**CARIBBEAN DEVELOPMENT BANK**

**TWO HUNDRED AND NINETY-SIXTH MEETING OF THE BOARD OF DIRECTORS**

**TO BE HELD VIRTUALLY**

**DECEMBER 9, 2021**

**PAPER BD 58/21**

# NOTIFICATION OF APPROVAL BY THE PRESIDENT – NATURAL DISASTER MANAGEMENT – IMMEDIATE RESPONSE LOAN – HURRICANES ETA AND IOTA BELIZE

Between November 4 and 5, 2020 Hurricane Eta, a Category 4 hurricane on the Saffir-Simpson Hurricane Wind Scale, made landfall along the north-eastern coast of Nicaragua, which is approximately 500 kilometres (km) southeast of Belize, with maximum sustained winds of 140 miles per hour (mph) or 224 kilometres per hour (km/h). Hurricane Eta quickly weakened as it travelled inland across Central America for two days before turning northwards into the Caribbean Sea. The outer bands of the hurricane produced gusty winds and heavy rainfall (10-20 inches) in Belize. This caused severe flooding in the Western District of Cayo, Southern District of Stann Creek, and Belize District, including Belize City.

2. Between November 16 and 17, 2020, Hurricane Iota, also made landfall as a strong Category 4 hurricane along the north-eastern coast of Nicaragua, with maximum sustained winds of 155 mph or 250 km/h. On November 18, 2020, Hurricane Iota rapidly weakened as it moved inland. The outer bands of Hurricane Iota produced gusty winds and heavy rainfall (10-20 inches) in Belize, especially in Toledo, Cayo, Belize and Stann Creek Districts.

3. On December 15, 2020, the Caribbean Development Bank (CDB) received a request from the Government of Belize (GOBZ) for an Immediate Response Loan (the Loan) for the purpose of restoring essential infrastructure damaged by rainfall and flooding caused by Hurricanes Eta and Iota. After receipt of the initial request, CDB staff had meetings with GOBZ to agree the full scope of works and services to be financed under the Loan. Following discussions and meetings with GOBZ regarding the options available for disaster risk management support under Disaster Management Strategy and Operational Guidelines (2021) (DiMSOG), the request was updated on March 26, 2021. Under paragraph 4.21 of the DiMSOG, CDB may offer emergency assistance, immediate short-term response and early recovery activities to shore up critical assets. Under DiMSOG, the President is authorised to approve an immediate response loan (IRL) to the Government of an affected Borrowing Member Country of an amount not exceeding the equivalent of five million United States dollars (USD5,000,000) to meet its expenses for clearing and cleaning of affected areas and for emergency restoration of infrastructure and essential public services.

4. On September 3, 2021, in accordance with the President's delegated authority under DiMSOG, the President approved a loan to GOBZ of an amount not exceeding the equivalent of two million, five hundred thousand United States dollars (USD2,500,000) from CDB's Special Funds Resources (SFR) (the Loan).

The Loan will assist GOBZ in financing the cost of emergency restoration of infrastructure in the affected areas, and consultancy services to provide independent inspection and certification of works (the Project), on the terms and conditions set out and referred to in paragraph 23.01 of the attachment to this Paper.

5. The Board is asked to note the approval by the President of the aforementioned loan and the terms and conditions thereof.

# MEMORANDUM OF RECOMMENDATION AND APPROVAL BY THE PRESIDENT OF A REQUEST FOR AN IMMEDIATE RESPONSE LOAN

**TO**: President

**FROM:** Director, Projects Department

**DATE:** September 7, 2021

**SUBJECT:** **Natural Disaster Management – Immediate Response Loan – Hurricanes Eta and Iota – Belize**

---

[Dollar ($) amounts refer to United States dollars (USD) unless otherwise stated]

| | | |
|---|---|---|
| **1.** | **COUNTRY**: | Belize |
| **2.** | **PROJECT TITLE**: | Natural Disaster Management – Immediate Response Loan – Hurricanes Eta and Iota – Belize |
| **3.** | **APPLICATION NO.:** | 2047 |
| **4.** | **PROJECT REGISTRATION NO.**: | 4269 |
| **5.** | **BORROWER**: | Government of Belize (GOBZ) |
| **6.** | **BENEFICIARY**: | Belize |
| **7.** | **IMPLEMENTING AGENCY**: | Ministry of Infrastructure Development and Housing (MOIDH) |
| **8.** | **SECTOR**: | Disaster Rehabilitation-Immediate Response |
| **9.** | **DATE OF APPLICATION**: | December 15, 2020 |
| **10.** | **TYPE OF FINANCING**: | Immediate Response Loan (IRL) |
| **11.** | **FUND SOURCE/AMOUNT**: | Unified Special Development Fund [SDF(U)] $2,500,000 – IRL |

**12.** **CONSISTENCY WITH OBJECTIVES AND PRIORITIES**

(a) **CDB's Strategic Objectives**: Building Economic and Environmental Resilience.

(b) **CDB's Corporate Priority**: Promoting Environmental Sustainability.

(c) **Country Objective**: Restoring essential public services.

(d) **SDF 10 Theme**: Building Environmental Resilience

## 13. BUDGET AND FUNDING SOURCE

13.01 The IRL, the equivalent of two million, five hundred thousand United States dollars ($2,500,000), is eligible for funding from the Caribbean Development Bank (CDB) Special Funds Resources (SFR). Funds are available within CDB's existing resources and will be spent in accordance with Table 1 below.

**TABLE 1: PROJECT FINANCING PLAN**
**($'000)**

| Project Components | CDB SDF(U) IRL | Percentage of Loan |
|---|---|---|
| 1. Emergency Restoration of Services | 2,460 | 98 |
| 2. Consultant Certification | 40 | 2 |
| **Total** | **2,500** | **100** |

## 14. BACKGROUND

14.01 Due to Hurricanes Eta and Iota occurring within a short period of each other, damage assessments were conducted as soon as Ministry of Infrastructure Development and Hosing (MOIDH) staff could reach various parts of the country. Since some areas were impacted by both hurricanes, it was somewhat difficult to attribute damage in some locations to one event or the other. The damage assessment report, on both hurricane events, provided by Belize's National Emergency Management Organisation (NEMO) as of January 25, 2021 (see Appendix 1), indicated that there was extensive flooding and undermining of public infrastructure (roads and bridges) and buildings due to rivers exceeding normal flood levels. NEMO also reported that the Macal, Mopan and Belize Rivers had risen to levels which exceeded the historical inundation levels of past notable tropical storms, such as Hurricane Mitch (1998) and Tropical Depression No. 16 (2008). Residents living in flood-prone areas experienced damage and loss to their homes and household effects. Cumulatively, approximately 900 families or 5,000 persons were impacted by flood waters. Farmers reported losses of vegetable crops and assorted fruits.

14.02 There was also reported damage to housing, public utilities, agriculture, fisheries and tourism. The total infrastructure damage caused by the hurricanes was estimated by NEMO to be approximately twenty million United States dollars ($20 mn).

14.03 As a result of the extensive damage caused by the hurricanes GOBZ declared a State of Public Emergency [a Level 2 event under the Disaster Management Strategy and Operational Guidelines (2021) (DiMSOG)] in the Belize, Orange Walk and Cayo Districts, as gazetted in Statutory Instrument no. 173 of 2020, dated December 7, 2020.

14.04 Following receipt of the request for the IRL to address the damage caused by the hurricanes, GOBZ and CDB staff had discussions and worked together to develop and agree on: (a) the scope of the proposed loan; (b) the Terms of Reference (TOR) for consultancy services for inspection and certification of the works; and (c) appropriate implementing arrangements for the proposed loan. Initially, separate IRL papers were drafted for the two hurricane events, in accordance with the older edition of DiMSOG. However, after internal discussions, it was agreed that the recently approved DiMSOG 2021 should be used as the basis for appraising the IRLs and that a combined paper should be prepared for both events. The change meant that the borrowing limit per event had increased from seven hundred and fifty thousand United States dollars (USD750,000) to two million, five hundred thousand United States dollars (USD2,500,000). GOBZ was apprised of the new limit and indicated that the initial project scope would be reviewed, updated and

resubmitted for CDB's consideration. The time taken to finalise and agree the scope of the works component of the project and related implementation arrangements contributed to delays in completing this paper.

## 15. DESCRIPTION

15.01 It is proposed that CDB provide financial assistance, by way of a loan to GOBZ, in an amount not exceeding the equivalent of $2,500,000 to assist GOBZ with emergency restoration of critical public infrastructure following damage caused by Hurricane Eta on November 4 and 5, 2020 and by Hurricane Iota on November 16 and 17, 2020 in Belize; and consultancy services to provide independent inspection and certification of the works (the Project). The emergency restoration works include repairs to: (a) sugar cane roads and culverts in Orange Walk and Corozal Districts, and village roads in Cayo District, damaged by Hurricane Eta; and (b) road and drainage works on the George Price Highway; a large section of road surface on the Philip Goldson Highway; and access roads, roadside drains, culverts, and bridges in Belize and Cayo Districts, damaged by Hurricane Iota.

15.02 All restoration works to be financed by the Loan have commenced. Only major restoration works on the Philip Goldson Highway and two minor roads in the Cayo District are left to be completed.

15.03 In the case of emergency restoration of critical public infrastructure, it will be a condition of the Loan that GOBZ engages a consultant (the Consultant) with qualifications and experience acceptable to CDB to assist with the supervision of the Project. The Consultant will perform technical inspections and certify expenditure for the works utilised for the Project. The TOR and budget for the consultancy services are at Appendix 2.

15.04 The duties of the Consultant include inspection of ongoing and completed works, and certification of same for reimbursement to GOBZ.

## 16. PROJECT OBJECTIVES

16.01 The objective of the Project is to assist GOBZ in financing the cost of emergency restoration of services in the aftermath of Hurricanes Eta and Iota.

## 17. PROJECT JUSTIFICATION/BENEFITS

17.01 The activities to be funded by the IRL are associated with GOBZ's immediate response programme in the aftermath of Hurricanes Eta and Iota, which enabled GOBZ to resume normal activities quickly and to begin planning for short, medium and long-term recovery and rehabilitation efforts.

## 18. IMPACT

18.01 The resources provided by the Loan will assist GOBZ in defraying the cost of restoring services to critical road, drainage and bridge infrastructure in Belize, Corozal, Cayo and Orange Walk Districts, to minimise the social and economic dislocation caused by Hurricanes Eta and Iota. In addition, it gives GOBZ the needed time to better define its requirements for the long-term reconstruction effort, through the reinstatement of some access to critically affected areas.

## 19. PROJECT IMPLEMENTATION/ EXECUTION

19.01 MOIDH has commenced coordinating all arrangements for the activities to be funded by the Project. As a condition precedent to first disbursement of the IRL, GOBZ shall designate a Project

Coordinator (PC) from within MOIDH, whose qualifications and experience are acceptable to CDB (see Roles and Responsibilities at Appendix 3). A senior engineer from within MOIDH, whose qualifications and experience are acceptable to CDB, has already been assigned as PC.

19.02 GOBZ will engage the Consultant to assist with supervision of the IRL and for independent certification of the works. It will be a condition precedent to disbursement in respect of the works that the Consultant is engaged. The Consultant identified by MOIDH is adequately qualified and experienced, has worked as a certification consultant on a previous Belize IRL, and is acceptable to CDB.

## 20. PROCUREMENT

20.01 Procurement shall be undertaken in accordance with the Procurement Policy for Projects Financed by CDB (November 2019) and the Procurement Procedures for Projects Financed by CDB (January 2021), subject to the exceptions permitted under DiMSOG. The Consultant will be required to review documents to ensure that contracts were procured in accordance with the provisions of the Loan Agreement.

## 21. DISBURSEMENT

21.01 The specific activities to be included in the Project, and for which the IRL may be disbursed, have been determined by GOBZ in consultation with CDB staff. The first disbursement of the IRL shall be made by November 1, 2021, and the IRL shall be fully disbursed by November 30, 2022, or such later dates as CDB may specify in writing. In accordance with DiMSOG, funds not claimed within 24 months of the date of the request to CDB will be cancelled.

21.02 In accordance with DiMSOG and CDB's Disbursement Guidelines for CDB-financed Projects (2019), expenditures by GOBZ, incurred from November 4, 2020, in connection with the effects of Hurricane Eta, and from November 16, 2020, in connection with the effects of Hurricane Iota, will be eligible for funding under the IRL. Only expenditures invoiced within 12 months of the dates of the disasters, namely, on or before November 3, 2021, for Hurricane Eta and November 15, 2021, for Hurricane Iota, will be eligible for payment under the IRL.

## 22. REPAYMENT OF LOAN

22.01 The Loan is to be repaid in fifty-two (52) equal or approximately equal and consecutive quarterly instalments, commencing three (3) years after the date of the Loan Agreement.

## 23. LOANS COMMITTEE RECOMMENDATION

23.01 Loans Committee considered this proposal by Round Robin on September 3, 2021, and agreed to recommend it for the approval of the President.

## 24. RECOMMENDATION

24.01 It is recommended that the President approve a loan to GOBZ of an amount not exceeding the equivalent of two million, five hundred thousand United States dollars ($2,500,000) (the Loan), from CDB's SFR to assist GOBZ in financing the emergency restoration of critical public infrastructure following damage caused by Hurricane Eta on November 4 and 5, 2020 and by Hurricane Iota on November16 and 17, 2020 in Belize; and consultancy services to provide independent inspection and certification of payment for works under the Project, on CDB's standard terms and conditions and on the following terms and conditions:

| No. | Subject | Terms and Conditions |
|---|---|---|
| 1. | **Parties** | Bank: Caribbean Development Bank (CDB)<br>Borrower: Government of Belize (GOBZ)<br>Implementing Agency: Ministry of Infrastructure Development and Housing (MOIDH) |
| 2. | **Amount of Loan** | The Bank agrees to lend to the Borrower an amount not exceeding the equivalent of two million, five hundred thousand United States dollars (USD2,500,000) from the Special Funds Resources (SFR) of the Bank (the Loan). |
| 3. | **Purpose** | The purpose for which the Loan is being made is to assist the Borrower in financing the emergency restoration of critical public infrastructure following damage caused by Hurricane Eta on November 4 and 5, 2020 and by Hurricane Iota on November 16 and 17, 2020 in Belize; and consultancy services to provide independent inspection and certification of the works (the Project). |
| 4. | **Repayment** | The Borrower shall repay the Loan in fifty-two (52) equal or approximately equal and consecutive quarterly instalments, commencing three (3) years after the date of the Loan Agreement. |
| 5. | **Interest** | The Borrower shall pay to the Bank interest at the fixed rate of zero decimal seventy-five percent (0.75%) per annum on the amount of the Loan disbursed and outstanding from time to time. Such interest shall be payable quarterly. |
| 6. | **Disbursement of Loan** | Except as the Bank may otherwise agree:<br>(a) the specific activities of the Project for which the Loan may be disbursed shall, from time to time, be determined by the Borrower in consultation with the Bank's staff. Such determination shall take into consideration the funding activities of other donors;<br>(b) the proceeds of the Loan may be used to finance expenditures incurred by the Borrower:<br>(i) during the period commencing November 4, 2020 and terminating on November 3, 2021 or such later date as |

| No. | Subject | Terms and Conditions |
|---|---|---|
| | | may be specified in writing by the Bank, in respect of the effects of Hurricane Eta;<br><br>(ii) during the period commencing November 16, 2020 and terminating on November 15, 2021 or such later date as may be specified in writing by the Bank, in respect of the effects of Hurricane Iota; and<br><br>(c) expenditures being financed by the proceeds of the Loan shall be certified by the Consultant engaged by the Borrower for this purpose.<br><br>The Borrower shall comply with the Bank's *"Disbursement Guidelines for CDB-Financed Projects"* published in January 2019, which publication is in effect at the date hereof and which may be amended from time to time by the Bank. |
| 7. | **Period of Disbursement** | The Bank shall have received an application for first disbursement of the Loan by November 1, 2021 or such later date as may be specified in writing by the Bank.<br><br>The Loan shall be disbursed up to November 30, 2022 or such later date as may be specified in writing by the Bank. |
| 8. | **Procurement** | Except as provided below, procurement of works and services to be financed from the Loan shall be in accordance with the following policy and procedures or such other policy and procedures as the Bank may from time to time specify in writing:<br><br>- *Procurement Policy for Projects Financed by CDB (November 2019); and*<br><br>- *Procurement Procedures for Projects Financed by CDB (January 2021).*<br><br>The following procurement exceptions apply:<br><br>Where appropriate, the exemptions provided under the Bank's *Disaster Management Strategy and Operational Guidelines (2021)* shall apply. |
| 9. | **Additional Condition(s) Precedent to First Disbursement** | The Bank shall not be obliged to make the first disbursement of the Loan until the Borrower has furnished or caused to be furnished to the Bank, evidence acceptable to the Bank, that:<br><br>(i) the Project Coordinator (PC) has been designated; and<br><br>(ii) the approval of the House of Representatives of the Borrower has been obtained with respect to the Loan. |

| No. | Subject | Terms and Conditions |
|---|---|---|
| 10. | **Condition Precedent to Disbursement in respect of the Works** | The Bank shall not be obliged to disburse any amount of the Loan in respect of the works until the Borrower has furnished or caused to be furnished to the Bank evidence acceptable to the Bank that the following condition have been satisfied:<br><br>The Borrower has engaged a consultant to provide the **Consultancy Services for Inspection and Certification of Works.** |
| 11. | **Project Implementation** | Except as the Bank may otherwise agree, the Borrower shall implement the Project through the Implementing Agency. |
| 12. | **Project Management** | The Borrower shall designate, and for the duration of the Project maintain, as Project Coordinator (PC), a person from within the Implementing Agency with qualifications and experience acceptable to the Bank, who shall be responsible for managing all aspects of the implementation of the Project, including the responsibilities set out in the **Roles and Responsibilities of the Project Coordinator**.<br><br>The qualifications and experience of any person subsequently designated as PC shall be acceptable to the Bank. |
| 13. | **Engagement of Consultants** | The Borrower shall, in accordance with the procurement policy and procedures applicable to the Loan, select and engage consultant(s) to provide the following consultancy services:<br><br>**Consultancy Services for Inspection and Certification of Works**<br><br>The Borrower shall, within a timeframe acceptable to the Bank, implement such recommendations arising from the aforementioned consultancy services, as may be acceptable to the Bank. |
| 15. | **Reports and Information** | Except as the Bank may otherwise agree, the Borrower shall furnish or cause to be furnished to the Bank: (i) the reports and information required to be furnished to the Bank in accordance with the **Roles and Responsibilities of the Project Coordinator** and the TOR for **Consultancy Services for Inspection and Certification of Works** in the form specified therein, or in such form or forms as the Bank may require, not later than the times specified therein for so doing; and (ii) a Project Completion Report within 60 days after final disbursement of the Loan, in such form as the Bank may require. |

**Signed:** *Isaac Solomon* *September 10,/2021*

Chairman, Loans Committee Date

25. **APPROVAL**

25.01 The abovementioned Loan is approved.

**Signed:** *Hyginus Leon* *September 15, 2021*
President Date

***SUPPORTING DOCUMENTATION:***

Appendix 1 - Damage Assessment Report
Appendix 2 - Draft Terms of Reference – Consultancy Services for Inspection and Certification of Works
Appendix 3 - Roles and Responsibilities of the Project Coordinator

| | |
|---|---|
| *Director*<br>*Projects Department* | *Mr. Daniel M. Best* |
| *Division Chief*<br>*Economic Infrastructure Division* | *Mr. L. O'Reilly Lewis* |
| *Operations Officer*<br>*Economic Infrastructure Division* | *Mr. Nigel Blair* |

**APPENDIX 1**

# National Emergency Management Organization
# Damage Assessment and Needs Analysis

---

# DETAILED SECTOR REPORT
# HURRICANES ETA & IOTA

**As at 25th January 2021**

**Belize C.A.**

## ACKNOWLEDGEMENT

The Ministry of Natural Resources, Petroleum and Mining, responsible for the Damage Assessment and Needs Analysis Committee, acknowledges the efforts of all concerned whose efforts made this report possible.

Contributors include:

The Damage Assessment and Needs Analysis Committee
The Damage Assessment and Needs Analysis Working Groups
Ministry of Infrastructure Development and Housing
The Ministry of Agriculture, Food Security and Enterprise
The Ministry of Public Utilities, Energy and Logistics
The Ministry of Health and Wellness
The National Meteorological Service
The Department of the Environment
National Coast Guard
Belize Defense Force

This Final Report is informed primarily by reports submitted by the following NEMO Committees: Damage Assessment and Needs Analysis (DANA) Leads in Cayo, Stann Creek and Belize Districts', NEMO District Emergency Coordinators, and Human Relief and Supplies Management Committee (HRSMC) Liaison Officer and the Department of Agriculture Sector Lead as well as drone imagery and other credible sources. It is based on rapid ground surveys in the areas impacted by floods where accessible.
Support with transportation and evacuation into and out of Crooked Tree Village is being provided by the Belize Defense Force (BDF), and the Belize Coast Guard. Emergency repairs to bridges and culverts are being provided by the Ministry of Works (MOW).

## EVENT SUMMARY

With the passage of Hurricane ETA over the country between November 1 – 6, 2020, the Stann Creek, Cayo and Belize Districts were heavily impacted by excessive rainfall between 10 – 20 inches. Following Eta, more heavy rains were produced as a result of the passage of Hurricane Iota making landfall over Nicaragua over November 16-17, 2020. Heavy rains of Iota also affected the Toledo, Cayo, Belize and Stann Creek Districts, producing more rain amounting to 10 to 20 inches. This volume of rainfall resulted in extreme flooding in areas associated with the outer bands of the system. Floods affected as much as 30,000 people, some directly, others suffered inconvenience whilst some were displaced. At the time of this report as much 5,000 people were receiving disaster- flood relief.

In the mountainous areas of the country, extreme flooding occurred in the west and south of the country initially and ultimately resulted in downstream communities. There are some areas which experienced localised flooding due to heavy rainfall but, the water receded as soon as the rains ceased. However, as the flood waters traversed the riverine system, other communities downstream started experiencing extreme flood conditions. The flooding has affected the transportation network, lives and livelihoods of many persons in these districts. In the Cayo and Belize District, the Damage Assessment and Needs Analysis Committee was activated, and coordinated visits were and are still being conducted between the NEMO Committees to assess the impacts caused by the flooding. The Macal, Mopan and Belize Rivers rose to levels which exceeded the historical stage of notable previous events such as Mitch and TD16.

Damage Assessments Teams were deployed in between the passage of the events due to the severity of the impacts sustained in different municipalities. There was an added risk to deploying damage assessments in between events due to the un historic flooding being experienced. Shelters were opened, disaster relief personnel deployed, and disaster relief accordingly commenced.

Noted was that there were some challenges in getting some Public Officers to report for disaster relief duties, as such, the efforts of those who reported became progressively strained and tedious.

Drone imagery and on the ground, validation were reviewed and reflected damages and losses to infrastructure, livestock, homes and household items, crops and tourism entities to name a few.

The indirect losses can be attributed to closure of roads that are vital for economic activities, and general disruption in economic activities due to prevailing flood conditions; **these have not been quantified**. Some of the immediate needs are for repairs to the road infrastructure, crop rehabilitation, replacement of damaged household furniture, and health and sanitation to prevent skin infections and water borne diseases.

As the flood conditions persist and the country received another high level of rainfall, this could further contribute to damages and losses especially in the agriculture sector. **Final costs sustained is BZD $93,000,000.00 as outlined below.**

**APPENDIX 1**

## DAMAGE AND LOSS SUMMARY

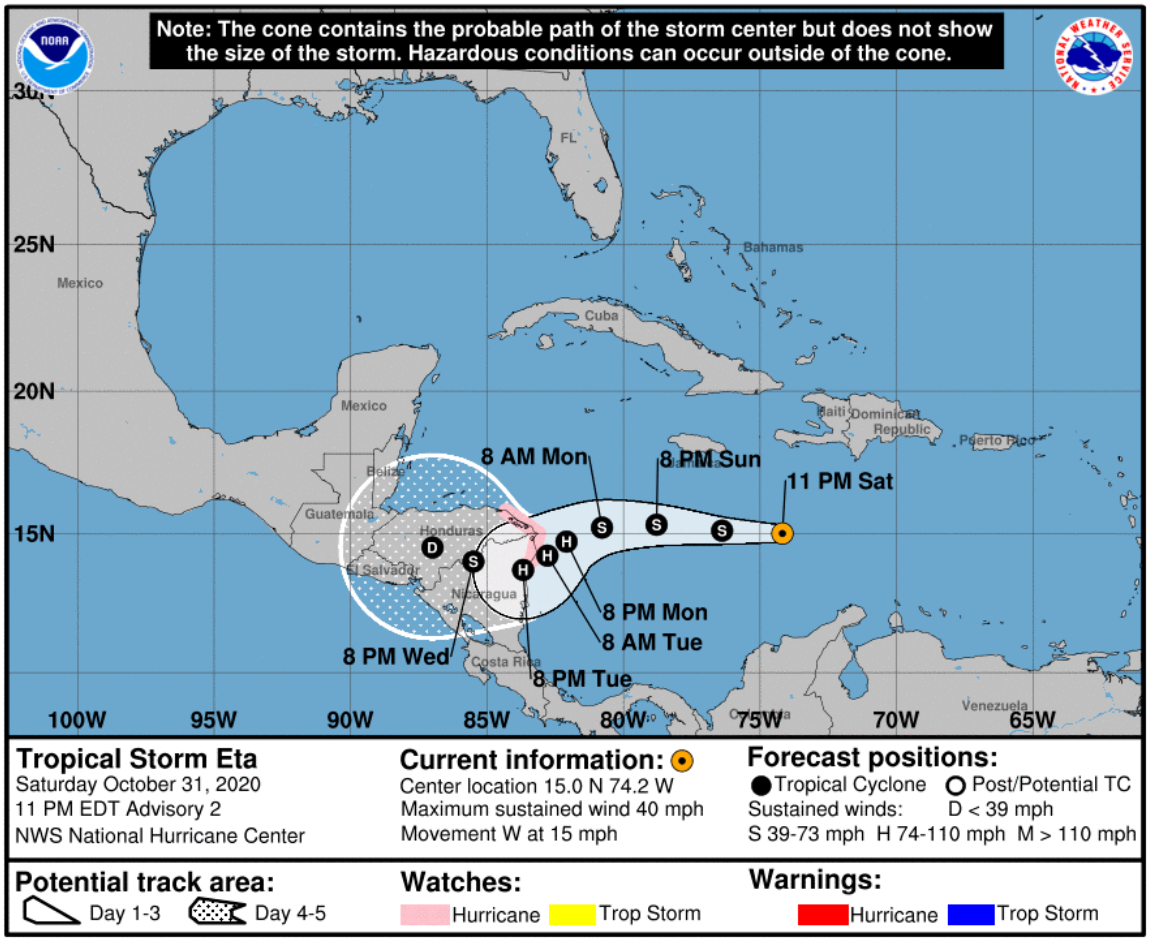
| SECTOR IMPACTED/NEEDS | AFFECTED | ESTIMATED VALUE IN LOSSES (BZD) | COMMENT |
|---|---|---|---|
| **PEOPLE**<br><br>**HOUSING** | Approximately 60, 000 persons directly and indirectly affected<br><br>Household items losses - 1000: families<br><br>1500: homes/ structures affected by rain, flood waters | <br><br>**$5, 000, 000.00**<br><br>**$7, 000, 000.00 Materials** | These are preliminary figures as the impact zones for Eta and Iota are very much similar except that Iota impact-damages extend to the two northern districts. |
| **INFRASTRUCTURE** | 14 road networks plus 210 small bridges affected.<br><br>All major roads and farm roads suffered extensive being under water for extensive periods. | **$40 million** + | As flood waters travel downstream, more communities are expected to be impacted. |
| **UTILITY**<br>**BWSL water system and village water board equipment in the villages in Cayo (***Bullet Tree, Santa Familia, Billy White and Duck Run One)* **and Belize Districts (***Crooked Tree, Lucky Strike***)** | Water pumps, wells, water intakes etc. | **$ 3.5 million +** | Deteriorating water quality at intakes. With prevailing flood waters, water contamination issues arise. |
| **AGRICULTURE** | 700 + Farmers and Livestock Producers and as much as 10, 000 acres of agricultural crops grain and vegetable commodities mostly affected. | **$ 18 million+** | Seeds for replanting crops and grass for cattle due to losses suffered by farmers resulting from their farms being waterlogged for two consecutive flood events. |
| **FISHERIES** | Fisheries harvesting. Delayed period of up to 2 weeks for flood waters to clear up and allow for harvesting. Increased sedimentation which may affect coral reefs. | **$4.5 million +** | Challenging to quantify as event is not yet finished.<br>Using best estimates, costs could increase as assessments are executed. |
| **TOURISM** | Major impacts are damages to archaeological assets, trail systems, and water damage to infrastructure due to excessive rainfall and flooding | **$3.5 million+** | Damage to Roads/Street (including Access Roads); Loss of Income; Erosion and Damage to Building Structure/Roof |
| **HEALTH** | Expected vector outbreaks, water contamination including faecal waste and gastrointestinal conditions associated with stagnant flood waters. | **$8 million +** | Needs: Additional medical supplies to treat dermal and gastrointestinal conditions |
| **ENVIRONMENT** | Coastal waters, littoral woodland forest, water quality | **$3.5 million+** | Evaluation of the different ecosystem services and the cost to clean up |
| | **ESTIMATED TOTAL: BZD** | **$93 million** | |

# FINALDETAILED SECTOR REPORT
# HURRICANES ETA AND IOTA

## 1.0 SITUATION

### 1.1 Nature of the Disaster:

In late October 2020, global models began to indicate the possibility of an area of low pressure developing over the southwest Caribbean Sea from a tropical wave that was approaching the eastern Caribbean. The tropical weather outlook from the National Hurricane Center (NHC) issued at 12:00 pm on Wednesday October 28, 2020 indicated that the system had a 20% (low) chance of development in 5 days. By Monday November 9 at 9:00 pm, Eta had gained strength and became a Category 4 Hurricane moving in a west-southwesterly direction with winds of 150 mph.




Rainfall gradually increased across Belize as Eta moved along the forecasted path resulting in the country receiving on average between 10- 20 inches of rainfall. Rains continued through much of the week with storm total rainfall exceeding 20 inches (508 mm) over the Mountain Pine Ridge. As Eta emerged off the coast of Honduras and moved northward, paralleling the coast of Belize late Thursday night into Friday

morning, torrential rain affected the country, with some central and northeastern areas recording over 5 inches of rainfall that night. This led to widespread flooding across the country. On November 15, 2020, NEMO advised about the formation of Hurricane Iota along the coast of Nicaragua bringing possible rainfall of 8 to 16 inches to Belize. This advisory was followed up on November 16 with forecast of intensification of Hurricane Iota to a Category 5 hurricane. The system was expected to intensify as a major hurricane until landfall; then weaken rapidly thereafter and dissipating over the mountainous terrain of Central America by Wednesday, November 18, 2020, producing heavy rainfall across Belize with total rainfall amounting to 10 to 20 inches. The advisor for November 17, 2020, emphasized the threat of flooding due to heavy rains especially over southern Belize, which peaked on Wednesday. Flood warning was in effect for the Cayo, Belize, Stann Creek and Toledo Districts.

### 1.2 Areas Affected

Below table reflects all areas affected by the ETA and IOTA hurricanes and associated floods. Those locations marked with asterisks were declared disaster areas.

| City/District | Communities | | |
|---|---|---|---|
| **STANN CREEK** | New Site Area Dangriga (Wagierale)** | Hopkins** | |
| **Belmopan City** | Riviera Area** | | |
| **CAYO** | Arenal | Benque Viejo Town | Unitedville |
| | Santa Familia | Calla Creek** | Blackman Eddy |
| | Ontario | Teakettle | Camalote |
| | Roaring Creek** | Valley of Peace | More Tomorrow |
| | Cotton Tree | | |
| **Belize City** | Jane Usher Blvd | Antelope St Extension | Belama Ph 3, 4 |
| | Freedom St | Neal Pen Road | Lake Independence (Jones St) |
| **BELIZE** | Gracie Rock | Freetown Sibun** | Hattieville** |
| | Western Pines | Burrell Boom** | Rancho Dolores** |
| | Mile 8 - Sunset/Western Pines | Scotland Halfmoon** | Double Head Cabbage |
| | Bermudian Landing** | St. Paul's Bank | Willows Bank |
| | Isabella Bank | Flowers Bank** | May Pen** |
| | Grace Bank** | Lucky Strike | Bomba |
| | Maskall | Gardenia | Rockstone Pond |
| | Sandhill | Boston | Lord's Bank** |
| | Davis Bank | Maskall | |

| City/District | Communities | | |
|---|---|---|---|
| **ORANGE WALK** | Santa Martha | Guinea Grass | |
| | Louisiana | Trial Farm | |
| **COROZAL** | Fireburn | Sarteneja | Caledonia |
| | Copper Bank | Progresso | Consejo |
| | San Andres | Libertad | San Narciso |
| | Chula Vista | | |

### 1.3 Effects on Population

The major impact to residents across all three districts were due to flooding. Residents living in flood prone areas experienced damages and losses to their homes, household effects, crops (watermelon, melon, cucumber, tomatoes, sweet pepper, corn, beans, pumpkins, cabbage, jalapenos, assorted fruits) to name a few. Cumulatively, approximately 900 families or 5,000 persons were impacted by flood waters. Farmers have reported losses on approximately 600 acres thus far. This number may increase as some areas are still inaccessible due to flooding conditions.

Relief supplies were distributed to those affected by the events with small food packages, cleaning supplies, and some personal sanitary supplies.

No Health-related impacts were reported as a result of the passage of the two hurricane events. As some areas are still under flood waters, this may change as the flood waters recede.

## 2.0 DAMAGE BY SECTOR

This section presents the results of the damage assessments and indicative losses sustained by the passage of ETA and IOTA. Assessments were conducted by the Sector Leads from the respective Ministries regarding their legal mandate.

### 2.1 Housing/shelters

Thus far, total of 5,000 persons from 900 households were affected by the event and resulted in losses of furniture and household appliances (refrigerators, mattresses, washers, sofa sets, stove and other electrical equipment) with values ranging from $500.00 to $8,000.00 each. A rough estimate of damages is BZD2,801,600.00 with average costs estimated for refrigerator, stove, washer, and mattress.

### 2.2 Infrastructure/Population Lifelines

Bridges in the Cayo District were closed due to flooding, namely, Bullet Tree Bridge, Iguana Creek Bridge, Roaring Creek, Rancho Dolores, and recently, the Crooked Tree Causeway.

Due to flooding from the Sibun River, the Coastal Road was closed but has been reopened as soon as the water receded allowing for traffic to pass. In the Belize River Valley, communities such as Flowers Bank and portions of Scotland Halfmoon Village, roads experienced flooding and have deteriorated. The Transportation network has been impacted in some areas due to flooding.

**APPENDIX 1**

Following table outlines the works needed as a result of the impacts on the roads and highways.

| ITEM | DISTRICT | TYPE OF DAMAGE |
|---|---|---|
| 1 | **CAYO** | |
| | **George Price Highway** | |
| | Mile 38.5 George Price Highway. (Near Saint Matthews Village) | Piping caused a hole through depth of road pavement and some scouring of materials from embankment occurred due to persistent rains. |
| | Mile 49 - Roaring Creek Bridge West Approach (950 ft section under water and maximum depth is 4.0 ft. and rising) | 1. scouring/erosion of surfacing materials 2. Re-gravelling of road shoulders. 3. undermining /lifting off surface dress treatment |
| | Mile 51 - Teakettle (80 ft section under 6 inches of water) | minimal erosion of road shoulder material |
| | Mile 56 - Blackman Eddy village (backwater from Belize River extending over highway - 14 inches over 100 ft) | minimal erosion of road shoulder material |
| | Mile 72-74.5 (Succotz to Benque Viejo Town) have several sections flooded and impassable) | 1. Erosion of road shoulder material. 2 Possible lifting of surface dressing. 3 possible potholes. 4. Debris clean up at bridge |
| | Succotz Village Streets | 1. Washout of surfacing materials. 2 Cleaning and reshaping of side drains. 3. Culvert washouts |
| | Benque Viejo Town Streets | 1. Washout of surfacing materials. 2 Cleaning and reshaping of Outlet Channels / side drains. 3. Culvert washouts |
| | Calla Creek Road & Cable Bridge - Cable bridge &approach flooded and impassable | 1. Washout of surfacing materials. 2 Cleaning and reshaping of Outlet Channels / side drains. 3. Culvert washouts |
| | Low Level Timber Bridge - Under several feet of water | Replacement of railing/cables. Re-replacement of a few decking /runners |
| | Bullet Tree - Santa Familia - Spanish Lookout Road Link - (Salvador Fernandez Bridge and several sections between Bullet Tree / Santa Familia Flooded and impassable) | 1. erosion/ scouring of surfacing material. 2 sedimentation build-ups of drains. 3. possible culvert washout |
| | Baking Pot Ferry - Closed due to flooding of Belize River | Minor damages to underside of ferry and tongue of the ferry. 2. replacement of cables which burst. |
| | Caracol Road (Blancaneaux to Caracol) | 1. scouring of approaches of bridges. 2 erosion of surfacing materials |
| | Iguana Creek Bridge / road approaches | 1. Scouring of abutments. 2 scouring of road shoulder materials. 3. Possible loss of surface dressing |
| | Buena Vista Road | 1. erosion of surfacing materials. 2 washouts of materials at culverts |
| | Valley of Peace / Yalbac Roads | 1. erosion of surfacing materials. 2 washouts of materials at culverts |

**APPENDIX 1**

| ITEM | DISTRICT | TYPE OF DAMAGE |
|---|---|---|
| | San Ignacio / Santa Elena Town Streets | 1. Washout of surfacing materials. 2 Cleaning and reshaping of Outlet Channels / side drains. 3. Culvert washouts |
| 2 | **BELIZE DISTRICT** | |
| | Mile 1 - 1.5, George Price Highway on approach to Belize City | 1. Loss of Surface Dressing. 2 Scouring / erosion of surface materials. 3. Drainage blockages |
| | Mile 8, Philip Goldson Highway, Ladyville | 1. Loss of Surface Dressing. 2 Scouring / erosion of surface materials. 3. Drainage blockages |
| | Mile 5, George Price Highway near Old Belize | Scouring of Highway Shoulders 1000ft x 10 ft x 12 inches deep |
| | Mile 16-17, George Price Highway near Hattieville | Scouring of Highway Shoulders 1000ft x 10 ft x 12 inches deep |
| | Approach to Rancho Dolores Bridge | Scouring of a 20 ft section of road |
| | Mile 4.7 approaching Sebastian Bridge / Mussel Creek Bridge on Belize River Valley Road | Scouring of one lane width of road |
| | Freetown Sibun | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Gracie Bank Road | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Grace Bank Road | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Old Northern Highway | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Bomba Road | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Corozalito Road | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Nago Bank Road | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Roads / Streets in Belize River Valley Area | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Crooked Tree Causeway/ Blackburn Causeway | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| 3 | **STANN CREEK DISTRICT** | |
| | Hummingbird Highway | |
| | Mile 26 – 29 | 1. Removal of material from roadway due to material slippage from side slopes 2. Cleaning /reshaping of drains |
| | Miles 34-35 | 1. Removal of material from roadway due to material slippage from side slopes 2. Cleaning /reshaping of drains |
| | Mile 8-10 near Hope Creek Village | Scouring of materials from road shoulders. Washout of materials at culvert locations, Clean-up of debris from drains |

**APPENDIX 1**

| ITEM | DISTRICT | TYPE OF DAMAGE |
|---|---|---|
| | Mile 4-5 near Sarawee Village | Scouring of materials from road shoulders. Washout of materials at culvert locations, Clean-up of debris from drains |
| | Bridges on Hummingbird Highway (Caves Branch, Sibun Mile 20 and Middlesex) | 1. Scouring of Abutments. Removal of trapped Debris |
| | Southern Highway near Silk Grass | 1. Loss of Surface Dressing of 1000 ft of pavement. 2 Clean-up of drains |
| | Maya Mopan Farm Road | Washout of double 4 ft dia culverts at 2 locations |
| | Village streets in Sarawee, Pomona, Hope Creek, Canada Hill, Silk Grass, Mullins River, Gales Point | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Village streets in Independence, Placencia, Seine Bight, Red Bank, Alta Vista, | 1. erosion of surfacing materials. 2 washout of materials at culverts |
| | Hopkins – Impassable | Scouring of road shoulder materials |
| | Sittee River Road | 1. Scouring /erosion of surface materials. Drainage cleaning |
| 4 | **TOLEDO DISTRICT** | |
| | **Bridges** | |
| | Corazon Bridge, San Lucas, Cacao, Otoxha, Elridgeville, Jacinto Bridge etc. | 1. Scouring of approaches. 2 Replacing of Decking and Runners on Bridges |
| | San Felipe Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| | Santa Anna Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| | Sunday Wood - Corazon - Conejo Road Link | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| | Monkey River Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| | San Pablo and Trio Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| | Blue Creek Road | Spot Patching and Grading |
| | Jordan and Santa Teresa Road | Spot Patching, Grading and Drainage cleaning/ Reshaping |
| | Otoxha Road | Spot Patching and Grading |
| | Dolores Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| | San Benito Poite Road | Spot Patching, Grading and Drainage cleaning/ Reshaping |
| | San Jose Village Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |

| ITEM | DISTRICT | TYPE OF DAMAGE |
|---|---|---|
| | San Jose - Santa Cruz Bypass | 1. Challenges with Drainage and access |
| | Boom Creek Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning. 4 Culvert washout |
| | Carib Reserve Road | 1. Scouring of road Shoulders, 2 Grading & Spot Patching 3. Drainage Cleaning |
| 5 | **ORANGE WALK DISTRICT** | |
| | Guinea Grass Road | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | Cacabix road | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | San Pablo Douglas Road | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | Old Northern Highway | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | Progresso Road O/ Walk Portion | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | BSI M1 Sugar Road | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | Chan Pine Ridge Road | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | YO Creek # 1 | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | YO Creek # 2 | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | Gonzales Sugar Road | Supply, transport, place, wet and compact suitable Marl. (Spot Patching) |
| | Philip Goldson Highway - mile 62 | Replacement of double 3 ft culvert by mile |

### 2.3 Agriculture and Food Security

**TABLE1: TOTAL AGRICULTURE LOSSES DUE TO THE FLOODS OF ETA AND IOTA**

| ETA and IOTA Hurricane: Agriculture Flood losses | | | |
|---|---|---|---|
| **Floods** | **Value of loss (BZ$)** | **Number of Farmers** | **Acreage Loss** |
| Eta | $11,008,437 | 518 | 6,496 |
| Iota | $7,205,069 | 449 | 6,496 |
| **Grand Total** | **$18,213,506** | **787** | **12,992** |

The Eta and Iota flooding's caused a **total loss of $18,213,505.93 equating to 12,992.2 acres**. A total of 787 farmers were affected by the floods. The flooding caused by **Hurricane Eta, ending of October 2020,**

**is valued at $11,008,436.62** with total acres loss of 6,499.60. Eta affected a total of 518 farmers located mostly in rural parts of the Belize and Cayo districts. The flooding caused by **Iota on the other hand in, mid-November 2020, is valued at an additional $7,205,069.31 with a total acres loss of 6,495.74**. Iota affected 449 farmers located mostly in the productive areas of Corozal, Belize and Cayo districts.

**Hurricane Eta**

**TABLE 2: TOTAL HURRICANE ETA FLOODING LOSSES**

| Hurricane Eta: Agriculture Flooding Losses by Category | | | |
|---|---|---|---|
| **Category** | **Value of loss (BZ$)** | **# of Farmers** | **Acreage Loss** |
| Pasture | $7,000.00 | 2 | 4 |
| Root crop | $24,620.90 | 21 | 12 |
| Sugarcane | $59,625.00 | 1 | 75 |
| Fruit | $861,526.08 | 87 | 97 |
| Vegetable | $4,507,702.12 | 407 | 561 |
| Grain | $5,547,962.52 | 170 | 5,748 |
| **Grand Total** | **$11,008,436.62** | **518** | **6,496** |

The floods caused by Hurricane Eta affected major productive areas in the Mopan, Macal and the Belize River. The commodities that were majorly affected were Grains and vegetables with a combine acreage of 6,308.5, and a total loss value of $10,055,664. The 170 Grain farmers lost $5.5 million in value and 5,747. 52 in acres. Moreover, 407 vegetable farmers lost $4.5 million and 561 acres.

**Hurricane Iota**

**TABLE 3: HURRICANE IOTA AGRICULTURE FLOODING LOSSES**

| **Categories** | **Value of loss (BZ$)** | **Number of Farmers** | **Acreage Loss** |
|---|---|---|---|
| Sugarcane | $398 | 1 | 1 |
| Root crop | $177,479 | 30 | 70 |
| Grain | $349,357 | 36 | 154 |
| Livestock | $759,070 | 77 | |
| Fruit | $920,016 | 137 | 172 |
| Vegetable | $2,021,750 | 198 | 146 |
| Pasture | $ 2,977,000 | 74 | 5954 |
| **Grand Total** | **$7,205,069** | **449** | **6496** |

Iota affected mostly the commodities of vegetables and pasture. Approximately $2,021,750 of the total loss is as a result of vegetable destruction and $2,977,000.00 as a result of the loss in pasture. Fruit trees and livestock also experienced major losses equating to $920,016 and $759,070 respectively.

Large productive areas in Spanish Lookout, Bullet Tree, El Progresso in the Cayo district were affected by the floods. Also, major productive areas such as Nago Bank, Bomba and Maskall in the Belize district were affected.

## ADDITIONAL CONSIDERATIONS/IMPACTS

Additional impacts have been the reduced availability of vegetables to supply local market demands, and subsequently increased prices due to the production shortages. Due to the losses in grains, namely corn and soybean, animal feed production will be affected.

With the loss of fresh vegetables, it is projected that there will be a shortage for the next two months, especially cabbage and tomato.

- With the increase in moisture, fungal diseases will be more prominent
- The livelihoods of rural farmers have been negatively affected due to loss of family income.
- Food Security as it pertains to the vegetable and animal feed sub-sector will be the ones mostly impacted.

Given the severity of the situation with farmers who have suffered damages during the most critical time, which is planting, it may become necessary for the importation of some vegetables over the next 2 months as well as support with vegetable seeds to advance crop replanting. Additionally, as pastures were affected, there is a need to assist with alternative feeds for livestock.

### 2.4 Fisheries

Sector damages and costs were determined for those that could be quantified as shown below in the subsections; however, for other fishery ecosystem damages which remain to be determined given the still existing flooding conditions, total costs remain estimated at $3.5 million plus BZD.

#### 2.4.1 Fishing Capacity

A total of 2,607 fishermen were impacted by Hurricane Eta and Iota. For the past three weeks, the Fisheries sector lost an estimated 5,477.50 lbs. in lobster tails, 13,874 lbs. in whole lobster and 96,722.50 lbs. in conch equating to a loss of 10 % or $452,760 for lobster production and 59% or $1,305,753.75 in conch production sue to inability to retrieve product from the sea. Minimal to no damages are reported in fishing vessels, gears or camps.

#### 2.4.2 Marine and coastal habitats (coral reefs, seagrass, beaches, and mangroves)

Freshwater has reached the main barrier reef with 6-12 inches of freshwater at the sea surface. The reef could be impacted by sedimentation and poor water quality resulting in poor coral health or mortality. The full extent of the floodwaters to the main reef has not been realized, further monitoring needs to occur.

Immediate needs would be to source financial resources to conduct surveys to determine overall coral health based on possible sedimentation on the reef and poor water quality as a result of the flood waters entering the marine environment. Surveys on seagrass beds should also be monitored for any impacts from the floodwaters.

### 2.5 Utilities

Three settlements were affected by the flooding caused by the storms.

I. Benque Viejo- In this settlement 2,540 households are being affected by low pressure water and supply interruptions. This is as a result of the flood destroying the main transmission

that crosses the river to the main spring source and the two wells currently in operation, are not able to meet the user demand.

II. San Ignacio/Santa Elena – In this settlement 6,341 households are being affected by water interruptions. This is a result of the failure of gallery electricals which are still submerged and at risk of damage under the flood waters. Functioning wells that are in operation are not able to meet full daily demand.

III. Belmopan – In this settlement 7,794 households experienced water interruption for only 12 hours due to flood water entering the intake house at Roaring Creek when it was at its highest level.

Any additional flooding can exacerbate the situation in these towns and downstream in the Belize District. Flooded conditions restrict access to damaged infrastructure. Related to water access, the upgrading of water systems, increasing storage capacity and locating additional water sources and production sites in Benque Viejo Del Carmen, San Ignacio, and Belmopan are essential.

### 2.6 Water

Water supply is restricted in some areas and water is being trucked in via water trucks. The Belize Water Services Limited (BWSL) reported severe damage to their intake in Benque Viejo Town located on the Mopan River and in the Belmopan Area on the Belize River where their facilities received several feet of water inside the pumping station which resulted in electrical damages and the need to replace the Benque Viejo Crossing. Additional damages were sustained to the distribution system requiring the repairs of broken water mains. Such damages have affected 8,881 users in Benque Viejo del Carmen and San Ignacio Towns and over 7,794 users in Belmopan City for a cumulative of over 18,000 water users. Damage values total approximately BZD$1,600,000. Forecasted costs associated with continuing existing flooding conditions provides a total value of approximately $3.5 million+ BZD.

### 2.5.2 Electricity

Electricity supply is somewhat normal; however, in some of the affected areas, access to electricity is limited or inaccessible due to either the power lines being submerged in flood waters or the need for electricians to conduct assessments on electrical switch boxes which were inundated in water.

### 2.7 Transport Sector

No damages or losses have been reported for the transport sector.

### 2.8 Tourism and Diaspora Relations

On November 26, 2020, a joint survey, between the Ministry of Tourism and Diaspora Relations and the Belize Tourism Board was issued to tourism stakeholders to assist in the compilation of information on the extent of the damages caused by these two tropical events. A total of 46 responses were received with 83 % of respondents being Hotel and Tourism Accommodation establishments, and with majority of responses coming from the Districts of Cayo, Stann Creek, and Belize. These respondents indicate that they have a cumulative employment of 371 persons currently, with an average of 8 employees per establishment.

The respondents indicated that the damages sustained due to tropical events IOTA and ETA are estimated at BZD1,174,472.25. It is also expected that this can increase to as much as $3.5 million Belize Dollars. A breakdown of these damages shows that the main areas (74%) of damages sustained were related to: 1) Damage to Roads/Street (including Access Roads) 2) Loss of Income 3) Erosion 4) Damage to Building Structure/Roof. These damages were concentrated primarily in the Ambergris Caye, Belize River Valley

and Mopan River areas. It is important to note that respondents from Placencia did indicate an important damage estimate to erosion caused by the tropical events.

Requests such as clean up kits, debris removal support and mold remediation were frequent. Of the remaining 51% of respondents, the following areas for assistance were also mentioned:

- Assistance with Marketing (for bookings)
- Assistance to remedy beach erosion
- Financial Support for Repair of Boat and Engines and other Equipment (Air Conditioners)
- Financial Support for Repair of Trails and Sidewalks
- Access Road Maintenance

Overall, the passage of IOTA and ETA had some notable impacts to the tourism sector, however, not to the same degree that has been seen by previous tropical systems. While a more in-depth assessment will be carried out now that the flood waters are receding, it is important to consider that many of our tourism stakeholders have not been in operation due to the COVID-19 pandemic, and a true representation of the actual impact of these two systems is difficult to ascertain at this time. Nonetheless, the information is pointing to a need to conduct a ground assessment to be carried out along the Mopan River, the Belize River Valley areas, Ambergris Caye and Placencia, as they key points of interest for support from NEMO and Government are:

- Support in fixing of Access Roads
- Assistance with Debris Clean Up
- Support in Management of Beach and River Bank Erosion
- Financial Assistance to repair or replace damaged equipment.

### 2.9 Environment and Solid Waste Sectors

Contents below present the findings of the assessment of damages and losses sustained by the Environment and Solid Waste Sectors.

#### 2.9.1 Vulnerability from Flooding

Flooding events can be classified in various categories, flash floods, single flooding event, multiple flood events or seasonal floods (Peterson, 2001). All these categories of flood always bring along some degree of disruption, loss and impacts associated by floods. Whether it is physical damage to property, loss of life, disruption of daily life, damage to crops and livestock or degradation of the environment, the impacts of floods create tangible and intangible losses to the population (Gautam and van der Hoek, 2003). There are different methods of quantifying damages and losses to property and livestock, calculating loss or impacts to the environment from floods, however, this area of study is not a fully researched thematic area. Thus, areas that need to be considered when conducting such assessments are vulnerable areas that can contribute to the environmental degradation (Gautam and van der Hoek, 2003).

Flood risks are normally determined based on hazards and vulnerabilities and thus these must be considered when trying to assess damages to environment (Rey W. et al., 2020). The hazards and vulnerable areas of concern which can contribute to degradation are, agricultural runoff, sewage waste contamination, garbage, and debris in drains or along roadsides, and runoffs from quarry pits. The runoff from these would be the source of possible contamination and pollution to the waterways and wetlands which eventually end up in the coastal environment.

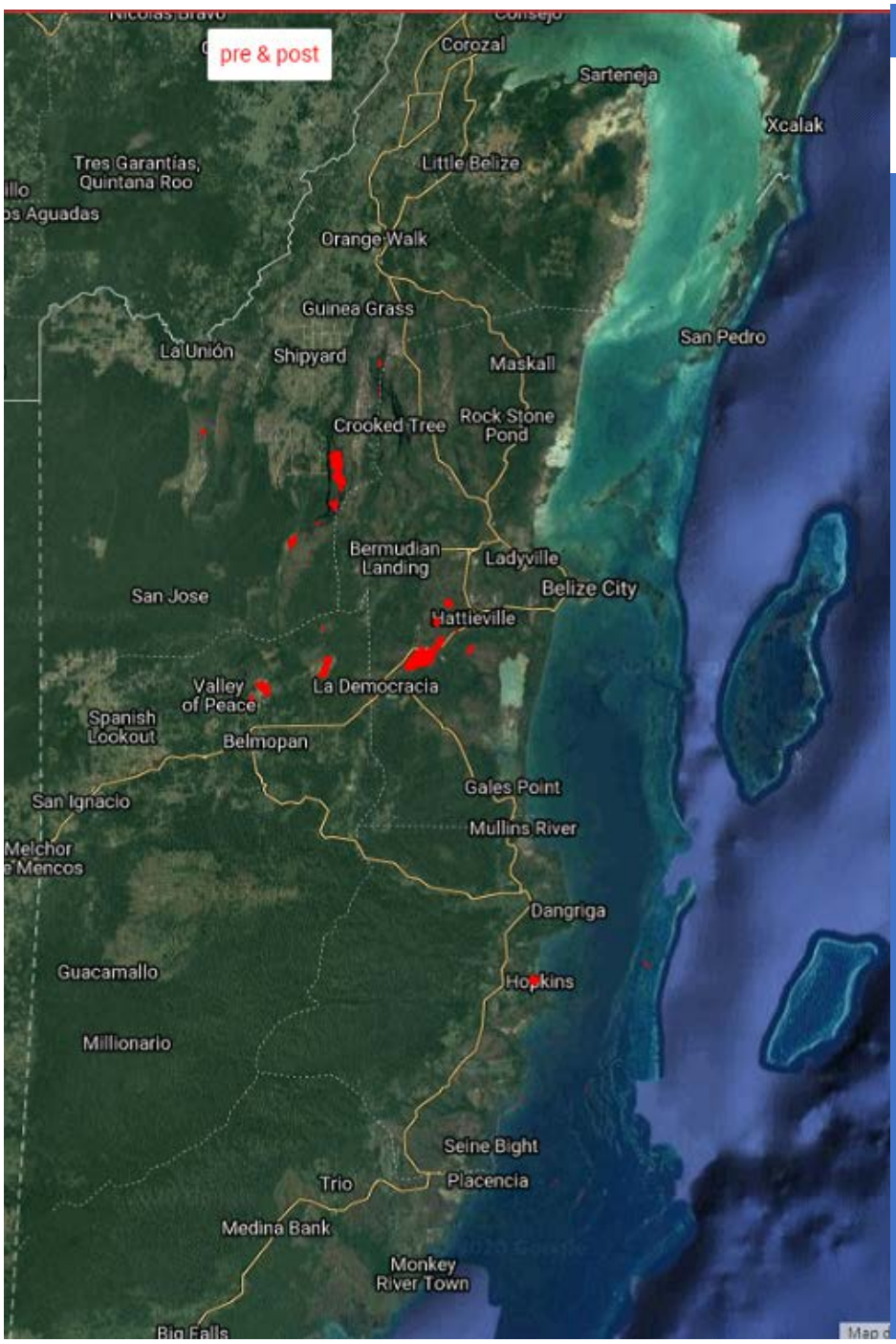
Agricultural runoff poses a significant risk to water pollution, in the US for example, agricultural non-point sources was the leading source of contaminants into waterways including wetlands (Ncube, 2015). The runoff can also be compounded by the remobilization of pesticide residues or chemicals already in the environment (Euripidou & Murray, 2004). Some of the vulnerable areas are low-lying farms near the riverbanks and streams which may use agrochemicals inputs in their farming practices. Apart from runoff, there is also the risk of contamination from sewage wastes.

Septic tanks and pit latrines, which are considered improved sanitation facilities are the most common methods of management of liquid wastes in Belize, particularly within the rural areas. The Belize Multiple Indicator Cluster Survey, 2015-2016, estimates that approximately 93% of our population use one of these systems. In the Belize and Cayo Districts septic tanks and pit latrine use accounts for approximately 63% and 0.3% of the population respectively (SIB, 2017). These systems can become inundated and compromised thus affecting the system or causing overflows into the flood waters, thereby contaminating the waters, and creating an environment which threatens public health and the quality of waters in these flooded areas.

Another factor to consider is garbage and illicit dumpsites along flood prone areas, roadways and drains. The garbage and debris can be washed away in flood waters ultimately ending up in our coastal areas which contribute to marine litter and microplastic pollution.

The literature review also suggests that another factor which can be considered a hazard is mining operations. However, this is more geared at mining for bauxite and other ores that can release heavy metals and other toxins which can be washed away during flood events. It is important to note that this type of mining is rare in Belize. The quarries in Belize are mostly for sand, gravel, clay and other similar materials, some of which are found in the Burrell Boom Area. River mining is also an activity that occurs along the high parts of the Belize River wherein sand, rocks and other aggregates are extracted. There is a possibility of loose materials associated with these activities washing downstream. Other environmental impacts associated with floods are erosion of riverbanks and coastal areas, however these are not being assessed at this time as these areas are still under flood conditions.

Environmental fate of all these pollutants and contaminants is the marine environment and ultimately, the coral reef. A study in 2009, revealed several common pesticides used in the banana and citrus industries were detected in significant levels along the study area, including the coral formation (Alegria, 2009). Flooding propelled agrochemicals into the marine environment due to runoff, considering that sections of the Santander farms and the Valley of Peace Farmers were reported to inundated because of these flooding events.




## AFFECTED AREAS

The flood affected several parts of the country. The map identifies the areas that were most affected and are likely to be affected by the rainfalls. The areas include parts of the Cayo District and Belize District. Localized flooding also affected several parts of the country resulting in the need for opening of shelters. These communities include: Gales Point Manatee, Hope Creek Village in the Stann Creek District and Santa Martha in the Orange Walk District and Chan Chen and Patchakan in the Corozal District. More prolonged impacts will affect communities such as Calla Creek, Santa Familia, Bullet Tree Falls, Burrell Boom, May Pen, and the communities along the Belize River Valley.

The above is not a comprehensive list of affected communities

*Image 1: Google Map of Belize, with areas in red being the affected areas, European Space Agency/Copernicus Sentinel Data,2020.*

The ecosystems affected on the mainland lie near and around the riparian zones along the riverbanks, agricultural areas, wetland areas, low-lying areas, and lowland savannahs.

**APPENDIX 1**


*Image 1: Shows flooded areas in the Cayo District from Calla Creek to Ontario Village; with aerial view of San Ignacio downtown, (European Space Agency/Copernicus Sentinel Data,2020).*

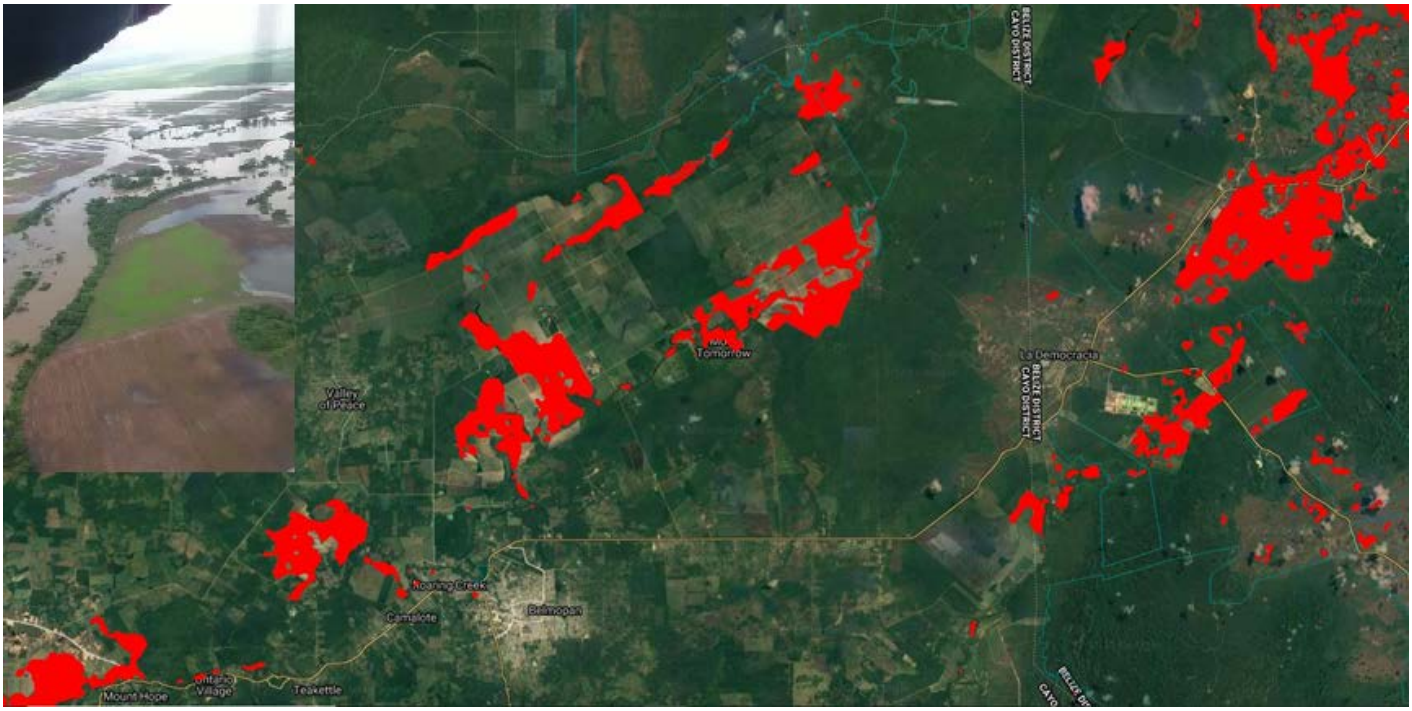



*Image 3: Flooded areas from Mount Hope to Democracia and note Flooding at Santander Farms, (European Space Agency/Copernicus Sentinel Data,2020).*

**APPENDIX 1**

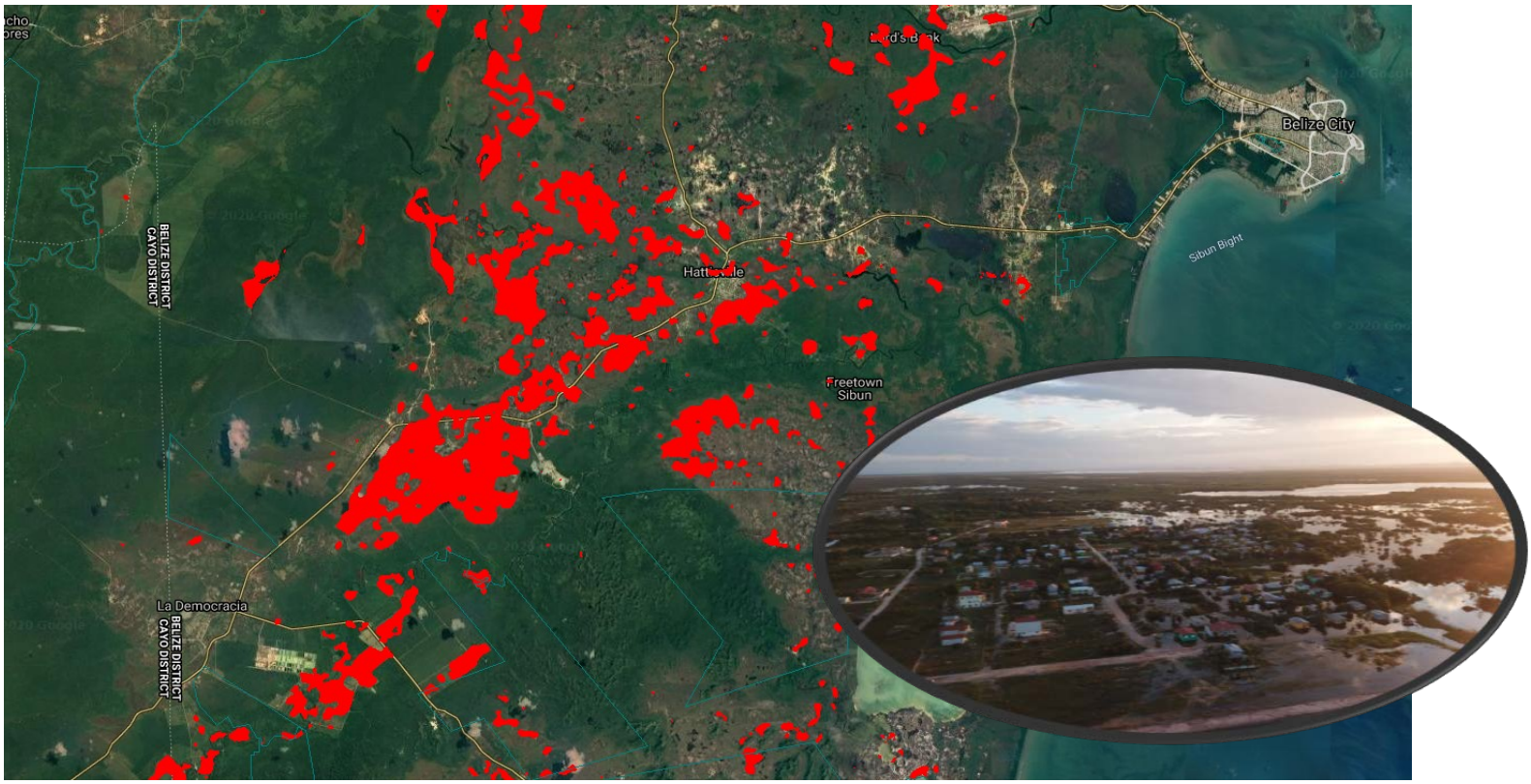



*Image 4: Flooded areas in the Belize District with picture of flooding at Western Paradise, (European Space Agency/Copernicus Sentinel Data,2020).*

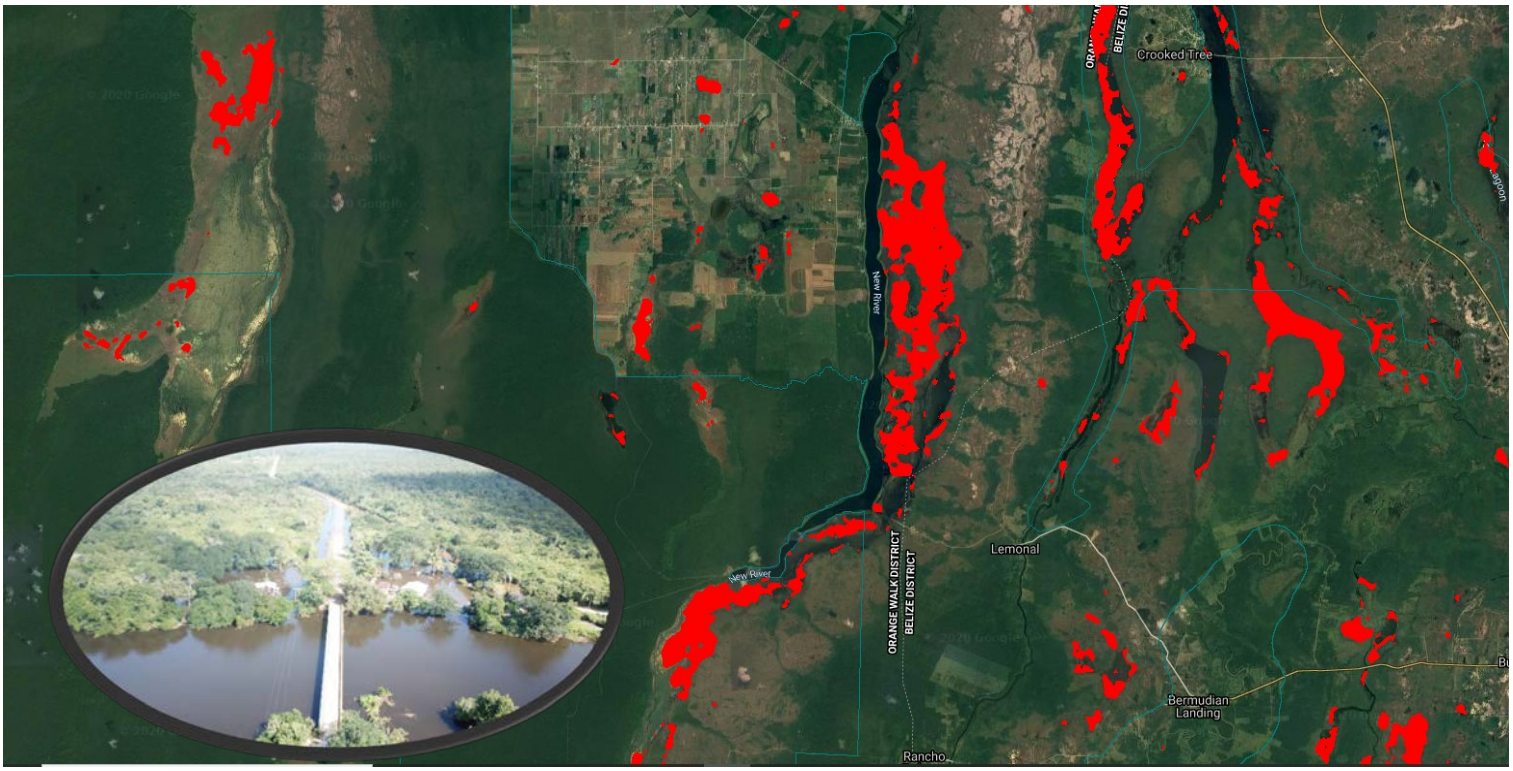



*Image 5: Flooded areas in the Belize District with image of flooding at Lemonal Village, Belize District, (European Space Agency/Copernicus Sentinel Data, 2020).*

### 2.9.2 Sensitive Areas/High Risk Areas

The approach taken by the Department was to contact the high-risk facilities in the various districts, however this report will concentrate on assessment conducted in the Cayo District as these high-risk facilities were the ones more prone to have been affected by the floods. High-Risk facilities do not include individual residence, mechanic shops and other light industries in the villages or the municipalities. Additionally, at the time of conducting this assessment, the excess water traveling down the Belize River did not affect the Belize City area. As mentioned earlier, there were flooding to the Valley of Peace Farms and Valley of Peace Association farms and sections of Santander Farms, all three of which uses vinasse fertilizer for the enhancement of soil for planting. As a result, it is expected that this would have some environmental degradation of the water quality within the Belize River. Table I below illustrates all those high-risk facilities contacted during the assessment and a narrative of their responses.

| Name of Organization / Company | District | Address / Location | Date of Comments- 24 November 2020 Information Collected from High Risk Facilities |
|---|---|---|---|
| Belize Natural Energy Ltd. | Cayo | Mile 3, Spanish Lookout Road, Iguana Creek | No Incident |
| Quality Poultry | Cayo | Center Road, Spanish Lookout | No incident |
| Cayo Grain & Agro Supply Ltd. | Cayo | Mile 54 George Price Highway | Raymond Barkman. No flooding. No loses in chicken and equipment. Crude oil is on high ground. |
| Vega Distributors | Cayo | Victoria Street, Benque Viejo Del Carmen | Diego Cruz (Sales rep. and researcher in the field). Have shelters for equipment and have private roads. Staff was given day off. Prepared before time, monitoring the flood in the field in the Valley of Peace. Plan was activated. They had harvested all their corn. A little of road erosion. In terms of fuel, it was secured and well stored. |
| Santander Farms | Cayo | 21 Saint Vincent Street, Belmopan (Office)<br>Facility Banana Bank | Ms. Rosalia Reymundo (HR Accounting Manager) they did activate their emergency plan. No Problem with Flooding they are in a hill and the warehouse is well secured. There was no incident. |

**APPENDIX 1**

| Name of Organization / Company | District | Address / Location | Date of Comments- 24 November 2020 Information Collected from High Risk Facilities |
|---|---|---|---|
| Maranco Ltd. | Cayo | 3 Iguana Creek, Spanish Lookout Road | In high alert. Did Activate the emergency plan. Now they are closed. Fuel/ Oil was secured. Fuel tanks were not all full just got enough to fuel 2 vehicles. Warehouse that stores fertilizers etc. are kept in a secured location. |
| Fab's Farming Supplies | Cayo | | Have not been in operation since March only a security guard is there. There are no chemicals/ oil/fuel on site. They are 3 1/2 miles from the river, so flooding did not affect. Everything has been moved and equipment has been stored. |
| Buca (Puma) Service Station | Cayo | Constitution Drive, Belmopan | No phone number found |
| Belize Western Energy Ltd. | Cayo | Forest Drive, Belmopan | No Incident |
| Femagra | Cayo | ½ Mile, Hummingbird Highway, Belmopan | No incident. |
| Cool Delights | Cayo | Forest Drive, Belmopan | called 2:48pm and said to call back in half an hour. Called back on Nov. 27, at 2:20 pm but Ms. Molina was out for lunch |
| Plett's LPG | Cayo | Center Road Lookout | They have done training yearly. The water did not reach the property. They are located on a small hill. |
| Belize Electric Company Limited (BECOL) | Cayo | Hydro Road, Benque Viejo | There was no incident (s) |
| Fein Catch | Cayo | La Democracia | Did activate the emergency plan last week. There was no incident. No large fuel tanks only keep about 100 gallons for generators. |
| Cross Road Farmer Supply | Cayo | Center Road Spanish Lookout | Called 622-6668 Mr. Florencio. But went to voice mail box. At 4:05 pm |

**APPENDIX 1**

| Name of Organization / Company | District | Address / Location | Date of Comments- 24 November 2020 Information Collected from High Risk Facilities |
|---|---|---|---|
| Corozal Farmers Supply | Corozal | 5th Avenue | No incident |
| Sunshine Industries | Cayo | 1096 My Refuge Road, Roaring Creek | Benjamin Freizen. No damages. No incident. Located on a hill. |
| Agro Veterinarian Jiron | Cayo | Savanah Street, San Ignacio | Far away from any creek. There were no incidents. |
| Reimer's Feed Mill | Cayo | Center Road, Spanish Lookout | No problem. They were on alert. In Corozal last week water reach by the roadside but did not enter the building. Belmopan and Santa Elena Orange Walk had no incident. Raised the chemicals about 2 feet due to the flooding. Using pallets. |
| Western Diaries | Cayo | Spanish Lookout | Did not have any loss. Had to move feed products to another area from San Ignacio to trucks up the hill close to Supermart Store. No incident in relation to fuel or agrochemicals. |
| Brodies | Cayo | Forest Drive, Belmopan | Chemicals are stored in a room. Fuel tank was not affected by the flood. Water did not reach the compound. Were on alert monitoring the water ponds. Located on high land. |
| The Wood Stop | Cayo | Forest Drive, Belmopan | Above flooding levels. There was no spill. Small creek nearby but there was no flooding the compound. Secured their drums and were on high on alert. |
| Pine Lumber Company Limited | Cayo | Georgeville Village, Cayo District | They took precautions. Management met and decided it was not necessary. Only the field got affected. |
| Spanish Lookout Community | Cayo | Spanish Lookout | Nidia Panti (Operations on the ground) 670-4410. Did not have any incident. Ponds are secured and there was no leak. |
| Valley of Peace Farms | Cayo | Valley of Peace | Did not activate the emergency response plan. Not been informed by any of the farmers of any issue or incident. There was no flooding in the general area. |

**APPENDIX 1**

| Name of Organization / Company | District | Address / Location | Date of Comments- 24 November 2020 Information Collected from High Risk Facilities |
|---|---|---|---|
| BSAL | Cayo | Western Cotton Tree Area | Did not have to activate emergency response plan. Everything was secured. Fuel and agrochemicals on high ground. Were on alert. Road on farms were flooded. Field was partially underwater. |

Table I: High-risks areas contacted during assessment along with responses from contact person

### 2.9.3 Water Quality

Degradation of the water quality is a major concern during flood events, weather from agricultural runoff, leachate of sewage or contamination with garbage. Water quality monitoring is one of the main ways to detect change in the waterways. The Department collected water samples along various points in affected areas for bacteriological testing, however the results are not yet ready. As such, the Department contacted the Belize Water Services Limited who presented water quality data result taken just prior to the flooding events and immediately after. These samples are taken from the facility's abstraction points. The information is listed below and labeled in Table 2.

**APPENDIX 1**

| DATE | | | 2-Nov-20 | 11-Nov-20 | 16-Nov-20 | 23-Nov-20 |
|---|---|---|---|---|---|---|
| Place Sample Collected | | DRINKING WATER GUIDELINE VALUES | RAW WATER - DRWTP | RAW WATER - DRWTP | RAW WATER - DRWTP | RAW WATER - DRWTP |
| Time Collected | am / pm | | 12:30 PM | 9:24 AM | 12:45 PM | 8:20 AM |
| **Chlorine** | mg/L | **0.5 - 2.0 mg/L** | RAW | RAW | RAW | RAW |
| **Total Coliforms** | colonies/ 100 mls | **0 colonies / 100 mls** | TNTC | 8500 | 12700 | 5700 |
| **Faecal Coliforms** | colonies/ 100 mls | | TNTC | | TNTC | 50 |
| ***E- Coli*** | colonies/ 100 mls | | TNTC | 0 | 50 | 36 |
| **ALKALINITY** | mg/L | | 135 | 82 | 122 | 102 |
| **CHLORIDE** | mg/L | | 25.2 | 10 | 7.9 | 11.0 |
| **FLUORIDE** | mg/L | | 0.102 | 0.064 | 0.091 | 0.080 |
| **IRON** | mg/L | | 1.07 | 1.780 | 0.32 | 0.22 |
| **HARDNESS, TOTAL** | TOTAL mg/L | | 202 | 138 | 154 | 141 |
| **NITRATE** | mg/L | | 6.98 | 3.12 | 4.41 | 5.37 |
| **SULPHATE** | mg/L | | 25 | 12 | 24 | 15 |
| **TRUE COLOUR** | COLOUR | | 24 | 29 | 27 | 48 |
| **TURBIDITY** | NTU | | 79.8 | 74.2 | 8.3 | 7.0 |
| **pH** | | | 7.99 | 7.62 | 7.37 | 7.23 |
| **ALUMINUM** | mg/L | | 0.017 | 0.007 | 0.081 | 0.00820 |
| **CONDUCTIVITY** | uS/cm | | 414 | 214 | 295 | 305 |
| **TDS** | mg/L | | 266 | 137 | 186 | 185 |
| **TEMPERATURE** | C | | 26.0 | 19.6 | 24.1 | 24.5 |
| **SALINITY** | ppt | | 0.199 | 0.102 | 0.140 | 0.145 |

*Table 2: Results of sample obtained by Belize Water Services Limited abstraction points at Double Run Water Treatment Plant.*

The results show high turbidity in the water, normally turbidity along the Belize River ranges between 0 NTU to 5 NTU. Turbidity is a measure of clarity of the water, excess turbidity is a cause of concern because it can provide shelter for pathogens. The turbidity at the sampling sites for November 2 and 11 were way above what is considered normal, then decreasing in the sampling done on November 16 and 23 were within the specific range. In terms of bacteriological parameters, total coliforms, fecal coliform, and E. Coli were also extremely high. On November 2, 2020, the colonies were too numerous to count (TNC). On November 11, 2020, there were approximately 8,500 colony forming units (CFU) per 100 ml of water. The results for the sampling done on November 16 and 23, 2020 were 12,700 CFU per 100 ml and 5,700 CFU per 100 ml, respectively. These increases are of concern because some of these bacteria can cause health impacts to persons in the areas. Additionally, the increased phosphates and sulfate levels seen are a direct result of runoff resulting from agricultural farms.

The images below labeled fig 6-10: illustrates the possible sources of pollution entering the water ways. Figures 1-4 illustrates the community of 8 Miles completely inundated. Figures 5 & 6 illustrates latrine within the Belize River Valley area, the Burrell Boom Transfer Station was also inundated and the erosion of the riparian forest and erosion of the riverbank, respectively. All sources of chemical and bacteriological pollutants entering within the waterways.

*Fig 6: Inundated homes at Western Pine*

*Fig 7: Inundated homes at Western Miles*

*Fig 8: Showing wetland areas towards Belize River*

*Fig 9: GP highway and west inundation*

*Fig 10: Pit latrine inundated*


*Fig 11: Transfer station inundated*

*Fig 12: Increased sedimentation due to erosion of banks*

### 2.8.5 Challenges and Assumptions

Challenges in conducting assessment for environmental impacts during flooding events is the flood itself. It is unsafe to collect waters sampling in flooded areas for risk of high energy currents. Additionally, the waters provide a barrier for establishing the impacted areas and the degrees of impact which would then be used to make an estimate of the costs associated with rehabilitation. Another challenge is that damage to coral systems for example requires a study baseline and continuous monitoring of parameters which are not usually collected for example pesticide residues.

It can be assumed that there will be a further strained on the health system considering that flooded waters normally result in the increased of vector borne diseases from mosquitos.

## 3.0 DAMAGE AND LOSSES COSTS

Placing a cost on the environmental damages brought forth by the flooding event is a difficult feat as the impacts are difficult to quantify, however we can quantify the costs associated with the decreased water quality. The Belize River is used by Belize Water Services to serve as the main potable supply for several communities. The increased turbidity and total coliform translate to increased costs for the treatment of

water. The same costs would be needed for rudimentary water supplies and for water companies that use the Belize River as its source.

According to the BWSL, because of the increased turbidity and bacteriological contamination of the river waters, there was an increased charge to further purify the abstracted water which resulted in the addition of aluminum as a coagulant treatment for the accretion of the excess particles suspended and dissolved within the water. Like aluminum, there was also excess addition of chlorine for treatment for E. coli and Coliforms. Both chemicals were increased up to about 50% the primary amount.

Another cost which should be considered is rehabilitation of areas degraded by the flood and other degraded areas like riverbanks, coastal areas, and the riparian zones. The estimation for rehabilitation is difficult to quantify because the areas are still flooded. These costs would include the costs of plants and replanting along the riverbanks. It would also include the costs for the aggregates such as sand, gravel etc. for the rehabilitation of any eroded banks.

The table below outlines the Total Economic Value lost after evaluation of the different ecosystem services and the cost to clean up as outlined according to the TOR for the Environment and Solid Waste Committee.

| Ecosystems | Ecosystem Services | Area affected | Economic Value (BZD) |
|---|---|---|---|
| Fisheries | Food production (scale fish, crabs, shrimp, turtles) | 47 fisherfolks | $21,150.00 |
| Forest | Timber, Tourism | Two protected areas and | $14,000 (tourism) $475,000.00 (timber) |
| Rivers (Fresh Water) | water provision. | Abstracting from different water source, additional treatment with aluminum and chlorine | $150,000.00 |
| Waste Clean up | Identification, collection and transfer of waste to designated site | Estuaries, Riparian Forest, and inundated areas | There was no cleanup conducted |
| | | **Total** | **$660,150.00** |

## 4.0 RECOMMENDATIONS

Based on this unprecedented flood event and the impacts on the environment it is imperative that the following measures be taken:

1. This flood event has highlighted the need to update the flood map and overlay with the hazard map, this will ensure that the areas previously not considered as high risk be accounted for in the future reference. Cabinet has directed that a national hazard mapping exercise be undertaken and to that effect a national task force has been established. Also, to inform post impact development, NEMO Department contribution to the GoB 100 days plan will inform hazard resilient home construction.
2. Although there was no analysis of fish samples taken, been cognizant that it is a means of earning an income, the consumption of freshwater fish species within the low-lying arears are not encourage. This is particularly recommended for those species that are predatorial species where bioaccumulation of pollutants may occur.

3. Recognizing the risks possess by climate change, developments within wetland areas should not be permissible without establishing a proper risk management plan.
4. Potable water within flooded areas should be provided from a well-treated and maintained source.
5. Although in many areas the maintenance of the 66ft reserve is not near enough for the control of pollution entering the rivers and stabilization of the riverbanks, at minimum, farmers along these rivers should be informed about the importance of maintaining the 66feet reserve as it helps with the preventing of agricultural runoff. The GOB should consider increasing the reserve along the rivers and facilitate the initiative of replanting of the riparian forest. This matter will be addressed at the LUA session in 2021.
6. Protect lowland areas and swamp lands which aid as basins during flood events. The construction of communities or agricultural plots in these vulnerable areas place these at risk. Moreover, removing natural drainage areas displaces waters into other areas during flood events. This matter will be addressed at the LUA session in 2021.
7. Ensure that the Ministry of Health advise residents affected by the flood about avoiding swimming or drinking of contaminated waters; they must also be vigilant for vector borne disease like malaria and dengue as some of these waters will stay stagnant and may provide breeding grounds for mosquitos.
8. Develop a system to detect pesticide residues along the coast of Belize to be able to detect change.
9. Most importantly, it is advisable that Belize establishes a Disaster Risk Retention Tool/instrument that can be used to deal with the occurrence of "recurrent, less severe events". This will allow the GOB to deal with unforeseen situations and should therefore establish guidelines for the creation of these contingency funds. Examples of these are Disaster Management Funds (DRM Funds), National Emergency Fund, National Fund for Disaster Prevention, Mitigation and Responses. Additionally, there can be established a fishing and agricultural Development fund where low interest loans are offered fisherfolks or farmers in the event of disaster.
10. Future reports must present information in the format requested by CCRIF, IDB, CDB and World Bank in particular highlighting the expenses incurred by the government. This is very important as these institutions have strategic recovery replacement capital that cab be injected post haste in the national economy Also budget allocation for the recovery from Finance need line items reflecting the activities that are redeemable through grant funding and loans from the IFIs so that SMART STREAM can be used to generate expenditure reports. Also Risk Financing budget allocations are required for each line ministry or the equivalent of an Emergency Fund.

## 5.0 PRIORITY NEEDS

Based on the preliminary damages and losses as a result of Eta and Iota, some of the immediate needs include materials for repair of roads, bridges, and culverts as those mentioned above and other affected areas; replacement of household furniture that were damaged, food packs, water, cleaning supplies, mattresses, hygiene kits and assistance in the agriculture sector for the rehabilitation of affected crops and livestock. There are also needs for health and sanitation to prevent and address health issues such as skin infections, diarrhea and other digestive problems due to water contamination.

## 6.0 CONCLUSION

Even though Belize was not directly hit by Hurricane ETA, the amount of rainfall received before, during and after this event cause major flooding to occur in the Belize Rural Area and throughout the country. With some houses under water for more than a month, residents were forced into shelters for an extended period while they waited for the flooding to recede.

**APPENDIX 1**

*Residents trying to cross Roaring Creek Bridge*

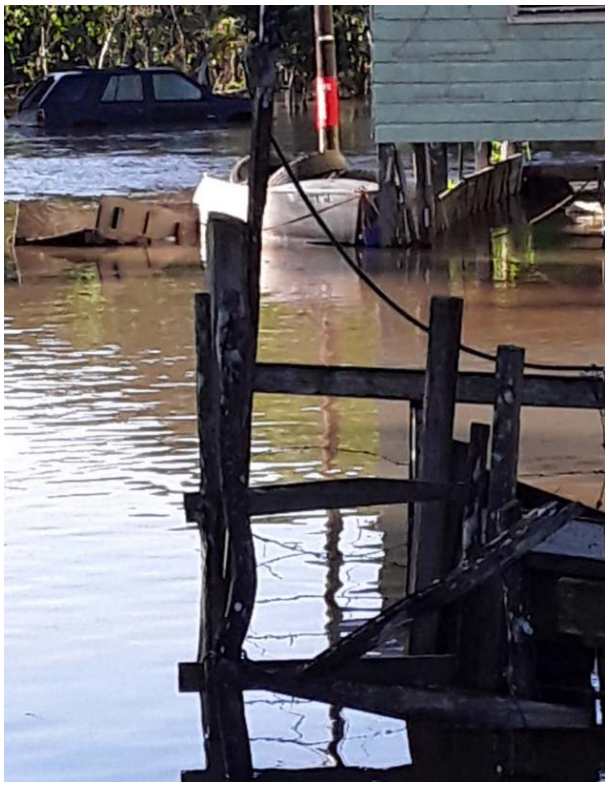
**Residents trapped in Calla Creek**

**Member of public trying to cross Roaring Creek Bridge 4 ft water**

**Rancho Dolores Bridge impassable**

**APPENDIX 1**

**Coast Guard assisting in Lemonal Village**



**Residence being affected in the village of Lemonal**

**Residents of lords bank through flood water with relief items**

**Inside of a resident house in the village of Burrell boom**


**Villagers of Rockville being assisted being trapped by flood waters**

**APPENDIX 1**

**Overview of San Ignacio Town**

**Mile 38.5 George Price Highway - St Matthews Village**

**APPENDIX 1**

Inundated homes at Western Pines

Inundated homes at Western Paradise

Showing wetland areas towards Belize River

GP highway and west inundation

Pit latrine inundated

**APPENDIX 1**


Transfer station inundated

Increased sedimentation due to erosion of banks

**APPENDIX 2**

# DRAFT TERMS OF REFERENCE

# CONSULTANCY SERVICES FOR INSPECTION AND CERTIFICATION OF WORKS

## 1. BACKGROUND

1.01 Hurricane Eta, the record-tying twenty-eighth named storm of the 2020 Atlantic Hurricane, and Hurricane Iota caused heavy damage across parts of Central America between November 3 and 6, 2020. With sustained winds of 140 miles per hour (224 kilometres per hour) and 10-12 inches of rainfall, Belize experienced severe flooding in the Western District of Cayo, Southern District of Stann Creek, and Belize District, including Belize City. Hurricane Iota, a Category 5 hurricane, made landfall as a strong Category 4 hurricane along the north-eastern coast of Nicaragua between November 16 and 17, 2020. Iota rapidly weakened as it moved inland and quickly dissipated on November 18, 2020. Nicaragua, which is located approximately 500 kilometres of Belize, experienced maximum sustained winds of 155 miles per hour or 250 kilometres per hour. The outer bands of Iota produced gusty winds and heavy rainfall (10-20 inches) in Belize, especially in Toledo, Cayo, Belize and Stann Creek Districts.

1.02 Immediately following the passage of Hurricanes Eta and Iota, the Government of the Belize (GOBZ) indicated its interest in obtaining an Immediate Response Loan (IRL) to address the damage caused. Since this expression of interest, GOBZ and staff of the Caribbean Development Bank (CDB) have had discussions and worked together to develop and agree on: (a) the scope of the proposed the consultancy; and (b) the Terms of Reference (TOR) for the consultant.

1.03 GOBZ has approached CDB for a loan to assist in financing the works in connection with the cleaning, clearing and restoration of essential services (the Works). CDB has agreed to make a loan of two million, five hundred thousand United States dollars (USD2,500,000) available to GOBZ.

## 2. OBJECTIVE

2.01 The objective of the assignment is to provide independent inspection and certification of the Works being funded under the loan.

## 3. METHODOLOGY

3.01 The Consultant will liaise with GOBZ and CDB; agree on the methodology to fulfil the TOR; and perform all investigative work and analyses required to realise the objective stated above. The methodology will involve inspection of all works in progress, including contract documents, design plans and specifications, and interface with the Project Coordinator (PC) to be appointed by GOBZ, and other relevant personnel in connection with the Works.

3.02 A major guiding principle will be close collaboration with all partners and stakeholders. To this end, PC will arrange the necessary meetings and site visits as required.

## 4. SCOPE OF WORK

4.01 The Consultant will:

(a) Liaise with PC and the CDB Operations Officer;

(b) Represent GOBZ at meetings and site visits of the technical team assembled by the Ministry of Finance;

(c) Review selection methods to ensure works contracts were procured in accordance with the Procurement Policy for Projects Financed by CDB (November 2019) and the Procurement Procedures for Projects Financed by CDB (January 2021), subject to the exceptions to these guidelines approved under the Disaster Management Strategy and Operational Guidelines (2021) (DiMSOG);

(d) Review any available invoices, receipts, payments, designs, drawings, specifications and other documents in connection with the proper carrying out of, and payment for, the Works in such detail as to verify, without undue duplication, their validity for completing the Works;

(e) Inspect the Works and require that such works be in accordance with the plans and specifications prepared by PC or other agent designated by GOBZ;

(f) Review and approve estimates and invoices submitted by the Contractors and suppliers for payment of works completed;

(g) Prepare payment certificates in a format acceptable to CDB; and

(h) Certify completed and ongoing works for reimbursement to GOBZ.

## 5. TIME, INPUT AND REPORTING

5.01 The Consultant shall furnish CDB and GOBZ with the following reports:

(a) one (1) copy each of a monthly report on the Works executed, with detailed costs and expenditures, and photographs (before and after implementation) within two (2) weeks of the end of each month;

(b) two (2) copies each of a draft Final Report on the services within thirty (30) days after completion of the Works; and

(c) two (2) copies each of the Final Report on the services after addressing any concerns of GOBZ, within two (2) weeks of receiving comments from GOBZ.

5.02 The Reports shall also be submitted in 'pdf format' as complete documents, as well as in Microsoft Word and Excel, AutoCAD, and/or other formats used in their creation. Electronic copies of all data used in the preparation of the Reports shall also be submitted to CDB and GOBZ.

## 6. QUALIFICATIONS AND EXPERIENCE

6.01 The consultancy should consist of at least one person having at least a BSc. in Civil Engineering, relevant experience in civil engineering and the certification of contractor payments and registered to practice as an engineer in Belize.

## BUDGET
**(USD)**

| **Item** | **Total** |
|---|---|
| Consultancy Services | 36,000 |
| Contingencies | 4,000 |
| **Total** | **40,000** |

**APPENDIX 3**

## ROLES AND RESPONSIBILITIES OF THE PROJECT COORDINATOR

The PC will report to the Chief Engineer, MOIDH. PC will be responsible for coordinating and monitoring all aspects of the implementation of the Project. He/she shall be assigned exclusively to the Project and will be supported by the administrative staff of the MOIDH. PC's duties will include, but will not be limited to:

(a) overall project coordination and monitoring;

(b) representation of GOBZ in all its dealings with contractors and direct labour;

(c) cost control and preparation of separate accounts for all project activities;

(d) preparation and submission to CDB of all applications for disbursement/reimbursement certified by the Consultant;

(e) liaison with CDB and the Consultant;

(f) arranging the necessary meetings and site inspections for the Consultant; and

(g) submission to CDB of a Project Completion Report within 60 days after final disbursement of IRL.