGal,
- Stafford Creek, producing 35 kGal to meet a daily consumption demand of 9 kGal,
- Staniard Creek, producing 45 kGal to meet a daily consumption demand of 28 kGal,
- Love Hill, producing 59 kGal to meet a daily consumption demand of 25 kGal,
- Fresh Creek, producing 68 kGal to meet a daily consumption demand of 38.3 kGal,
- Bowen Sound, producing 44 kGal to meet a daily consumption demand of 38.3 kGal,
- Cargill Creek, producing 28 kGal to meet a daily consumption demand of 38.3 kGal.

Only the systems at Nichols Town, Red Bays and Cargill Creek have storage systems. Up to 6400 kGal can be stored at Nichols Town while only 12 kGal and 15 kGal can be stored at Red Bays and Cargill Creek, respectively. There, however, is a manmade pond at Fresh Creek that is 300x25 feet. The depth of this pond varies between 2-5 feet depending on the level of rainfall the area receives. Due to the brackish nature of the water supplied through the pipelines, chlorination is heavily done as treatment leading to the increased saltiness of the water being supplied.

The typical mode of solid waste disposal on Andros is to dump at formal sites near main settlements, burn and sporadically make room for more refuse. Almost all sites are unregulated, have debris spread over wide areas and hence risk contaminating water supply areas. However, with the plan for the construction of sanitary landfills and most resorts operating a system of daily waste management geared toward recycling there is room for improvement in the solid waste management of not just the Andros Island but other Family Islands. Although public dumping is a common phenomenon across the Family Islands, like the others, there is no centralised method of waste disposal and so there is limited data on the volumes of waste generated specifically in this island.

This is also the case as it relates to wastewater. Table 3-14 shows the residents of Andros either rely on septic systems or pit latrines for wastewater disposal. The vast majority (95.99%) prefers the former. With no wastewater treatment facility operating on the island, there is also no centralised method of wastewater management and so limited data is available for wastewater management on Andros.

3.8.2.3 Existing Infrastructure and Proposed Upgrades on the Family Islands

Andros

Mangrove Cay and South Andros

The key infrastructure of focus for this Project located in this region are the wellfields in Mangrove Cay and at The Bluff and Congo Town as well as the RO facilities at Kemps Bay. There are 30 operational wells (4 inches in diameter) and 6 pumps at the Mangrove Cay wellfield, and 28 wells of the same size and 5 pumps at The Bluff and Congo Town wellfield. It is proposed that these wellfields be upgraded with surface mounted 1.5 horsepower centrifugal pumps. Along with the pumps, it is proposed that the existing pipework at these wellfields be replaced with PVC pipes – about 4000 feet of pipework would be required on Mangrove Cay and 2500 feet required at The Bluff and Congo Town.

In terms of wellfield electrification, the Mangrove Cay wellfield is fully electrified with BPL poles located in the wellfield. There is approximately 1333 feet of above ground cabling to this wellfield. For the other wellfield, cabling is deemed a necessity as utility poles run only from a storage tank to the pump house. Cabling then runs from the pump house to the wellfield. For the wellfields in both locations, there would be a need for an area of firebreak clearance. This is estimated to be 160000 sq. ft at Mangrove Cay and 100000 sq. ft. at The Bluff and Congo Town. These areas have been calculated as a buffer from the pipework on the wellfields and would cover the pumps and distribution centre. The pumping stations at both wellfields are not considered to be in a good condition and so upgrades in the form of new windows and roofing are needed, as well as backup generators and fire extinguishers. The storage capacity at these wellfields are also considered insufficient, with the proposed upgrades intended to increase the capacity at Mangrove Cay by 250 kGal to provide storage for up to a week, and by 75 kGal at The Bluff and Congo Town.

Both wellfield expansion and pipe replacement are proposed upgrades to be conducted on Mangrove Cay. The number of wells at Mangrove Cay is intended to be increased by 15 and assuming all pipework on Mangrove Cay are to be replaced with PVC pipes, the upgrades would see 72,605 feet of pipes being replaced.

North and Central Andros

There are more recognized wellfields in North and Central Andros than in the south with 9 wellfields being managed by the WSC. Of the 9, only one is proposed to undergo expansion with an additional 12 wells being the intended addition. The Love Hill, Fresh Creek and Nicholls Town wellfields are the only that are expected to have pipe replacement works conducted, with up to 23,000 feet of pipework expected to be replaced in the latter, including works at Lowe Sound. Two submarine pipe crossings are proposed at the Fresh Creek and Cargill Creek sites, with a proposed 38,129 feet connection from the latter to Love Hill. Storage systems are only available at the Nicholl's Town, Red Bays and Cargill Creek wellfields – Nicholl's Town's storage capacity of 6400 kGal is the only of the three deemed

sufficient and as such is the only wellfield where there is no intention for increasing storage capacity. The following lists the proposed increase in storage capacity for each wellfield:

- Red Bays: 25 kGal increase
- Mastic Point: 150 kGal increase
- Stafford Creek: 100 kGal increase
- Staniard Creek: 150 kGal increase
- Love Hill: 175 kGal increase
- Fresh Creek: 200 kGal increase
- Bowen Sound: 150 kGal increase
- Cargill Creek: 100 kGal increase

Power lines located in all these wellfields will be trenched and ducted and a backup generator be added to each, with the exception of the Nicholl's Town, Staniard Creek, Fresh Creek and Cargill Creek fields. A fuel store is required at each wellfield, along with fire extinguishers.

The figure below shows the key infrastructure located on Andros.

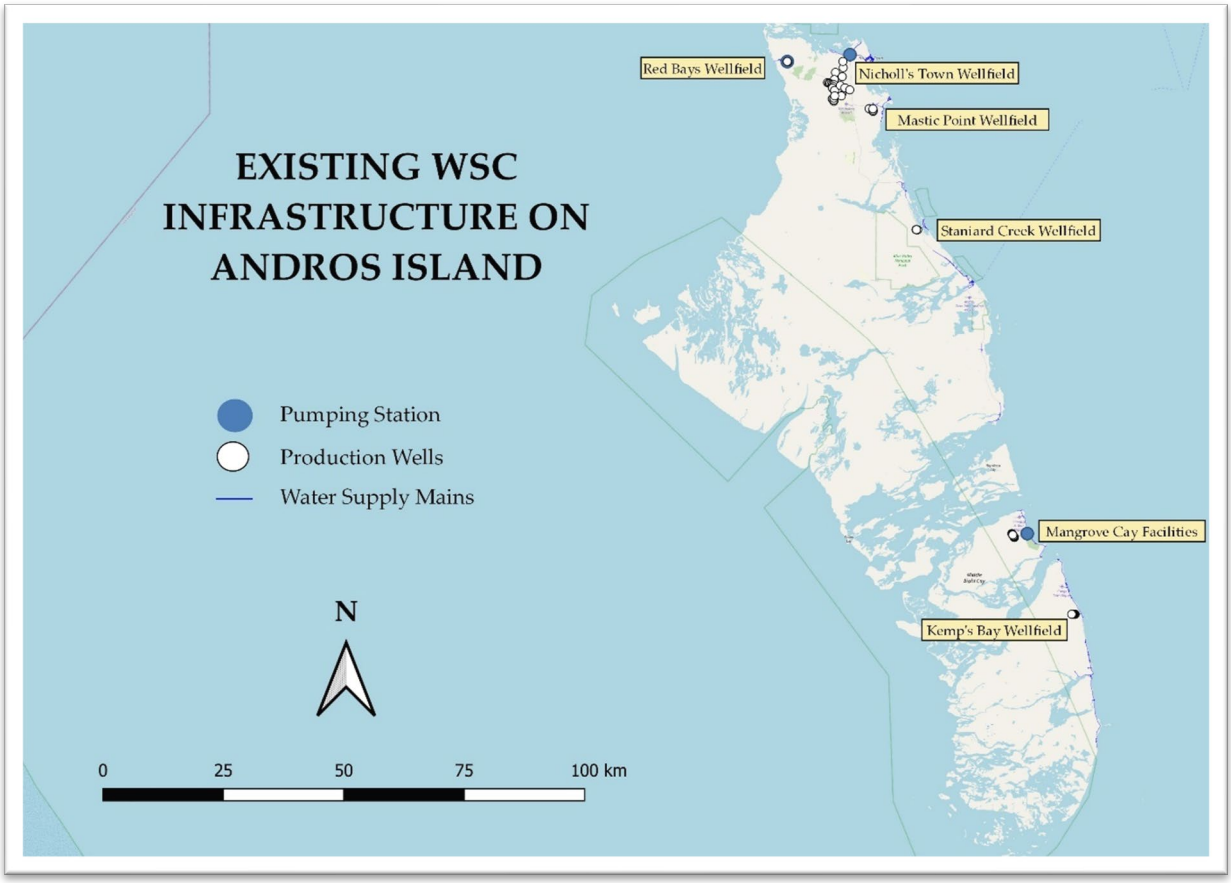

Figure 3-30: Key WSC Infrastructure on Andros

Abaco

The largest wellfield on Abaco is at Sandy Point with 45 wells that were initially constructed. However, with just 6 of these wells now operational, the Marsh Harbour and Cedar Harbour wellfields are the largest in terms of the number of operational wells they house (21 out of a total 28, and 21 out of a total 35, respectively). Marsh Harbour, however, is the only wellfield with an equal number of operational wellfield pumps as operational wells. Expansion is proposed only for the Sandy Point wellfield and the Blackwood wellfield that currently has only 3 operational wells. The expansion would

see both wellfields receive 12 additional wells and would see the Blackwood wellfield be connected with the Cedar Harbour wellfield to the north. These three wellfields would also be the only subject to pipe replacement activities where the galvanized pipes in these fields leading to pump stations would be changed due to being exposed to high rates of corrosion. The pumping stations at only the Marsh Harbour and Moore's Island are considered to be in good condition and so are the only sites not requiring a new pumping station. Backup generators are located at each of the wellfield sites except for the Cherokee Sound site where a 25 kW generator would be required. As well, fire extinguishers are located at most of the wellfield sites but it is important to ensure that these extinguishers are serviced as often as necessary.

Treasure Cay, Green Turtle Cay, Marsh Harbour, Crossing Rocks and Sandy Point are locations where the storage capacity of the wellfields are considered to be sufficient. Additional storage is required in the following locations:

- Blackwood: 50 kGal increase
- Cedar Harbour: 75 kGal increase
- Casuarinas Point: at least 10 kGal increase
- Cherokee Sound: 25 kGal increase
- Moore's Island: 150 kGal increase

The figure below shows the key WSC infrastructure on Abaco.

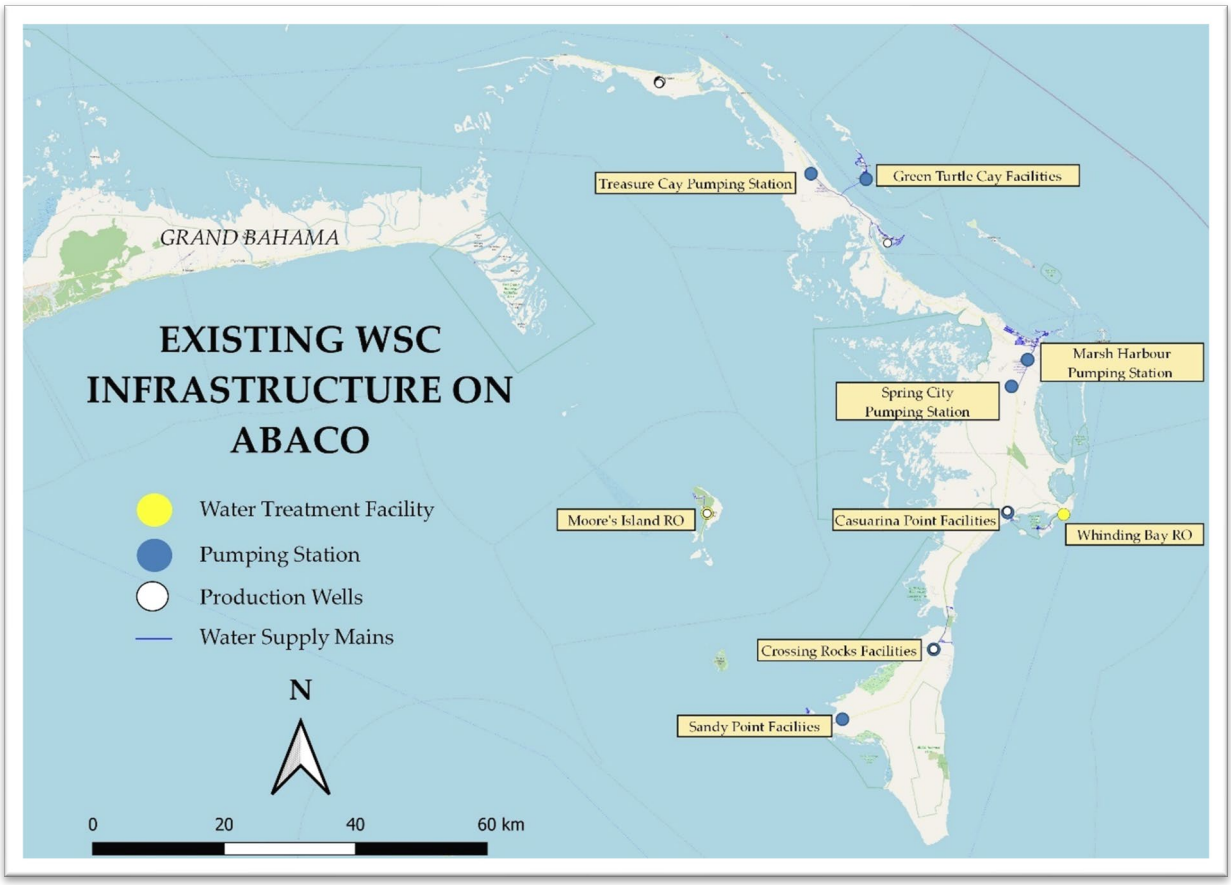

Figure 3-28: Existing WSC Infrastructure on Abaco

Acklins

Key WSC infrastructure on Acklins include the wellfield and RO system at Lovely Bay, the pumping station at Hardhill and RO systems at Snug Corner and Salina Point. The infrastructure on Acklins is unique from the other focus islands in that all the wells in these areas are operational, and as such

there is no proposed expansion of any wellfields on this island. There is uncertainty over the actual size of the wells in these areas – the wells at the Lovely Bay wellfield are described as being the size of cisterns with varying diameters. As none of the abovementioned sites have more than 5 operational wells, it is expected that the storage capacity would be minimal when compared to other islands. The storage capacity is considered sufficient only at Lovely Bay. However, it is still proposed that an additional 25 kGal of storage capacity is provided such that this system can meet a storage capacity for a minimum of three days. This additional capacity is also proposed for the systems at Snug Corner and Salina Point, and an additional 10 kGal proposed for Hard Hill. As pipework at Hard Hill is above ground, it is also proposed that 4500 feet of 2 inch PVC pipe be installed and buried. Considerations are also being made to allow for the connection between the Snug Corner system and Hard Hill as opposed to providing additional storage as storage tanks in this area are considered to be too exposed.

The following figure shows the location of the key WSC infrastructure on Acklins.

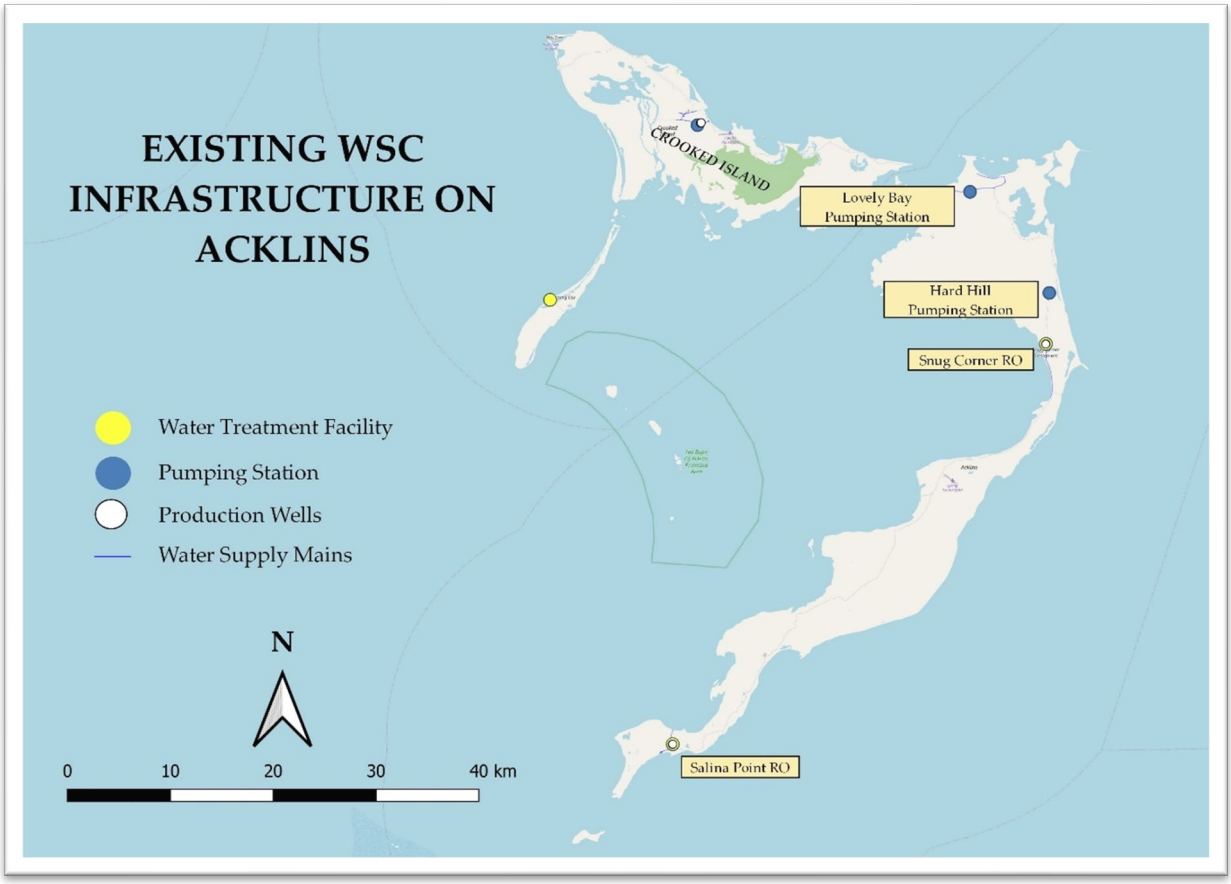

Figure 3-29: Key WSC Infrastructure on Acklins

3.8.3 Vulnerability of the Existing and Proposed Infrastructure

There is a notable lack of freshwater sources on the island outside of lakes. That is, there are no distinct rivers on the island. However, there still exists the risk of flooding from prolonged/heavy rainfall and storm surges induced by tropical cyclone activities. This is especially pertinent to the infrastructure located in flood prone and coastal areas, as well as any area where associated infrastructure lacks protection from potential hazards.

The Windsor Wellfield on the island should be considered due to its vulnerability to flooding. Along with the possible damages incurred to existing infrastructure, there is a real threat of saline intrusion that could lead to the contamination of the freshwater lens that sit atop the groundwater resources

of the island. In addition to causing supply service interruptions owing to damaged infrastructure, flooding can have an impact on the quality of surface and groundwater resources. Given that there is a heavy reliance on groundwater resources for water supply across the island, this possible contamination is especially detrimental. Saline intrusion, however, only poses as a significant risk to coastal regions. Floodwaters often carry contaminants such as agricultural runoff, industrial chemicals, sewage, and debris which, upon infiltration, can reach the aquifers that supply wellfields, leading to contamination. As well, flooding can physically damage the wellheads and other infrastructure, either via inducing erosion or abrasive action making them susceptible to contamination and reducing their operational efficiency. The latter potential issue may be further exacerbated as the wellfields may be rendered inaccessible for maintenance and monitoring, delaying essential operations.

Not only does climate change variability threaten the increased likelihood of more severe tropical cyclonic systems that increase the likelihood of flooding and storm surges, but the increased potential for drought conditions must be considered due to the threat of fires. It should also be noted that fires could also be as a result of anthropogenic factors, but it could be argued that such a human activity may be driven by the human complications that arise with changing climate conditions. As well, whilst a recent survey shows that 97% of the WSC's customers find the service reliable, the possibility of dissatisfied customers inflicting infrastructural damage cannot be overlooked. Along with the expected physical damage to wellheads, pumps, and other critical infrastructure, fires are also potential inductors of groundwater contamination – high temperatures can cause materials to melt or crack, leading to breaches where contaminants can enter. Furthermore, fires, especially in urban or industrial areas, can result in the release of various chemicals. These can include firefighting chemicals (like foams), burnt materials, and debris, which can infiltrate the soil and reach the groundwater during precipitative events that can cause these contaminants to leach into the wellfield. As such, it is important that considerations be made to implement fire control mechanisms that will mitigate against potentially destructive effects.

Arguably the greatest threat to the infrastructure of a SIDS, particularly in the Caribbean, is the threat of a hurricane. High intensity hurricanes, such as Hurricane Dorian, bring high volumes of rain and high frequency winds, both with destructive properties. Hurricanes can lead to flooding and storm surges that could have the aforementioned effects, as well as could cause notable damage to infrastructure via high wind shears. It is, therefore, important that climate risk reduction efforts treat hurricanes as a paramount priority.

3.8.4 Summary of Proposed Upgrades/Interventions to the Water Sector Infrastructure

Table 3-15: Proposed Upgrades/Interventions to the Water Sector on each Island

ISLAND	PROPOSED UPGRADES/INTERVENTIONS
New Providence	✓ Installation of surface mounted centrifugal pumps (consideration for submersible pumps) ✓ Approximately 4000 feet of cabling to pumping stations ✓ New pumping station with effective exhaust and ventilation mechanisms ✓ Back-up generators for pumping stations (800 Amps) ✓ Fire protection mechanism at pumping stations ✓ Increased storage capacity at Windsor Wellfield
Andros	✓ Replacing galvanized pipework with PVC at wellfields (Mangrove Cay, The Buff and Congo Town, Love Hill, Fresh Creek and Nicholl's Town) ✓ Developing submarine pipe crossings at Kemps Bay, Fresh Creek and Cargill Creek

ISLAND	PROPOSED UPGRADES/INTERVENTIONS
	✓ Connecting 2 systems in South Andros and from Cargill Creek to Love Hill ✓ Consideration for the installation of float valves and the associated remedial works such as installing pressure tanks ✓ Increased storage capacity at wellfields ✓ New pumping stations at wellfield locations with effective exhaust and ventilation mechanism ✓ Fire protection mechanisms at pumping stations ✓ Fuel stores at wellfields ✓ Additional wells at Cargill Creek ✓ Bridge pipe crossings at Stafford Creek and Staniard Creek
Abaco	✓ Replacing galvanized pipework with PVC at Blackwood, Cedar Harbour and Sandy Point wellfields ✓ Additional wells at Sandy Point and Blackwood wellfields ✓ Submarine pipe crossings at Treasure Cay ✓ Increased storage capacity at Blackwood, Cedar Harbour, Cherokee Sound and Moore's Island wellfields ✓ New pumping stations at Blackwood, Cedar Harbour, Treasure Cay, Green Turtle Cay, Casuarinas Point, Cherokee Sound, Crossing Rocks and Sandy Point wellfields ✓ Pressure tanks at Casuarinas Point and Crossing Rocks ✓ Back-up generator at all wellfields except at Cherokee Sound ✓ Fire protection mechanisms at pumping stations
Acklins	✓ Replacing galvanized pipework with PVC at Hard Hill wellfield ✓ Connection between Snug Corner and Hard Hill systems ✓ Increased storage capacity and new pumping stations at Hard Hill, Snug Corner and Salina Point ✓ Fuel stores at wellfields ✓ Fire protection mechanisms at pumping stations ✓ Pressure Tank at Hard Hill ✓ Back-up generators at Snug Corner and Salina Point
Eleuthera	No upgrades proposed.
San Salvador	
Exuma	

4 SOCIAL CONSIDERATIONS

4.1 Gender Impact Assessment

The European Institute for Gender Equality defines a Gender Impact Assessment (GIA) as an ex ante evaluation, analysis or assessment of a law, policy or programme that makes it possible to identify, in a preventative way, the likelihood of a given decision having negative consequences for the state of equality between women and men. To expand this definition for the purposes of this initiative, the gender assessment will seek to identify how the proposed upgrades to the infrastructure of the island's water sector is likely to impact those who rely on a clean and reliable source either to conduct business, to practice their livelihood or simply for domestic purposes. The GIA builds on the preceding socio-economic baseline assessment and water sector assessment of each of the target islands as well as ensures a specific gender lens to that analysis and also an elaboration of initial gendered risks. This type of assessment is important for the estimation of the different effects (positive, negative or neutral) of the potential implementation of the proposed development to gender equality – ensuring that the rights and opportunities.

4.1.1 Demographics and Employment

The gender ratio of the Bahamian population shows a slightly higher proportion of females – 51.8% of the population was represented by females as of 2022. However, there is a clear disparity in the gender roles on the island (Fielding and Ballance 2019). This disparity can be extrapolated to water usage and the dependence on a reliable water supply. Women are typically found to be more responsible for undertaking domestic activities while the males tend to partake in more recognized economic activities, such as fishing and farming which are two of the most primary activities practised on the islands. Tourism and hospitality also play a key role in the island's economy and this industry typically comprises more of females than males. This is consistent across the Caribbean where data shows that tourism related activities do employ a higher proportion of females than other sectors. This is more attributable to high female participation rates in the hospitality sector than in travel and supporting activities. That female participation in tourism related activities is more concentrated in lower skill, lower paid occupations is partly supported by female participation rates in management positions – across all sectors, females are least well represented in management of all the job categories (Pastore, et al., 2020). In the Bahamas, women in positions of service, such as maids, or the women working as vendors in the market, are viewed as substandard citizens, and their jobs are considered unskilled and socially inferior (Higgs, 2015).

The 2023 Labour Force Survey showed that the majority of the labour force were employed as either 'Professional, Technicians and Associate Professionals' (21%) or as 'Service Workers and Shop Market Sales Workers' (24%). The female dominated occupational groups were 'Professional, Technicians and Associate Professionals'. 'Clerks', and 'Service Workers and Shop Market Sales Workers', while the male dominated occupations were related to agriculture, fishery, or occupations that required knowledge of craftsmanship or the use/operation/assembly of machinery. In general, the labour force also consists of more females than males, with 54.5% being represented by females. The importance of water in these different employment sectors vary. The fundamental activities in the agriculture and fishing sectors would arguably require more water than the service sector – fishermen reportedly practice the method of bringing at least a gallon of water on their fishing voyeurs for drinking and sanitation purposes, and farmers naturally require water for irrigation purposes. This, however, does not negate the water requirement in other employment sectors as water is key for sanitation, purification, maintenance and industrial purposes. Despite these differences, water supply is not selective – no sector experiences preferential supply – and the aim of the WSC is to ensure equal, reliable and quality supply of water to all residents.

4.1.2 Gender Roles

Gender disparities are not contained within the labour force but persist across society. For example, gender disparities also extend to the general roles that each gender assumes in the island's culture.

Women making a livelihood while also potentially serving as the sole breadwinner of a family bear additional pressures to ensure their families are taken care of. Of the 106,645 households in the Bahamas as recorded in 2019, approximately 42% (44,805 households) were headed by a female. It is important to consider the mental and physical effects that changes to the supply and availability of water could have on females. This includes having to travel outside of residential spaces to public standpipes for water, having to secure a reliable source of water for domestic purposes (typically for cleaning, washing and cooking), and the need for water to meet feminine hygiene requirements. It is also important to consider that from a male's perspective who tends to be tasked with being his household's primary breadwinner, the lack of a reliable water source may put a strain on livelihoods, and this may also have mental and physical impacts. Along with having a reliable source of water, the quality of water being supplied may have different gender implications. The issues of low pressure and 'hardened' water that are frequent points of contention, therefore, would pose an issue to both genders that use water for different reasons, whether it be considerably salty water being supplied to households for domestic purposes or water of low quality being used for irrigation, stunting agricultural yields and impacting income generation.

4.1.3 Risk of Sexual Exploitation, Abuse and Harassment

The risk of the exploitation of women and girls in the country is not to be overlooked. This is especially true for females who are tasked with staying home to fulfil domestic responsibilities, females who have to travel long distances for water supply and females who work/reside in areas where there is a large concentration of males. The Bahamas has an average of 133 rape victims per 100,000 residents (UNODC, 2007). According to the Royal Bahamas Police Force's 2023 Crime Statistics Report, all reported crimes against people experienced a nationwide decrease in 2023 when compared to the statistics measured in 2022, with the exception of rape that experienced an 11% increase. As well, the rates of offences like rape, unlawful sexual intercourse and attempted rape generally remained unchanged. Of the victims of sexual offences, females accounted for 97% while males accounted for 95% of the suspects.

All of the above scenarios are potential influencers of high rates of gender-based violence (GBV) and should be considered when seeking to upgrade the existing infrastructure of the country's water sector. In the most extreme cases, a project of this scale and scope tend to employ more men than women and this is evidenced by the 2023 Labour Force Survey results that show the labour force in the sector most relevant to the implementation of this Project is dominated by males (~91% of craft or related workers/plant and machine operators and assemblers were men[20]). This could lead to a level of financial dependence or vulnerability in females that threaten the possibility of sexual violence or exploitation – this is not necessarily due to the mere presence of men but often relates to various factors, including workplace culture, power dynamics, and gender dynamics. Victims of sexual violence face much more difficult barriers when they are financially dependent on their perpetrators. This is applicable for both domestic violence as well as in the workplace where females may be seen subordinate in a male-dominant profession – recognising that women are likely to be part of the work team in areas such as engineering, construction and traffic management there is also the risk of sexual harassment and assault on job sites. Furthermore, literature has also shown that for female victims, workplace-related perpetrators are usually male, but the literature is mixed regarding male victims (McLaughlin, et al., 2012). On that matter, it is recommended that a fair hiring process be implemented in the event that the local labour force will be tapped into for the implementation of this Project. This fair process should see females be granted a fair and equal opportunity to enhance female representation in the Project workforce, ultimately reducing the likelihood of financial vulnerability and a labour force gender ratio heavily skewed in favour of males. Activities such as develop and implementing a fair and transparent gender-sensitive local construction worker recruitment plan is recommended as it exemplifies the measures that can be taken to promote capacity building and

[20] Labour Force Survey 2022 - The Bahamas

inclusivity across genders. Ensuring training and work opportunities are equally accessible to all social groups and that the considerations of different groups are accounted for in the decision-making process is imperative for achieving gender equality. It is also important that the executing agency, as well as any contractors and sub-contractors involved in the implementation of the Project implement a mechanism to sensitize staff and communities on gender sensitive issues, such as sexual gender based violence (SGBV) and sexual exploitation and harassment (SEAH).

4.1.4 Social Networking

Social networks are important for women as they continue to balance the inequalities around domestic responsibilities and employment or income generation activities to support their families. Social networks in this instance speaks to those outside of social media, and would include churches, schools, social clubs, and community activities that serve to provide mental and emotional support, informal knowledge sharing and recreation. Dependence of family and child-care support after school, can be severely impacted by lack of access due to traffic congestion and interruptions, or due to health and hygiene issues due to interruptions or contamination of water supply. Social networks must not be overlooked as responding to more than physical need, as it is a vital part of social well-being, and aids those dealing with anxiety, depression and similar mental health issues.

4.1.5 Education

4.1.5.1 Gender Disparities in Educational Achievements

The table below shows the types of educational institutions that are located across the Bahamian islands. New Providence hosts 32% of all these institutions and is the only island with any form of recognized post-secondary institution.

Table 4-1: Types and Numbers of Educational Institutions 2018, Source: Planning and Research Section, MOEST

SCHOOL TYPE	NEW PROVIDENCE	FAMILY ISLANDS	TOTAL
Pre-school	4	5	**9**
Primary	25	69	**94**
All-age	0	13	**13**
Junior High	7	1	**8**
Senior High	7	0	**7**
Secondary	1	23	**24**
Special	8	5	**13**
Post-secondary/Tertiary	2	0	**2**
TOTAL	**54**	**116**	**170**

The Government of Bahamas in the 2010s implemented an initiative for **"The Advancement of Women in Education in the Bahamas"**[21]. Under this initiative, the National High School Diploma a was established as a benchmark for minimum basic education that every child should obtain before leaving the school system and included standards for civics, punctuality, job readiness and community service. This positively affected over 30,348 girls who make up 51% of the total student enrolment in schools in 2015 (see Table 4-2 below). Assessments of the enrolment rates show that there are just hundreds more males attending public schools but just over a thousand more females attending private schools.

Table 4-2: Public and Private Student Enrolment by School Type - 2017-2018 School Year
Source: Department of Education, Science and Technology

SCHOOL TYPE	PUBLIC		PRIVATE		TOTAL
	Males		Females	Males	Females
Preschool	219	249	0	0	**468**

[21] The Bahamas National Review on the Implementation of the Beijing Declaration and Platform for Action

SCHOOL TYPE	PUBLIC		PRIVATE		TOTAL
Primary	11,919	11,389	1,606	1,691	**26,605**
Junior High	3,434	3,403	37	59	**6,933**
Senior High	2,773	3,071	0	0	**5,844**
Secondary	3,037	2,937	686	806	**7,466**
All-Age	517	572	5,282	6,059	**12,430**
Special School	124	112	0	0	**236**
TOTAL	**22,023**	**21,733**	**7,611**	**8,615**	**59,982**

As well, the initiative oversaw the establishment of special education services for children with mild learning and developmental disabilities. During this period, the Ministry of Education also invested in the digital evolution of the education sector with heightened emphasis on the incorporation of technology in the delivery of education.

A review of enrolment, graduation, and attainment data show that females were more likely to enroll in higher education. For the period 2010 to 2017, enrolment of females at the College of The Bahamas (COB) and The Bahamas Baptist Community College (BBCC) was almost three times as large as that of males – over this 8-year period, there were 854 male graduates at the COB (~22%) which was significantly less than the 2946 females (~78%) that graduated at that higher educational level. There were more male graduates only in the Mathematics, Physics and Technology fields, with 70% of the graduates in that field being males. At the BBCC over this same period, only 18% of the graduates were males. According to the National Review of the Educational Sector, the quality of education, training and life-long learning opportunities for women and girls were significantly improved – from primary school to tertiary learning, there is a greater probability of women and girls experiencing higher educational achievements than their male counterparts. In the 2017-2018 school year, 480 scholarships awarded in the categories of Merit, Academic, Technical and Grants were received by 63% female students.

Despite females tending to complete some form of higher education, employment status and opportunities are still found to be more favourable to males. The 2023 Labour Force Survey showed that more males were employed in all sectors, except for the hospitality and service sectors, although in these sectors more males were found to be in managerial positions. The Ministry of Social Services in the Bahamas in 2024 reported that women in the Bahamas were found to be the main contributors to the labour force (men accounted for 46%, while women accounted for 54%). With more women making up the labour force, yet more males are employed in most sectors, it can be deduced that a large percentage of the working female population are employed in the service and hospitality sectors – the only sectors with a greater female to male ratio. In light of these existing disparities, the Project should make provisions to allow for equal opportunities for training and hiring in the technical fields, and equal opportunity for females to pursue higher employment statuses through capacity building and equality sensitization.

4.1.5.2 Gender, Education and Water Access

When considering the impacts that the reliability of the water sector would have on education, it is important to emphasize in particular gender differences and needs. The absence of water in a public setting, such as an educational institution, can be perceived as a public health risk as water is necessary for sanitation practices. This is evidenced by the closure of the Sherlin C. Bootle High School on Abaco due to a prolonged disruption of the water supply.

By looking through a gender-focused scope, it is clear to see the difference in the importance of a reliable water supply for females as opposed to males. For example, in many regions, women and girls are disproportionately responsible for the collection of water. By improving the water sector to ensure access to clean and safe water, it can significantly reduce the time and effort women and girls spend

on water collection. This time savings can lead to increased opportunities for attending school, studying, and pursuing education, particularly for girls who might otherwise miss school to help with water collection. As well, improved water infrastructure often leads to better sanitation and hygiene practices. This can reduce the incidence of waterborne diseases. Fewer health issues translate into fewer school absences and a better learning environment. With increased access to clean water and improved health, there is a greater chance of students staying in school longer and completing their education. This has long-term benefits, including better career opportunities and improved socio-economic status.

Feminine hygiene is a critical issue that intersects significantly with this Project, particularly in relation to education. Addressing this aspect can have profound impacts on the health, dignity, and educational outcomes of women and girls. Access to clean and safe water is essential for effective menstrual hygiene management. Girls and women (relevant to students and teachers) need adequate water and sanitation facilities to manage menstruation safely and hygienically. Without proper facilities, they may face difficulties in maintaining cleanliness, which can lead to health issues and discomfort. Failure to provide a clean and reliable water source to aid in menstrual hygiene management can lead to school absenteeism among girls.

4.2 Age (Youth, Adults and the Elderly)

Different ages are affected differently by issues to the water supply. The youth, especially those who attend schools, are affected during water outages as in many cases, schools are advised to close in the event of a disruption to the water supply, either by leakages, shutoffs for repair or power outages. Water outages are typically preceded by public notifications that allow residents the opportunity to collect water. In some cases, this affects workers as the times designated for water collection may coincide with workhours. These are just cursory examples of the influence that the water supply has on different age groups. Regarding the country's demographic profile, in 2023 people over 65 years of age accounted for approximately 9.3% of the total population and approximately 18.5% was represented by those under the age of 15. This indicates a dependency ratio of 38.5 potentially passive people per 100 potentially active people[22].

The availability of a reliable water supply is crucial across all age demographics, each characterized by specific needs and susceptibilities. For infants and young children, access to clean water is indispensable for drinking, hygiene, and the preparation of safe food, thereby playing a critical role in the prevention of waterborne diseases such as diarrhoea and in supporting optimal growth and development. The importance of a reliable water supply on infants can also be extended to parents as a reliable source that provide the aforementioned benefits would reduce the likelihood of parents enduring mental fatigue or stress rising from complications developed in infants due to the lack of or poor quality water supply. Ensuring the provision of safe water is also fundamental to reducing child mortality rates. For school-aged children, an adequate water supply translates into improved sanitation facilities in educational institutions, which correlates with decreased absenteeism and enhanced learning conditions. The presence of clean water and proper sanitation facilities within schools mitigates the transmission of infectious diseases, promoting a healthier and more consistent attendance rate. There would also be a decrease in the number of water outages that have led to the temporary closure of schools across the Family Islands. For adolescents, particularly females, access to clean water and hygienic facilities is imperative for effective menstrual hygiene management, consequently reducing stigma and school absenteeism during menstruation.

For the working-age population, particularly those engaged in labor-intensive occupations, access to water is essential for maintaining hydration, productivity, and overall health. A sufficient water supply supports physical endurance, prevents heat-related illnesses, and contributes to safe and efficient working conditions. In agricultural sectors, reliable water sources are critical for irrigation purposes,

[22] The Bahamas Country Profile

thus ensuring food security and stable economic livelihoods. The elderly population, which exhibits heightened vulnerability to dehydration and waterborne illnesses, requires consistent access to safe water to maintain hydration and health. Moreover, clean water is vital for managing chronic health conditions and ensuring the effectiveness of medical treatments.

4.3 Persons with Disabilities (PWDs)

The 2010 Disability Report of the Population and Housing Census indicated that there were 10,138 disabled persons in the country, 5,250 of which were males accounting for more than half (51.8%). With a total population of 351,461 in 2010, PWDs accounted for 2.9% of the total population. The most common form of disability was that of lack of mobility due to paralysis or dismemberment which was the reason for almost one quarter of the persons being disabled, with blindness and mental disorders being the next most prevalent reasons.

PWDs have more medical needs than other groups due to various physical health conditions and blockage of a key road and/or extended delays in movement due to increased traffic could have detrimental effects on their health care due to loss of access to health facilities, pharmacies and care professionals. In the case of women, who already experience time poverty due to bearing the majority of domestic tasks, time loss due to traffic could have cascading effects on any productive or care work women may have to do. Added to this, are women working informal sector, making their livelihoods who may experience disruptions to income generating activities as project activities occur and this will have implications on other aspects of their lives including their dependents.

4.4 Considering Social Dynamics

It is important that the proposed development and all associated activities acknowledge the need for the abovementioned social considerations. Emphasis should be placed on ensuring no Project activities greatly disrupt existing gender dynamics if not in a positive way, which would be evidenced by the promoted participation of women in the workforce and producing an environment that safeguards the interests of both genders (males and females), allowing equal rights and opportunities. Where different genders rely on a stable and reliable water supply for different purposes (domestic and economic), the inclusion of all social groups should also be prioritized, especially as it relates to the use and access of this and other resources – human and physical.

5 IMPACT ASSESSMENT

This chapter presents an assessment of the potential environmental and social impacts for the proposed upgrades/interventions to improve the climate resilience of the water sector of the Bahamas during the implementation and execution stage of the Project. These impacts include, but are not limited to, air and noise pollution, threats to worker and community health and safety, temporary disruptions in water supply, contamination of groundwater and public supply, short-term employment opportunities, improved public health, climate resilient infrastructure, capacity building and institutional strengthening. Based on the assessment of the proposed sites of work on the different islands, the potential for land acquisition and/or resettlement is non-existent. This is partly due to most of the proposed works being upgrades to already existing systems owned and operated by the WSC, as well as the fact that there are little to no formal residences situated in an area that would be threatened by the potential of resettlement by the works.

The detailed mitigation measures of the above-mentioned impacts are included in the Environmental and Social Management Plan (ESMP) which is to serve as an addendum to this report. The analysis considers the physical, ecological and socio-economic impacts and assesses the probability and magnitude of impacts from project activities on the receiving physical environment, ecological resources and social environment, as well as the specific islands for which these upgrades/interventions and their associated potential impacts are deemed relevant. The proposed upgrades to the water sector that were considered in this chapter are:

1. Wellfield Expansion
2. Pipe Replacement
3. Increasing Storage for Resilience
4. Risk Reduction at Wellfields
5. Risk Reduction at Pumping Stations

5.1 Wellfield Expansion

The proposed expansion of the wellfields is intended to be undertaken on the following islands:

- Andros
- Abaco
- New Providence

5.1.1 The Construction Phase

Table 5-1 shows the potential impacts of the proposed intervention to expand and improve wellfields on the target islands. These potentials impacts are expected primarily in the construction phase.

Table 5-1: Potential Impacts of Wellfield Expansion during the Construction Phase

RISKS/BENEFITS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Environmental Degradation (Destruction/Alteration of Physical, Ecological and Socioeconomic Environments)	The construction of new wells can lead to significant land disturbance. This includes clearing vegetation, altering land contours, and potentially affecting local wildlife habitats. Construction activities can also increase the risk of soil erosion, particularly if not managed properly. This can lead to sedimentation in water resources, potentially affecting water quality. Furthermore, drilling and construction activities can introduce pollutants into the environment. This includes potential spills of drilling fluids, fuels, and other chemicals used in the process.	Short to Medium-Term	- Implement best practices in construction to minimize land disturbance, control erosion, and prevent pollution. This includes using silt fences, erosion control mats, and proper waste disposal methods. Re-vegetate disturbed areas promptly after construction to stabilize soil and reduce erosion. - Develop and implement spill prevention and response plans to manage potential chemical spills and contamination risks.
Utility Disruptions	Construction activities may require the rerouting of existing utilities or the installation	Short to Medium-Term	- Undertake a mapping exercise that identifies the utilities in the Project area.

RISKS/BENEFITS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	of new utility connections, which can cause temporary disruptions to services such as water, electricity, and telecommunications. Temporary disruptions to the public water supply may negatively affect women and girls that rely on water for menstrual hygiene purposes, along with general hygiene and sanitation practices that have no gender indifferences. Furthermore, Women and girls generally assume the responsibility for the collection of water and usage for domestic activities, i.e., washing, cooking, cleaning, gardening, etc. Disruptions in electricity supply can hinder women's ability to run businesses from their homes, to access online education, and to improve household conditions. This lack of access can limit these opportunities and exacerbate gender inequalities.		- Coordination with other utilities (electricity, tele-communications) is necessary to avoid accidental damage and ensure continuous service. - In the event that there are going to be scheduled outages of a utility service, affected communities should be informed at least two weeks in advance and alternative sources of that utility be shared, if possible. - Scheduled outages of the water supply should be offset by public education campaigns on alternative water sources and water conservation strategies
Noise and Air Pollution	The machinery and equipment used for drilling and construction can generate significant noise and air pollution, affecting local air quality and causing disturbances to wildlife and nearby residents. Historical trends in gender roles and employment show that men are more likely to be involved in construction activities and so would be exposed to air pollution and	Short-term	- Use noise barriers, dust suppression techniques, and restrict construction activities to certain hours to minimize disturbances to local communities. - Equip workers with appropriate personal protective equipment (PPE), including masks and earmuffs when necessary.

RISKS/BENEFITS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	excessive noise. However, with the recommendation to enhance the representation of women in the Project workforce, including for construction, women are also prone to exposure to both air and noise pollution. This can lead to respiratory issues, cardiovascular diseases, and other health problems.		- Workers assigned to noisy tasks should be frequently rotated to avoid exposure.
POSITIVE			
Employment Opportunities	The process of expanding and maintaining a wellfield creates jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors. Special considerations must be made for sourcing local labourers, and they should have access to trainings and other opportunities that allow for personal development. With the recommended measure to prioritize the enhancement of women representation in the Project workforce, it is expected that women will be afforded equal access and opportunities for employment related to the construction of wellfields.	Short to Long-term	- Prioritize identification/sourcing of human resources from the local labour force to allow for the building of local capacity as it relates to water resource management and climate resilient strategies. - Ensure provisions for non-discrimination and reasonable accommodation as well as equal pay for work of equal value - See Chapter 8.6 for measures related to enhancing and protecting women in the Project workforce.
Infrastructure Development	Expanding a wellfield often involves upgrading infrastructure such as pipelines, storage facilities, and treatment plants, which can improve the overall efficiency and resilience of the water supply system.	Long-term	- Opt for pipeline materials that resist corrosion and pressure fluctuations.

RISKS/BENEFITS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
			- Include features like variable-speed pumps and automated level controls to manage water distribution more effectively. - Schedule routine inspections and maintenance to prevent system failures and extend the lifespan of associated infrastructure.
Training and Experience	Workers and engineers involved in the construction phase stand to gain valuable experience and skills that can be applied to future projects. Professional development can enhance their career prospects and contribute to the local workforce's overall expertise relating to climate resilience initiatives. Trainings offered should also be made easily accessible to women to reduce the gender disparities when it comes to technical expertise.	Long-term	Trainings provided should include: - appropriate H&S practices, - water resource management, - climate resilient strategies, - environmental monitoring and protection, and - community engagement.
Community Engagement	Projects of this scale often involve community engagement, including public meetings and consultations. This can increase community awareness about water resources and lead to better public understanding and involvement in local water management. Tailoring communication strategies to reach women effectively through local women's groups, social media, or community leaders can help ensure they receive relevant Project	During the Construction Phase	- The Contractor's Community Liaison Officer (CLO) with responsibility for continued engagement with communities should inform communities of all Project details and expectations, including timelines, possible disruptions to utilities and traffic, and public meetings. - The Contractor's Project team should consist of several CLOs to ensure all

RISKS/BENEFITS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	information and have the opportunity to participate. Men might have easier access to information through networks or informal channels. However, ensuring that men are also engaged in discussions about gender-specific impacts is important for creating inclusive solutions.		communities in the wider project area is accounted for/can be engaged with. - It is important that community engagement activities include inputs from both genders to avoid the information provided by communities to inform decision-making being heavily skewed to one gender. As such, targeted measures should be implemented to strive for equal participation of both genders in engagement activities. This should also be applied for the inclusion of PWDs, the youth and the elderly. These measures include: o Sharing invitations to any NGOs or civil society associations with particular focus on any vulnerable social groups o Use communication channels and languages that are accessible and familiar to the targeted groups. This might involve translating materials, using community radio, or engaging local leaders who can reach the group effectively o Schedule meetings and events at times that are convenient for vulnerable groups, considering their daily routines and responsibilities. For

RISKS/BENEFITS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
			example, hold meetings in the evenings or weekends if that better fits the schedules of working parents or those with other commitments. ○ Organize focus groups or workshops specifically for vulnerable groups to provide a safe space for them to share their perspectives and experiences.

5.1.2 The Operations Phase

Table 5-2 shows the potential impacts of the proposed intervention to expand and improve wellfields on the target islands. The potentials impacts listed in the table are expected primarily in the operations phase.

Table 5-2: Potential Impacts of Wellfield Expansion during the Operations Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Reduction in Groundwater Levels	Increasing the number of wells can lead to a decline in groundwater levels due to increased extraction rates. This can result in lowered water tables and affect the availability of groundwater for other users and ecosystems.	Long-term	- Implementing a robust monitoring system to track groundwater levels, quality, and usage can help in managing wellfields sustainably. - Implement groundwater protection measures, such as wellhead protection zones and proper sealing of abandoned wells.
Surface Subsidence	Over-extraction of groundwater can lead to subsidence, where the ground surface sinks due to the compaction of aquifer materials. This can damage infrastructure and alter natural drainage patterns.	Long-term	- Employ directional drilling techniques to reduce surface disturbance and allow for more precise well placement.
Alteration to Water Quality	Additional wells can potentially affect water quality. Over-extraction can lead to the intrusion of saline water in coastal areas or the drawing in of contaminants from surrounding areas. As groundwater sources are the main sources of water on New Providence and the Family Islands, if the water supply is of substandard quality, domestic activities may be affected. Poor quality water used for domestic purposes could lead to health issues. Clean water is also essential for feminine hygiene practices.	Long-Term	- Establish ongoing monitoring programs to track environmental impacts during and after construction and ensure proper maintenance of wells and associated infrastructure. - This monitoring program should regularly measure groundwater levels, water quality, and the condition of wells. - Considerations should be made for the use of real-time data collection and remote sensing technologies to track changes and detect potential issues early.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	Furthermore, poor quality water may affect livelihoods, particularly of those employed in sectors with a high reliance on water for productivity, such as those in the agricultural sector. The 2023 Labour Force Survey shows that there are significantly more men employed in the agriculture sector as skilled labourers. Water of poor quality used in agriculture may affect yields and livelihoods, which may then cause stress and anxiety in men who tend to be the main breadwinner of their households. Stress and anxiety in men are arguably one of the drivers of domestic based violence.		
Ecosystem Disruption	Lowered groundwater levels can affect surface water bodies, wetlands, and ecosystems that depend on a stable groundwater supply. Reduced water availability can impact plant and animal species, particularly those adapted to specific hydrological conditions.	Short-term to Medium-term	- Sensitisation of workers to the faunal species within the area and the steps they are to take if certain species are found. - The need to understand who to contact for assistance and how to relocate habitats or species out of harms ways during the construction period. - Employ directional drilling techniques to reduce surface disturbance and allow for more precise well placement. This would require a detailed Biodiversity Assessment that should be considered.
Aquifer Depletion	The rate of aquifer recharge can be outpaced by the rate of extraction, leading to long-term depletion of the aquifer. This can have lasting effects on water availability and sustainability.	Medium-term to Long-term	- Implement an aquifer management plan that includes sustainable yield calculations to ensure that extraction rates do not exceed natural recharge rates.
	Increased extraction can affect the availability of water for agricultural, industrial, and residential users. This	Long-Term	- Encouraging water conservation and the use of alternative water sources (such as recycled

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
Water for Socioeconomic Activities	can lead to conflicts over water rights and access, particularly in arid or water-scarce regions. As well, the need for deeper wells and more advanced pumping technology can increase the cost of water extraction. This can impact the affordability of water for different users. The effect of water access and affordability issues may lead to complications in different socioeconomic activities. For example, with more men in agriculture, there is a chance that poor access or poor quality can disrupt this type of livelihood. The effects of this can be significant especially if agriculture is a person's sole source of income. Disruptions or complications of livelihoods can lead to depression, anxiety and a general feeling of displeasure. There is a risk of GBV in an instance where a male, who is his household's sole breadwinner, has his livelihood being disrupted by water issues and takes out his frustration on his female partner.		water) can reduce the pressure on groundwater resources. - Implement a regulatory system to prevent instances of overextraction and to allow for periods of natural recharge. - Encourage conservation? measures of water use for different economic activities. For example, encourage the use of efficient irrigation techniques such as drip irrigation or sprinkler systems that minimize water wastage.
POSITIVE			
Enhanced Water Supply	Expanding a wellfield can significantly increase the volume of water available for various uses, including drinking, agriculture, and industrial processes. This is particularly beneficial in a region with increasing water demands.	Long-term	- Because there will always be a high public demand for water, there should be educational campaigns encouraging the use of water conservation techniques to reduce the strain on the public water supply.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	An improved water supply of higher quality and reliability stands to benefit both men and women, allowing for proper hygiene practices and supporting livelihoods.		
Enhanced Drought Resilience	Having an increased number of wells can provide a more reliable water supply, reducing the risk of shortages during dry periods or times of high demand – A wellfield expansion can improve a community's resilience to droughts by providing a more robust and flexible water supply system. The burden of care to source and collect water during drought conditions would be reduced in both genders. Water would also be available for use in different socioeconomic activities, supporting livelihoods and reducing stress, anxiety and general displeasure.	Long-term	- Encourage water conservation and harvesting activities to reduce the strain placed on wellfields to ensure that there are always at a capacity to withstand drought conditions. - Implement a monitoring system to track groundwater levels, quality, and usage. Early warning systems can help predict potential shortages and enable timely responses to emerging drought conditions. - Engage with the community to promote awareness of water conservation and the importance of protecting groundwater resources.
Support for Socioeconomic Activities	Increased water availability can support agricultural expansion and intensification, leading to higher crop yields and more stable food supplies. This is also true for the fishing industry as water is a key resource, especially as it relates to sanitation and equipment maintenance. An enhanced water supply would also be beneficial to individuals reliant on a reliable supply to conduct domestic activities. This would reduce the need for persons travelling long distances for water. This is	Long-term	- Establish accessible community water points to serve areas with inadequate infrastructure. - Offer targeted programs to assist women, the elderly, and youth in accessing water resources. - Implement routine maintenance schedules for water infrastructure to prevent outages. In the event of inevitable outages, develop contingency plans to address water shortages or failures promptly.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	particularly beneficial to females, those living with disabilities and the youth/elderly. As well, a more reliable supply would reduce outages in schools, reducing the frequency of temporary closures that affect the efficiency and effectiveness of the educational sector.		
Employment Opportunities	The process of expanding and maintaining a wellfield creates jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors. Special considerations must be made for sourcing local labourers, and they should have access to trainings and other opportunities that allow for personal development. With the increase in employment in these fields, there is a high possibility of a labour influx (mostly men) moving into or travelling to different communities. The implications of this range from an increased probability of GBV to the spread of STIs due to increased instances of unprotected sexual activity.	Short to Long-term	- Engage with local communities through consultations and feedback sessions to educate them on the different employment opportunities that an improved water supply would facilitate: o Short-term employment opportunities offered through the Project should be promoted. These opportunities would include working on the construction team and serving as traffic wardens. o Sensitize residents on how the improved infrastructure and resilience of the water sector would support livelihoods dependent on a reliable supply of water.
Improved Public Health	Access to a reliable and clean water supply is crucial for public health. Expanded wellfields can help ensure that communities have sufficient water for drinking, sanitation, and hygiene. This can reduce the incidence of waterborne diseases and improve overall health outcomes.	Long-term	- Implement a daily monitoring system to ensure that the water supply is in compliance with stipulated standards.

5.2 Pipeline Replacement

The proposed replacement of pipelines is set to be undertaken in the following islands:

- Andros
- Abaco
- Acklins

5.2.1 The Construction Phase

Table 5-3 lists the potential impacts of the proposed pipe replacement works.

Table 5-3: Potential Impacts of Pipeline Replacement during the Construction Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Pest (Mosquito) Proliferation	Men might experience higher exposure to illnesses from pests due to greater time spent outside, particularly during construction activities. However, with the recommendation to enhance women representation in the Project workforce, women are also at high risk to pest proliferation. While men and women on the workforce are equally at risk, particularly to the threat of mosquitos, pregnant females from communities close to the works should be given special consideration due to their high metabolic rate and higher levels of carbon dioxide emission that mosquitos are drawn to.	Short to Medium-term	- Ensure that no open containers are kept on site that could be used for the storage of water. - Empty, drain or cover all open containers containing water. - Establish an effective drainage channel on all sites. Ensure that site surfaces are properly graded to promote water runoff and avoid puddling. - Keep vegetation around the site well-trimmed to reduce mosquito resting areas. Prevent dense, overgrown areas where mosquitoes can hide and breed.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
Health and Safety Risks to Workers and the Public	Excavation and pipe replacement activities pose safety risks to workers, including the potential for trench collapses, equipment accidents, and exposure to hazardous materials. Dust, noise, and potential exposure to contaminants during pipe replacement can pose public health risks, especially for vulnerable populations such as children, elderly, and individuals with respiratory conditions. Men generally have greater physical strength, which can impact the types of tasks they are assigned and their risk of physical injury. Women may be at a higher relative risk for certain types of injuries if tasks are not adapted to accommodate different strength levels. Women might face unique health risks related to reproductive health and menstruation, including exposure to harmful substances that could affect fertility or pregnancy. Gender-based job roles often mean that women might be assigned to less hazardous roles, but this can also result in less access to safety training and career advancement opportunities.	Short-term (during the Construction Phase)	- Workers should be trained in appropriate health and safety procedure and should be equipped with the necessary PPE. - Workers assigned to noisy tasks should be frequently rotated to avoid exposure. - Communication with the public about potential hazards and safety precautions is important. - Have at least one person on site at any given time that is trained and certified in delivering first aid. - Establish support systems and reporting mechanisms for harassment and discrimination cases to help ensure a safe and respectful work environment for all employees. - See Chapters 8.2, 8.6 and 10.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
Disruptions to Traffic and Mobility	Any disruption to movement, mobility and traffic flow is likely to affect access to and from local services including education and health services for local residents and other users. There will also potential disruption to commercial activities for several small and medium sized businesses. Road closures or restrictions due to pipe replacement works can cause significant traffic congestion and delays. Detours and alternative routes may lead to longer commute times and inconvenience for local residents and businesses. This may be caused either by the actual works or material transport	Short-term	- Consult the public regarding and informed of the proposed works and the possibility for traffic congestion and disruption Proper signage, barriers, and traffic management plans are necessary to ensure the safety of pedestrians and motorists around construction zones. - Coordinate with public transportation providers to enhance service availability and frequency during disruption periods. - When necessary, potential alternate routes should be identified, and this should be clearly communicated with the public in advance. - As best as possible, limit works in peak traffic hours. - See Chapter 7.5. - Include training of drivers.
Generation of Waste	Pipe replacement works can generate significant amounts of waste materials, including old pipes, excavated soil, and construction debris which can be	Long-term	- There should be a designated area for waste storage at the Project sites.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	detrimental if directly released into the environment.		- Waste should be collected by an approved Contractor and disposed of at an approved disposal site. - Implement a waste segregation system on-site to separate recyclable materials such as metals, plastics, concrete, and asphalt from general waste. - Where suitable, reuse excavated soil and aggregate on-site for backfill or landscaping purposes. - If the old pipes are in reasonable condition, consider repurposing them for other projects or uses. Salvage other materials such as valves, fittings, and hardware that can be refurbished and reused.
Environmental Degradation (Destruction/Alteration of Physical, Ecological and Socioeconomic Environments)	Excavation and construction activities can lead to soil disturbance, potentially causing erosion and runoff. Spills or leaks of hazardous materials (e.g., fuel, lubricants) during replacement works can contaminate soil and groundwater.	Short to Medium-Term	- Implement best practices in construction to minimize land disturbance, control erosion, and prevent pollution. This includes using silt fences, erosion control mats, and proper waste disposal methods. - Re-vegetate disturbed areas promptly after construction to stabilize soil and reduce erosion. - Develop and implement spill prevention and response plans to manage potential chemical spills and contamination risks.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
			- Properly store and handle hazardous materials to prevent spills and contamination.
Utility Disruptions	Construction and excavation activities may require the rerouting of existing utilities or the installation of new utility connections, which can cause temporary disruptions to services such as water, electricity, and telecommunications. Planned outages need to be managed to minimize disruption and ensure public safety. Unexpected encounters with unmarked or improperly documented utilities can cause delays and additional costs. Disruptions can significantly affect the ability of women to perform the domestic tasks that they often take on, leading to increased stress and workload. While men may also handle domestic tasks, the impact of utility disruptions may be less pronounced if they are less involved in day-to-day household management.	Short to Medium-Term	- Undertake a mapping exercise that identifies the utilities in the Project area. Coordination with other utilities (electricity, tele-communications) is necessary to avoid accidental damage and ensure continuous service. - See Chapter 8.1
Noise and Air Pollution	The machinery and equipment used for excavation and construction activities can generate significant noise (especially if work is conducted near residential areas or during nighttime) and air pollution, affecting local air quality and causing disturbances to wildlife and nearby residents, especially	Short-term	- It is important that frequent wetting activities be carried out in the event of excavation and/or land clearing to prevent mass fugitive emissions. - All vehicles should be frequently maintained.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	those with pre-existing respiratory conditions. Women may be more susceptible to respiratory issues such as asthma and bronchitis due to differences in lung size and hormonal influences. Long-term exposure to air pollutants like particulate matter can exacerbate these conditions. Pregnant women in particular are at higher risk from air pollution, which can affect fetal development and increase the risk of preterm birth, low birth weight, and developmental issues. Men may also experience significant health impacts from air pollution, including increased risk of heart disease and lung cancer. Chronic exposure can lead to decreased lung function and exacerbation of pre-existing health conditions.		- All workers should be equipped with the appropriate PPE (i.e., respiratory masks) - Stakeholder engagement is critical before construction activities start to discuss with locals what to expect and how they can be mitigated. - See Chapters 7.2 and 7.3.
POSITIVE			
Employment Opportunities	The process of excavating and replacing pipelines can create jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors. Special considerations must be made for sourcing local labourers (including women, PWDs and they should	Short to Long-term	- Prioritize siphoning human resources from the local labour force to allow for the building of local capacity as it relates to water resource management and climate resilient strategies.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	have access to trainings and other opportunities that allow for personal development. The employment opportunities that are likely to be generated throughout this Project are typically seized by males according to the 2023 Labour Force Survey that shows men dominating the numbers in the fields of construction, industry and engineering. With the increase in employment in these fields, there is a high possibility of a labour influx (mostly men) moving into or travelling to different communities. The implications of this range from an increased probability of GBV to the spread of STIs due to increased instances of unprotected sexual activity.		- See Chapter 8.6 for measures related to enhancing and protecting women in the Project workforce.
Infrastructure Development	Pipeline replacement activities usually include some amount of excavation that affects existing roadways. Completion of pipeline replacement should lead to the resurfacing of roads to an improved state relative to pre-excavation conditions.	Long-term	- Opt for pipeline materials that resist corrosion and pressure fluctuations. - Include features like variable-speed pumps and automated level controls to manage water distribution more effectively. - Schedule routine inspections and maintenance to prevent system failures and extend the lifespan of associated infrastructure.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
			- Prioritize the resurfacing of roads where excavation efforts have caused damage.

5.2.2 The Operations Phase

Table 5-4 lists the potential impacts of the proposed pipe replacement during the Operations Phase of the Project.

Table 5-4: Potential Impacts of Pipeline Replacement during the Operations Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Environmental (Soil and Water) Contamination	Pipelines can suffer from leaks or ruptures, releasing harmful substances such as chemicals into the environment. These spills can contaminate soil and water, leading to long-term environmental damage.	Short to Medium-term	- Use leak detection systems and sensors to monitor pipeline integrity and detect potential leaks or breaches early. - Conduct frequent inspections of the construction site and pipeline components to identify and address any signs of leaks or potential issues. - Create and implement detailed spill response plans that outline procedures for containing and cleaning up spills or leaks quickly.
Public Health and Safety Risks	Possible contamination of the public water supply risks health and safety issues for consumers. Physical damage to the pipes and microbial contamination are prime sources of potential contamination of water being piped for public supply. **Physical damages:** Corrosion of metal pipes can lead to the release of rust and other particles into the water, affecting water quality and safety. As well, physical damage to pipelines, such as leaks or breaks, can allow contaminants from the surrounding soil or environment to enter the pipeline.	Short-term	- Select pipeline materials that are resistant to corrosion and degradation. Ensure they are suitable for the specific environmental conditions they will be exposed to. - Conduct regular testing of water quality to detect any contaminants that may have entered the system. This includes testing for microbial, chemical, and physical contaminants. - Perform ongoing maintenance of pipelines, including cleaning, inspecting, and repairing any issues that could lead to contamination.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	Microbial Contamination: Pathogens, such as Salmonella, can contaminate water if introduced through leaks or cross-connections. These pathogens can cause gastrointestinal illnesses and other health issues. Biofilms can form inside pipelines, providing a habitat for bacteria and other microorganisms. This can lead to the release of pathogens into the water supply. Women may experience increased risks of reproductive health issues due to contaminants like heavy metals or pathogens in the water, which can affect menstrual health and overall reproductive well-being. Contaminated water can also pose significant risks to pregnant women and their unborn children, potentially causing developmental issues or miscarriages. For lactating mothers, contaminated water can affect breast milk quality, impacting infant health. Contaminants like heavy metals and chemicals in the water can lead to long-term health issues for men, such as kidney disease or cancer. These health problems might not be immediately apparent but can significantly impact quality of life and productivity. Men, who may be more involved in outdoor or industrial activities, might face increased exposure to contaminated water sources, especially if they are involved in agriculture or other industries relying on water.		- If chlorinating, adjust chlorine dosage according to the quality of the source water, including turbidity, organic matter, and pH levels, as these factors can affect chlorine's effectiveness.
Utility Disruptions	Pipeline repairs or maintenance may require the rerouting of existing utilities or the installation of new utility connections, which can cause temporary disruptions to services such as water, electricity, and	Short to Medium-Term	- Inform the public about planned repairs well in advance through multiple channels (e.g., flyers, social media, local news). Include

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	tele-communications. Planned outages need to be managed to minimize disruption and ensure public safety. Women typically handle domestic chores, including managing water needs for cooking, cleaning, and sanitation. Disruptions can increase their workload and stress, affecting their ability to perform these tasks efficiently. Men may face disruptions in their employment, particularly if they work in sectors dependent on water (e.g., agriculture, construction). The inability to access a reliable water supply can lead to decreased productivity or income loss.		details about the expected duration, affected areas, and any necessary precautions. - Collaborate with utility companies to ensure they are aware of the repairs and can adjust their services accordingly. This coordination helps in minimizing overlapping disruptions. - Schedule major repair work during off-peak hours or times of lower demand to minimize disruption to residents and businesses. This can include night work or weekend work. - Set up temporary water distribution points or provide bottled water if water service is disrupted. Ensure these are accessible to all affected residents.
POSITIVE			
Quality and Reliability **Public Health**	New pipes often have improved materials and technologies, leading to enhanced reliability, reduced maintenance costs, and fewer leaks or breaks. PVC pipes especially (which are the preferred pipes to replace existing networks) are beneficial due to the resistance to corrosion, even when exposed to chlorinated disinfectants. Women, often primarily responsible for managing household hygiene, benefit significantly from reliable water access. Access to clean water is crucial for women's reproductive health. It reduces the risk of waterborne diseases and complications during	Long-term	- Conduct regular inspections and maintenance of water supply systems to identify and address potential issues before they lead to disruptions. - Promote sustainable water use practices, including the use of recycled water for non-potable purposes and integrating green infrastructure solutions. - Launch public education campaigns to raise awareness about water conservation, hygiene, and the importance of a reliable

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	pregnancy and childbirth. Clean water also supports menstrual hygiene, which is vital for overall health. Men also benefit from a consistent supply of clean water, which supports overall health and reduces the risk of waterborne diseases. This can lead to fewer health-related absences from work and improved productivity.		water supply. Engage the community in water management efforts, including public consultations, workshops, and feedback mechanisms. - Provide regular updates on water quality, supply status, and any planned maintenance or improvements. Use multiple communication channels to reach different communities.
Support for Socioeconomic Activities	Increased water availability can support agricultural expansion and intensification, leading to higher crop yields and more stable food supplies. This is also true for the fishing industry as water is a key resource, especially as it relates to sanitation and equipment maintenance. In essence, a reliable water source can enhance the productivity and profitability of reliant socioeconomic activities. An enhanced water supply would also be beneficial to individuals reliant on a reliable supply to conduct domestic activities. This would reduce the need for persons travelling long distances for water. This is particularly beneficial to females, those living with disabilities and the youth/elderly. As well, a more reliable supply would reduce outages in schools, reducing the frequency of temporary closures that affect the efficiency of the educational sector.	Long-term	- Establish accessible community water points to serve areas with inadequate infrastructure. - Offer targeted programs to assist women, the elderly, and youth in accessing water resources. - Implement routine maintenance schedules for water infrastructure to prevent outages. In the event of inevitable outages, develop contingency plans to address water shortages or failures promptly.

5.3 Increasing Storage for Resilience

The proposed increase in the water storage capacity for resilience is expected on the following islands:

- Andros
- Abaco
- Acklins

5.3.1 The Construction Phase

Table 5-5 lists the potential impacts of the proposed water storage capacity increase works.

Table 5-5: Potential Impacts for Increasing Storage for Resilience during the Construction Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Environmental Degradation: Habitat Loss and Soil Disruption	Larger storage facilities may require clearing land, which can lead to the loss of natural habitats and biodiversity. This is particularly concerning in ecologically sensitive areas. The excavation and construction process can disturb soil, leading to erosion, sedimentation in nearby water bodies, and potential impacts on local flora and fauna. The construction of storage tanks requires significant amounts of raw materials such as concrete, steel, and other construction materials, which can contribute to resource depletion and environmental degradation if not sourced sustainably. Construction activities can lead to runoff containing pollutants, such as oil, chemicals, or sediment, which may contaminate local water sources if not properly managed.	Long-term	- Implement best practices in construction to minimize land disturbance, control erosion, and prevent pollution. This includes using silt fences, erosion control mats, and proper waste disposal methods. - Re-vegetate disturbed areas promptly after construction to stabilize soil and reduce erosion. - Develop and implement spill prevention and response plans to manage potential chemical spills and contamination risks.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
Air and Noise Pollution	Construction activities tend to generate higher levels of dust and noise emissions than baseline conditions. Prolonged exposure to these pollutants poses serious risks to worker and community health and safety, possibly leading to or exacerbating respiratory illnesses, issues with concentration and hearing loss. Men in construction activities will also be exposed to noise from heavy machinery. However, with the recommendation to enhance the representation of women in the Project workforce, including for construction, women are also prone to exposure to both air and noise pollution. This can lead to respiratory issues, cardiovascular diseases, and other health problems.	Long-term	- Use noise barriers, dust suppression techniques, and restrict construction activities to certain hours to minimize disturbances to local communities. - Equip workers with appropriate personal protective equipment (PPE), including masks and earmuffs when necessary. - Workers assigned to noisy tasks should be frequently rotated to avoid exposure.
Worker Health and Safety	Construction sites pose health and safety risks to workers, including accidents, exposure to hazardous materials, and long-term health impacts from working conditions. Men generally have greater physical strength on average, which can impact the types of tasks they are assigned and their risk of physical injury. Women may be at a higher relative risk for certain types of injuries if tasks are not adapted to accommodate different strength levels. Women might face unique health risks related to reproductive health and menstruation,	During Construction Phase	- Workers should be trained in appropriate health and safety procedure and should be equipped with the necessary PPE. - Workers assigned to noisy tasks should be frequently rotated to avoid exposure. - Communication with the public about potential hazards and safety precautions is important. - Have at least one person on site at any given time that is trained and certified in delivering first aid.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	including exposure to harmful substances that could affect fertility or pregnancy. Gender-based job roles often mean that women might be assigned to less hazardous roles, but this can also result in less access to safety training and career advancement opportunities. Women may face harassment or instances of discrimination on construction sites, which can impact mental health and overall well-being.		- Establish support systems and reporting mechanisms for harassment and discrimination cases to help ensure a safe and respectful work environment for all employees. - See Chapters 8.2, 8.6 and 10.
POSITIVE			
Employment Opportunities	The process of increasing the storage capacity of existing storage facilities can create jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors. The employment opportunities that are likely to be generated throughout this Project are typically seized by males according to the 2023 Labour Force Survey that shows men dominating the numbers in the fields of construction, industry and engineering. With the increase in employment in these fields, there is a high possibility of a labour influx (mostly men) moving into or travelling to different communities. The implications of this range from an increased probability of GBV to	Short to Long-term	- Prioritize siphoning human resources from the local labour force to allow for the building of local capacity as it relates to water resource management and climate resilient strategies. - Special considerations must be made for sourcing local labourers (including women, PWDs and they should have access to trainings and other opportunities that allow for personal development. - See Chapter 8.6 for measures related to enhancing and protecting women in the Project workforce.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	the spread of STIs due to increased instances of unprotected sexual activity.		
Capacity Building of Local Labour Force	The construction phase should provide opportunities for personal skill development of the labour force, particularly as it relates to climate resilience and water infrastructure. Targeted skill development provisions would enhance the capabilities and employability of the local labour force. The recommendation to improve representation of women in the Project workforce would facilitate the skilled development of not just men, who are more likely to be employed in these construction activities. This would reduce the gender disparities in skilled labour – more women would have the capacity to participate in such activities, making them more employable.	Long-term	- Develop a training schedule on best practices and methods of application - There should be equitable access to these development opportunities

5.3.2 The Operations Phase

Table 5-6 lists the potential impacts for the proposed increase in the water storage capacity of the target islands during the Operations Phase of the Project.

Table 5-6: Potential Impacts for Increasing Storage for Resilience during the Operations Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Increased Energy Consumption	Increased storage capacity, particularly in RO facilities, may lead to higher energy consumption for pumping and maintaining water quality as more water would need to be pumped from wells to storage tanks or reservoirs. As well, ff the storage facilities are located farther from the wellfield, the energy required to transport water increases due to higher friction losses in longer pipelines.	Short to Medium-term	- Incorporating sustainable practices, such as using renewable energy sources and implementing advanced water management technologies, can mitigate environmental impacts. - Conduct regular energy audits to identify and address inefficiencies in the water pumping and treatment processes.
Water Quality due to Stagnation **(Tastes and Odours)**	Improper management of large storage facilities can lead to issues like algal blooms and contamination if water remains stagnant for extended periods. Stagnant water provides a conducive environment for the growth of bacteria, including harmful pathogens such as Legionella, E. coli, and Pseudomonas. Algae and biofilms can form on the surfaces of storage tanks and pipes, further degrading water quality and posing health risks. Stagnant water often develops unpleasant tastes and odors due to the accumulation of organic matter and microbial activity. Health risks vary dependent on gender with women (including pregnant women and especially those with the burden of domestic activities) particularly at risk to a contaminated supply.	Short-term	- Implement a monitoring system where the quality of stored water is frequently tested so early actions can be taken to prevent or reduce the risk of quality degradation. - To prevent water stagnation and maintain water quality in large storage tanks, circulation pumps may be needed. These pumps consume additional energy. In some cases, aeration systems are used to maintain water quality by providing oxygen to the stored water, which also requires energy. - Schedule regular maintenance to clean storage tanks, remove sediments, and inspect for signs of microbial growth or corrosion.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
POSITIVE			
Structural Integrity	Larger storage facilities require more robust structural support and regular maintenance to ensure integrity. The risk of structural failure or leaks increases with the size of the facility. Increased capacity often means more complex systems, which can be harder to maintain and repair. This can lead to higher operational costs and increased risk of downtime.	Short-term	- Conduct regular inspections and maintenance of storage tanks and associated infrastructure to ensure their structural integrity. - Invest in training and development programs for staff to equip them with the necessary skills to manage larger and more complex storage systems effectively.
Groundwater Resource Management	Increased storage capacity can help manage peak demand and improve water quality by allowing for more controlled and stable water treatment processes. Enhanced storage capacity in a wellfield can allow for better management of groundwater resources, reducing over-extraction and promoting sustainable water use.	Long-term	- Conduct community-wide awareness campaigns to educate all genders about the benefits of improved water storage and how to utilize it effectively.
Public Health	Improved water storage capacity can enhance the reliability of water supply, contributing to better public health outcomes by ensuring consistent access to clean water. With more storage capacity, water treatment processes can be more consistent and effective, leading to improved water quality – adequate storage allows for better control of contaminants and pathogens through extended contact times with disinfectants and more thorough monitoring and management practices. Consistent access to a healthy supply of water reduces the burden of stress for water usage, which can impact health, education, and economic opportunities. Due to women and girls traditionally being more responsible for domestic water management, an enhanced water storage and treatment reduce the risk of contamination, improving	Long-term	- Provide targeted education and training programs for both men and women on water management, hygiene, and maintenance of storage facilities. - Design water storage facilities with considerations for accessibility and maintenance that accommodate the needs of both women and men. For example, ensure that facilities are safe and easy to access, and that maintenance responsibilities are shared equitably. - Implement community outreach programs to raise awareness about the benefits of

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	health outcomes for women and children who are particularly susceptible to such diseases.		improved water storage and quality. Engage local communities in monitoring and maintaining water systems to ensure that they meet the needs of all members. - Regularly monitor and evaluate the impact of water storage improvements on different genders to ensure that the benefits are equitably distributed.
Emergency Preparedness	Enhanced storage capacity can improve a community's resilience to natural disasters, such as droughts, by providing a larger buffer of available water – larger storage capacity provides a substantial buffer of potable water, which is crucial during disasters such as droughts, floods, earthquakes, or contamination events. This buffer helps maintain supply continuity when normal operations are disrupted. During natural disasters, women and children often face heightened vulnerability due to their roles in managing household water and other responsibilities. Improving the storage capacity ensures that there is a sufficient supply of potable water available, which can alleviate the immediate burden on whomever (man or woman) that would need to spend significant time and effort securing clean water.	Long-term	- Involve women and other marginalized groups in disaster planning and response efforts. Their input can ensure that water storage solutions address the specific needs of all community members and are equitable. - Provide training for both men and women on disaster preparedness, including how to manage and utilize enhanced water storage effectively. Education should emphasize the importance of equitable access and responsibilities during emergencies.

5.4 Risk Reduction at Wellfields

The proposed interventions include implementing firebreaks, retrofitting wells with modern wellheads and implementing well flushing mechanisms on the following islands:

- Andros
- Abaco
- New Providence

5.4.1 The Construction Phase

Table 5-7 lists the potential impacts of risk reduction interventions proposed for wellfields during the Construction Phase.

Table 5-7: Potential Impacts of Risk Reduction Interventions at Wellfields during the Construction Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Alteration to Physical and Ecological Environment	Creation of firebreaks may involve clearing vegetation, which can disrupt ecosystems and habitats. Firebreaks may alter the visual aesthetics of the landscape, especially in natural or scenic areas. Construction activities associated with retrofitting may cause disturbance to the surrounding environment, including soil erosion and habitat disruption. Land disturbance associated with cabling installation may impact natural habitats and landscapes, while above-ground infrastructure can detract from visual aesthetics. Discharge from well flushing activities may contain sediments, chemicals, or contaminants	Short to Medium-term	- Conduct controlled vegetation management within firebreak areas, including regular trimming, mowing, or selective removal of vegetation. Schedule these vegetation management activities during periods of low wildlife activity to minimize disturbance to local habitats. - Minimize non-herbicidal methods whenever possible to minimize ecological impacts. - Prioritize the establishment of diverse native plant communities to support local biodiversity. Monitor restored areas for invasive species and take prompt action to control their spread. - Use natural barriers such as berms, hedges, or strategically planted trees to visually screen firebreaks from surrounding areas.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	that could affect nearby water bodies or ecosystems.		- Incorporate revegetation efforts, soil stabilization measures, and erosion control techniques to restore disturbed habitats. Monitor restored areas over time to assess the effectiveness of restoration efforts and make adjustments as needed.
Water Resource Consumption	Flushing wells requires the use of water resources, which may conflict with conservation goals or water scarcity concerns. Well flushing activities may temporarily disrupt wellfield operations, leading to service interruptions or reduced efficiency.	Short-term	- Implement water conservation measures to reduce the volume of water used for well flushing, such as optimizing flushing frequency and duration. - Utilize captured rainwater or recycled water for flushing activities where feasible to minimize reliance on freshwater resources. - Coordinate flushing activities with other maintenance tasks to minimize disruptions to wellfield operations and optimize resource utilization. Communicate flushing schedules to stakeholders, including water utility customers and regulatory agencies, to promote transparency and awareness of well maintenance efforts.
Safety Risks	Improper installation or maintenance of electrical cabling can pose safety hazards, including electrical shocks, fires, and electromagnetic field exposure. Men are more likely to be involved in these types of activities and so stand to be at risk to these safety hazards. However, the intention to include more women in the Project workforce, including the construction workforce, suggests that they too would be at risk to safety hazards.	Short-term	- Prioritize underground installation of electrical cabling to minimize visual impact and reduce disturbance to surface ecosystems. - Coordinate with utility companies and local authorities to identify optimal routes for underground cabling that avoid sensitive habitats and cultural resources.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
			- Conduct health and safety trainings prior to any potentially hazardous activities. All workers must be provided with adequate PPE.
POSITIVE			
Capacity Building of Local Labour Force	The construction phase should provide opportunities for personal skill development of the labour force, particularly as it relates to climate resilience and water infrastructure. Targeted skill development provisions would enhance the capabilities and employability of the local labour force. The recommendation to improve representation of women in the Project workforce would facilitate the skilled development of not just men, who are more likely to be employed in these construction activities. This would reduce the gender disparities in skilled labour – more women would have the capacity to participate in such activities, making them more employable.	Long-term	- Develop a training schedule on best practices and methods of application - There should be equitable access to these development opportunities
Employment Opportunities	The Project activities can create jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors. With the increase in employment in these fields, there is a high possibility of a labour influx (mostly men) moving into or travelling to different communities. The implications of this	Employment Opportunities	- Employment opportunities should be advertised so as to allow for equitable access to all genders - Conduct relevant training sessions on health and safety protocols, emergency response and water infrastructure for capacity building

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	range from an increased probability of GBV to the spread of STIs due to increased instances of unprotected sexual activity.		

5.4.2 The Operations Phase

Table 5-8 lists the potential impacts of reducing risk at wellfields during the Operations Phase.

Table 5-8: Potential Impacts of Risk Reduction Interventions at Wellfields during the Operations Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Disruption to Groundwater Supply	Flushing wells requires the use of water resources, which may conflict with conservation goals or water scarcity concerns. Well flushing activities may temporarily disrupt wellfield operations, leading to service interruptions or reduced efficiency. Any possible disruptions to the groundwater supply during well-flushing activities could impact both men and women differently: - Women are traditionally found to be more responsible for the use of water for domestic purposes. Any disruptions could cause difficulties in the completion of domestic duties, possibly leading to increased stress. Proper hygiene and sanitation practices would also be hindered by any disruptions. This is particularly impactful on women and girls who have to consider menstrual hygiene both at home and away (at work or school). - Economic activities dependent on water, such as agriculture, also stand to be affected by any disruptions. With the 2023 Labour Force Survey showing more men in skilled agriculture, they are more prone to economic	Long-term	- Implement water conservation measures to reduce the volume of water used for well flushing, such as optimizing flushing frequency and duration. - Utilize captured rainwater or recycled water for flushing activities where feasible to minimize reliance on freshwater resources. - Coordinate flushing activities with other maintenance tasks to minimize disruptions to wellfield operations and optimize resource utilization. Communicate flushing schedules to stakeholders, including water utility customers and regulatory agencies, to promote transparency and awareness of well maintenance efforts.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	losses in this way, leading to financial stress and anxiety.		
POSITIVE			
Reduced Fire Risk and Enhanced Safety and Protection of Infrastructure	Implementing firebreaks around wellfields helps reduce the risk of wildfires spreading to critical infrastructure. By creating a buffer zone devoid of vegetation, the likelihood of fires reaching wellheads, pipelines, and other equipment is minimized. Firebreaks act as barriers that protect wellheads, pumping stations, and other facilities from damage caused by wildfires. This proactive measure prevents potential disruptions to water supply and minimizes the need for costly repairs or replacements. Firebreaks improve safety for workers and emergency responders by providing a clear, accessible space for firefighting activities. This facilitates rapid response and containment of fires, reducing the potential for injuries and property damage. All genders stand to be affected by operational hazards. Increasing resilience can, therefore, only be seen as a net positive for workers, community members and first responders.	Long-term	- Conduct regular inspections of firebreaks to ensure they are free of vegetation and debris that could compromise their effectiveness. This includes removing any new growth or materials that may have accumulated since the last maintenance check. - Involve local communities, landowners, and stakeholders in the planning and maintenance of firebreaks. Their local knowledge and support can enhance the effectiveness of firebreaks and ensure they address specific regional risks. - Ensure that firebreaks provide clear and accessible routes for firefighting equipment and personnel. This may involve constructing access roads or pathways to facilitate quick deployment of firefighting resources.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
Improved Monitoring and Control (Protection against Contamination)	Retrofitting existing wells with modern wellheads allows for better monitoring and control of groundwater extraction. Wellhead retrofitting includes measures to prevent contamination of groundwater sources. This may involve installing protective casings, seals, and monitoring devices to detect and mitigate potential sources of contamination, such as chemical spills or surface runoff. Women, often responsible for managing household water, might be particularly concerned about the quality of water used for drinking, cooking, and sanitation. Ensuring that retrofitting measures are effective in preventing contamination can directly protect the health of women and children who may be more sensitive to water quality issues.	Long-term	- Schedule regular inspections and maintenance of retrofitted wellheads to ensure that all components are functioning correctly and that protective measures remain effective. - Provide training for well operators and maintenance personnel on the new wellhead technologies, monitoring systems, and best practices for groundwater protection. - Train staff in emergency response procedures for potential contamination events, including how to use monitoring data to detect issues early and take appropriate actions.
Maintaining Water Quality	Well flushing is a crucial preventive maintenance activity that helps maintain water quality by removing sediments, biofilm, and accumulated debris from well screens and casings. Flushing prevents the buildup of contaminants that could compromise water quality and pose risks to public health. Flushing helps prevent microbial growth or organic matter accumulation within wells that can	Long-term	- Maintain comprehensive records of flushing activities, including dates, methods, equipment used, and water quality data. - Implement reporting systems to communicate flushing results and issues to relevant stakeholders, including water management teams and regulatory agencies.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	impair well performance, reduce pumping efficiency, and introduce pathogens or odors into the water supply. Regular flushing restores and maintains the efficiency of well pumps and screens by removing obstructions and restoring flow rates. This ensures optimal well performance and prolongs the lifespan of pumping equipment, reducing the need for costly repairs or replacements. Also, well flushing is an essential component of emergency preparedness plans, particularly during contamination events or water quality incidents. Flushing can help quickly restore water quality and minimize the impact of contamination on public health and safety. Women, who are often primary caregivers, may be more directly concerned with household water quality and its implications for family health. Ensuring that well flushing activities effectively prevent contamination helps protect the health of all genders, but particularly those who are responsible for managing household health and sanitation.		- Provide training for well operators and maintenance personnel on best practices for flushing, equipment operation, and safety procedures. promote gender inclusivity in these roles by encouraging women to enter technical fields and providing equal opportunities for career advancement. Specialized training programs should be accessible to all genders, addressing any barriers women might face in pursuing such careers. - Ensure that safety protocols are in place to protect personnel during flushing activities, including proper use of PPE. Safety protocols must address gender-specific concerns. For example, PPE should be designed to fit all genders appropriately. This ensures that women and men have equal protection against potential hazards during maintenance tasks.
Safe, Reliable and Stable Power Supply	Electrical cabling infrastructure at wellfields improves the safety and reliability of electrical systems. Properly insulated and grounded cables reduce the risk of electrical hazards, such as shocks, fires, and equipment damage, ensuring the safety of personnel and equipment.	Long-term	- Provide comprehensive training for staff on electrical system operations, safety procedures, and emergency response. Ensuring that women have equal access to these roles can help address gender imbalances in technical fields. Special training programs for women in electrical

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	Cabling infrastructure provides a stable power supply to wellfield equipment, including pumps, motors, and control systems. Reliable electrical connections minimize the risk of power outages or voltage fluctuations that could disrupt operations and compromise water supply reliability. Wellfields equipped with electrical cabling infrastructure are better prepared to handle emergencies, such as power outages or equipment failures. Backup power systems, such as generators or battery backups, can be easily integrated into the electrical network to ensure continuity of operations during emergencies.		engineering and related fields can be beneficial for this purpose and hence should be considered a priority. - Implement safety protocols for handling and maintaining electrical cabling, including procedures for safe installation, inspection, and repair. PPE should be designed to fit all genders comfortably to ensure safety and effectiveness. Women's health and safety, especially if they are pregnant or have other health considerations, should be factored into any safety protocols developed. - Conduct regular emergency drills to prepare staff for scenarios involving electrical failures or power outages. - Regularly inspect and maintain grounding systems to ensure they are functioning correctly.

5.5 Risk Reduction at Pumping Stations

The proposed interventions include upgrading existing pumping stations, constructing new stations, the inclusion of a pressure tank, back-up generators and fuel stores for all systems, and to ensure all sites are equipped with fire extinguishers. These activities are to be done on the following islands:

- Andros
- Abaco
- Acklins
- New Providence

5.5.1 The Construction Phase

Table 5-5 lists the potential impacts of risk reduction interventions proposed for wellfields during the Construction Phase.

Table 5-9: Potential Impacts of Risk Reduction at Pumping Stations during the Construction Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Habitat Disruption	Construction activities associated with upgrading and constructing pumping stations may result in habitat disruption and fragmentation, particularly if located in ecologically sensitive areas.	Short to Medium-term	- Conduct comprehensive ecological assessments to identify sensitive habitats, species, and ecosystems potentially affected by the project. Select sites and routes for new infrastructure that minimize intrusion into these ecologically sensitive areas. - Designate specific areas for construction activities to limit the spread of disturbance and schedule construction activities to avoid critical periods for wildlife, such as breeding or migration seasons. - Install silt fences, erosion control blankets, and sediment basins to prevent soil erosion and sedimentation of water resources.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
Alteration of Water Quality	The installation of pressure tanks and backup generators may introduce contaminants or pollutants into groundwater or surface water sources if not properly managed. Women, particularly those responsible for household water management and health, may be more directly concerned with the safety and quality of water used for family consumption. Contamination can have significant health impacts, and ensuring effective management practices is crucial for protecting all community members, especially those in caregiving roles.	Short-term	- Conduct baseline water quality assessments to understand the current status of water quality in the area and use these assessments to inform project design and identify potential sources of contamination. - Implement erosion control measures like silt fences, sediment traps, and erosion control blankets to prevent sediment runoff into water resources. Disturbed soils can be stabilized promptly with vegetation or mulch. - Conduct regular water quality monitoring during and after construction to detect any changes in water quality parameters (e.g., pH, turbidity, nutrient levels, contaminants). Use this monitoring data to promptly address any water quality issues that arise. - Implement proper waste management practices to ensure that construction and operational wastes do not contaminate water sources.
Noise and Air Pollution	Increased construction and operational activities at pumping stations may generate noise and air pollution, potentially impacting nearby ecosystems and communities. Noise and air pollution from construction and operational activities can affect the health of nearby residents. Women, particularly those who are	Short-term	- Use noise barriers, dust suppression techniques, and restrict construction activities to certain hours to minimize disturbances to local communities. - Equip workers with appropriate personal protective equipment (PPE), including masks and earmuffs when necessary.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	pregnant, elderly, or have young children, may be more sensitive to the health impacts of pollution. Chronic exposure to noise and air pollution can exacerbate health issues, such as respiratory problems and stress, disproportionately affecting women who often bear the brunt of caregiving responsibilities. Those on the workforce would be more exposed to air and noise pollution and so are likely to be most impacted. Traditionally, men tend to dominate the construction or skilled labour workforce and so would be deemed most at risk to pollutants. However, it should be		- Workers assigned to noisy tasks should be frequently rotated to avoid exposure. - Conduct training sessions on proper health and safety protocols. - Implement frequent wetting of exposed surfaces where necessary. - Keep all equipment and vehicles well maintained and serviced. - See Chapters 7.2 and 7.3.
Disruption to Traffic and Mobility	Construction activities and infrastructure installations may disrupt local traffic patterns, access to public spaces, and mobility for residents and businesses in the vicinity of each target site. Disruptions in local traffic and access can create additional challenges and stress for all genders as they navigate altered routes and potentially increased travel times. Consideration should be made particularly for those who are found to be more responsible for a significant share of caregiving responsibilities, including transporting children to school, attending appointments, and managing household errands – traditionally this role is occupied by women.	Short-term	- Inform the public of the proposed works and the possibility for traffic congestion and disruption. - Proper signage, barriers, and traffic management plans are necessary to ensure the safety of pedestrians and motorists around construction zones. - When necessary, potential alternate routes should be identified, and this should be clearly communicated with the public in advance. - As best as possible, limit works in peak traffic hours. - See Chapter 7.5

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
POSITIVE			
Capacity Building of Local Labour Force	The construction phase should provide opportunities for personal skill development of the labour force, particularly as it relates to climate resilience and water infrastructure. Targeted skill development provisions would enhance the capabilities and employability of the local labour force. The recommendation to improve representation of women in the Project workforce would facilitate the skilled development of not just men, who are more likely to be employed in these construction activities. This would reduce the gender disparities in skilled labour – more women would have the capacity to participate in such activities, making them more employable.	Long-term	- Develop a training schedule on best practices and methods of application - There should be equitable access to these development opportunities
Employment Opportunities	The Project activities can create jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors. With the increase in employment in these fields, there is a high possibility of a labour influx (mostly men) moving into or travelling to different communities. The implications of this range from an increased probability of GBV to the spread of STIs due to increased instances of unprotected sexual activity.	Employment Opportunities	- The process of increasing the storage capacity of existing storage facilities can create jobs in construction, engineering, and ongoing operations. Indirectly, increased water availability can stimulate job growth in agriculture, industry, and related sectors.

5.5.2 The Operations Phase

Table 5-10 lists the potential impacts of risk reduction interventions proposed for wellfields during the Operations Phase.

Table 5-10: Potential Impacts of Risk Reduction at Pumping Stations during the Operations Phase

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
NEGATIVE			
Increased Energy Consumption	The operation of pumping stations and associated equipment, such as pressure tanks and backup generators, may increase energy consumption and greenhouse gas emissions, potentially contributing to climate change. Higher energy consumption can lead to increased utility costs, which can disproportionately affect women, particularly those managing household budgets. Women, especially single mothers or low-income earners may face greater financial strain from rising energy costs.	Long-term	- Implement a regular maintenance schedule to keep equipment running efficiently. Well-maintained equipment typically operates more efficiently and has a longer lifespan. It is also recommended that periodic energy audits be conducted to identify and address any inefficiencies in the system. - Train employees on energy conservation practices and the importance of energy efficiency in daily operations. Encourage a culture of energy efficiency, where staff are proactive in identifying and implementing energy-saving measures.
POSITIVE			
Reduced Fire Risk (Fire Safety)	Equipping sites with fire extinguishers aims to enhance fire safety and emergency response	Long-term	- Implement a regular inspection schedule for fire extinguishers to check for proper pressure,

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	capabilities. However, inadequate fire safety measures or equipment malfunction may increase the risk of fire incidents and associated impacts. Therefore, it is important these mechanisms are frequently monitored and serviced. As well, training sessions are drills are necessary for workers to be aware of how to respond in the event of fire emergencies		functionality, and expiration dates. Ensure that all fire safety equipment is in good working condition and replace or repair any malfunctioning equipment promptly. - Keep detailed records of inspections, maintenance, and servicing of fire extinguishers and other fire safety equipment. - Provide regular training sessions and conduct fire drills for all workers on the proper use of fire extinguishers, fire safety procedures, and emergency response protocols. Trainings should be updated frequently to reflect any changes in safety procedures or equipment. Fire safety training should be designed to be inclusive and accessible to all employees, regardless of gender. This includes providing training materials in various languages and formats and ensuring that all genders feel comfortable participating in drills and training sessions. - Develop support systems for employees who may be particularly affected by fire risks, such as single parents or those responsible for elderly family members. This could include additional training or resources to help manage these responsibilities during the case of any emergencies.
Emergency Response	The presence of backup generators and fuel stores enhances emergency response capabilities during power outages or natural disasters. This would minimize the possible effects during emergency	Long-term	- Implement a regular maintenance schedule for backup generators and fuel storage systems. This includes routine checks and servicing to ensure optimal performance and safety.

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	events when the primary source of energy has been disrupted. However, ensuring proper maintenance and operation of backup systems is essential to minimize potential risks during emergencies. Women and men may experience different impacts during emergencies. For instance, pregnant women, elderly women, and those with specific health needs may be more vulnerable during power outages or natural disasters. Ensuring that backup systems are reliable and well-maintained helps reduce the risk for these groups by ensuring continued access to an essential service that is the water supply.		- Develop and offer training programs on the use and maintenance of backup generators that are accessible to all employees. Tailor training materials to accommodate various learning styles and ensure that they address the needs of employees with different roles and responsibilities. - Conduct regular emergency response drills that include scenarios involving power outages. Ensure that these drills are inclusive, considering the roles and responsibilities of all employees, including those with caregiving responsibilities.
Operational Efficiency	Including a pressure tank helps maintain consistent water pressure throughout the distribution system, improving the efficiency of water delivery and reducing the risk of pipe bursts and leaks. This would reduce water losses, promoting water conservation and sustainable resource management. Women, particularly those who are pregnant, elderly, or have caregiving responsibilities, may be more affected by issues related to water pressure, such as intermittent supply or water quality problems. Consistent water pressure helps ensure a reliable supply of safe water, which is crucial for all, but especially for those with increased needs.	Long-term	- Establish a routine inspection schedule for pressure tanks to check for signs of wear, corrosion, or leaks. - Develop and conduct emergency response drills that include scenarios involving pressure tank failures. Training should cover how to manage pressure fluctuations and address potential issues.
Safe, Reliable and Stable Power Supply	Installing backup generators ensures uninterrupted operation of pumping stations during power outages, enhancing the resilience of the water supply system	Long-term	- Regularly check and replenish fuel supplies for backup generators to ensure they are ready for use. Implement a system for monitoring fuel levels and

RISKS	POTENTIAL IMPACTS	IMPACT DURATION	PROPOSED MITIGATION/ ENHANCEMENT MEASURES
	against disruptions caused by electrical failures or natural disasters. Backup generators help maintain water supply during power outages, which benefits all residents, regardless of gender. Women often manage household budgets and may be more directly affected by economic impacts related to water supply disruptions. By reducing the frequency of power outages and associated issues, backup generators can lessen the financial burden on households, particularly on women managing limited resources.		scheduling refills to avoid running out of fuel during an outage. - Ensure that backup generators are easily accessible for maintenance and emergency repairs. This includes clear access routes and adequate space around the generators for safe operation.

SECTION II
THE ESMP

6 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

6.1 Introduction to the ESMP

The Environmental and Social Management Plan (ESMP) outlined in this chapter presents all the guidelines necessary to direct the environmental and social management and occupational health and safety of the Project, including, but not limited to: (i) the different environmental and social plans or programs that will comply with the environmental, social and health and safety requirements that are necessary to carry out the activities of the project works, complying with the policies and regulations of both the CDB and the national government, (ii) institutional obligations and responsibilities for the elaboration and implementation of the required measures, (iii) description of the environmental and social monitoring plan in the construction, operation, closure and post-closure stages of the project, identifying the expected results, the parameters to be measured, the places of measurement, the methods and tools used and the periods/frequency in which the measurements will be made, the costs, and the responsible institutions, (iv) implementation schedule of each of the proposed measures, define responsibilities and reference budget.

6.1.1 Objectives of the ESMP

The plan's overall goals are to:

- Describe the measures required to implement management and mitigation commitments made in relation to the construction and operational impacts identified in the ESIA;
- Specify the additional steps necessary to achieve good practice and approval conditions set forth by international funding organizations (CDB, etc.) and the Department of Environmental Planning and Protection (DEPP);
- Define the duties and responsibilities of the Project's environmental and social management organization;
- Ensure that the entire project team is aware of the environmental and social expectations and requirements.

All contractors and subcontractors shall comply with the provisions of the plan, as applicable, to the tasks they are employed to undertake.

6.1.2 Scope of the ESMP

This chapter presents the structure of the ESMP, which follows on from the identification of the potential environmental and social impacts and proposed mitigation actions identified in the ESIA.

The Environmental and Social Management Plan (ESMP) is made up of environmental and social management tools that satisfy the criteria outlined in the CDB's Environmental and Social Safeguards as well as specific Environmental and Social Management Plans (EMPs) that outline the systems and procedures that will be put in place over time by the project team to ensure compliance with local and international standards. They outline precise action plans for waste management, emergency preparedness, community involvement, and environmental health and safety.

6.2 Key Environmental and Social Impacts and Mitigation

6.2.1 Construction Phase

The mitigation measures proposed for the Construction Phase primarily surround the following risks:

- Air Pollution
- Noise and Vibration Pollution
- Flooding
- Disruption of biological communities
- Social Conflict
- Health and Safety of Workers and Community

- Interruption to Local Businesses and Livelihoods
- Gender Inequality in Workforce
- Community Road Safety
- Utility management and coordination

The ESMP for the construction phase includes the following plans to guide compliance with standards and policies as discussed above:

Environmental Health and Safety Management Plan - This comprehensive plan complies with the CDB's environmental and social policy framework. It gives special consideration to environmental and worker health and safety regulations, resource efficiency, and pollution control. It comprises every necessary requirement to keep track of the efficiency of the mitigating actions taken to lessen the negative effects of the activities carried out during the construction phase. All project components will be covered under this plan, and it outlines how construction waste, including any liquid and hazardous wastes, should be managed in compliance. Regarding the scope of its job, the Contractor will be accountable, but it is the Implementing Agency's responsibility to make sure the Contractor is in compliance with the plan.

- Stakeholder Engagement Plan - This plan is intended to manage social conflict that may occur as a result of the projects and to ensure that the stakeholders that would potentially be directly or indirectly impacted by Project activities are kept informed via communication process integrated into Project activities. It is also constituent of the Consultation and Participation Strategy and the Grievance Redress Mechanism (GRM) which present measures to be used for community engagement, dissemination of project information and grievance management, and will be utilised as a key element in all the proposed management, monitoring and mitigation measures.
- Security Management Plan - This plan is intended to manage security during construction and operation.
- Contractor Management Plan - This plan is intended to guide how contracts are administered and managed.
- Any required livelihood restoration measures identified during site-level screening will be incorporated into the CESMP or CESHSMP, or addressed through a short livelihood restoration protocol, ensuring compliance with CDB's ESRP.Labour Management Plan – This plan is intended to provide support for the hiring and management of labourers that is responsive to the local community and vulnerable groups.
- Emergency Response Plan – This plan is intended to ensure that effective safety measures are implemented to minimize the impacts of emergency events. It encourages the training of workers and the maintenance of emergency response equipment.
- Utility Management/Coordination plan – This plan is intended to prevent, where necessary, and minimize the likelihood of utility disruptions due to the different works. It encourages coordination between the Project Team and utility providers.

6.2.2 Operational Phase

It is not anticipated that the project's operating phase will have significant adverse effects. Results are anticipated to be mostly favourable after the project's construction phase is over. The ESMP for the operations phase of the project includes the Environmental Health and Safety Management Plan, the Consultation and Participatory Strategy and Grievance Mechanism which had been previously discussed in the Construction Phase of the project.

6.2.3 Management Plans

The following plans have been prepared for the identified environmental aspects and risks to the project:

1. Environmental Health and Safety Management Plan
2. Social Management Plan
3. Security Management Plan
4. Workers Health and safety plan
5. Emergency Response Plan
6. Contractor Management Plan
7. Labour Management Plan (including Code of Conduct and GBV Prevention)
8. Stakeholder Engagement Plan
9. Grievance Redress Mechanism

7 ENVIRONMENTAL HEALTH AND SAFETY PLAN

Chapters 8 to 11 present the Environmental and Social Management Plan (ESMP), which follows on the identification of the potential environmental and social impacts and proposed mitigation actions as detailed in the ESA.

The following plans have been prepared for the environmental health and safety risks identified:

a) Water Quality Management

b) Air Quality Management

c) Noise Management

d) Traffic Management

e) Worker Health and Safety Management

f) Community Health and Safety Management

g) Access to the Community Management

h) Emergency Response Management

i) Biodiversity Management

7.1 Water Quality Management

7.1.1 Monitoring Standards

According to the Bahamas Bureau of Standards and Quality, the public water supply should conform to the requirements of the most recent edition of the World Health Organization's (WHO's) guidelines and standards on potable water[23]. It is, therefore, recommended that this be followed if there is no intention for specific guidelines be developed for this Project.

7.1.2 Monitoring Equipment and Stations

Monitoring should be done from source areas twice per month and should be taken offshore from primary construction and operation activities. The results at the end of the sampling period will be compared to the stipulated standards.

7.1.3 Monitoring Frequency

During construction, monitoring will be carried out randomly twice per month during the first month or as stipulated only in areas where construction activities are being undertaken at a given time. After the first month, once per month is recommended until the end of construction or maintenance activities.

7.1.4 Management and Mitigation Measures

In addition to the monitoring procedures, the Contractor will ensure that these measures are followed:

- Effective implementation, monitoring and enforcement of National Environmental Policy, the Environmental Health Services Act and the Environmental Planning and Protection Act, action by the DEPP and DEHS
- Record complaints and relevant responses

[23] WHO Drinking Water Specifications

- Enforce the proper disposal of solid waste, hazardous materials and otherwise recyclable materials
- Ensure walkways are kept clean to prevent runoff discharge.
- Ensure there is continuous monitoring and maintenance of pipeline infrastructure.

7.1.5 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the water quality monitoring system.

Table 7-1: Key Performance Indicators for Water Quality Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Equipment maintenance log and schedule	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Twice per month or as stipulated by the DEHS
Notice to stakeholders	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Receiving Water Quality parameters within stipulated standards	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

7.1.6 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The Site and surrounding marine environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.1.7 Data Analysis and Reporting

The sampled data will be compared to the DEHS's standard for coastal water quality and included in the environmental monitoring report prepared and submitted to DEHS. If there are any exceedances, this will be reported immediately to the EHS Manager to allow for the implementation of corrective

measures or adjustment in management strategies based on the results and where practicable to the operations.

7.2 Air Quality Management

7.2.1 Monitoring Standards

The draft Environmental Health Air Emissions Regulations are enforced under Section 31 of the Environmental Health Act. The Air Emissions Regulations require all projects/developments with associated emissions, depositions, or discharges of any regulated air contaminant to obtain permit approval by the Director of the DEHS prior to initiating discharges to ambient air. As with the Water Quality Standards (see Chapter 8.1.1), it is recommended that the guidelines stipulated by WHO be followed. These guidelines cover the emissions of air pollutants such as: particulate matter, sulphur dioxide, nitrogen dioxide, ozone, carbon monoxide and lead. These standards are outlined in the table below.

Table 7-2: Air Quality Standards Extracted from the WHO Air Quality Guidelines 2021

POLLUTANT	**STANDARD** ***µg - micrograms (One-millionth of a gram)**
Particulate Matter ($PM_{2.5}$)	10 µg*/m3 annual mean 25 µg/m3 24-hour mean
Particulate Matter (PM_{10})	20 µg/m3 annual mean 50 µg/m3 24-hour mean
Ozone (O_3)	100 µg/m3 8-hour mean
Nitrogen Dioxide (NO_2)	40 µg/m3 annual mean 200 µg/m3 1-hour mean
Sulphur Dioxide (SO_2)	200 µg/m3 1-hour mean 20 µg/m3 24 hour mean 500 µg/m3 10-minute mean
Carbon Monoxide (CO)	100 µg/m3 15-minute mean 60 µg/m3 30-minute mean 30 µg/m3 1-hour mean 10 µg/m3 8-hour mean
Lead (Pb)	0.5 µg/m3 annual mean

7.2.2 Monitoring Equipment and Stations

Samples for particulate matter should be collected using calibrated pumps. The pumps should be placed at the approximate respiratory height of the individual(s) for a 24-hour period. The data obtained from the analyses of the filter should be expressed as the exposure levels of particulate matter (PM10) using a Time Weighted Average (TWA). The results at the end of the sampling period will be compared to the WHO standards. The Monitoring stations will be changed as the activities progress. The monitoring stations established will be based on the prevailing winds and most sensitive human receptors.

7.2.3 Monitoring Frequency

Prior to the construction, a monitoring baseline will be established for both particulate matter and noise. This will involve continuous monitoring for a 24-hour period along the length of the proposed site.

During construction, monitoring will be carried out randomly twice per month during the first month or as stipulated by the DEHS only along the sections that are under construction at the time. After the first month, once per month is recommended until the end of construction or during maintenance activities.

7.2.4 Management and Mitigation Measures

In addition to the monitoring procedures, the Contractor will ensure that these measures are followed:

General measures

- Effective implementation, monitoring and enforcement of National Environmental Policy, the Environmental Health Services Act and the Environmental Planning and Protection Act, actioned by the DEPP and DEHS
- Record complaints and relevant responses

Fugitive Dust Control Measures

- Cover haulage vehicles transporting aggregate, soil and cement
- Cover and/or wet onsite stockpiles of aggregate, soil etc., especially during windy and dry conditions
- Locate sources of dust away from sensitive receptors
- Ensure proper stock piling/storage and disposal of solid waste
- Wet cleared land areas regularly
- Wet dust suppression methods on unsealed roads must be implemented to prevent generation of nuisance dust.
- Provide workers with the necessary PPE e.g. dust masks, and ensure that they are worn correctly
- There must be strict speed limits on dust roads to prevent dust entrainment into the atmosphere.
- Restrict the dropping of material from height during loading and unloading
- Revegetate cleared areas immediately following construction to prevent loose soil from being blown away

Emissions Control Measures

- Operate well maintained vehicles and equipment
- All earth moving vehicles and equipment must be regularly maintained to ensure their integrity and reliability.
- Backs of trucks transporting waste debris, soil need to be covered
- Construction vehicles and machinery shall not be left to idle when not in use.

- Maintain all generators, vehicles, and other equipment in good working order to minimise exhaust fumes.
- Limit use of roads in populated areas.

7.2.5 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the air quality monitoring system.

Table 7-3: Key Performance Indicators for Air Quality Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Equipment maintenance log and schedule	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Twice per month or as stipulated by the DEHS
Notice to stakeholders	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Air Quality parameters within stipulated standards	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Log of wetting frequency	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Use of personal equipment gear	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Daily
Log of Complaints	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Weekly

7.3 Noise Management

7.3.1 Monitoring Standards

It is recommended that the Community Noise Guidelines of the World Health Organization be adopted as guidelines governing noise generation for this Project. The Guidelines list the decibel levels at which people would be only minimally affected by noise. Table 8-4 below illustrates some of these recommended values.

Table 7-4: Noise Standards Extracted from the WHO Guidelines on Environmental Noise

SPECIFIC ENVIRONMENT	NOISE LIMIT/L_{EQ} dBA	
Residential	Daytime: 55	Nighttime: 45
Commercial	24 hours: 70	
Industrial	24 hours: 70	

7.3.2 Monitoring Equipment and Stations

At the same stations where air quality samples are taken during construction, ambient noise measurements will be made concurrently. Noise will be measured using a sound level meter that has been calibrated. Before each survey, the meter will be calibrated, and the equipment's model will be made explicit.

The monitors will be placed 1.5 meters above the ground and no closer than 3 meters away from any reflective surface (such as a wall). The background or ambient noise levels that would exist in the absence of the facility or the source(s) of noise under examination serve as a broad representation of the noise level limit. Additionally, a calibrator that has been factory calibrated will be used to examine the instrument both before and after the survey.

7.3.3 Monitoring Frequency

Over the course of two to three minutes, noise level readings will be obtained, and the average (geometric mean) noise level will be recorded in decibels (dBA). During the building phase or the maintenance phase, these readings will be taken at the same time as the air samples.

7.3.4 Management and Mitigation Measures

In addition to the monitoring procedures, the Contractor will ensure the following noise reduction options are implemented where necessary:

- Provide workers with the necessary PPE e.g., hearing protection and ensure that they are worn
- Consult with and sensitize residents in the area to the types of activities that will take place ahead of the works and assign a liaison person with whom the residents can relate
- Ensure project activities are scheduled during working hours of 8:00 a.m. to 5:00 p.m.
- Maintain all equipment in proper working order to avoid excessive noise generation
- If complaints regarding noise are received from residents, consider installing partial screening around the noisiest activities and/or mufflers on noisy equipment
- Limit implementation of noisy works simultaneously and time intervals
- Frequent change of personnel that are employed for noisy works
- In case of complaints, they should be recorded, and appropriate action should be taken via the GRM.
- Effective implementation, monitoring and enforcement of National Environmental Policy, the Environmental Health Services Act and the Environmental Planning and Protection Act, actioned by the DEHS

7.3.5 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the noise monitoring system.

Table 7-5: Key Performance Indicators for Noise Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSBILITY	FREQUENCY
Equipment maintenance log and schedule	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Twice per month or as stipulated by the DEHS
Notices to stakeholders	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Noise parameters within EPD standards	Results Certificate	Contractor; Results to be presented to the Implementing Agency	
Log of complaints	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Use of personal equipment gear	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

7.3.6 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The Site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.3.7 Data Analysis and Reporting

The sampled data will be compared to the DEHS's standard for noise as well as the baseline data and the analysis will be included in the environmental monitoring report prepared and submitted to DEHS. If there are any exceedances, this will be reported immediately to the EHS Manager to allow for the

implementation of corrective measures or adjustment in management strategies based on the results and where practicable to the operations.

7.4 Waste Management

The primary goal of a Waste Management Plan is to enable proper waste management by identifying and categorizing waste intended for construction and operation stages, as well as specifying the tasks to be performed and responsibilities. Waste management includes operations such as waste disposal, storage, collection, transportation, sorting, and treatment, as well as its monitoring and planning. The Contractor is primarily responsible for the administration and supervision of waste management.

7.4.1 Monitoring Frequency

In the anticipation that waste will be collected on a weekly basis, the monitoring of waste should be done weekly to ensure that all measures are being implemented and followed.

7.4.2 Management and Mitigation Measures

Metal, wood, old oil, lubricants and other oil derivatives, tires, plastic, paper and cardboard, glass, and organic waste are examples of the types of waste that are expected to be generated during construction yard operation and management. Other types of waste, including urban solid waste and hazardous waste, may be generated as a result of the operation and maintenance of the replaced pipelines.

While the Contractor will ensure that every effort is made to abide by the following mitigation measures during construction or operations in order to lessen the potential negative effects of inappropriate waste disposal and management, it is important that the project proponent identify, in an early phase, the waste that construction works and the construction sites will produce, to guarantee the correct implantation of waste management measures.

General Solid Waste Management

- Contain garbage and construction debris onsite until disposal at the approved municipal disposal site
- Prohibit burning of solid waste on project sites
- Create green areas and/or plant trees around the perimeter of the site to act as a visual screen, where possible.
- Develop and implement waste management plan during construction phase.
- Avoid solid waste becoming habitats for disease vectors.
- Effective implementation, monitoring and enforcement of National Environmental Policy, the Environmental Health Services Act and the Environmental Planning and Protection Act, as required by the DEPP and DEHS
- Create a viable waste management system including worker training on storage, handling and disposal of wastes
- Consult local environmental and waste management authorities on applicable waste management practices and available companies for correct pickup and deposition. Waste produced through the life cycle of the project should be sent to an appropriate final destination, taking into account the solutions provided by licensed operators in the region.
- Create a specific, clearly identified, waste collection area on the construction yards
- Ensure that containers have lids to prevent odours and to protect from natural events like rain

Spill Prevention and Hazardous Waste Management

- Environmental conditions must be included in any construction contracts, thereby making contractors accountable for preventing accidental spillages
- Effective implementation, monitoring and enforcement of National Environmental Policy, Environmental Health Services Act and the Environmental Planning and Protection Act and action by the DEPP and DEHS
- Conduct preventive maintenance for vehicles and machinery to ensure integrity and reliability and reduce/avoid leaks
- Conduct any on site repairs on impervious surfaces.
- Ensure proper handling, use and storage of all chemical and hazardous waste according to best practices:
    - Provide spill containment and cleanup equipment on site
    - Personnel handling chemicals and hazardous substances must be trained in the use of spill prevention measures
    - Personnel handling chemicals and hazardous substances must be trained in the correct use of the appropriate Personal Protective Equipment (PPE)
    - Utilise the proper dispensing equipment
    - Storage areas must be well marked with appropriate signage.
    - All hazardous substances must be stored on an impervious surface in a designated bunded area, able to contain 110 % of the total volume of materials stored at any given time.
    - Fuel and lubrication of equipment and motor vehicles shall be conducted in a manner that affords the maximum protection against spill and evaporation. There shall be no storage fuel on the project site. Fuel must be brought to the project site each day that Work is performed.
    - Clean up any spills (including existing spills) immediately, through containment and removal of product and appropriate rehabilitation or disposal of contaminated soils
    - All hazardous waste must be disposed of at a registered hazardous waste disposal facility, which is under the Ministry of Health and the Environment or stored in designated, lined and bunded areas as approved by the DEHS
    - Handling and disposal of hazardous waste is only conducted by trained personnel wearing the correct PPE
    - Any spilling incidents must be reported as soon as possible.
- Ensure proper handling and disposal of asbestos material:
    - Asbestos material, such as can be found in old pipelines, is a deadly carcinogen that should only be handled by licensed asbestos abatement professionals.
    - When handling asbestos trained personnel must seal off the work area with plastic sheeting to prevent contamination outside. Surfaces that do not need abating must be covered in plastic sheeting.
    - Warning signs must be posted to alert others that an asbestos project is underway.

- Wear Personal Protective Equipment such as an N-100 or P-100 respirator and protective clothing to prevent asbestos exposure.
- Asbestos-containing materials should be wetted prior to any removal efforts. Once removed it should be double bagged in 6-millimeter plastic bags and enclosed in a plastic, leak-tight container with a lid and proper labelling. It can only be disposed of in an appropriate way at advised landfills.
- Decontamination enclosure areas must be provided to allow workers to remove contaminated clothing, shoes and tools.

7.4.3 Key Performance Indicators

The following Key Performance Indicators (KPIs) have been selected in order to evaluate the effectiveness of the solid waste management system.

Table 7-6: Key Performance Indicators for Waste Management

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
No construction waste deposited on the roadways or in nearby vegetated areas (waste disposal in proper containers , no waste on the ground in the site)	Site Inspection	Contractor; Results to be presented to the Implementing Agency	Twice per month
No leakages or spills	Monitor possible spills Inspection of site by Contractor	Contractor; Results to be presented to the Implementing Agency	
Limited sediment-laden run-off during heavy rain	Monitor nearby/downstream wells and water bodies for significant sediment deposits	Contractor; Results to be presented to the Implementing Agency	
Approved Contractors	Inspection of licenses and documentation	Contractor; Results to be presented to the Implementing Agency	
Re-siting, Stockpiling/Storage	Less construction waste being delivered to the dump	Contractor; Results to be presented to the Implementing Agency	
Recycling Rates	Inspection of recycling records	Contractor; Results to be presented to the Implementing Agency	Annual

7.4.4 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency: Water and Sewerage Corporation (WSC) is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The Site will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted, or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

The CONTRACTOR is responsible for assigning a Community Liaison Officer (CLO) who is responsible for communicating with potentially impacted communities, providing project updates regarding timelines and impending activities.

7.4.5 Data Analysis and Reporting

If there are any exceedances, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

7.5 Traffic Management

7.5.1 Monitoring Standards

Recommendations received from the Road Traffic Department will serve as the standards to be adhered to during activities that will impact the normal flow of traffic.

7.5.2 Monitoring Frequency

Monitoring will be carried out by the Road Traffic Department according to the frequency that is stipulated in their authorization.

7.5.3 Management and Mitigation Measures

The Contractor will ensure that the following measures are put in place to manage potential traffic disruptions:

- Work should only be carried out in sections.
- "Work Ahead' / 'Detour' Signs should be used ahead of potential traffic disruptions.
- Material delivery to the site should be limited in peak traffic times during weekdays:
    - 6-9 am
    - 4-7 pm
- Advertisements should be placed in the media before any roadworks will take place. Notices should also be posted/shared as regularly as possible or when required to communicate on any issue that may lead to disruptions in traffic flow. The Contractor's CLO should establish

communication channels with potentially affected communities so information on changes in traffic flow can be easily disseminated.

- Avoid blocking entrances to businesses.
- Cuts in the road should be filled as soon as works in the area is completed so as to avoid disruptions in movement of traffic and erosion in case of heavy rains.
- Dirt/debris should not be stored on sidewalks or roadways.
- Wherever works are taking place pedestrian, and vehicular traffic must not be completely obstructed. The use of flag persons will be required. Where routes will be rendered impassable, alternative routes must be identified in advance and these routes shared with affected communities.
- Before the start of construction works, develop and distribute an initial project information packet to business owners and community leaders.
- Alert businesses about local construction works two weeks in advance (or a stipulated time frame as agreed between local businesses and the Contractor) and of any changes in the initial scheduling.
- Promote the efficient and effective use of the Grievance Redress Mechanism including timely responses linked with the use of a Community Interaction Form signed off on by all parties including the contractor and the person who engages.
- Implement the use of proper signage; construction vehicle speed limits; speed limits near schools, churches and populated areas; training of drivers; defensive driving; maintenance of construction vehicles, and use of traffic wardens.
- Establish procedures for the transport of equipment and heavy loads, a protocol for reporting vehicle accidents and a log for traffic related incidents.
- Establish a Project community road safety awareness plan for residents living close to the road and for workers, and a monitoring mechanism to ensure effective implementation of the plan. This is the responsibility of the Contractor's CLO.

7.5.4 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the traffic management system.

Table 7-7: Key Performance Indicators for Traffic Management

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Detour signs	Inspection of the site	Contractor; Results to be presented to the Implementing Agency	As stipulated by the Road Traffic Department
Advertisements in the media	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

Log of complaints	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Traffic Wardens	Inspection of the site	Contractor; Results to be presented to the Implementing Agency	
Accidents/near misses	Inspection of site and review of incident log	Contractor; Results to be presented to the Implementing Agency	Weekly

7.5.5 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

The Implementing Agency: Water and Sewerage Corporation is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The Site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.5.6 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

7.6 Worker Health and Safety Management

The nature of the activities to be undertaken during the implementation of this Project typically presents occupational health and safety hazards, especially to those primarily involved in construction activities. Exposure to these risks can result in physical injuries and pain, chronic respiratory diseases (e.g., asthma, COPD), musculoskeletal disorders, noise-induced hearing loss, and skin problems, among other things. Other threats to worker health and safety include SGBV and SEAH which can lead to the spread of STIs and may cause mental anguish and a feeling of fear, anxiety and displeasure in the workplace. The above mentioned pose a significant threat to the physical and mental well-being of workers. Thus, in order to reduce such risks and preserve workers' health, the current chapter focuses on the management and mitigation measures that are recommended to be followed to reduce risk to worker health and safety.

7.6.1 Monitoring Frequency

Monitoring will be carried out by the Contractor daily to minimize possible incidents.

7.6.2 Management and Mitigation Measures

The mitigation measures presented in this chapter addresses the risks posed by different occupational health and safety hazards. These hazards include:

- falling from heights or into pits and trenches,
- injuries from the projection of fragments of rocks or falling objects,
- slips/trips and falls (especially while carrying heavy loads),
- musculoskeletal injuries (especially of the back) resulting from lifting and moving heavy loads,
- injuries caused by the circulation of vehicles,
- hearing impairment/loss,
- exposure to dust and air pollution,
- chemical hazards from exposure to various chemicals,
- injuries from the operation of heavy machinery, medical health cases and electrocution,
- exhaustion and/or dehydration,
- SGBV and SEAH.

The Contractor will ensure that these mitigation measures are followed during construction and operational activities:

- The contractor must have a health and safety policy that is known and understood by all workers. It must be visible to the workers on site.
- It is recommended that a worker's code of conduct be developed and a training program for workers on the Code of Conduct be implemented.
- Clearly stipulate the key principles in operation at key areas on site.
- Provide fair compensation and treatment of workers for work done.
- Establish a reasonable and adequate work schedule.
- Provide equitable and ethical terms and conditions of employment for workers.
- Provide safe and acceptable working conditions, including securing worker health and safety.
- Inform the employees of the occupational risks and preventative measures that must be taken to address these risks.
- Inform workers of their legal rights and obligations and provide them with the necessary training on Project occupational health and safety.
- Ensure all workers have the required personal protective equipment required of them to work on the Project and to regularly monitor to ensure compliance.
- Perform routine checks of health and safety equipment to ensure that they proper functioning.
- Assign an officer with responsibility for worker health and safety.
- Construction areas should be clearly demarcated with safety signs and barriers to prevent possible incidents.
- Clear labelling of hazard risks on the construction site will be critical.
- Workers should be properly trained in the proper use of construction equipment.
- All workers must be trained in the proper use of all health and safety equipment.
- Contractor has procedures for high-risk work activities, working at heights, working in trenches, working in heat, hot works, confined spaces, etc.
- All workers must be trained in the proper handling and management/ disposal of all types of waste.

- Workers should be protected from all forms of exploitation, abuse as well as harassment and have access to tools and systems to seek redress.
- The contractor EHS Manager/ Officer shall maintain a register of all EHS related incidents that have occurred as a result of the activities associated with the contract. EHS incidents that should be recorded include fires, accidents, spills of hazardous materials that contaminate soil or water resources, stop-order notices issued by the Department of Labour, DEPP or any other relevant agency, non- compliance with this ESMP.
- The CONTRACTOR must promptly report in writing to the EMPLOYER all accidents whatsoever arising out of, or in connection with, the performance of the Work, whether on or adjacent to the Site, which caused death, personal injury or property damages, giving full details and statements of witnesses. In addition, if death or serious injuries or serious damages are caused, the accident shall be reported immediately, to the EMPLOYER.
- EHS incident reports will include as a minimum, a description of the incident, actions taken to contain any damage to the environment, personnel or the public, and the corrective actions to repair/remediate any damage.
- Sensitize workers on SGBV and SEAH in the workplace at least annually. All workers must sign to a Code of Conduct that explicitly condemns SGBV and SEAH. Victims of any form of violence in the workplace should have easy access to a grievance, complaint or referral mechanism that allows for the prompt and anonymous handling of any related incidents in the work environment.
- All construction plant and equipment, tanks and machinery shall be maintained in a good state of repair throughout the construction period
- Equipment maintenance will be carried out on an impermeable surface
- Leakage from equipment will be prevented by regular inspection and repair
- Areas under construction should be clearly demarcated.
- Emergency medical supplies must be available and easily accessible in the case of an incident.
- In the event that the onsite medical supplies are not adequate, the incident needs to be escalated to the hospital – an accident/incident response plan should be easily accessible to all workers
- Ensure adequate mobile toilets are easily accessible for workers.
- Ensure drinking water and access to shade for breaks.
- In the event that a worker is exposed to hazardous material they should immediately be taken for medical attention.
- Label and isolate exposed electrical wires, keeping them far from busy areas.
- At least two persons will always be present when work is being carried out on electrical equipment. No attempt will be made to service or adjust unless another person capable of rendering first aid and CPR is also present.
- Irrigate construction work sites frequently.
- Arrange for initial and periodic medical examinations.
- Define and delineate road access routes.

- In the event of a road accident involving WSC employees or contractors:
    - The EHS Manager and the Police will be contacted immediately with details of the location and nature of the incident,
    - The accident site will be cordoned off to keep the public at a safe distance from the scene and to allow easy access for first responders and emergency services,
    - If it is safe to do so, first responders under the guidance of the EHS Manager will remove victims of the crash and place them in an area where they can receive first aid treatment and assessment. Victims should be moved as little as possible until the extent of their injuries is determined,
    - Vehicles involved in the crash are not to be moved until the Police arrive,
    - Victims will be moved to a hospital or medical centre if required,
    - If members of the public are involved in an accident which has occurred as a result of a WSC employee or contractor, the injured persons will either be given first aid and/or taken to the nearest hospital for treatment, depending on their injuries, and
    - Details of the accident including how it was caused, number of persons involved, police reports, etc. will be recorded by the EHS Manager.

7.6.3 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the health and safety management system.

Table 7-8: Key Performance Indicators for Worker Health and Safety Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONIORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Health and Safety Policy including workers code of conduct and procedures for high risk activities (working at height, working in trenches, hot works etc)	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Daily
Health and Safety Signs	Inspection of the site	Contractor; Results to be presented to the Implementing Agency	
Training log and schedule	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Register of all EHS related incidents	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Equipment maintenance log and schedule	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONIORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Emergency Kit (one in each site office)	Inspection of site offices	Contractor; Results to be presented to the Implementing Agency	
Accident/incident response plan	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
GRM for workers	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

7.6.4 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that the health and safety management policy is clearly understood by all workers and that all mitigation measures are carried out and that monitoring reports are prepared. The Contractor should ensure that an Environmental Health and Safety (EHS) Manager is employed to oversee the specific requirements of this plan.

It is the responsibility of the EHS Manager to ensure that the health and safety requirements are clearly communicated with all workers. The EHS Manager will serve as the duty-bearer for the site.

It is the responsibility of the workers to ensure that they understand the health and safety requirements and that they abide by them.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed non-compliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.6.5 Data Analysing and Reporting

If there are any violations, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

7.7 Community Health and Safety Management

Dust and noise are among the most threatening to community health and safety. The impact from both are concerning for the more vulnerable members of the Project areas such as pregnant women; babies, the elderly and the infirmed as there is the possibility to exacerbate undergoing or underlying ailments and conditions. As well, the potential for the proliferation of pests and vermin due to

improper waste management and drainage could pose damaging to communities close to the areas where work is proposed. The introduction of unfamiliar faces in communities from the workforce may also induce a sense of insecurity (real and/or perceived) in these communities and so should be considered. Other threats to community health and safety include SGBV and SEAH which can lead to the spread of STIs and may cause mental anguish and a feeling of fear, anxiety and displeasure in communities close to the Project areas.

7.7.1 Monitoring Frequency

Monitoring will be conducted daily by the Contractor to minimize possible incidents.

7.7.2 Management and Mitigation Measures

The Contractor will ensure that the following mitigation measures are followed during construction and operational activities:

- Perform routine checks of health and safety equipment to ensure that they are properly functioning to prevent accidents that can negatively impact the public.
- Utilize communication channels such as the tv/radio and signs to inform the public of the ongoing works and possible risks including mosquito and other vector-borne risks. The communication strategy employed should be as per the Stakeholder Engagement Plan presented in Chapter 9.
- Assign an officer with responsibility for community health and safety.
- Construction areas should be clearly demarcated with safety signs and barriers to prevent possible incidents including information to report any issues or incidents that may occur.
- The contractor EHS Manager/Officer shall ensure that they utilize the consultation plan to inform community members of planned activities and safety protocols that must be adhered to. This should take place before the start of construction or maintenance works. The community and workers should be informed of the grievance redress mechanism that is to be utilized if there are any issues or complaints.
- The contractor EHS Manager/Officer shall maintain a register of all EHS related incidents that have occurred as a result of the activities associated with the contract. EHS incidents that should be recorded include fires, accidents, spills of hazardous materials that contaminate soil or water resources, stop-order notices issued by the DEPPor any other relevant agency, non-compliance with this ESMP.
- Each EHS related incident will be investigated by the client's EHS officer and an incident report forwarded to the contractor. An incident report by whom and to whom will be presented within five working days.
- EHS incident reports will include as a minimum, a description of the incident, actions taken to contain any damage to the environment, personnel or the public, and the corrective actions to repair/remediate any damage.
- All construction plant and equipment, tanks and machinery shall be maintained in a good state of repair throughout the construction period.
- Equipment maintenance will be carried out on an impermeable surface.
- Leakage from equipment will be prevented by regular inspection and repair.
- Areas under construction should be clearly demarcated and restricted access to members of the community.

- Emergency medical supplies must be available and easily accessible in the case of an incident.
- In the event that the onsite medical supplies are not adequate, the incident needs to be escalated to the hospital.
- In the event that a community member is exposed to hazardous material they should immediately be taken for medical attention.
- Any holes dug and depressions caused by equipment or supplies are addressed in a timely manner to avoid creating opportunities for the breading of vectors such as mosquitoes.
- Conduct community sensitization on SGBV, its impact, and available support mechanisms in which the understanding of gender equality and respectful relationships are promoted.
- Train project staff and contractors on SGBV risks, prevention, and zero-tolerance policies.
- Encourage the implementation of the Grievance Redress Mechanism to address community concerns and to report issues of concern.

7.7.3 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the health and safety management system.

Table 7-9: Key Performance Indicators for Community Health and Safety Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Health and Safety Policy	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Monthly
Health and Safety Signs	Inspection of the site	Contractor; Results to be presented to the Implementing Agency	
Log of Complaints	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Register of all EHS related incidents	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Equipment maintenance log and schedule	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Project landing page with relevant information for the community	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Emergency Kit	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Weekly

7.7.4 Roles and Responsibilities

It is the responsibility of the Contractor's CLO to ensure that the community is aware of planned activities and the health and safety protocols that they need to abide by for their protection and safety. It is important that all mitigation measures are carried out and that monitoring reports are prepared.

It is the responsibility of the Contractor's designated Community Liaison Officer (CLO) to act as a bridge between the project team and the community. This officer should always be aware of the project activities and the diversity of the community and should be linked to relevant local authorities or an established and trusted NGO.

The Executing Agency, WSC, is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan. The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.7.5 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

7.8 Emergency Response Management

7.8.1 Monitoring Standards

The works will be monitored by the Contractor based on adherence to the DEPP's and the Disaster Risk Management Authority's guidelines.

7.8.2 Monitoring Frequency

Monitoring will be carried out by the Contractor daily.

7.8.3 Management and Mitigation Measures

The Contractor will ensure that the following measures are put in place for effective emergency response: including have identified first responders for incidents and emergency numbers clearly visible on the site.

Hurricane

- Stay informed about hurricane forecasts and warnings.
- Store loose materials, equipment, and debris in a secure location or tie them down.
- Develop and communicate a hurricane emergency plan for all workers.
- Ensure there are first aid supplies, communication equipment, and emergency power sources available on-site.

- Have a clear plan for temporary shutdown or evacuation of the construction site in advance of a hurricane's arrival; ensure workers are informed of the plan and evacuation routes.

Fire

- In the event of a fire- there should be sufficient, available and well-maintained firefighting equipment.
- If the fire is too large, the fire brigade shall be called to extinguish it.

Heavy rainfall and Flood Prevention

- As much as possible work should not be done during the torrential rain.
- In the event of pending heavy rainfall, all equipment should be removed from near drains and rivers where it could be washed away.
- Workers must be trained in the requirements of the emergency preparedness and response plan.

Earthquakes

- Use of flexible pipe joints and penetrations into tanks to prevent breakage from earthquake movements.
- All works should be done to local and international building codes and standards where possible.
- An emergency preparedness and response plan must be in place to cover man-made and natural hazards. Workers must be trained in the requirements of the emergency.

Utility Disruption

- As much as possible, works should be done away from essential utility lines identified in the site assessment.
- In the event of any water disruptions: see Chapter 9.1.

7.8.4 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the emergency response measures.

Table 7-10: Key Performance Indicators for Emergency Response Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Maintenance Log	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Daily
Incident Log	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Log of complaints	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

7.8.5 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that the emergency response measures are clearly understood by all workers and that all management and mitigation measures are carried out and that monitoring reports are prepared.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The Site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.8.6 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

7.9 Biodiversity Management

7.9.1 Monitoring Standards

The works will be monitored by the Contractor based on adherence to the DEPP's guidelines.

7.9.2 Monitoring Frequency

Monitoring will be carried out by the Contractor (via a qualified environmental specialist) according to the frequency that is stipulated in the DEPP's guidelines.

7.9.3 Management and Mitigation Measures

The Contractor will ensure that the following measures are put in place to manage the flora and fauna in the construction area:

- Wetland areas should not be cleared and drainage into these should be managed with silt traps and other mechanisms to reduce the impact of poor water quality and siltation on the protected area.;
- All construction sites should be clearly demarcated; no clearing of vegetation, storage of materials or other construction related activities shall be permitted outside the demarcated construction area.
- Areas where priority plant species are growing must be demarcated as no-go zones; in the event that the uprooting of trees is unavoidable, replantation must be prioritized to conserve the biodiversity of the area.
- Establish an appropriate drainage network to prevent runoff into wetlands and other water resources on the islands.
- Avoid indiscriminate habitat destruction and localise the proposed development as much as possible (including support areas and services).

- Ensure that proper handling, use, storage and disposal of all chemicals are done according to best practices and are not near or at water courses or waterbodies
- Have spill containment and clean-up equipment on site and dispose of waste in accordance with best practices
- Report and clean accidental spills immediately; contaminated soils must be removed and disposed of at a registered disposal site.
- Properly maintain and service equipment.
- Refuelling should not be done near vegetated areas.
- Limit activities that may prove a nuisance to animals to short time frames.
- Engage with the local communities and stakeholders to raise awareness about the importance of biodiversity conservation.

7.9.4 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the community access.

Table 7-11: Key Performance Indicators for Biodiversity Management

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
No major losses to priority species	Review and inspection of documentation/ ecological monitoring reports	Contractor; Results to be presented to the Implementing Agency	As outlined in DEHS Guidelines
Signage	Inspection of the site	Contractor; Results to be presented to the Implementing Agency	
No overspill into wetland areas	Inspection of site	Contractor; Results to be presented to the Implementing Agency	
Tracking of status of wetlands	Weekly inspection of wetlands	Contractor; Results to be presented to the Implementing Agency	

7.9.5 Roles and Responsibilities

It is the responsibility of the Contractor to ensure all workers are made aware of the importance of following the management and mitigation and that monitoring reports are prepared.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The Site and surrounding wetland will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

7.9.6 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the EHS Manager to allow for management strategies to be changed according to the results.

8 SOCIAL MANAGEMENT

The following plans have been prepared for the identified social risks:

a) Water Supply Management

b) Enhancing Representation and Safety of Women in the Project Workforce

c) Management of Unions and General Workers

d) Security Management

e) Labour Management

f) Contractor Management

8.1 Water Supply Management

8.1.1 Monitoring Standards

The supply of water will be monitored by the WSC.

8.1.2 Monitoring Frequency

Monitoring will be carried out daily by the WSC.

8.1.3 Management and Mitigation Measures

The WSC will ensure that the following measures are put in place to mitigate against the potential impacts of any possible disruption of the water supply:

- Communicate planned water shutdowns well in advance to affected communities. Implement scheduled shutdowns during times of lower demand and provide alternative water sources if necessary.
- Identify and plan for alternative water sources that can be used during construction to minimize dependence on the existing water supply. This may involve utilizing temporary wells, importing water, or using recycled water.
- Implement temporary water storage solutions to store water before construction activities begin. This can help maintain water supply during interruptions and prevent shortages.
- Plan and execute construction activities in phases to minimize the duration and extent of disruptions. Prioritize critical water supply infrastructure to be addressed first.
- Install temporary bypass systems to redirect water flows around construction areas, allowing uninterrupted water supply to downstream users.
- Implement water conservation programs within affected communities to reduce overall demand during construction. Educate residents about the importance of water conservation practices.
- Develop and communicate clear emergency response plans to address unforeseen disruptions promptly. This includes defining roles and responsibilities, communication protocols, and coordination with local authorities.
- Implement measures to control dust and sediment generated during construction to prevent contamination of water sources. Use barriers, sediment basins, and other erosion control techniques.
- Use high-quality materials during the replacement of pipelines to minimize the risk of corrosion and other forms of degradation to prevent leakages.

8.1.4 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the plan to manage water supply.

Table 8-1: Key Performance Indicators for Water Supply Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Log of Complaints	Review and inspection of documentation	WSC	Weekly
Planned Shutdowns Schedule	Review and inspection of documentation		
Log of Disruptions	Review and inspection of documentation		

8.1.5 Roles and Responsibilities

It is the responsibility of the CONTRACTOR to ensure that any construction activities that is foreseen to possess the potential to disrupt the existing water supply is communicated with the WSC in advance so a plan of action can be promptly developed.

It is the responsibility of the WSC to ensure that a supply of water to the general public is maintained throughout the duration of the Project. In the event that there is an unavoidable or unforeseen disruption to the supply, the WSC is responsible for communicating with the public on the best plan of action, maintaining constant communication on the status of the disruption and providing, when possible, alternative supplies of water.

8.1.6 Data Analysis and Reporting

Any disruption to the existing water supply should be documented, as well as the course of action taken, the duration and the effects.

8.2 Enhancing Representation of Women and PWDs in the Project Workforce

8.2.1 Monitoring Standards

The works will be monitored by the Contractor.

8.2.2 Monitoring Frequency

Monitoring will be carried out by the Contractor as work progresses in the community.

8.2.3 Management and Mitigation Measures

The Contractor will ensure that the following measures are put in place to ensure there is adequate representation of women in the project workforce:

- As part of the Implementing's agency contractual arrangements with the construction contractor, encourage the construction contractor to maximise local employment opportunities and to work with the local communities (and their leaders) in establishing a fair and transparent system for local worker recruitment. This process should be aided by the Project Management Unit's (PMU) CLO.
- Inform the educational and/or vocational institutes of the types of job opportunities that will be available through the Project to influence the types of semi-skilled training programmes offered in the Project area during pre-construction and construction phases.
- Ensure good communication as well as coordination with unions,

- Emphasis should be placed on training women as well as men to improve their recruitment prospects for semi-skilled positions. This will require necessary trainings and collaboration with the Department of Gender and Family Affairs.
- Take steps to ensure that qualified women are afforded equal access to job opportunities from the Project (linked to the first mitigation measure) including promoting their participation, ensuring information is posted in relevant sites and media and ensuring that selection processes are bias and discrimination-free.
- All applicants will be made aware of the grievance mechanism to report any complaints associated with gender-biased or unfair treatment.
- Implement measures to ensure zero tolerance of SGBV including SEAH that may be gendered in nature. These measures must include: a) Include in the Code of Conduct for employees and contractors the prohibition of sexual and gender-based violence and include a protocol with the steps to take to respond and provide assistance to victims in cases when these situations occur; b) Implement training programs to raise awareness and prevent sexual and gender-based violence addressed to project employees and contractors; c) Ensure the GRM can channel and respond to Sexual and Gender-based Violence (SGBV) complaints relating to incidents at the worksite and between workers and pedestrians and other users of the area. This includes measures to raise complaints anonymously, ensure confidentiality, and ensure referral and access to health and psychological services for complainants. The Construction Contractor's Gender and Social Safeguarding Specialist would be responsible for the monitoring of responses to SGBV complaints at the project level. As well, the PMU's Gender and Social Safeguarding Specialist would support on referring victims to the relevant services for assistance.

8.2.4 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness the plan to enhance the representation of women in project works.

Table 8-2: Key Performance Indicators for Better Inclusion in the Project Workforce

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Local worker recruitment policy	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Weekly
Training log and schedule	Review and inspection of documentation; Assessment of worker performance	Contractor; Results to be presented to the Implementing Agency	
Register of all workers employed by sex and age	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Log of complaints including on SEAH and SGBV issues	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Inclusion in the Code of Conduct of the prohibition of sexual and gender-based violence and a response protocol for incidents	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Inception and Monthly
Training programs to prevent sexual and gender-based violence for employees and contractors	Review and inspection of documentation; Training schedules and attendance sheet	Contractor; Results to be presented to the Implementing Agency	
Establishment and use of GRM to facilitate anonymous complaints, confidentiality and referral to support services.	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

8.2.5 Roles and Responsibilities

It is the responsibility of the Contractor to manage social conflicts as well as related social risks. The contractor must adhere to the local worker recruitment policy to be free from gender biases. The contractor must also ensure that all workers and community members are adequately aware of the grievance mechanism to log complaints that need to be addressed.

There should be constant liaison with relevant NGOs and the Department of Gender and Family Affairs as necessary. A referral pathway for referring GBV incidents or suspected cases to the police and other relevant authorities should also be established using the existing guidance in place in the country. These cases will only be acted upon provided the victim's consent is formally ascertained.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary. The CONTRACTOR is responsible for assigning a Social and Gender Specialist who is responsible for the implementation, monitoring and enforcement of the mitigation measures recommended. The Social and Gender Specialist is also responsible for the receipt of complaints, grievances and/or recommendations via the GRM and is responsible for ensuring all inputs are handled in a timely and effective manner. It is the responsibility of the Social and Gender Specialist to ensure that any measures taken in response to feedback via the GRM are communicated to the aggrieved or user of the GRM.

8.2.6 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the EHS Manager and any complaints logged.

8.3 Management of Unions and General Workers

This management plan presents the strategy recommended to address various aspects of the employment relationship, promoting communication, fostering a positive work environment, and ensuring fair and transparent practices. This plan will be monitored throughout the entire duration of

the Project to ensure that a positive environment and relationship is maintained between WSC and its contractors, inclusive of both unionized and non-unionized workers.

8.3.1 Management Measures

- Establish regular communication channels with unions and non-unionized workers. For unions, establish a line of communication with a union representative.
- Clearly communicate policies, procedures, and any changes affecting workers.
- Implement mechanisms for employee feedback, such as suggestion boxes, regular surveys, or town hall meetings.
- Include workers in decision-making processes that affect their work conditions.
- Provide conflict resolution training for managers and employees.
- Provide opportunities for skill development and career advancement.
- Regularly assess workplace hazards and implement preventive measures.
- Train employees on safety protocols and emergency procedures.
- Implement policies to prevent discrimination and promote equal opportunities, in keeping with the Bahamas Employment Act (2001)
- Regularly evaluate and update the management plan based on feedback and changing circumstances.

8.3.2 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the plan to manage unionized and non-unionized workers.

Table 8-3: Key Performance Indicators for Management of Unions and General Workers

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Log of Complaints / Grievances	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Weekly
Employee Turnover Rate	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Log of Worker Conflicts	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Training Schedule and Attendance Sheets	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

8.3.3 Roles and Responsibilities

It is the responsibility of the CONTRACTOR to ensure that the recommended management measures are taken to foster a positive working environment and relationship with all workers employed over the duration of the Project, both unionized and non-unionized. The CONTRACTOR must maintain a positive relationship with any unions represented in the Project's labour force and must communicate any plans, activities or changes that may affect any workers employed to the Project.

8.3.4 Data Analysis and Reporting

All conflicts, incidents, and trainings should be documented.

8.4 Security Management Plan

8.4.1 Monitoring Standards

The safety and security of the workers and equipment would be the responsibility of the Contractors. They should coordinate with the Royal Bahamas Police Force (RBPF) when operating in areas with high risk to ensure the safety of equipment and all stakeholders.

8.4.2 Monitoring Frequency

Monitoring for safety and security should be carried out throughout all phases of the project.

8.4.3 Management and Mitigation Measures

The Contractor will be responsible for the following measures to ensure the safety and security of personnel and equipment during all phases of the project. The risk level and impact to the site(s) will have to be assessed and the appropriate mitigation measures devised. Some mitigation measures include:

- Creation of site-specific security plan based on an assessment of the security risk.
- Liaise and communicate with the Royal Bahamas Police Force (RBPF) to assess the risk associated with each site for every stage of the project.
- Contact the RBPF for the area to advise of areas where work will be conducted prior to commencement of work.
- Ensure that key assets and property are secured or removed to a secure location when not in use.
- Where possible ensure perimeter of areas has appropriate security fencing and areas are well illuminated.
- Control site access by ensuring limited access points and controlled entry.
- Engage with community members and encourage them to report suspicious activities to the RBPF.
- Encourage security awareness among employees and ensure security supervisor is always at the site.
- Maintain a security risk register and periodically review the security risk plan to update the security mitigation measures.
- Contract licensed security services to guard and patrol sites where necessary. Security personnel should be unarmed and properly trained in de-escalation techniques.
- Consider the use of technology, such as tagging, GPS tracking and video surveillance to detect and alert for any security issues or treats.
- Ensure that police forces and/or private security guards safeguarding the project area comply with the project's Code of Conduct provisions regarding the prohibition of SEAH.
- Ensure the participation of police force/private security guards in trainings related to the prevention of sexual and gender-based violence.

8.4.4 Key Performance Indicators

The following KPIs have been select in order to evaluate the effectiveness of the plan to mitigate against treats to security.

Table 8-4: Key Performance Indicators for Security Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Security Risk Register	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Daily
Incident Log	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Number of Police Officers or Private Security Guards that participated in trainings to prevent sexual and gender-based violence / Total number of Police Officers and Private Security Guards safeguarding the project	Review of training schedules and attendance sheets	Contractor; Results to be presented to the Implementing Agency	Monthly

8.4.5 Roles and Responsibilities

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection Plan. The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted, or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

8.4.6 Data Analysis and Reporting

If there are any security incidents, these are to be reported to the Implementing Agency and the RBPF within 24 hours. The implementing agency will be required to ensure the appropriate mitigation measures are implemented and the RBPF will be responsible for investigating the incident.

8.5 Contractor Management Plan

8.5.1 Monitoring Standards

The works will be monitored by the Implementing Agency.

8.5.2 Monitoring Frequency

Weekly monitoring will be carried out by the Implementing Agency during both construction and operational phases.

8.5.3 Management and Mitigation Measures

The Implementing Agency will ensure that the following measures are put in place to manage all contractors throughout the project:

- The Implementing Agency will provide the Contractor with attributes for all parts of the Contractor Management Plan including requirements to Contractor and also a Work Statement for the various phases of work including models for standard documents.
- The Contractor is expected to abide by this Contractor Management Plan.
- The Contractors will enter into a business partnership with the Implementing Agency after completing a successful tender process following the government procurement guidelines.
- Each contractor will have a legally binding, written contract that defines specific terms and conditions including workers code of conduct
- The Contractor will provide the integrated solution for execution of the work phases, including the economic, environmental and social approach. These should be the primary content of a CESMP or a CESHSMP.
- The Contractor will abide by the management actions and mitigations measures provided in the ESMP associated with the project.
- The Contractor shall include, for all submarine pipeline crossings and bridge crossings, site-specific statements within the CESMP or CESHSMP detailing measures to manage marine and coastal impacts in sensitive habitats and for community and worker safety. These statements will address turbidity and sediment control through appropriate work methods, timing of activities and monitoring frequency strategies to:
    - minimise disturbance to the seabed and any sensitive habitats, and
    - spill prevention and response protocols for fuels and chemicals used during these types of works.

  Additionally, the Contractor will implement community and worker safety arrangements, including exclusion zones, clear signage and coordination with local marine users and bridge traffic to prevent accidents and disruptions.
- The contractor will follow the CDB guidelines regarding sourcing of materials (ensuring proper sourcing from borrower pits and for solar panels).
- The Contractor will implement a formal Chance-Find Procedure to manage the discovery of any cultural heritage artefacts during construction activities. All contractors and site personnel will be trained to recognise and report potential chance finds, including archaeological, paleontological, historical, or culturally significant materials. Upon discovery, work in the immediate area will be halted, the find secured, and relevant authorities notified. The Engineer will oversee the procedure, ensuring documentation, expert assessment, and appropriate mitigation measures are undertaken before resuming work.

- The Contractors will present to the Implementing Agency, all the information for all subcontractors and the procedures for verification and validation services.
- Each Contractor will have a single point of contact to the Implementing Agency for contractual matters. The contact points, for each site, will monitor the activities.
- The Point of Contact will ensure compliance of the Project against the General Commitments Register. Weekly they will report about achievements and problems and the current situation to the Implementing Agency.
- Each Contractor/Subcontractor will identify the responsibilities and authorities of the Project staff. This information will be published in a project contact sheet and approved by the Implementing Agency.
- Each Contractor will have requirements for quality assurance clearly identified within the Statement of Work, including the requirement to allow independent quality inspections of materials and work processes;
- Each subcontract will contain appropriate terms and conditions;
- The Contractor is responsible for project management, for control and monitoring activities regarding constructors' actions and has overall responsibility for environmental, social, health and safety, and cultural heritage aspects of the project.
- The Contractors will prepare work plans in compliance with the project's requirements and submit to the Implementing Agency for their Approval. These workplans should include site specific method statements for work in protected areas and sensitive habitats.
- Contractors must nominate the following employees:
    - representative for site coordination;
    - representative for traffic management and coordination
    - representatives for EHS responsibilities;
    - representatives for technical execution, budget, Project phases;
    - first aid competent person;
    - representative for waste management;
    - team for guarding the site; and
    - team responsible for intervention on accidental pollution events.
    - Social and gender safeguards
    - Representative for communication/stakeholder holder engagement
- All Contractors are also required to comply with all relevant national regulatory requirements.
- Each week, the Contractors will prepare and deliver to the Implementing Agency a weekly progress report for each aspect of the work.
- Each week, the Contractors will prepare and deliver to the Implementing Agency weekly progress reports on environmental, social and health and safety performance including reports on the KPIs presented in the Environmental and Social Management Plan.

8.5.4 Key Performance Indicators

The following KPIs in the following table have been selected in order to evaluate the effectiveness of the contractor management process.

Table 8-5: Key Performance Indicators for the Contractor Management Plan

KEY PERFORMANCE INDICATOR	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Weekly Report on achievements and problems	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	Weekly
Project contact sheet	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Reports on quality inspections	Quality inspections of materials and work processes	Contractor; Results to be presented to the Implementing Agency	
Work plan	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Weekly progress reports on each aspect of the work	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	
Weekly progress reports on environmental, social and health and safety performance	Review and inspection of documentation	Contractor; Results to be presented to the Implementing Agency	

8.5.5 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that there is compliance with all contractual requirements.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The site and surrounding environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted, or equitable adjustments allowed to the

CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

8.5.6 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the Implementing Agency.

8.6 Labour Management Plan

8.6.1 Monitoring Standards

The works will be monitored by the Contractor.

8.6.2 Monitoring Frequency

Weekly monitoring will be carried out by the Contractor, prior to and as work progresses in the Community until the end of activities.

8.6.3 Management and Mitigation Measures

The Contractor will ensure that the following measures are put in place to manage labourers throughout the proposed works:

- It is recommended that the ILO standards for minimum age requirements for employment be adopted – The ILO Convention No. 138 states that the minimum age for admissions to work should not be less than the age of completion of compulsory schooling and not less than 15 years.
- It is imperative that the labour management benefits the local community in terms of providing jobs for local workers, particularly in the context of Bahamas where youth employment and under-employment may be considered an issue. The Labour Management Plan should support local hires, particularly those populations for which employment is less available, namely women and youth.
- Given the size and scale of the project, opportunities should be encouraged for the local population, including the mentioned groups, if not only in the form casual labour supporting the project.
- At the largest site at any given time, further consultations with the WSC will outline how many workers are expected onsite (working along the pipeline routes, etc) during the Construction phase. Additional consultations will outline the nature of the work and skillsets desired for elaborating in this section.
- This equitable hiring framework should be honoured by project contractors where possible and supported by the Project Team and Supervising Engineer.
- The contractor should work with local government and agencies to encourage participation from vulnerable groups (particularly women and youth) and small business owners in providing services to sites, food services for example, where relevant.
- Local media, radio and social media (Facebook, Instagram etc.) could be used to disseminate equal opportunity hiring notices, as well as provide information on available related skills training opportunities.
- In meeting these commitments, the SEP can be used for guidance as well as the Decent work checklist.
- In keeping with social and gender standards in this context, principles for ensuring fair and equal access to employment as well as non-discriminatory hiring practices that avoid Sexual Exploitation and Abuse (SEA) and or forced labour is key.

- It is essential to ensure that work is decent, fairly paid, non-discriminatory and also free of all forms of violence, abuse and exploitation.
- The labour management plan will adhere to all provisions as outlined in the labour policy and the draft sexual harassment policy, including any provisions that exist regarding migrant labour or forced labour.
- The Code of Conduct is to be followed, with training for all site workers on the Code of Conduct being done prior to the commencement of construction works.

8.6.4 Proposed Checklist Matrix for Decent Work

Decent Work Areas of Focus	Checklist Questions	Checklist Responses			Score
		Yes (1)	No (0)	Unsure (0.5)	
Equal Work Opportunities	Are work opportunities open to women, youth, and PWDs?				
	Are opportunities advertised in multiple media and in diverse languages/dialects ?				
	Is there a documented employment process that provides basic work protections?				
	Is labour inspection carried out?				
Loss of Access to Work	Are there anticipated works or activities that will lock off access to work for communities and or specific groups for more than a few hours?				
	Are mitigation actions in place to address that loss of access to work e.g. compensation ?				
Risk of Forced Labour	Are there appropriate checks in place to for employee age requirements, documentation as well as compliance with labour laws?				

	Including for casual labour? Should a labour inspection be carried out, is it likely that the site and any other related areas would pass? Does a visible and simple mechanism/ set of instructions exist for a worker or a community member to report possible labour code violation or suspicions of a violation? Are these regularly communicated?	

8.6.5 Code of Conduct

8.6.5.1 Sexual Exploitation, Harassment, Abuse and Any Form of Discrimination

Introduction

The project is committed to ensuring a work environment which minimizes any negative impacts on the local environment, communities, and its workers. The project also strongly commits to creating and maintaining an environment in which Sexual Exploitation and Abuse (SEA), Sexual Harassment (SH), discrimination or any other form of prejudice or abuse have no place, and where they will not be tolerated by any employee, sub-contractor, supplier, associate, or any representative of the company implementing the proposed works.

The purpose of this *Code of Conduct* is to:

1. Create a common understanding of what constitutes acceptable and unacceptable forms of conduct during work and in any interactions with the community and beneficiaries. This includes the prohibition of sexual exploitation and abuse, and sexual harassment including their forms, the reasons behind their prohibition and the sanctions to be deployed.
2. Create a shared commitment to fair, appropriate and socially responsive behaviors and guidelines for company employees as well as contractors/third-party suppliers to prevent, report, and respond to SEA and SH, and
3. Create understanding that breach of this code of conduct will result in disciplinary action.
4. Frequency and content of the training for the prevention of sexual exploitation and abuse.

Definitions

1. **Sexual Exploitation and Abuse (SEA)**[24]

Is defined as any actual or attempted abuse of a position of vulnerability, differential power, or trust, for sexual purposes, including, but not limited to, profiting monetarily, socially or politically from the sexual exploitation of another[25].

- **Sexual Abuse:** "The actual or threatened physical intrusion of a sexual nature, whether by force or under unequal or coercive conditions." **Usually between project team members and beneficiaries.**
- **Sexual Harassment:**[26] Unwelcome sexual advances, request for sexual favors, and other verbal or physical conduct of sexual nature. **Usually between members of the project team, within the WSC and between project team and contractors.**

Examples of sexual exploitation and abuse include, but are not limited to:

- A project worker tells women in the community that he can get them jobs related to the work site (cooking and cleaning) in exchange for sex.
- A worker that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A project worker gets drunk after being paid and rapes a local woman.
- A project worker denies passage of a woman through the site that he is working on unless she performs a sexual favor.
- A manager tells a woman applying for a job that he will only hire her if she has sex with him.
- A worker begins a friendship with a 16-year-old girl who walks to and from school on the road where project related work is taking place. He gives her motor rides to school. He tells her that he loves her. They have sex. In this case, even though the age of consent for the country maybe be 16, this is still illegal for the purposes of the project as the acceptable age of consent in this case is 18 years of age.

2. **Sexual Harassment versus SEA**[27]

SEA occurs against a beneficiary or member of the community. Sexual harassment occurs between personnel/staff of an organization or company and involves any unwelcome sexual advance or unwanted verbal or physical conduct of a sexual nature. The distinction between the two is important so that agency policies and staff trainings can include specific instruction on the procedures to report each.

Examples of sexual harassment in a work context include, but are not limited to:

- Male staff comment on female staffs' appearances (both positive and negative) and sexual desirability.
- When a female staff member complains about comments male staff are making about her appearance, they say she is "asking for it" because of how she dresses.
- A male manager touches a female staff members' buttocks when he passes her at work.
- A male staff member tells a female staff member he will get her a raise if she sends him naked photographs of herself.

[24] As defined in the UN Secretary's bulletin – Special Measures for protection from sexual exploitation and abuse October, 9, 2003 ST/SGB/2003/13

[25] In the context of World Bank Financed operations exploitation occurs when access to, or benefit from a World Bank Financed good or service is used to extract sexual gain.

[26] Inter-Agency Standing Committee *Protection against Sexual Exploitation and Abuse (PSEA): Inter-agency cooperation in community based complaint mechanism. Global standard Operating Procedures*. May 2016

[27] Ibid

3. Consent

The choice behind a person's voluntary decision to do something. Consent for any sexual activity must be freely given, ok to withdraw, made with as much knowledge as possible, and specific to the situation. If agreement is obtained using threats, lies, coercion, or exploitation of power imbalance, it is not consent. **Under this Code of Conduct[28] consent cannot be given by anyone under the age of 18**, **regardless of the age of majority or age of consent locally. Mistaken belief regarding the age of the child is not a defense**.

There is no consent when agreement is obtained through:

- the use of threats, force or other forms of coercion, abduction, fraud, manipulation, deception, or misrepresentation
- the use of a threat to withhold a benefit to which the person is already entitled, or
- a promise is made to the person to provide a benefit.

4. Discrimination

Any distinction, exclusion or preference made on the basis of race, colour, sex, religion, political opinion, national extraction or social origin, which has the effect of nullifying or impairing equality of opportunity or treatment in employment or occupation.

Examples of discrimination in a work context include, but are not limited to:

- Refusing to hire or promote someone based on their race, ethnicity or religion
- Implementing policies or practices that disproportionately impact certain religious groups
- Refusing to provide reasonable accommodation for PWDs
- Treating employees different based on their age, particularly during recruitment or layoff processes
- Not being paid equally as someone doing the same job with an equal or similar level of qualification or experience

While all forms of violence against a community resident or a co-worker are forbidden, this code of conduct emphasizes the prevention and reporting of sexual exploitation and abuse (SEA), sexual harassment and discrimination which constitute gross misconduct, and is grounds for termination or other consequences related to employment and employment status:

Individual signed commitment (example):

I, _____, acknowledge that sexual exploitation and abuse (SEA) and sexual harassment, are prohibited. As an *(employee/contractor)* of *(contracted agency / sub-contracted agency)* in (*country)*, I acknowledge that SEA and SH activities on the work site, the work site surroundings, at workers' camps, or the surrounding community constitute a violation of this *Code of Conduct*. I understand SEA and SH activities are grounds for sanctions, penalties or potential termination of employment. Prosecution of those who commit SEA, SH and discrimination may be pursued if appropriate.

I agree that while working on the project I will:

[28] In accordance with the United Nations Convention on the Rights of the Child.

- Treat all persons, including children (persons under the age of 18), with respect regardless of sex, race, color, language, religion, political or other opinion, national, ethnic or social origin, gender identity, sexual orientation, property, disability, birth or other status.
- Commit to creating an environment which prevents SEA and SH and promotes this code of conduct. In particular, I will seek to support the systems which maintain this environment.
- Comply with the laws governing the land with regards to employment and will strive to provide equal opportunities to all, ensure work environments are safe and compensate those employed under me with fair wages.
- **Not** participate in SEA and SH as defined by this *Code of Conduct* and as defined under *(country)* law (*and other local law, where applicable).*
- **Not** use language or behavior towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- **Not** participate in sexual contact or activity with anyone below the age of 18. Mistaken belief regarding the age of a child is not a defense. Consent from the child is also not a defense. I will not participate in actions intended to build a relationship with a minor that will lead to sexual activity.
- **Not** solicit**/**engage in sexual favors in exchange for anything as described above.
- Unless there is the full consent by all parties involved, recognizing that a child is unable to give consent and a child is anyone under the age of 18, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" under this Code.

I commit to:

- Adhere to the provisions of this code of conduct both on and off the project site.
- Attend and actively partake in training courses related to preventing SEA and SH as requested by my employer.

If I am aware of or suspect SEA and SH, at the project site or surrounding community, I understand that I am encouraged to report it to the Grievance Reporting Mechanism (GRM) or to my manager. The safety, consent, and consequences for the person who has suffered the abuse will be part of my consideration when reporting. I understand that I will be expected to maintain confidentiality on any matters related to the incident to protect the privacy and security of all those involved.

Sanctions: I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning or formal warning
- Additional training.
- Loss of salary.
- Suspension of employment (with or without payment of salary)
- Termination of employment.
- Report to the police or other authorities as warranted.

I understand that it is my responsibility to adhere to this code of conduct. That I will avoid actions or behaviors that could be construed as SEA and SH. Any such actions will be a breach this Individual Code of Conduct. I acknowledge that I have read the Individual Code of Conduct, do agree to comply with the standards contained in this document, and understand my roles and responsibilities to prevent and potentially report SEA and SH issues. I understand that any action inconsistent with this Individual Code of Conduct or failure to act mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

8.6.5.2 Health and Safety

Introduction

The project is committed to ensuring a work environment which minimizes any negative impacts on the local environment, communities, and its workers. The project also strongly commits to creating and maintaining an environment in which the Health and Safety of all employees, sub-contractors, suppliers, associates, or any other representatives of the company implementing the proposed works are prioritized.

8.6.6 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the Labour Management Plan.

Table 8-6: Key Performance Indicators for Labour Management

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Decent Work Matrix	Review and completion of the Decent Work Matrix	Contactor; Results to be presented to the Implementing Agency	Monthly
Sensitization and Gender Risk Management Training	Sensitization training completed (including training on GRM/GBV) for key stakeholders as well as contractors and employees on the Project (2 sessions held – in person or hybrid)	Social and Gender Advisor/Consultant	Prior to commencement of construction works and agreed intervals
Gender Sensitive Monitoring Training	1-2 sessions for contractors/project management staff/CLO	Social and Gender Advisor/ Consultant	Prior to commencement of construction works and agreed intervals

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Code of Conduct Training	1-2 training sessions provided to site workers	Contractor	Prior to commencement of construction works and agreed intervals

8.6.7 Roles and Responsibilities

It is the responsibility of the Contractor to ensure that the Labour Management Plan is sufficiently implemented and monitored. If there is a potential challenge due to planned works, the contractor must ensure that all workers and community members are adequately aware and the alternatives are clearly expressed to minimize social impacts.

The Implementing Agency is responsible for assigning the ENGINEER and the CONTRACTOR as the responsible parties for undertaking the monitoring required and for implementing the mitigation measures necessary.

The site and surrounding marine environment will be monitored by the ENGINEER for negative impacts caused by the construction Works. The ENGINEER will notify the CONTRACTOR in writing of any observed noncompliance with local environmental laws regulations, permits, and other elements of the CONTRACTOR's Environmental Protection plan The CONTRACTOR shall, after receipt of such notice, inform the ENGINEER of the proposed corrective action and take such action when approved by the Contracting Officer.

The ENGINEER may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No time extensions shall be granted or equitable adjustments allowed to the CONTRACTOR for any such suspensions. This is in addition to any other actions the ENGINEER may take under the Contract, or in accordance with applicable laws.

8.6.8 Data Analysis and Reporting

If there are any violations, this will be reported immediately to the EHS Manager and any incidents logged.

9 STAKEHOLDER ENGAGEMENT PLAN

This plan should outline the measures to be used for community engagement, dissemination of project information and grievance management and will be utilised as a key element in all the proposed management, monitoring and mitigation measures outlined in this document. This plan would be responsibility of the Implementing Agency and Contractor.

9.1 Context

The Bahamas, an archipelagic nation consisting of over 700 islands and cays, faces unique challenges in the management and delivery of water resources. The Water & Sewerage Corporation (WSC) is the lead national agency responsible for water supply, while other service providers operate under franchise agreements or as private utilities (e.g., Grand Bahama Utility Company – GBUC, Consolidated Water).

The archipelagic nature of the country presents stakeholder coordination, capacity, and presence challenges, particularly across the Family Islands, where many national government agencies lack a permanent presence. New Providence, the most populated island, has relatively strong institutional capacity, whereas Family Islands face limitations in technical capacity, governance, and monitoring capabilities.

Stakeholder coordination in the water sector occurs primarily between WSC and service providers. Economic regulation remains limited, with tariffs set by Parliament and below full cost recovery, while monitoring of water resources is largely centralized within WSC. Disaster preparedness involves coordination with the Department of Disaster Management & Emergencies (DRMA), NOAA, and other local agencies.

9.2 Key Elements of the Water Sector Project

The proposed Climate Resilience of the Water Sector Project a=targets New Providence, North and CentralAndros, South Andros and Mangrove Cay, Acklins and Abaco and aims to:

1. **Upgrade Water Infrastructure**
    - Replacement of pipelines and rehabilitation of wellfields
    - Implementation of solar-powered pumping systems
    - Pressure management improvements
2. **Enhance Climate Resilience and Drought Adaptation**
    - Expansion of water storage capacity
    - Leak detection and non-revenue water reduction
    - Strengthened emergency water supply mechanisms for Family Islands
3. **Institutional Strengthening**
    - Training for WSC staff in water operations and climate resilience
    - Incorporation of gender and social inclusion practices
    - Capacity building for local authorities and NGOs
4. **Community and Social Benefits**
    - Reliable water supply for households, schools, and health facilities

- Reduced dependence on water trucking
- Strengthened support for tourism, agriculture, and fisheries
- Disaster preparedness and emergency water management

9.3 Population and Gender Profile

Understanding the demographic composition of the target islands is critical for designing inclusive engagement strategies. Sex-disaggregated data supports the development of gender-sensitive approaches and ensures equitable participation.

National Overview (2022 Census)

Total Population

Indicator	Total	Male	Female	% Male	% Female
Population	398,165	191,667	206,498	48.1%	51.9%
Direct Beneficiaries	321,698	154,510	167,188	48.1 %	51.9%

Women comprise a slightly larger proportion of the population, which is reflected across all islands. It also implies that engagement with stakeholders should be designed to accommodate women's schedules, transportation needs, and safety concerns to ensure inclusive participation. For consultations on Family Islands, flexible approaches such as small-group meetings, mobile outreach teams, and virtual platforms may be necessary to overcome logistical challenges. Additionally, sex-disaggregated key performance indicators (KPIs) must be monitored across all stakeholder activities to track progress toward gender-responsive outcomes.

9.4 Methodology

The Stakeholder Engagement Plan (SEP) was developed through a participatory and consultative approach, ensuring the perspectives, concerns, and expectations of all relevant stakeholders were systematically captured and integrated. The process involved a combination of desk-based research, stakeholder mapping, and direct engagement with government agencies, community representatives, civil society organizations, and vulnerable groups, including women, youth, and persons with disabilities. Focus group discussions, key informant interviews, and community meetings were conducted to gather qualitative insights, while surveys and secondary data sources provided quantitative context. This iterative engagement process enabled the identification of priority issues, potential impacts, and opportunities for inclusive participation, ensuring the SEP reflects both the social, environmental, and cultural context of the project and aligns with international best practices for stakeholder engagement. Details of the consultative process can be found in the documents shown in the links below:

9.5 Stakeholder Identification

For the purpose of the analysis, stakeholders are grouped within the following broad categories:

1. Affected communities including community members living adjacent to the construction works – families, individuals and social structures and networks including formal or informal community organisations;
2. Sensitive human receptors in the vicinity of the construction works, including schools, health facilities (hospitals), nurseries and early childhood care and educational facilities, care facilities for older adults, persons who at home during the day, etc.;
3. Local businesses and their representative organisations;

4. Local persons seeking employment;
5. Tourist Interests;
6. Heritage Interests;
7. Local Government – MENR, DEHS, Municipality;
8. Politicians (Local Government Councillors, Members of Parliament and Representatives of the Opposition);
9. Residents of the affected municipalities;
10. Project contractors and sub-contractors;
11. Central government agencies (including regulatory agencies);
12. National civil societies (e.g. environmental NGOs); women's groups and groups representing the vulnerable in the population
13. The media; and
14. The general public.

9.6 Stakeholder Analysis and Engagement Strategies

Figure 9-2 ranks stakeholders based primarily on their level of importance (those who may be directly or indirectly affected by project activities) and their level of concern regarding the outcome of the project. The key local stakeholders (high priority stakeholders), those whose participation in the project is critical to achieving the project objectives, are the following:

- Affected communities including CBOs and local NGOs;
- Individual and families living adjacent to the construction works;
- Sensitive human receptors in the vicinity of the construction works;
- Landowners and informal occupants in the footprint of the project;
- Local businesses and their representative organisations;
- Farmers and Fishers;
- Local persons seeking employment;
- Tourist Interests; and
- Heritage Interests.

A second figure also maps stakeholders against their level of influence and their degree of interest in the project. This second figure also presents the recommended communication/engagement strategy as the project rolls-out. The level of interest is defined as the degree to which a stakeholder is concerned about the outcomes of the Project. A key question here is, "Will stakeholders be positively or negatively affected?" The level of influence looks at the degree to which a stakeholder can make or break the project, for example, through the provision of funding, their cooperation, protest action, or through legal means, etc. The list of stakeholders at the community and institutional level with whom the project should engage and consult throughout the project is provided in Figure 10-2.

Figure 9-1: Stakeholder Priority Mapping

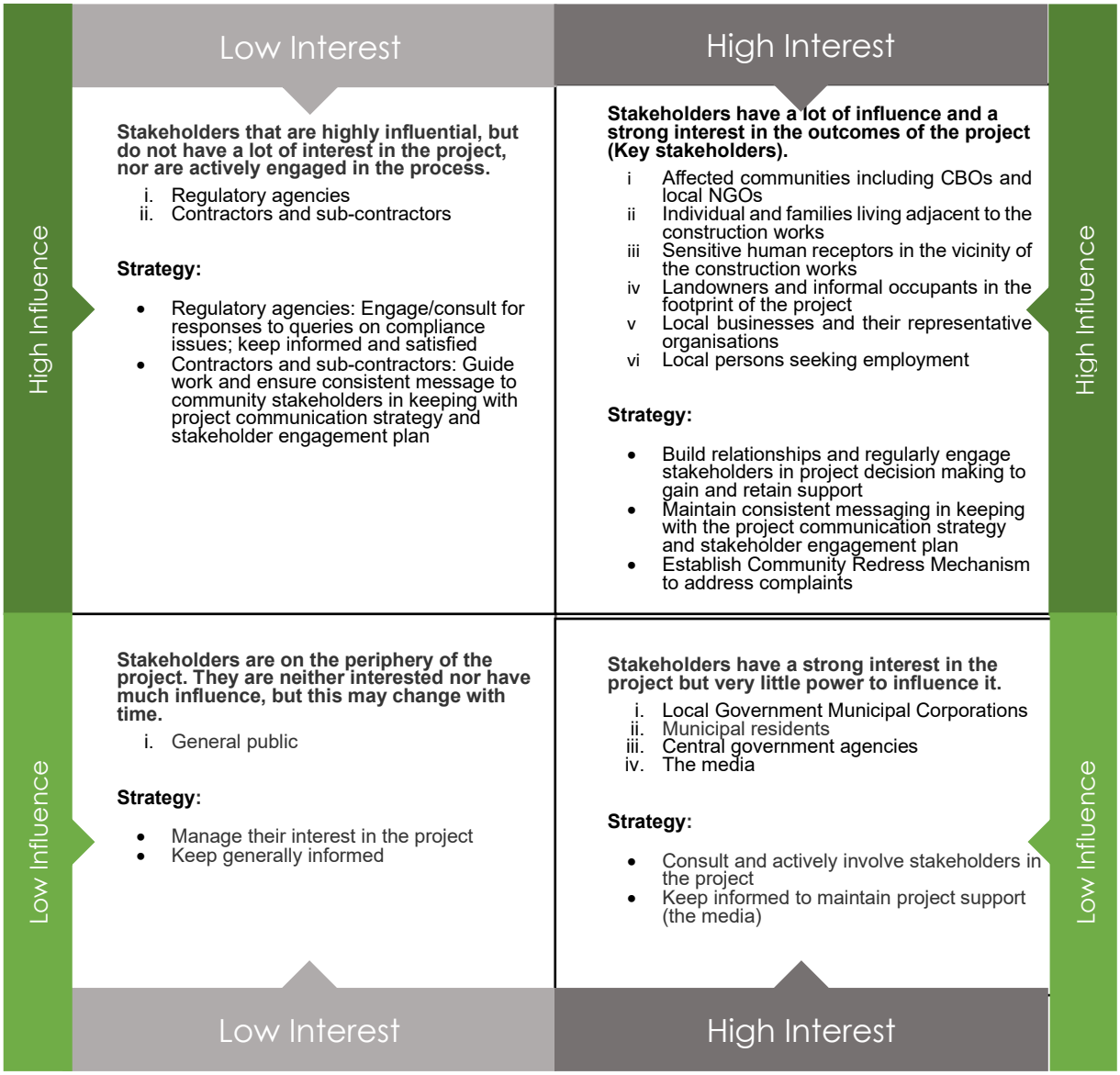

Figure 9-2: Stakeholder Mapping Results and Strategy for Engagement

Table 16-1 lists the stakeholders identified as important to the implementation of the Project and their criticality. The criticality of the stakeholders in the engagement process was categorized as follows:

- **Critical:** stakeholders who would be most directly affected by the works and the outcomes of the project
- **Important:** stakeholders with the potential to be impacted and whose responsibility, concerns or mandate are important to inform the decision making process
- **Interested:** stakeholders who are of little threat to the works and outcomes of the Project that act as either a regulatory agency, contributor to the works or a source of data.

Table 9-1: Importance and Criticality of Identified Stakeholders

STAKEHOLDER	IMPORTANCE TO THE PROJECT/INTEREST IN THE PROJECT	CRITICALITY
Communities identified close to pipelines to be replace, wellfields or any other key infrastructure	The communities close to the Project area are most at risk to the potential impacts of the works and the operations of the Project components. It is important that these communities are included in the engagement process, informed of all Project updates and expectations, and the redress mechanism to be implemented to address all concerns.	CRITICAL
Farmers, Fishers, Hoteliers (tourism related activities), Businesses and individuals relying on water for domestic purposes	One of the primary objectives of the Project is to increase the resilience of the water sector to ensure key infrastructure are in a state to facilitate a reliable supply of water for use. The quantity and quality of water to be supplied will influence domestic and economic activities.	
Labourers and Workers Unions (**e.g., CBTUC)**	Labourers are at risk to any accidents that may occur while doing works. It is important that their health and safety are prioritized and that unions are engaged to ensure fair and reasonable working conditions for all labourers on the Project.	
Schools	With some schools experiencing temporary closure due to temporary water outages, it can be claimed that the learning/educational experience is dependent on a reliable water supply.	IMPORTANT
Ministry of Education	Government entity overseeing schools. Important to collaborate with to identify impacts on schools and to inform mitigation measures.	
Ministry of Transport and Energy, and the Road Traffic Department	Government entity responsible for transportation. Important to collaborate with to ensure road works are communicated with the public, are restricted to acceptable hours and to identify and communicate alternative routes.	
Ministry of Tourism, Investment and Aviation	Government entity responsible for tourism activities. It is important to collaborate to minimize the impacts on any tourism related activities.	
Ministry of Agriculture and Marine Resources	Responsible for the protection of agricultural and coastal interests.	
Ministry of Health and Social Development	Community and worker health and safety are priorities of the Project, so effective communication with responsible experts are needed to guide health and safety practices to reduce impacts on health and wellbeing.	

Department of Gender and Family Affairs	Concerned with gender affairs, representing one vulnerable group. Collaboration is important to ensure that gender rights are protected, and that both genders can be equally represented in the Project's labour force.	
Disabilities Affairs Division of the Ministry of Social Services and Urban Development	Represents vulnerable groups that may be affected by Project activities.	
Ministry of Environment and National Resources	Government agency responsible for the protection of the natural environment.	INTERESTED
Department of Environmental Planning and Protection	Regulatory body that ensures that the physical environment is protected and that environmental standards are adhered to.	
Department of Environmental Health Services	Responsible for waste collection and disposal.	
Bahamas Electricity Corporation	Utility company	
Department of Physical Planning	Responsible for the progressive development of land in urban and rural areas.	
The Bahamas National Statistical Institute	Responsible for the provision of statistical data to inform the social baseline.	
The Bahamas Chamber of Commerce and Employers' Confederation	Concerns itself with the protection of the business community.	

9.7 Gender Integration

Gender integration measures will include separate consultation channels for women, men, and mixed groups to ensure diverse perspectives are captured. Engagement timing and locations must be considerate of participants' care responsibilities, and female facilitators should be included where appropriate to foster comfort and inclusivity. Additionally, sex-disaggregated data should be collected for all key performance indicators (KPIs) to monitor progress toward gender-responsive outcomes.

9.8 Stakeholder Engagement During Project Implementation

A schedule should be developed for the consultations intended to facilitate disclosure of information on the project. It is anticipated that engagement will help to build and maintain over time a constructive relationship with all stakeholders.

The sample consultation schedule is presented in the table below that shows likely communication required while executing the Project. It outlines the communication needs, timing and method for the stakeholders relevant for each management plan.

Table 9-2: Likely Stakeholder Consultations under the Project

#	Plan	Content	Sessions	Method	Target Audience
1	Worker Health and Safety Plan	Health and safety procedures and personal protective gear that need to be worn during construction activities.	1. Prior to Implementation 2. During the Works	Training and sensitisation sessions with contract workers on site. Bulletins on the notice board on site as reminders, safety signs.	Workers Project Management
2	Community Health and Safety Plan	Health and safety precautions and protocols that need to be adhered to during construction and operation activities.	1. Prior to Implementation 2. During the Works	Meetings and sensitisation sessions with community members. Bulletins on the community notice board and signage at site boundaries as reminders, safety signs.	Community Members Local Hospitals / Authorities Project Management
3	Traffic Management Plan	Traffic Management Plans and impediment mitigation efforts.	1. Prior to Implementation 2. During the Works	Meetings and sensitisation sessions with community members. Bulletins on the community notice board and signage at site boundaries as reminders, safety signs.	Community Members Affected Groups Local Authorities / Traffic Wardens
4	Waste Management Plan	Plans to receive and remove solid and hazardous waste offsite to appropriate off-site disposal. Procedures for handling and disposing of solid and hazardous waste material.	1. Prior to Implementation 2. During the Works	Collectors to be advised via letter and telephone conversation. Worker sensitisation sessions	Waste Authorities Project Management and Relevant Staff
5	Social Management Plan	ESMP Sensitisation	1. Prior to Implementation 2. During the Works	Direct engagement at the individual level	Community Members Affected Groups NGOs
6	Security Management Plan	Communication to all security contractors and subcontractors during project	1. Prior to Implementation 2. During the Works	Direct engagement at the individual level	Community Members Affected Groups

#	Plan	Content	Sessions	Method	Target Audience
		activities as well as workers regarding proper security protocols.			NGOs Project Management Local Authorities
7	Contractor Management Plan	Management Processes and Procedures	1. Prior to Implementation 2. During the Works	Direct engagement at the individual level	Contractors Subcontractors Project Management
8	Labour Management Plan	HR policies, GBV/SEAH prevention, GRM procedures	1. Prior to Implementation 2. During the Works	Direct engagement at the individual level	Workers Project Management

9.9 Key Performance Indicators

The following KPIs have been selected in order to evaluate the effectiveness of the stakeholder engagement plan.

Table 9-3: Key Performance Indicators for Stakeholder Engagement

KEY PERFORMANCE INDICATORS	HOW WILL IT BE MONITORED AND MEASURED	RESPONSIBILITY	FREQUENCY
Log of and timely response to complaints	Review of documentation	Contractor; reported to Implementing Agency	Weekly (complaints addressed within 10 working days)
Sex-disaggregated participation in consultations	Attendance tracking & reporting	Community Liaison Officer	Monthly
Number of workshops / sensitization sessions conducted	Session records	Project Management	Monthly
Stakeholder satisfaction	Surveys / feedback forms	Implementing Agency	Biannual
Log of and timely response to complaints	Review of documentation	Contractor; reported to Implementing Agency	Weekly (complaints addressed within 10 working days)

9.10 Roles and Responsibilities

It is the responsibility of the WSC that the Contractor is effectively sensitized on appropriate health and safety procedures, emergency procedures, waste management procedures and all other

applicable standard procedures to maintain environmental, worker and community health and safety. The Contractor shall ensure that all training and sensitization sessions are accessible to its workers and that an effective channel of communication is established with the communities. It is the responsibility of the Contractor to manage social conflicts and project concerns that may arise. The contractor must ensure that all workers and community members are adequately aware of the grievance mechanism to log complaints that need to be addressed.

A Community Liaison Officer should be employed by the Executing Agency to lead the consultation activities.

Role	Responsibility
WSC	Ensure contractor awareness of procedures, emergency plans, waste management, and community engagement protocols
Contractor	Implement engagement, manage social conflicts, ensure workers/community awareness of GRM, maintain records
Community Liaison Officer (CLO)	Lead consultations, track participation, report feedback, coordinate with NGOs and local authorities
Project Management	Oversee SEP implementation, ensure adherence to KPIs, facilitate coordination with government agencies and stakeholders

10 PROJECT COMMUNICATION STRATEGY AND PLAN

The Project Communication Strategy and Plan outlines a structured approach to ensure clear, transparent, and inclusive communication throughout the project lifecycle. It serves as a framework for engaging stakeholders effectively, fostering trust, and promoting active participation. By integrating gender and social considerations, the strategy aims to keep all stakeholders informed of objectives, timelines, and impacts, while providing accessible channels for feedback and grievance resolution. Ultimately, this plan supports the development of a socially responsible and collaborative environment that strengthens the project's credibility and success.

10.1 Purpose and Objectives

The purpose of this Communication Strategy is to guide effective, transparent, and inclusive communication with all stakeholders throughout the project lifecycle. It aims to:

- Ensure stakeholders are informed of project objectives, timelines, activities, and impacts.
- Promote meaningful participation of affected communities, especially vulnerable groups including women, youth, persons with disabilities, and low-income households.
- Facilitate feedback, grievance reporting, and timely response to concerns.
- Build trust and social license for project implementation.
- Integrate gender and social considerations into all communication efforts.

10.2 Key Principles

The communication strategy will adhere to the following principles:

- Transparency: Share accurate and timely information.
- Inclusiveness: Ensure participation from all affected groups, including marginalized communities.
- Cultural Sensitivity: Respect local customs, language preferences, and social norms.
- Gender Sensitivity: Promote equitable participation of women and men in consultations and feedback mechanisms.
- Accessibility: Use multiple formats and channels to ensure information reaches all stakeholders, including persons with disabilities.
- Responsiveness: Address questions, concerns, and grievances promptly.

10.3 Stakeholder Mapping and Target Audience

Stakeholders will be categorized and engaged according to their level of influence, interest, and exposure to project impacts. No indigenous people as a distinct group was identified in the Bahamas. Key stakeholder groups include:

Stakeholder Group	Communication Needs	Preferred Channels	Frequency
Local communities & residents	Project updates, potential impacts, benefits, grievance reporting	Community meetings, flyers, posters, radio, SMS, social media	Monthly updates and as-needed notifications
Vulnerable groups (women, youth, PWDs)	Project impacts, opportunities, GRM access	Focus group discussions, targeted meetings, accessible materials	Quarterly consultations
Government agencies	Regulatory compliance, approvals, progress reporting	Official letters, emails, meetings	As required by project milestones

Project employees & contractors	Health & safety, social safeguards, project updates	Toolbox talks, internal memos, posters	Bi-weekly or per project phase
Media	Accurate reporting on project developments	Press releases, site visits	As needed
NGOs & CSOs	Partnership and feedback on social impacts	Meetings, workshops	Biannual or as needed

10.4 Communication Channels and Tools

A mix of channels and tools tailored to stakeholder needs and local contexts. This section outlines the platforms and methods that will be used to share information, gather feedback, and promote inclusive engagement. By combining face-to-face interactions, printed materials, digital platforms, local media, and targeted approaches such as SMS alerts and focus group discussions, the strategy. The following are the communication channels and tools that will be utilise to continuously engage with various groups of stakeholders:

- Community Meetings and Workshops: For face-to-face engagement and participatory feedback.
- Printed Materials: Flyers, posters, newsletters, and brochures with accessible language and visuals.
- Digital Platforms: Project website, social media, email newsletters for wider dissemination.
- Local Media: Radio announcements and press releases to reach broader audiences.
- SMS Alerts / Hotlines: For urgent updates or reminders and GRM promotion.
- Focus Group Discussions (FGDs): For targeted engagement with women, youth, and PWDs.

10.5 Information Management

The processes for maintaining accurate records of communications, consultations, and feedback are critical to ensure there is robust information management for transparency, accountability, and effective stakeholder engagement. The project will employ the following strategies to management information and knowledge products:

- Maintain a stakeholder database with contact information, communication preferences, and engagement history.
- Document all communications, meetings, and consultations for monitoring and reporting.
- Ensure sex-disaggregated data collection for all consultations and feedback mechanisms.
- Translate key materials into local languages and formats accessible to persons with disabilities.

10.6 Feedback and Grievance Mechanism (GRM)

The Feedback and Grievance Mechanism is a cornerstone of this communication strategy, providing stakeholders with safe, confidential, and accessible channels to voice concerns or complaints. See Section 11 on the GRM.

10.7 Roles and Responsibilities

The effective implementation of the communication strategy will be dependent on various project staff and stakeholders executing their roles and responsibilities. The specific duties of project team members will include the Project Manager, Social/Gender Specialist, Community Liaison Officers,

Communications Officer, and contractors. Each role will contribute to ensuring that communication activities will be inclusive, timely, and aligned with the Stakeholder Engagement Plan (SEP).

Role	Responsibilities
Project Manager	Oversight of communication strategy implementation; ensuring compliance with SEP
Social/Gender Specialist	Develops content, ensures inclusivity and gender sensitivity, coordinates community engagement
Community Liaison Officers	Facilitate local meetings, stakeholder consultations, and GRM management
Communications Officer	Manages media, newsletters, website, and digital communications
Contractors / Employees	Adhere to internal communication protocols, report concerns, and support outreach activities

10.8 Monitoring and Reporting

Monitoring and reporting processes will ensure that communication efforts will remain effective, inclusive, and responsive. Engagement activities, feedback, and grievances will be tracked and analyzed to inform decision-making. Quarterly reports will summarize participation levels, corrective actions, and progress toward gender-responsive outcomes, supported by sex-disaggregated data for transparency and accountability.

10.9 Risk Management in Communication

Proactive risk management will be vital to maintaining trust and preventing disruptions in stakeholder engagement. Potential communication risks, such as misinformation, exclusion of vulnerable groups, low participation, and sensitive issues, will be identified, and strategies will be provided to mitigate them. By anticipating challenges and applying culturally appropriate approaches, the project will ensure that communication will remain accurate, inclusive, and effective throughout its lifecycle.

10.10 Project Communication Roadmap

The following table details the project communication roadmap.

Project Phase	Communication Activity	Target Audience	Frequency / Timing	Notes
Project Preparation / Planning	Stakeholder identification & mapping	Project team, Government agencies	Once, at start	Update database throughout project
	Introductory community meetings	Local communities, vulnerable groups	Once per community	Explain project objectives, benefits, potential impacts
	Press release / media announcement	General public, media	Once, at project launch	Highlight transparency, project goals
	GRM promotion & hotline setup	Local communities, vulnerable groups	Once, then continuous	Provide clear guidance on how to raise concerns

Design & Pre-Implementation	Detailed project briefings	Local communities, government agencies	As designs are finalized	Include gender and social inclusion considerations
	Focus Group Discussions (FGDs)	Women, youth, PWDs	Quarterly	Collect inputs for project adaptation
	Information materials distribution	Communities, stakeholders	As needed	Flyers, posters, accessible formats
Implementation / Construction	Regular community meetings	Local communities, vulnerable groups	Monthly	Update on progress, address concerns, promote safety awareness
	SMS / hotline updates	Residents, affected households	Bi-weekly	Urgent updates, notifications of disruptions
	Contractor and worker briefings	Project staff & contractors	Bi-weekly	Health, safety, social safeguards, code of conduct
	Media updates / site visits	Media, NGOs	Quarterly or as needed	Promote transparency and positive impacts
Monitoring & Evaluation	Stakeholder feedback surveys	Communities, vulnerable groups	Quarterly	Collect data for social monitoring
	GRM reports and follow-ups	Communities, authorities	Continuous	Ensure timely grievance resolution
	Progress reports including sex-disaggregated participation	Project team, funders	Quarterly	Feed into SEP and project monitoring
Project Closure / Handover	Final community meetings	Local communities, government agencies	Once at project completion	Share results, lessons learned, sustainability plan
	Final press release / media briefing	General public, media	Once	Highlight achievements, social benefits, and GRM closure
	Knowledge sharing / lessons learned workshop	NGOs, government, project team	Once	Discuss best practices for future projects

Notes on Gender & Social Inclusion Integration:

- Every meeting or consultation should actively invite women, youth, and PWDs.
- Materials should be in accessible formats (large print, local language, audio, visual aids).
- All feedback should be logged and analyzed in **sex-disaggregated form**.

11 GRIEVANCE REDRESS MECHANISM

11.1 GRM Description

A Grievance Redress Mechanism (GRM) will be established prior to the start of construction and operational activities on the target islands of the Bahamas. The GRM provides affected individuals, communities, and project workers with a transparent and accessible process to raise concerns or complaints, ensuring timely and appropriate responses. It offers an alternative to external dispute resolution processes and is available at no direct cost. Access to the GRM does not prejudice other legal remedies, including administrative or judicial recourse.

Scope

The GRM covers grievances arising during both construction and operational phases, including environmental, social, and gender-related concerns. Special attention will be given to addressing grievances related to gender-based violence (GBV), sexual exploitation, abuse, and harassment (SEAH), and other issues affecting women, girls, and vulnerable groups. Procedures for handling GBV/SEAH complaints will be developed by the Social and Gender Safeguarding Specialist (SGSS) of the Project Management Unit (PMU) in collaboration with the Division of Gender and Family Affairs in The Bahamas.

The GRM also applies to project workers. In such cases, the project Code of Conduct (CoC) will govern appropriate behaviour, reporting procedures, and mitigation of workplace misconduct, taking into account social norms, cultural beliefs, and human behaviour. The CoC will guide actions to address breaches, minimize risks, and provide safe and equitable workplaces. The guiding principles of GRM include:

- Transparency, fairness, and confidentiality
- Accessibility for all stakeholders, including women, youth, and marginalized groups
- Timely acknowledgment, logging, and resolution of complaints
- Gender-sensitive handling of grievances, ensuring safety and dignity of complainants
- Flexibility in reporting, including anonymous complaints

Reporting Channels

There are multiple accessible options are available on different island of The Bahamas: These include:

- Telephone hotline / WhatsApp
- Email and web-based grievance form
- In-person reporting at project offices or to designated community focal points
- Suggestion/complaint boxes at local administrative centers
- Through community liaison officers (CLOs) Anonymous complaints are allowed and handled with equal seriousness.

Process and Timeframes

The grievance resolution process will follow a structured and time-bound approach to ensure transparency, accountability, and timely responses to stakeholder concerns. Each step is designed to provide clarity on responsibilities and expected timelines, from the initial receipt of a grievance to its final resolution and documentation. The process will prioritize accessibility, fairness, and responsiveness, while offering escalation options if the complainant is not satisfied with the proposed solution. The following are different stages and timeframe associated with each:

1. Receive & register the grievance (Day 0–2)
2. Acknowledge receipt to complainant (Day 2–5)
3. Assess & assign to responsible unit (Day 5–10)
4. Investigate & propose solution (Within 30 days)
5. Communicate outcome to complainant (Within 30–40 days)
6. Escalation options provided if complainant is unsatisfied

7. Close & document case when resolved

The system ensures non-retaliation, confidentiality, and protection of complainants.

GRM Process

Step 1: Submission of Grievances

Grievances can be received at varying levels of formality (Table 1). Complainants are encouraged to complete the Grievance Collection Form, available at the Implementing Agency's office, project websites, or designated facilities.

Level of Formalization	Examples
Least formal	Oral complaints received face-to-face, recorded by staff during field visits, meetings, or at designated locations
Somewhat formal	Oral complaints received via telephone or remote access
More formal	Written complaints submitted during face-to-face meetings, site visits, or designated locations
Most formal	Written complaints submitted remotely via mail, internet, or grievance collection boxes (multiple locations recommended)

Anonymous submissions are allowed where necessary. Complaints may also be submitted to third parties who forward them to the local Contractor or designated administrator of the GRM.

Step 2: Logging and Addressing Complaints

The SGSS of the local Contractor and the PMU are responsible for logging and addressing complaints. A grievance log will track each complaint, record actions taken, and maintain updates on its status. Responses must be provided to the complainant, with particular attention to gender-based grievances. Grievances must be monitored regularly to ensure timely resolution.

Step 3: Escalation

If a grievance cannot be resolved at Step 2, it will be escalated to the Caribbean Development Bank (CDB) Projects Complaints Mechanism (PCM), managed by the Office of Integrity, Compliance, and Accountability (ICA). Complaints can be submitted via:

- Webform: https://secure.ethicspoint.com/domain/media/en/gui/55678/index.html
- Whistleblower hotline: 770-409-5029
- Telephone: 246-539-1777
- Email: ica@caribank.org
- Mail: Head, Office of Integrity Compliance and Accountability, Building A, Caribbean Development Bank, P.O. Box 408, Wildey, St. Michael, Barbados, W.I. BB11000

Complaints related to the project can also be sent to: anticorruption@caribank.org and Projectscomplaints@caribank.org

Additionally, the Green Climate Fund (GCF) Independent Redress Mechanism can be accessed by project workers, communities, and other stakeholders:

- GCF Independent Redress Mechanism
- Submit a complaint

Special Provisions

The project's Grievance Redress Mechanism (GRM) includes enhanced provisions to ensure safe, ethical, and confidential handling of Gender-Based Violence (GBV), Sexual Exploitation, Abuse and Harassment (SEAH), and other highly sensitive complaints. All GBV/SEAH-related grievances bypass the general GRM workflow entirely and are routed to a separate, confidential survivor-centered mechanism operated exclusively by trained personnel. This specialized pathway ensures that no personal or identifying information is recorded at any stage, safeguarding survivors from further harm or exposure.

In recognition of additional vulnerabilities faced by women, children, the elderly, migrants, and persons with disabilities (PWDs), the GRM integrates tailored procedures that guarantee safe reporting and dignified treatment. These include trauma-informed communication, accessible reporting channels, and referral protocols designed to respond appropriately to differing needs and risk profiles.

Special Pathways for GBV/SEAH Grievances

The GBV/SEAH grievance pathway is guided by a set of non-negotiable principles designed to uphold the rights, privacy, and safety of survivors. These principles include:

- A strictly survivor-centered approach to all interactions and decisions.
- Absolute confidentiality and rigorous safeguarding of all information.
- A clear prohibition on project staff conducting investigations or attempting to verify allegations.
- Immediate referral to qualified GBV service providers rather than internal handling.
- No use of mediation, conflict resolution, or attempts at negotiated settlement.
- A commitment to avoid asking for evidence or details about the incident.

This specialized pathway emphasizes protection over procedure, acknowledging that survivors' wellbeing and autonomy take priority over administrative documentation.

How GBV/SEAH Cases Are Received

Survivors may submit a disclosure or seek support through multiple safe avenues. These include a dedicated confidential phone or SMS line, any GRM access point where trained staff are instructed not to document personal details, or through referral by trusted intermediaries, such as women's organizations, social workers, clinics, or the police. Anonymous disclosures are also accepted to lower barriers to reporting and ensure survivors can seek assistance regardless of their comfort level with formal processes.

GBV/SEAH Response Process

GBV/SEAH complaints are not processed through the standard GRM steps. Instead, they follow a specialized protocol to ensure survivor safety, confidentiality, and immediate access to professional support:

1. Receive disclosure with sensitivity and without judgment.
2. Do not record names, contact details, or any identifying information.
3. Provide immediate information on available certified support services.
4. Notify the trained GBV focal point within 24 hours.
5. Refer the survivor to an approved service provider, which may include:
    - Health and medical services
    - Psychosocial and counselling support
    - Protection services
    - Police services, *only at the survivor's explicit request*

6. Follow up solely to confirm the survivor accessed support, without asking for updates on the incident.
7. Record anonymized case statistics only, with no narrative descriptions.
8. No feedback loop is required from the survivor unless they request continued communication.

This process ensures that the project fulfils its duty of care while respecting the agency and privacy of those affected.

Family Island Accessibility Features

To ensure the GRM is accessible across the Family Islands, the project incorporates communication methods that align with local norms, technological realities, and trusted community systems. The mechanism includes strong reliance on WhatsApp for rapid communication, community radio announcements, and partnerships with churches, pastors, and school principals who often serve as informal connectors. The Community Liaison Officer (CLO) will conduct monthly Island Engagement Rounds to maintain visibility and trust, while islands without permanent Water and Sewerage Corporation (WSC) offices will be supported through digital-only channels and mobile service units. These adaptations ensure that residents of remote or unattended islands can reliably access grievance services. Recognising these communication norms and preferences on the Family Islands, the GRM integrates:

- Strong reliance on WhatsApp for quick, trusted communication
- Local radio and community announcements
- Use of church networks, pastors, and school principals as connectors
- Monthly Island Engagement Rounds by the CLO
- Ensuring unattended islands have digital-only channels supported by WSC
- Mobile service units for islands without permanent WSC offices

Monitoring and Reporting

The GRM incorporates a robust monitoring and reporting framework to track performance, ensure accountability, and continuously strengthen responsiveness.

Monthly internal reports will document:

- Number of grievances received
- Type and category of grievance
- Gender and age disaggregation (voluntary)
- Resolution rate
- Anonymized GBV/SEAH referrals
- Timeframes met and unmet

Quarterly reports to the Caribbean Development Bank (CDB) will summarize SEP implementation progress, GRM effectiveness, challenges encountered, lessons learned, and corrective measures undertaken.

An **annual public summary** will present aggregated information on trends, actions taken, and confirmed improvements in responsiveness, without disclosing any confidential or sensitive information.

Disclosure

The GRM will be widely publicised to ensure communities across all target islands are aware of their rights and the channels available to them. Information will be disseminated through the WSC website, printed flyers, social media platforms, town meetings, and briefings with local government authorities.

An easy-to-read one-page infographic will also be produced to increase reach and comprehension, particularly for community members with low literacy or limited internet access.

Updates and Responsibilities

The Implementing Agency is responsible for reviewing and updating the GRM as project details become finalized. It will ensure all affected communities, workers, and stakeholders are aware of the GRM and understand how to access it safely and confidentially.

11.2 Grievance Collection Form

(Used by Stakeholder)

Case No. _____

Applicant's Name _____

Sex: [Male] [Female] [Other] [Prefer not to say]

Applicant description: □ community member □ site worker

Age: _____

□ I wish to submit complaint anonymously (in a way that prevents identification by name)

□ I demand that none of my personal details be disclosed without my consent

Address:_____
_____
_____

Telephone: _____

Email: _____

Description of Comment/Complaint: (Subject of case, when did it occur, location, who is involved, effects of situation)

_____
_____
_____
_____
_____

Date of Incident: _____

□ One-time incident/complaint (date_____)

□ Happened more than once (indicate how many times: _____)

□ Ongoing (a currently existing problem)

According to the applicant, what measures would provide solution to the problem?

_____
_____
_____
_____
_____
_____
_____

Signature: _____

Date: _____

Note: Please forward this form to: Project Office - Implementing Agency

_____

_____

_____

Telephone: _____

Email: _____

11.3 Grievance Monitoring Form

(Used by Social and Gender Safeguarding Specialist)

This Form is the responsibility of the Social and Gender Safeguarding Specialist.

Case No. _____

Applicant's Name _____

Sex: [Male] [Female] [Other] [Prefer not to say]

Applicant description: □ community member □ site worker

Age: _____

Address:_____
_____

Telephone: _____

Email: _____

Complaint

_____
_____
_____

_____
_____

Root Cause Analysis

- List all the possible contributing factors
- Identify most probable reason

_____
_____
_____
_____
_____

Corrective Action

_____
_____
_____
_____

Preventative Action if problem can re-occur

_____
_____
_____
_____

12 ROLES AND RESPONSIBILITIES IN EXECUTING THE ESMP

Given the recommended management plans, it is important that clear roles and responsibilities are defined.

12.1 The Water and Sewerage Corporation

As the Executing Agency, the WSC is responsible for the hiring of a Construction Contractor (the responsibilities of which are described in Chapter 11.2) to undertake construction activities that would achieve the intended outcome increasing the climate resilience of the nation's water sector. In hiring a Contractor, the WSC's Project Management Unit (PMU), inclusive of a Social and Gender Safeguarding Specialist (SGSS), will be responsible for implementing an advertising campaign that is gender neutral – a campaign that promotes fair and equal work and training opportunities for both men and women.

12.2 The Construction Contractor

The Construction Contractor is responsible for the preparation and implementation of the CESMP/CESHSMP. This plan should detail the approach to ensure that the execution of construction activities do not compromise the existing physical and socioeconomic environmental conditions of the Project area. The Contractor is also responsible for adhering to all applicable management plans listed in Chapters 6 to 10 and would be required to sign to a Code of Conduct that accounts for worker health and safety, community health and safety and the prevention of SGBV and SEAH in communities and in the work environment. As the CESMP/CESHSMP and the recommended management plans listed in Section II of this report are living documents (subject to change upon revision and Project updates), the Contractor would also be responsible for updating these plans when necessary. Updated plans will need approval from the Caribbean Development Bank (CDB). This will be clearly Identified in Tender Documents and the scope of work of the Contractor, and allowances have been made for this in the cost estimates of the works program.

The Contractor's team should consist of at least an Environmental Health and Safety (EHS) Officer responsible for enforcing and monitoring measures to reduce risks to worker health and safety and potential impacts to the physical and socioeconomic environment (monitoring activities related to waste management, drainage, safety equipment and training); a Social and Gender Safeguarding Specialist (SGSS) responsible for enforcing and monitoring measures to prevent incident of SGBV and SEAH, and responding to any related complaints and grievances; and a Community Liaison Officer (CLO) responsible for continuous engagement with communities within the Project area that are exposed to Project activities and associated potential impacts. The CLO will work in tandem with the SGSS to monitor the GRM available to workers and communities, ensuring that grievances are received and handled promptly. This will be clearly identified in the Tender Documents and the scope of work of the Contractor, and allowances have been made for this in the cost estimates of the works program.

The documentation of Project activities, scheduling, and grievances would be the shared responsibility of the three specialists who would be required to produce appropriate reports as stipulated in the recommended management plans.

12.3 The Design Review and Construction Supervision Consultant

This Construction Supervision Consultant is responsible for overseeing the activities undertaken by the Construction Contractor. The Consultant will include an Environmental Health and Safety (EHS) Officer, a Social and Gender Safeguarding Specialist (SGSS), and Community Liaison Officer (CLO) to ensure the project complies with all stipulated management and mitigation measures. The Consultant will maintain detailed records of site activities, changes, incidents, and grievances and prepare progress reports, quality reports, and any required documentation for the client, CDB.

The Design Review and Construction Supervision Consultant will be hired in advance of tendering to undertake final review of tender docs and will therefore input into the final scope of works to manage E&S risks.

The Design Review and Construction Supervision Consultant will conduct a site-level land and access screening procedure during detailed design. If the screening identifies any potential physical or economic displacement, including temporary impacts, the Consultant will ensure that proportionate mitigation measures are prepared in accordance with CDB's ESRP. The Consultant will review and confirm that these measures are incorporated into the Contractor's ESMP prior to commencement of works and will monitor compliance throughout construction.

Part of the Design Review and Construction Supervision Consultancy firm's assignment will be to collaborate closely with Construction Contractors to organize community consultations. The Design Review and Construction Supervision Consultancy will directly coordinate the logistics and cover the costs for these consultations, while the Construction Contractors will lead the on-the-ground consultation processes. There is also budget included for training the Contractors in E&S issues.

The budget for this is broken down in the Table below.

Item	Cost	Included in:
Environmental and Health and Safety Specialist	400,000	Key Expert under Construction Supervision Consultancy
Gender and Social Safeguarding Specialist	400,000	Key Expert under Construction Supervision Consultancy
Travel for E&S supervision by: Environmental and Health and Safety Specialist; and Gender and Social Safeguarding Specialist	100,000	Reimbursable expenses under Construction Supervision Consultancy
Surveys	50,000	Reimbursable expenses under Construction Supervision Consultancy
Training	60,000	Reimbursable expenses under Construction Supervision Consultancy
Community consultations	315,000	Reimbursable expenses under Construction Supervision Consultancy
TOTAL	**1,325,000**	

12.4 The Technical Project lead Consultant

A technical project lead will be hired to support the PMU in the day to day implementation of the project providing technical oversight of implementation, including matters related to environmental management, and grievance redress, *etc*.

12.5 The PMU

Within the PMU, Gender and Social Safeguarding Specialist will be procured and contracted by WSC to support timely and effective implementation of gender mainstreaming during project execution, namely through the Gender Action Plan (GAP). They will work closely with other members of the WSC project management/execution team, including, inter alia: the Procurement Specialist; the Monitoring and Reporting Specialist; the Project Assistant; the Project Accountant; and the WSC Project

Coordinator. The Gender and Social Safeguarding Specialist will also work closely with the gender expert within the team contracted under the Design Review and Construction Supervision Consultancy (see Chapter 11.3).

There is an additional Consultancy for 'Professional fees for Supplementary Data Gathering' which will be procured by the PMU. A firm will be procured and contracted by WSC to administer detailed baseline surveys in Year 2, and follow-up surveys with smaller sample sizes in Years 5 and 7 of the project to collect supplementary data related to project progress risks and benefits. This supplementary data is expected to be used to support regular project progress monitoring and reporting, and will also be used as input data for the independent mid-term and final evaluations. This data may be relevant for supporting management of E&S risks.

Item	Cost	Included in:
[illegible]	260,000	Project Management Costs
Travel costs for Gender and Social Safeguarding Specialist	22,500	Project Management Costs
Professional fees for Supplementary Data Gathering Consultancy	480,000	Project Management Costs
TOTAL	**762,500**	

13 SUMMARY AND CONCLUSION

The increase in national demand for water in the Bahamas has placed a strain on the nation's groundwater supplies that serve as the primary source for human consumption. The importance of water across the islands in the Bahamian archipelago cannot be understated, with different domestic and economic activities (namely agriculture, fishing and tourism-related activities) reliant for efficiency, high productivity and convenience. With the increase in importance of privately owned entities in the water sector, whether for distribution, packaging or supply, the complexity of the sector risks dependence on ideal conditions to maintain a reliable supply. However, ideal conditions are seldom experienced given the current state of the infrastructure of the water sector across the Bahamas. As well, Climate Change is acknowledged as a major potential threat to the ability of the nation to meet the gradually increasing demand of its people, with tropical cyclonic activity characteristic of the Caribbean region, high intensity wave action, droughts and fires all hazardous events that could prove detrimental to the supply, distribution and sourcing of water.

This acknowledgement of the changing climate has brought forth the initiative to increase the resiliency of the Bahamas' Water Sector in the face of Climate Change. Climate resilience in the sector is expected not only to increase the capacity to weather the effects of climate variability, but to support and promote development of significant economic sectors such as Tourism which is the main contributor to the nation's economy. The outcomes of this Project are expected to increase the reliability of the water sector, address inequalities, and promote fairness across genders and social/vulnerable groups. The proposed infrastructure interventions under the scope of this Project include:

- ✓ Upgrading and constructing pumping stations for resilience
- ✓ Expanding wellfields and upgrading them for improved operations resilience and groundwater management
- ✓ Increasing the resilience of submarine pipe crossings
- ✓ Connecting systems to account for isolation

- ✓ Increasing the storage capacity at key sites

13.1 Summary of impacts, impact rating and mitigation measures

An impact summary matrix is provided as Appendix 1 which identifies:

a) The Works component, construction Phase, location,
b) Each risk, the nature and magnitude of the impact, and its impact rating
c) The relevant IFC performance standard
d) Proposed Mitigation measures.

13.2 Performance standards

The Summary provided in Appendix 1 identifies risks in relation to CDB's Performance Requirements and IFC's Performance Standards, as set out below:

- Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts
- Performance Standard 2: Labor and Working Conditions
- Performance Standard 3: Resource Efficiency and Pollution Prevention
- Performance Standard 4: Community Health, Safety, and Security
- Performance Standard 5: Land Acquisition and Involuntary Resettlement
- Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- Performance Standard 7: Indigenous Peoples
- Performance Standard 8: Cultural Heritage

The Summary Matrix in Appendix 1 identifies risks and mitigation measures which meet IFC's performance standards 2, 3, 4, and 6.

This projects E&S management framework (ESIA, ESMP, CESMP/CESHSMP) is aligned with Performance Standard 1. The WSC, as the executing agency, will oversee implementation through dedicated safeguards specialists within the PMU. The management of E&S risks and impacts at the Contractor level will be done through the CESMP/CESHSMP. Additionally, the Design Review and Construction Supervision Consultant will include qualified safeguards specialists responsible for monitoring and reporting on the contractor's compliance with IFC Performance Standards throughout the project lifecycle.

Risks relating to the remaining performance standards have not been identified, or are considered *De Minimis*, as described below:

- Performance Standard 5: Land Acquisition and Involuntary Resettlement. Most of the infrastructure investments are rehabilitation or retrofitting existing assets for resilience. Some additional storage tanks are required but WSC have confirmed that this can be achieved within their existing sites. Connecting water supply systems will require new pipes and valves to connect supply systems between small urban villages to provide resilience, but this work will all be undertaken in the road reserve, and by its nature is outside of developed areas (connecting the isolated urban water supply systems along rural roads). WSC has a recent history of installing new pipe network in recent years (some with support from CDB under the ongoing Water Supply Improvement Project) within the road reserve with no requirement for land acquisition or resettlement. Maintaining access to properties and traffic management during construction will be critical elements of this work and is covered under proposed frameworks for impact mitigation.
- Performance Standard 7: Indigenous Peoples. There are no Indigenous People in The Bahamas.

- Performance Standard 8: Cultural Heritage. There are no cultural heritage sites near any proposed activities. The opportunity will be taken to train contractors on heritage sensitivity while ensuring that there is coordination with national heritage authorities.

13.3 Conclusion

Despite the potential impacts that the Project activities may induce, the overall aim of the Project would prove beneficial to the people of Bahamas as a more climate resilient water sector would ensure a more reliable water supply that would allow for the betterment of the quality of life of the general population, supporting economic activities and promoting sustainable development across the nation.

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APPENDIX 1: RISK ASSESSMENT AND MITIGATION ACTIONS

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Wellfield Expansion	Construction	Andros Abaco New Providence	Environmental Degradation (Destruction/Alteration of Physical, Ecological and Socioeconomic Environments)	The construction of new wells can lead to significant land disturbance. This includes clearing vegetation, altering land contours, and potentially affecting local wildlife habitats. Construction activities can also increase the risk of soil erosion, particularly if not managed properly. This can lead to sedimentation in water resources, potentially affecting water quality. Furthermore, drilling and construction activities can introduce pollutants into the environment. This includes potential spills of drilling fluids, fuels, and other chemicals used in the process.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Natural Habitats and Biodiversity Conservation.	1. Implement best practices in construction to minimize land disturbance, control erosion, and prevent pollution. This includes using silt fences, erosion control mats, and proper waste disposal methods. Re-vegetate disturbed areas promptly after construction to stabilize soil and reduce erosion. 2. Develop and implement spill prevention and response plans to manage potential chemical spills and contamination risks.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Wellfield Expansion	Construction	Andros Abaco New Providence	Utility Disruptions	Construction activities may require the rerouting of existing utilities or the installation of new utility connections, which can cause temporary disruptions to services such as water, electricity, and telecommunications. Temporary disruptions to the public water supply may negatively affect women and girls that rely on water for menstrual hygiene purposes, along with general hygiene and sanitation practices that have no gender indifferences. Furthermore, Women and girls generally assume the responsibility for the collection of water and usage for domestic activities, i.e., washing, cooking, cleaning, gardening, etc. Disruptions in electricity supply can hinder women's ability to run businesses from their homes, to access online education, and to improve household conditions. This lack of access can limit these opportunities and exacerbate gender inequalities.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS4: Community Health, Safety, and Security	Directly Affected Communities.	1. Undertake a mapping exercise that identifies the utilities in the Project area. 2. Coordination with other utilities (electricity, tele-communications) is necessary to avoid accidental damage and ensure continuous service. 3. In the event that there are going to be scheduled outages of a utility service, affected communities should be informed at least two weeks in advance and alternative sources of that utility be shared, if possible. 4. Scheduled outages of the water supply should be offset by public education campaigns on alternative water sources and water conservation strategies.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Wellfield Expansion	Construction	Andros Abaco New Providence	Noise and Air Pollution	The machinery and equipment used for drilling and construction can generate significant noise and air pollution, affecting local air quality and causing disturbances to wildlife and nearby residents. Historical trends in gender roles and employment show that men are more likely to be involved in construction activities and so would be exposed to air pollution and excessive noise. However, with the recommendation to enhance the representation of women in the Project workforce, including for construction, women are also prone to exposure to both air and noise pollution. This can lead to respiratory issues, cardiovascular diseases, and other health problems.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Use noise barriers, dust suppression techniques, and restrict construction activities to certain hours to minimize disturbances to local communities. 2. Equip workers with appropriate personal protective equipment (PPE), including masks and earmuffs when necessary. 3. Workers assigned to noisy tasks should be frequently rotated to avoid exposure.
Wellfield Expansion	Operation	Andros Abaco New Providence	Reduction in Groundwater Levels	Increasing the number of wells can lead to a decline in groundwater levels due to increased extraction rates. This can result in lowered water tables and affect the availability of groundwater for other users and ecosystems.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS3: Resource Efficiency and Pollution Prevention	Natural Habitats and Biodiversity Conservation.	1. Implementing a robust monitoring system to track groundwater levels, quality, and usage can help in managing wellfields sustainably. 2. Implement groundwater protection measures, such as wellhead protection zones and proper sealing of abandoned wells.
Wellfield Expansion	Operation	Andros Abaco New Providence	Surface Subsidence	Over-extraction of groundwater can lead to subsidence, where the ground surface sinks due to the compaction of aquifer materials. This can damage infrastructure and alter natural drainage patterns.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS3: Resource Efficiency and Pollution Prevention	Natural Habitats and Biodiversity Conservation.	Employ directional drilling techniques to reduce surface disturbance and allow for more precise well placement.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Wellfield Expansion	Operation	Andros Abaco New Providence	Alteration to Water Quality	Additional wells can potentially affect water quality. Over-extraction can lead to the intrusion of saline water in coastal areas or the drawing in of contaminants from surrounding areas. As groundwater sources are the main sources of water on New Providence and the Family Islands, if the water supply is of substandard quality, domestic activities may be affected. Poor quality water used for domestic purposes could lead to health issues. Clean water is also essential for feminine hygiene practices. Furthermore, poor quality water may affect livelihoods, particularly of those employed in sectors with a high reliance on water for productivity, such as those in the agricultural sector. The 2023 Labour Force Survey shows that there are significantly more men employed in the agriculture sector as skilled labourers. Water of poor quality used in agriculture may affect yields and livelihoods, which may then cause stress and anxiety in men who tend to be the main breadwinner of their households. Stress and anxiety in men are arguably one of the drivers of domestic based violence.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Establish ongoing monitoring programs to track environmental impacts during and after construction and ensure proper maintenance of wells and associated infrastructure. 2. This monitoring program should regularly measure groundwater levels, water quality, and the condition of wells. 3. Considerations should be made for the use of real-time data collection and remote sensing technologies to track changes and detect potential issues early.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Wellfield Expansion	Operation	Andros Abaco New Providence	Ecosystem Disruption	Lowered groundwater levels can affect surface water bodies, wetlands, and ecosystems that depend on a stable groundwater supply. Reduced water availability can impact plant and animal species, particularly those adapted to specific hydrological conditions.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Natural Habitats and Biodiversity Conservation.	1. Sensitisation of workers to the faunal species within the area and the steps they are to take if certain species are found. 2. The need to understand who to contact for assistance and how to relocate habitats or species out of harms ways during the construction period. 3. Employ directional drilling techniques to reduce surface disturbance and allow for more precise well placement. This would require a detailed Biodiversity Assessment that should be considered.
Wellfield Expansion	Operation	Andros Abaco New Providence	Aquifer Depletion	The rate of aquifer recharge can be outpaced by the rate of extraction, leading to long-term depletion of the aquifer. This can have lasting effects on water availability and sustainability.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	- Implement an aquifer management plan that includes sustainable yield calculations to ensure that extraction rates do not exceed natural recharge rates.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Wellfield Expansion	Operation	Andros Abaco New Providence	Water for Socioeconomic Activities	Increased extraction can affect the availability of water for agricultural, industrial, and residential users. This can lead to conflicts over water rights and access, particularly in arid or water-scarce regions. As well, the need for deeper wells and more advanced pumping technology can increase the cost of water extraction. This can impact the affordability of water for different users. The effect of water access and affordability issues may lead to complications in different socioeconomic activities. For example, with more men in agriculture, there is a chance that poor access or poor quality can disrupt this type of livelihood. The effects of this can be significant especially if agriculture is a person's sole source of income. Disruptions or complications of livelihoods can lead to depression, anxiety and a general feeling of displeasure. There is a risk of GBV in an instance where a male, who is his household's sole breadwinner, has his livelihood being disrupted by water issues and takes out his frustration on his female partner.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS3: Resource Efficiency and Pollution Prevention	Directly Affected Communities.	1. Encouraging water conservation and the use of alternative water sources (such as recycled water) can reduce the pressure on groundwater resources. 2. Implement a regulatory system to prevent instances of overextraction and to allow for periods of natural recharge. 3. Implement a regulatory system to prevent instances of overextraction and to allow for periods of natural recharge. 4. Encourage conservation? measures of water use for different economic activities. For example, encourage the use of efficient irrigation techniques such as drip irrigation or sprinkler systems that minimize water wastage.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Pest (Mosquito) Proliferation	Men might experience higher exposure to illnesses from pests due to greater time spent outside, particularly during construction activities. However, with the recommendation to enhance women representation in the Project workforce, women are also at high risk to pest proliferation. While men and women on the workforce are equally at risk, particularly to the threat of mosquitos, pregnant females from communities close to the works should be given special consideration due to their high metabolic rate and higher levels of carbon dioxide emission that mosquitos are drawn to.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS4: Community Health, Safety, and Security	Community, Worker Health and Safety.	1. Ensure that no open containers are kept on site that could be used for the storage of water. 2. Empty, drain or cover all open containers containing water. 3. Establish an effective drainage channel on all sites. Ensure that site surfaces are properly graded to promote water runoff and avoid puddling. 4. Keep vegetation around the site well-trimmed to reduce mosquito resting areas. Prevent dense, overgrown areas where mosquitoes can hide and breed.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Health and Safety Risks to Workers and the Public	Excavation and pipe replacement activities pose safety risks to workers, including the potential for trench collapses, equipment accidents, and exposure to hazardous materials. Dust, noise, and potential exposure to contaminants during pipe replacement can pose public health risks, especially for vulnerable populations such as children, elderly, and individuals with respiratory conditions. Men generally have greater physical strength, which can impact the types of tasks they are assigned and their risk of physical injury. Women may be at a higher relative risk for certain types of injuries if tasks are not adapted to accommodate different strength levels. Women might face unique health risks related to reproductive health and menstruation, including exposure to harmful substances that could affect fertility or pregnancy. Gender-based job roles often mean that women might be assigned to less hazardous roles, but this can also result in less access to safety training and career advancement opportunities.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS4: Community Health, Safety, and Security	Community, Worker Health and Safety.	1. Workers should be trained in appropriate health and safety procedure and should be equipped with the necessary PPE. 2. Workers assigned to noisy tasks should be frequently rotated to avoid exposure. 3. Communication with the public about potential hazards and safety precautions is important. 4. Have at least one person on site at any given time that is trained and certified in delivering first aid. 5. Establish support systems and reporting mechanisms for harassment and discrimination cases to help ensure a safe and respectful work environment for all employees.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Disruptions to Traffic and Mobility	Any disruption to movement, mobility and traffic flow is likely to affect access to and from local services including education and health services for local residents and other users. There will also potential disruption to commercial activities for several small and medium sized businesses. Road closures or restrictions due to pipe replacement works can cause significant traffic congestion and delays. Detours and alternative routes may lead to longer commute times and inconvenience for local residents and businesses. This may be caused either by the actual works or material transport	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS4: Community Health, Safety, and Security	Directly Affected Communities.	1. Consult the public regarding and informed of the proposed works and the possibility for traffic congestion and disruption Proper signage, barriers, and traffic management plans are necessary to ensure the safety of pedestrians and motorists around construction zones. 2. Coordinate with public transportation providers to enhance service availability and frequency during disruption periods. 3. When necessary, potential alternate routes should be identified, and this should be clearly communicated with the public in advance. 4. As best as possible, limit works in peak traffic hours. 5. Include training of drivers.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Generation of Waste	Pipe replacement works can generate significant amounts of waste materials, including old pipes, excavated soil, and construction debris which can be detrimental if directly released into the environment.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Toxic and Hazardous Substances Control and Management.	1. There should be a designated area for waste storage at the Project sites. 2. Waste should be collected by an approved Contractor and disposed of at an approved disposal site. 3. Implement a waste segregation system on-site to separate recyclable materials such as metals, plastics, concrete, and asphalt from general waste. 4. Where suitable, reuse excavated soil and aggregate on-site for backfill or landscaping purposes. 5. If the old pipes are in reasonable condition, consider repurposing them for other projects or uses. Salvage other materials such as valves, fittings, and hardware that can be refurbished and reused.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Environmental Degradation (Destruction/Alteration of Physical, Ecological and Socioeconomic Environments)	Excavation and construction activities can lead to soil disturbance, potentially causing erosion and runoff. Spills or leaks of hazardous materials (e.g., fuel, lubricants) during replacement works can contaminate soil and groundwater.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Natural Habitats and Biodiversity Conservation.	1. Implement best practices in construction to minimize land disturbance, control erosion, and prevent pollution. This includes using silt fences, erosion control mats, and proper waste disposal methods. 2. Re-vegetate disturbed areas promptly after construction to stabilize soil and reduce erosion. 3. Develop and implement spill prevention and response plans to manage potential chemical spills and contamination risks. 4. Properly store and handle hazardous materials to prevent spills and contamination.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Utility Disruptions	Construction and excavation activities may require the rerouting of existing utilities or the installation of new utility connections, which can cause temporary disruptions to services such as water, electricity, and telecommunications. Planned outages need to be managed to minimize disruption and ensure public safety. Unexpected encounters with unmarked or improperly documented utilities can cause delays and additional costs. Disruptions can significantly affect the ability of women to perform the domestic tasks that they often take on, leading to increased stress and workload. While men may also handle domestic tasks, the impact of utility disruptions may be less pronounced if they are less involved in day-to-day household management.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS4: Community Health, Safety, and Security	Directly Affected Communities.	- Undertake a mapping exercise that identifies the utilities in the Project area. Coordination with other utilities (electricity, tele-communications) is necessary to avoid accidental damage and ensure continuous service.

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Pipeline Replacement	Construction	Andros Abaco Acklins	Noise and Air Pollution	The machinery and equipment used for excavation and construction activities can generate significant noise (especially if work is conducted near residential areas or during nighttime) and air pollution, affecting local air quality and causing disturbances to wildlife and nearby residents, especially those with pre-existing respiratory conditions. Women may be more susceptible to respiratory issues such as asthma and bronchitis due to differences in lung size and hormonal influences. Long-term exposure to air pollutants like particulate matter can exacerbate these conditions. Pregnant women in particular are at higher risk from air pollution, which can affect fetal development and increase the risk of preterm birth, low birth weight, and developmental issues. Men may also experience significant health impacts from air pollution, including increased risk of heart disease and lung cancer. Chronic exposure can lead to decreased lung function and exacerbation of pre-existing health conditions.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. It is important that frequent wetting activities be carried out in the event of excavation and/or land clearing to prevent mass fugitive emissions. 2. All vehicles should be frequently maintained. 3. All workers should be equipped with the appropriate PPE (i.e., respiratory masks). 4. Stakeholder engagement is critical before construction activities start to discuss with locals what to expect and how they can be mitigated.

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Pipeline Replacement	Operation	Andros Abaco Acklins	Environmental (Soil and Water) Contamination	Pipelines can suffer from leaks or ruptures, releasing harmful substances such as chemicals into the environment. These spills can contaminate soil and water, leading to long-term environmental damage.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Use leak detection systems and sensors to monitor pipeline integrity and detect potential leaks or breaches early. 2. Conduct frequent inspections of the construction site and pipeline components to identify and address any signs of leaks or potential issues. 3. Create and implement detailed spill response plans that outline procedures for containing and cleaning up spills or leaks quickly.

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Pipeline Replacement	Operation	Andros Abaco Acklins	Public Health and Safety Risks	Possible contamination of the public water supply risks health and safety issues for consumers. Physical damage to the pipes and microbial contamination are prime sources of potential contamination of water being piped for public supply. Physical damages: Corrosion of metal pipes can lead to the release of rust and other particles into the water, affecting water quality and safety. As well, physical damage to pipelines, such as leaks or breaks, can allow contaminants from the surrounding soil or environment to enter the pipeline. Microbial Contamination: Pathogens, such as Salmonella, can contaminate water if introduced through leaks or cross-connections. These pathogens can cause gastrointestinal illnesses and other health issues. Biofilms can form inside pipelines, providing a habitat for bacteria and other microorganisms. This can lead to the release of pathogens into the water supply. Women may experience increased risks of reproductive health issues due to contaminants like heavy metals or pathogens in the water, which can affect menstrual health and overall reproductive well-being. Contaminated water can also pose significant risks to pregnant women and their unborn children, potentially causing developmental issues or miscarriages. For lactating mothers, contaminated water can	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS4: Community Health, Safety, and Security	Community, Worker Health and Safety.	1. Select pipeline materials that are resistant to corrosion and degradation. Ensure they are suitable for the specific environmental conditions they will be exposed to. 2. Conduct regular testing of water quality to detect any contaminants that may have entered the system. This includes testing for microbial, chemical, and physical contaminants. 3. Perform ongoing maintenance of pipelines, including cleaning, inspecting, and repairing any issues that could lead to contamination. 4. If chlorinating, adjust chlorine dosage according to the quality of the source water, including turbidity, organic matter, and pH levels, as these factors can affect chlorine's effectiveness.

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				affect breast milk quality, impacting infant health. Contaminants like heavy metals and chemicals in the water can lead to long-term health issues for men, such as kidney disease or cancer. These health problems might not be immediately apparent but can significantly impact quality of life and productivity. Men, who may be more involved in outdoor or industrial activities, might face increased exposure to contaminated water sources, especially if they are involved in agriculture or other industries relying on water.									

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Pipeline Replacement	Operation	Andros Abaco Acklins	Utility Disruptions	Pipeline repairs or maintenance may require the rerouting of existing utilities or the installation of new utility connections, which can cause temporary disruptions to services such as water, electricity, and tele-communications. Planned outages need to be managed to minimize disruption and ensure public safety. Women typically handle domestic chores, including managing water needs for cooking, cleaning, and sanitation. Disruptions can increase their workload and stress, affecting their ability to perform these tasks efficiently. Men may face disruptions in their employment, particularly if they work in sectors dependent on water (e.g., agriculture, construction). The inability to access a reliable water supply can lead to decreased productivity or income loss.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS4: Community Health, Safety, and Security	Directly Affected Communities.	1. Inform the public about planned repairs well in advance through multiple channels (e.g., flyers, social media, local news). Include details about the expected duration, affected areas, and any necessary precautions. 2. Collaborate with utility companies to ensure they are aware of the repairs and can adjust their services accordingly. This coordination helps in minimizing overlapping disruptions. 3. Schedule major repair work during off-peak hours or times of lower demand to minimize disruption to residents and businesses. This can include night work or weekend work. 4. Set up temporary water distribution points or provide bottled water if water service is disrupted. Ensure these are accessible to all affected residents.

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Increasing Storage	Construction	Andros Abaco Acklins	Environmental Degradation: Habitat Loss and Soil Disruption	Larger storage facilities may require clearing land, which can lead to the loss of natural habitats and biodiversity. This is particularly concerning in ecologically sensitive areas. The excavation and construction process can disturb soil, leading to erosion, sedimentation in nearby water bodies, and potential impacts on local flora and fauna. The construction of storage tanks requires significant amounts of raw materials such as concrete, steel, and other construction materials, which can contribute to resource depletion and environmental degradation if not sourced sustainably. Construction activities can lead to runoff containing pollutants, such as oil, chemicals, or sediment, which may contaminate local water sources if not properly managed.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low	PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Natural Habitats and Biodiversity Conservation.	1. Implement best practices in construction to minimize land disturbance, control erosion, and prevent pollution. This includes using silt fences, erosion control mats, and proper waste disposal methods. 2. Re-vegetate disturbed areas promptly after construction to stabilize soil and reduce erosion. 3. Develop and implement spill prevention and response plans to manage potential chemical spills and contamination risks.

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Increasing Storage	Construction	Andros Abaco Acklins	Air and Noise Pollution	Construction activities tend to generate higher levels of dust and noise emissions than baseline conditions. Prolonged exposure to these pollutants poses serious risks to worker and community health and safety, possibly leading to or exacerbating respiratory illnesses, issues with concentration and hearing loss. Men in construction activities will also be exposed to noise from heavy machinery. However, with the recommendation to enhance the representation of women in the Project workforce, including for construction, women are also prone to exposure to both air and noise pollution. This can lead to respiratory issues, cardiovascular diseases, and other health problems.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Use noise barriers, dust suppression techniques, and restrict construction activities to certain hours to minimize disturbances to local communities. 2. Equip workers with appropriate personal protective equipment (PPE), including masks and earmuffs when necessary. 3. Workers assigned to noisy tasks should be frequently rotated to avoid exposure.

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Increasing Storage	Construction	Andros Abaco Acklins	Worker Health and Safety	Construction sites pose health and safety risks to workers, including accidents, exposure to hazardous materials, and long-term health impacts from working conditions. Men generally have greater physical strength on average, which can impact the types of tasks they are assigned and their risk of physical injury. Women may be at a higher relative risk for certain types of injuries if tasks are not adapted to accommodate different strength levels. Women might face unique health risks related to reproductive health and menstruation, including exposure to harmful substances that could affect fertility or pregnancy. Gender-based job roles often mean that women might be assigned to less hazardous roles, but this can also result in less access to safety training and career advancement opportunities. Women may face harassment or instances of discrimination on construction sites, which can impact mental health and overall well-being.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS4: Community Health, Safety, and Security	Community, Worker Health and Safety.	1. Workers should be trained in appropriate health and safety procedure and should be equipped with the necessary PPE. 2. Workers assigned to noisy tasks should be frequently rotated to avoid exposure. 3. Communication with the public about potential hazards and safety precautions is important. 4. Have at least one person on site at any given time that is trained and certified in delivering first aid. 5. Establish support systems and reporting mechanisms for harassment and discrimination cases to help ensure a safe and respectful work environment for all employees.

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Increasing Storage	Operation	Andros Abaco Acklins	Increased Energy Consumption	Increased storage capacity, particularly in RO facilities, may lead to higher energy consumption for pumping and maintaining water quality as more water would need to be pumped from wells to storage tanks or reservoirs. The storage facilities are located farther from the wellfield, the energy required to transport water increases due to higher friction losses in longer pipelines.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Incorporating sustainable practices, such as using renewable energy sources and implementing advanced water management technologies, can mitigate environmental impacts. 2. Conduct regular energy audits to identify and address inefficiencies in the water pumping and treatment processes.
Increasing Storage	Operation	Andros Abaco Acklins	Water Quality due to Stagnation (Tastes and Odours)	Improper management of large storage facilities can lead to issues like algal blooms and contamination if water remains stagnant for extended periods. Stagnant water provides a conducive environment for the growth of bacteria, including harmful pathogens such as Legionella, E. coli, and Pseudomonas. Algae and biofilms can form on the surfaces of storage tanks and pipes, further degrading water quality and posing health risks. Stagnant water often develops unpleasant tastes and odors due to the accumulation of organic matter and microbial activity. Health risks vary dependent on gender with women (including pregnant women and especially those with the burden of domestic activities) particularly at risk to a contaminated supply.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS4: Community Health, Safety, and Security	Directly Affected Communities.	1. Implement a monitoring system where the quality of stored water is frequently tested so early actions can be taken to prevent or reduce the risk of quality degradation. 2. To prevent water stagnation and maintain water quality in large storage tanks, circulation pumps may be needed. These pumps consume additional energy. In some cases, aeration systems are used to maintain water quality by providing oxygen to the stored water, which also requires energy.

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													3. Schedule regular maintenance to clean storage tanks, remove sediments, and inspect for signs of microbial growth or corrosion.

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Risk Reduction at Wellfields	Construction	Andros Abaco New Providence	Alteration to Physical and Ecological Environment	Creation of firebreaks may involve clearing vegetation, which can disrupt ecosystems and habitats. Firebreaks may alter the visual aesthetics of the landscape, especially in natural or scenic areas. Construction activities associated with retrofitting may cause disturbance to the surrounding environment, including soil erosion and habitat disruption. Land disturbance associated with cabling installation may impact natural habitats and landscapes, while above-ground infrastructure can detract from visual aesthetics. Discharge from well flushing activities may contain sediments, chemicals, or contaminants that could affect nearby water bodies or ecosystems.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Natural Habitats and Biodiversity Conservation.	1. Conduct controlled vegetation management within firebreak areas, including regular trimming, mowing, or selective removal of vegetation. Schedule these vegetation management activities during periods of low wildlife activity to minimize disturbance to local habitats. 2. Minimize non-herbicidal methods whenever possible to minimize ecological impacts. 3. Prioritize the establishment of diverse native plant communities to support local biodiversity. Monitor restored areas for invasive species and take prompt action to control their spread. 4. Use natural barriers such as berms, hedges, or strategically planted trees to visually screen firebreaks from surrounding areas. 5. Incorporate revegetation efforts, soil stabilization measures, and erosion control techniques to

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													restore disturbed habitats. Monitor restored areas over time to assess the effectiveness of restoration efforts and make adjustments as needed.

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Risk Reduction at Wellfields	Construction	Andros Abaco New Providence	Water Resource Consumption	Flushing wells requires the use of water resources, which may conflict with conservation goals or water scarcity concerns. Well flushing activities may temporarily disrupt wellfield operations, leading to service interruptions or reduced efficiency.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Directly Affected Communities.	1. Implement water conservation measures to reduce the volume of water used for well flushing, such as optimizing flushing frequency and duration. 2. Utilize captured rainwater or recycled water for flushing activities where feasible to minimize reliance on freshwater resources. 3. Coordinate flushing activities with other maintenance tasks to minimize disruptions to wellfield operations and optimize resource utilization. Communicate flushing schedules to stakeholders, including water utility customers and regulatory agencies, to promote transparency and awareness of well maintenance efforts.

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Risk Reduction at Wellfields	Construction	Andros Abaco New Providence	Safety Risks	Improper installation or maintenance of electrical cabling can pose safety hazards, including electrical shocks, fires, and electromagnetic field exposure. Men are more likely to be involved in these types of activities and so stand to be at risk to these safety hazards. However, the intention to include more women in the Project workforce, including the construction workforce, suggests that they too would be at risk to safety hazards.	x–ðÏ Γ	©Ñ	xñ	~ →	c ñ	High	PS2: Labor and Working Conditions	Community, Worker Health and Safety.	1. Prioritize underground installation of electrical cabling to minimize visual impact and reduce disturbance to surface ecosystems. 2. Coordinate with utility companies and local authorities to identify optimal routes for underground cabling that avoid sensitive habitats and cultural resources. 3. Conduct health and safety trainings prior to any potentially hazardous activities. All workers must be provided with adequate PPE.

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Risk Reduction at Wellfields	Operation	Andros Abaco New Providence	Disruption to Groundwater Supply	Flushing wells requires the use of water resources, which may conflict with conservation goals or water scarcity concerns. Well flushing activities may temporarily disrupt wellfield operations, leading to service interruptions or reduced efficiency. Any possible disruptions to the groundwater supply during well-flushing activities could impact both men and women differently: 1. Women are traditionally found to be more responsible for the use of water for domestic purposes. Any disruptions could cause difficulties in the completion of domestic duties, possibly leading to increased stress. Proper hygiene and sanitation practices would also be hindered by any disruptions. This is particularly impactful on women and girls who have to consider menstrual hygiene both at home and away (at work or school). 2. Economic activities dependent on water, such as agriculture, also stand to be affected by any disruptions. With the 2023 Labour Force Survey showing more men in skilled agriculture, they are more prone to economic losses in this way, leading to financial stress and anxiety.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS4: Community Health, Safety, and Security	Directly Affected Communities.	1. Implement water conservation measures to reduce the volume of water used for well flushing, such as optimizing flushing frequency and duration. 2. Utilize captured rainwater or recycled water for flushing activities where feasible to minimize reliance on freshwater resources. 3. Coordinate flushing activities with other maintenance tasks to minimize disruptions to wellfield operations and optimize resource utilization. Communicate flushing schedules to stakeholders, including water utility customers and regulatory agencies, to promote transparency and awareness of well maintenance efforts.

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Risk Reduction at Pumping Stations	Construction	Andros Abaco Acklins New Providence	Habitat Disruption	Construction activities associated with upgrading and constructing pumping stations may result in habitat disruption and fragmentation, particularly if located in ecologically sensitive areas.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Low	PS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Natural Habitats and Biodiversity Conservation.	1. Conduct comprehensive ecological assessments to identify sensitive habitats, species, and ecosystems potentially affected by the project. Select sites and routes for new infrastructure that minimize intrusion into these ecologically sensitive areas. 2. Designate specific areas for construction activities to limit the spread of disturbance and schedule construction activities to avoid critical periods for wildlife, such as breeding or migration seasons. 3. Install silt fences, erosion control blankets, and sediment basins to prevent soil erosion and sedimentation of water resources.

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Risk Reduction at Pumping Stations	Construction	Andros Abaco Acklins New Providence	Alteration of Water Quality	The installation of pressure tanks and backup generators may introduce contaminants or pollutants into groundwater or surface water sources if not properly managed. Women, particularly those responsible for household water management and health, may be more directly concerned with the safety and quality of water used for family consumption. Contamination can have significant health impacts, and ensuring effective management practices is crucial for protecting all community members, especially those in caregiving roles.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	High	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Conduct baseline water quality assessments to understand the current status of water quality in the area and use these assessments to inform project design and identify potential sources of contamination. 2. Implement erosion control measures like silt fences, sediment traps, and erosion control blankets to prevent sediment runoff into water resources. Disturbed soils can be stabilized promptly with vegetation or mulch. 3. Conduct regular water quality monitoring during and after construction to detect any changes in water quality parameters (e.g., pH, turbidity, nutrient levels, contaminants). Use this monitoring data to promptly address any water quality issues that arise. 4. Implement proper waste management practices to ensure that construction and operational wastes do

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
													not contaminate water sources.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Risk Reduction at Pumping Stations	Construction	Andros Abaco Acklins New Providence	Noise and Air Pollution	Increased construction and operational activities at pumping stations may generate noise and air pollution, potentially impacting nearby ecosystems and communities. Noise and air pollution from construction and operational activities can affect the health of nearby residents. Women, particularly those who are pregnant, elderly, or have young children, may be more sensitive to the health impacts of pollution. Chronic exposure to noise and air pollution can exacerbate health issues, such as respiratory problems and stress, disproportionately affecting women who often bear the brunt of caregiving responsibilities. Those on the workforce would be more exposed to air and noise pollution and so are likely to be most impacted. Traditionally, men tend to dominate the construction or skilled labour workforce and so would be deemed most at risk to pollutants.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Use noise barriers, dust suppression techniques, and restrict construction activities to certain hours to minimize disturbances to local communities. 2. Equip workers with appropriate personal protective equipment (PPE), including masks and earmuffs when necessary. 3. Workers assigned to noisy tasks should be frequently rotated to avoid exposure. 4. Conduct training sessions on proper health and safety protocols. 5. Implement frequent wetting of exposed surfaces where necessary. 6. Keep all equipment and vehicles well maintained and serviced.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Risk Reduction at Pumping Stations	Construction	Andros Abaco Acklins New Providence	Disruption to Traffic and Mobility	Construction activities and infrastructure installations may disrupt local traffic patterns, access to public spaces, and mobility for residents and businesses in the vicinity of each target site. Disruptions in local traffic and access can create additional challenges and stress for all genders as they navigate altered routes and potentially increased travel times. Consideration should be made particularly for those who are found to be more responsible for a significant share of caregiving responsibilities, including transporting children to school, attending appointments, and managing household errands – traditionally this role is occupied by women.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS4: Community Health, Safety, and Security	Directly Affected Communities.	1.Inform the public of the proposed works and the possibility for traffic congestion and disruption. 2. Proper signage, barriers, and traffic management plans are necessary to ensure the safety of pedestrians and motorists around construction zones. 3. When necessary, potential alternate routes should be identified, and this should be clearly communicated with the public in advance. 4. As best as possible, limit works in peak traffic hours.

Works Component	Phase	Island	Risk	Nature of the Impact	Extent of Impact	Impact Duration	Likelihood of Impact	Magnitude of Impact	Significance of Impact	Impact Rating	IFC Performance Standard	CDB Performance Requirement	Proposed Mitigation Measures
Risk Reduction at Pumping Stations	Operation	Andros Abaco Acklins New Providence	Increased Energy Consumption	The operation of pumping stations and associated equipment, such as pressure tanks and backup generators, may increase energy consumption and greenhouse gas emissions, potentially contributing to climate change. Higher energy consumption can lead to increased utility costs, which can disproportionately affect women, particularly those managing household budgets. Women, especially single mothers or low-income earners may face greater financial strain from rising energy costs.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	Moderate	PS3: Resource Efficiency and Pollution Prevention	Pollution Prevention, Control and Management.	1. Implement a regular maintenance schedule to keep equipment running efficiently. Well-maintained equipment typically operates more efficiently and has a longer lifespan. It is also recommended that periodic energy audits be conducted to identify and address any inefficiencies in the system. 2. Train employees on energy conservation practices and the importance of energy efficiency in daily operations. Encourage a culture of energy efficiency, where staff are proactive in identifying and implementing energy-saving measures.

APPENDIX 2: STAKEHOLDER MAPPING DIAGRAM – INFLUENCE VS. INTEREST

Stakeholder Group	Influence	Interest	Criticality	Engagement Strategy
Communities near project infrastructure	High	High	Critical	Direct engagement, workshops, regular updates, GRM access
Farmers, Fishers	Medium	High	Important	Community meetings, training on water use, updates on water availability
Hoteliers / Tourism operators	Medium	Medium	Important	Meetings, email updates, coordination with Ministry of Tourism
Workers / Unions	High	Medium	Important	Training sessions, labor meetings, code of conduct enforcement
Schools / Ministry of Education	Medium	High	Important	Engagement on water outages, hygiene protocols, informational sessions
Local Government Agencies (MENR, DEHS, Municipality)	High	Medium	Interested	Regular briefings, coordination meetings
NGOs / CBOs	Medium	Medium	Important	Participation in consultations, feedback sessions
Environmental & Regulatory Agencies	High	Low	Interested	Reporting, policy updates, data sharing

Diagram: The diagram would visually place stakeholders in four quadrants:

- **High Influence / High Interest:** Communities near project infrastructure (critical engagement)
- **High Influence / Low Interest:** Regulatory agencies
- **Low Influence / High Interest:** Farmers, fishers, schools
- **Low Influence / Low Interest:** General public

APPENDIX 3: ISLAND-LEVEL STAKEHOLDER ENGAGEMENT PLAN TEMPLATE

Stakeholder Group	Examples / Notes	Preferred Engagement Methods	Frequency / Timing	Key Messages / Focus Areas	Responsible Party	Notes on Inclusivity / Gender / Vulnerable Groups
Local Communities / Residents	Villagers, households, local associations	Town hall meetings, community workshops, flyers, posters, radio, SMS	Introductory meeting once; updates monthly or as needed	Project objectives, benefits, potential impacts, schedule of works	Community Liaison Officer / Social Specialist	Ensure women, youth, and PWDs are invited; accessible materials; consider remote settlements
Traditional Leaders / Elders	Chiefs, community elders, respected local leaders	One-on-one meetings, small focus groups, informal consultations	Initial consultation; as needed during project milestones	Respect for local customs, community priorities, feedback channels	Social Specialist / Project Manager	Leverage their authority to facilitate wider participation; document inputs
Government / Local Authorities	Councillors, town committees, planning or utility departments	Official letters, meetings, workshops	At key project milestones	Compliance, approvals, reporting, collaboration	Project Manager / Liaison Officer	Engage early to integrate local governance perspectives; coordinate approvals
Private Sector / Business Operators	Small businesses, tourism operators, fishers, farmers	Workshops, focus group discussions, written updates	Quarterly or as needed	Impact mitigation, business continuity, potential benefits, opportunities	Social Specialist / Communications Officer	Ensure equitable representation; include women-led enterprises
Civil Society / NGOs	Community-based organizations, environmental groups	Stakeholder workshops, meetings, newsletters	Biannual or as needed	Collaboration, sustainability, social monitoring	Social Specialist / Project Manager	Engage NGOs working with vulnerable groups; include youth and women organizations
Vulnerable Groups	Women, youth, PWDs, resource-dependent households	FGDs, targeted workshops, home visits, accessible formats	Quarterly or as needed	Rights, project benefits, GRM access, inclusion in planning	Social Specialist / Community Liaison Officer	Collect sex- and age-disaggregated data; ensure safe participation
Media / Public Communications	Local newspapers, radio stations, online media	Press releases, media briefings, site visits	As needed for project updates	Transparency, project milestones, social benefits	Communications Officer	Highlight community benefits; avoid sensitive/confidential info
Project Employees / Contractors	On-site staff, subcontractors	Toolbox talks, internal memos, posters	Bi-weekly or per project phase	Code of conduct, health & safety, social safeguard obligations	Project Manager / HR	Ensure training includes gender sensitivity and social inclusion

Guidelines for Using the Template

1. **Customize per island:** Adjust stakeholder groups, examples, and engagement methods according to population size, social structure, and communication access.
2. **Include activity-specific engagement:** Indicate whether the activity is construction, planning, capacity building, or monitoring.
3. **Track participation:** Maintain a database with attendance, feedback, grievances, and sex- and age-disaggregated data.
4. **Feedback loop:** Clearly define how input from each group will be considered and responded to in the project.
5. **Accessibility:** Ensure materials and meetings are accessible — large print, audio, translations, or sign language support if needed.
6. **Documentation:** Record minutes, decisions, and actions to feed into SEP monitoring

and reporting.

APPENDIX 4: ISLAND-LEVEL COMMUNICATION STRATEGY TEMPLATE

1. Purpose

Briefly state the objective of the communication strategy for the island, for example:

To ensure timely, transparent, and inclusive communication with all stakeholders on [Island Name] regarding project objectives, activities, potential impacts, and benefits, while promoting participation, feedback, and social accountability.

2. Objectives

- Ensure all affected communities and stakeholders are informed of project plans and progress.
- Promote inclusive participation of women, youth, PWDs, and marginalized groups.
- Facilitate stakeholder feedback and grievances through an accessible GRM.
- Build trust and support local ownership of the project.
- Align communication with island-specific social, cultural, and governance contexts.

3. Key Principles

- **Transparency:** Share accurate and timely information.
- **Inclusiveness:** Ensure representation from all community segments.
- **Cultural Sensitivity:** Respect local customs, language, and social norms.
- **Gender Sensitivity:** Promote equitable participation of women and men.
- **Accessibility:** Use multiple formats to reach all stakeholders, including persons with disabilities.
- **Responsiveness:** Respond promptly to questions and grievances.

4. Stakeholder Mapping

Stakeholder Group	Examples / Notes	Engagement Needs	Preferred Channels	Notes / Adaptations
Local Communities	Residents, households, local associations	Awareness of project objectives, impacts, and benefits	Community meetings, flyers, posters, local radio, SMS	Ensure women, youth, and PWD participation; adapt for remote settlements
Traditional Leaders / Elders	Chiefs, community elders	Guidance on cultural norms, facilitation of engagement	One-on-one meetings, focus groups	Recognized authority to mobilize community participation
Government / Local Authorities	Councillors, town committees, planning/utility departments	Regulatory compliance, reporting, approvals	Official letters, meetings, workshops	Engage early; integrate local governance perspectives
Private Sector	Small businesses, tourism operators, fishers	Information on potential impacts, opportunities	Focus groups, workshops, written updates	Ensure inclusion of women-led enterprises
Civil Society / NGOs	Local NGOs, community-based organizations	Partnership, sustainability, social monitoring	Workshops, meetings, newsletters	Include women, youth, and vulnerable groups
Vulnerable Groups	Women, youth, PWDs, resource-dependent households	Awareness of rights, access to GRM, participation in planning	FGDs, targeted workshops, home visits, accessible formats	Collect sex- and age-disaggregated data; safe participation
Media	Local newspapers, radio, online platforms	Project updates, transparency	Press releases, media briefings, site visits	Highlight community benefits
Project Staff / Contractors	On-site employees, subcontractors	Understanding social safeguards, code of conduct	Toolbox talks, memos, posters	Include gender and social inclusion training

5. Communication Channels and Tools

- **Face-to-face:** Community meetings, workshops, FGDs, home visits.
- **Printed materials:** Flyers, posters, brochures in accessible formats.
- **Digital / Remote:** Social media, project website, email newsletters.
- **Local media:** Radio announcements, press releases.
- **Direct alerts:** SMS, WhatsApp groups, or mobile outreach for urgent updates.

6. Island-Specific Considerations

- **Population & Literacy:** Tailor materials for literacy level; include visuals or audio where needed.
- **Cultural Context:** Respect local traditions and social hierarchies; involve elders or community leaders.
- **Access & Logistics:** Consider dispersed settlements; plan meetings in accessible locations or mobile outreach.
- **Feedback Mechanisms:** Ensure GRM is adapted to local context, trusted by the community, and accessible.

7. Feedback and Grievance Mechanism (GRM)

- Multiple channels: in-person, phone, SMS, online, suggestion boxes.
- Acknowledge grievances within **5 working days**; resolve within **30 days**.
- Maintain confidentiality, gender sensitivity, and safety.
- Track and report grievances with sex- and age-disaggregated data.

8. Roles and Responsibilities

Role	Responsibilities
Project Manager	Oversight of island-level communications; integration with SEP
Social/Gender Specialist	Develop content, ensure inclusivity, coordinate community engagement
Community Liaison Officer	Facilitate local meetings, workshops, GRM management
Communications Officer	Media, newsletters, digital communications, public relations
Contractors / Staff	Follow internal communication protocols; report concerns; support outreach

9. Monitoring and Reporting

- Track engagement activities, participation, and feedback.
- Maintain sex- and age-disaggregated records.
- Produce periodic reports for project management and SEP compliance.
- Use feedback to adapt engagement approaches.

10. Timeline / Roadmap (Optional for Each Island)

- **Preparation / Planning:** Stakeholder mapping, introductory briefings.
- **Design / Pre-Implementation:** Consultations, workshops, participatory mapping.
- **Implementation / Construction:** Regular updates, SMS alerts, community meetings.
- **Monitoring / Capacity Building:** Surveys, FGDs, training, feedback collection.
- **Closure / Handover:** Final meetings, public reporting, knowledge transfer.

10.1 Island- and Activity-Specific Roadmap

1. Stakeholder Mapping and Early Engagement

Activity	Family Island Considerations	Timeline	Lead
Identify key local stakeholders (community leaders, councils, NGOs, women/youth groups)	Smaller population means more direct engagement; rely on local leaders for introductions	Month 1	Project Team
Conduct initial island-level consultations	Consider island size and transport limitations; combine multiple meetings in one visit	Month 1–2	Project Team & Local Liaison
Map vulnerable groups and gender-disaggregated demographics	Use local data, engage women/youth organizations for accurate insights	Month 1–2	Social/GESI Specialist

2. Communication and Information Dissemination

Activity	Family Island Considerations	Timeline	Lead
Develop island-specific communication materials	Simplify content for smaller communities; translate or adapt if local dialects exist	Month 2	Communication Team
Disseminate project updates	Use local radio, community boards, and in-person meetings due to limited internet coverage	Month 2–ongoing	Communication Team
Schedule townhall meetings	Avoid market days, religious holidays, or school events; consider evening sessions	Month 2–ongoing	Project Team & Local Leaders

3. Grievance Redress Mechanism (GRM)

Activity	Family Island Considerations	Timeline	Lead
Establish island-level GRM channels	Use local offices, trusted intermediaries, or mobile kiosks; ensure privacy for sensitive complaints	Month 2–3	Social/GESI Specialist
Train local staff/community focal points	Focus on accessibility, gender sensitivity, and cultural appropriateness	Month 3	Project Team
Monitor and respond to grievances	Ensure rapid feedback despite transport/logistics constraints	Month 3–ongoing	Project Team & Local Liaison

4. Project Implementation Activities (Construction/Operations)

Activity	Family Island Considerations	Timeline	Lead
Site preparation and construction	Schedule transport of materials considering ferry/boat availability; hire local labor when possible	Month 4–12	Construction Team
Environmental and social monitoring	Conduct frequent island visits; train local monitors for ongoing observation	Month 4–12	Environmental/Social Team
Community engagement during operations	Regular updates via in-person meetings or mobile outreach; consider island-specific concerns	Month 6–Ongoing	Project Team

5. Capacity Building and Training

Activity	Family Island Considerations	Timeline	Lead
Technical training (e.g., water system maintenance, renewable energy operations)	Limit group size; provide transport support; schedule around school/work	Month 3–6	Training Team
Gender and inclusion workshops	Target women and youth; ensure sessions are accessible	Month 3–6	Social/GESI Specialist
Knowledge transfer and local ownership	Identify island champions for sustainability	Month 6–Ongoing	Project Team

6. Monitoring, Reporting, and Feedback

Activity	Family Island Considerations	Timeline	Lead
Regular island-specific monitoring	Use local focal points to collect data; combine visits with other project activities	Month 6–Ongoing	Monitoring Team
Feedback loops to communities	Conduct summary meetings every 3–6 months; provide visual and simple reports	Month 6–Ongoing	Communication & Project Team
Adaptive management	Adjust activities based on island-specific feedback	Month 6–Ongoing	Project Management