Guyana Water Incorporated

Water and Sanitation Sector Strategic Plan 2017 – 2021

Prepared by the GWI staff under the coordination of **Lancelot F. Mars**, Head of the Strategic Planning, Evaluation and Monitoring Department with the approval of

Dr. Richard Van-West Charles

Managing Director, GWI

Approved by the Board of Directors on 5/09/2017

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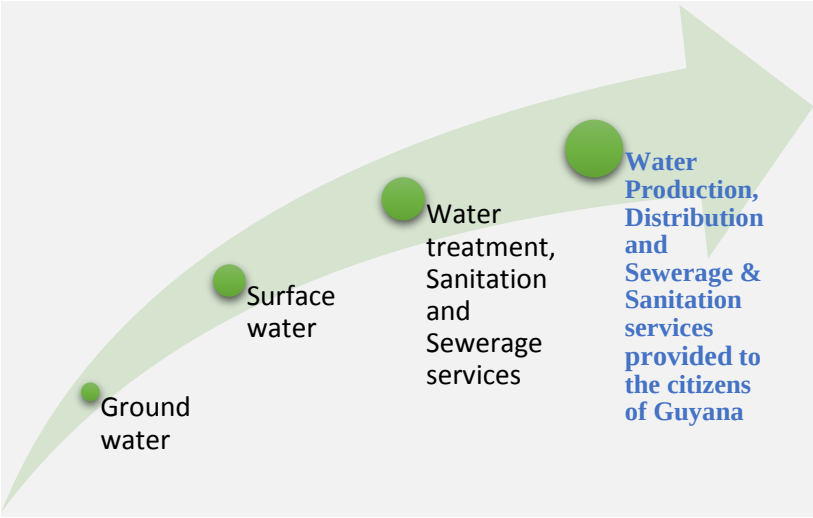
EXECUTIVE SUMMARY

GWI is a Government of Guyana solely owned Public Corporation charged with the responsibility for water production and sewerage disposal in Guyana. Its mission is directed towards equity of services of potable water with the highest quality standards at affordable rates and the furtherance of government's policy regarding watershed management. The Corporation's new 5-year Strategic Plan covers the period 2017 – 2021.



GWI derives 90% of its water from ground sources and the remainder 10% from surface sources. Water comes from 137 wells and is processed in 24 treatment plants. A review of the objectives and targets of the previous 5-year plan reveals that it did not adequately focus on the operational strategic objectives of the Corporation and demonstrated the supportive inputs required for mission success, not only to produce water but its elements of access, level of service and quality. **The new plan is projecting 212 million m^3 annual water production by 2021; 100% 24-hours availability to a level of 5 metres (coastal areas) with 100% WHO quality standards and the expansion of services in both the coastal and hinterland areas requiring a total Capital Budget of G$41.2 billion.** It will seek the PUC's approval for new Tariffs to generate additional revenue to cover costs. Funding for the new plan is expected from several sources, namely its own revenue G$6.3 billion, Government of Guyana (including electricity subvention) G$12.1 billion and the IDB/EU G$6.5 billion. It will be exploring additional funding for the **unfunded amount of G$16.3 billion which may extend beyond the 5-year program period**.

The operations support department has identified critical factors for mission achievement through their **Situation and Gap Analysis** such as an expansion of the customer base especially in hinterland communities and the reduction of Non-Revenue Water with rapid responses to leaks reports, 100% metering for all accounts and the decrease of chemical dependent processes for its treatment plants. It plans to replace the aging distribution lines in Georgetown with a new 'ring' system which will link all the distribution lines for redundancy and efficiency of supply to service connections. The Corporation also will focus on solar technology for its energy usage in keeping with the government's efforts to transform Guyana into a 'Green Economy'. GWI has reorganized several of its departments, notably water quality for better data collection and interventions to ensure quality standards. And, to address the problems with billing accuracy, it plans to replace the current HiAffinity Program with a new customer Information System. It introduced the concepts of Log frame, Situation Analysis of the population demand and the supply for water services and Program Budgeting to provide managers in the Operations and supporting departments with a blueprint for service delivery. The Corporation's programs are

being planned in tandem with regional needs and it has instituted a process for communicating with the RDC's and NDC's to provide service information and obtain insights into development plans for communities. It has also developed an interactive public communications process (App) which allows customers and citizens to communicate and receive information on its services.

THE CORPORATION

Guyana Water Incorporated (GWI) was created in 2002 under the Water and Sewerage Act of Guyana and serves as the Public Supplier of water and sewer services in Guyana[1] under a license issued by the government and functions under the ministerial control of the Ministry of Communities. Its service standards and rates are monitored and regulated by the Public Utilities Commission (PUC)[2] which sets its Tariffs or charges for consumer water and sewerage services. The Minister of Communities is required to present GWI's Annual Report to Parliament by the ninth (9) month each year in a report to the sole shareholder (government) on behalf of the citizens of Guyana. Its functions and responsibilities are administered by a Board of Directors comprised of persons appointed by the Government of Guyana and the day-to-day administration is the responsibility of the Managing Director with the Corporate Management Team (CMT) comprised of various Executive Directors, in addition to managers, supervisors and non-management personnel.

1.1 Vision

The Corporation's vision statement is: To ensure an efficient, sustainable and financially viable water and sewerage Corporation delivering a high quality of service to customers.

1.2 Mission

Its mission is: To deliver safe, adequate and affordable water and ensure safe sewerage systems for improved public health and sustainable economic development.

1.2.1 Customer Centered Focus

GWI sees its mission's focus on the citizens of Guyana who use water and sewerage service provided by the Corporation. It therefore, is the central objective of the plans for service delivery in this Strategic Plan.

1.3 Operating License

GWI has an operating license for the supply of water and the collection of waste water. The Corporation has advocated changes to some sections of the license such as the process for customer service disconnection for non-payments, unobstructed access to customer property and enforcement of penalties for charges. Efforts were made to obtain approval for these and this will continue during the life of the new plan, with the addition of a recommendation for Tariffs changes.

1.4 Government of Guyana Control

GWI operates under Government of Guyana ministerial control. The Minister of Communities has ministerial responsibility for the Corporation and presents an annual report to Parliament

[1] See Pgs. 74-75 (Maps of GWI Operational Areas)
[2] See Public Utilities Commission Act.

on the activities of the Corporation. This is in lieu of the Annual General Meeting (AGM) which is required by corporations for reporting to its shareholders which in this case if the Government of Guyana.

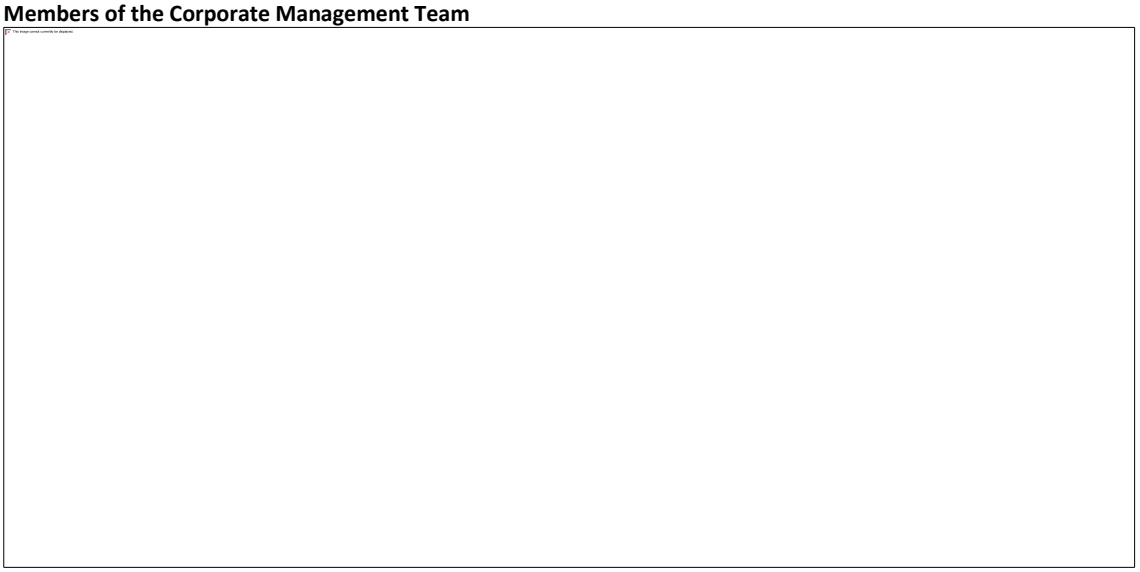
1.5 Corporate Governance

The corporate governance of the Corporation is carried out by the Board of Directors and the day-to-day management of the Corporation is the responsibility of the Managing Director, Dr. Richard Van-West Charles. The structure is also comprised of the Corporate Management Team (CMT) with Executive Directors and department heads. The CMT meets at least monthly to review organizational performance and managerial effectiveness and approve plans for operations and administration. Going forward, it will be the forum for planning and design and program execution meetings and the discussion of monitoring and evaluation reports submitted by the Strategic Planning Department. It will also receive reports from the Cross-Functional Programmatic Committees.

1.6 Cross-Functional Programmatic Committees

GWI has five (5) Cross-functional Programmatic Committees which monitor Water Production and Quality, Water Supply and Distribution, Sanitation, Organization and Management and Finance and Revenue. The committees meet monthly to review and approve operational matters.

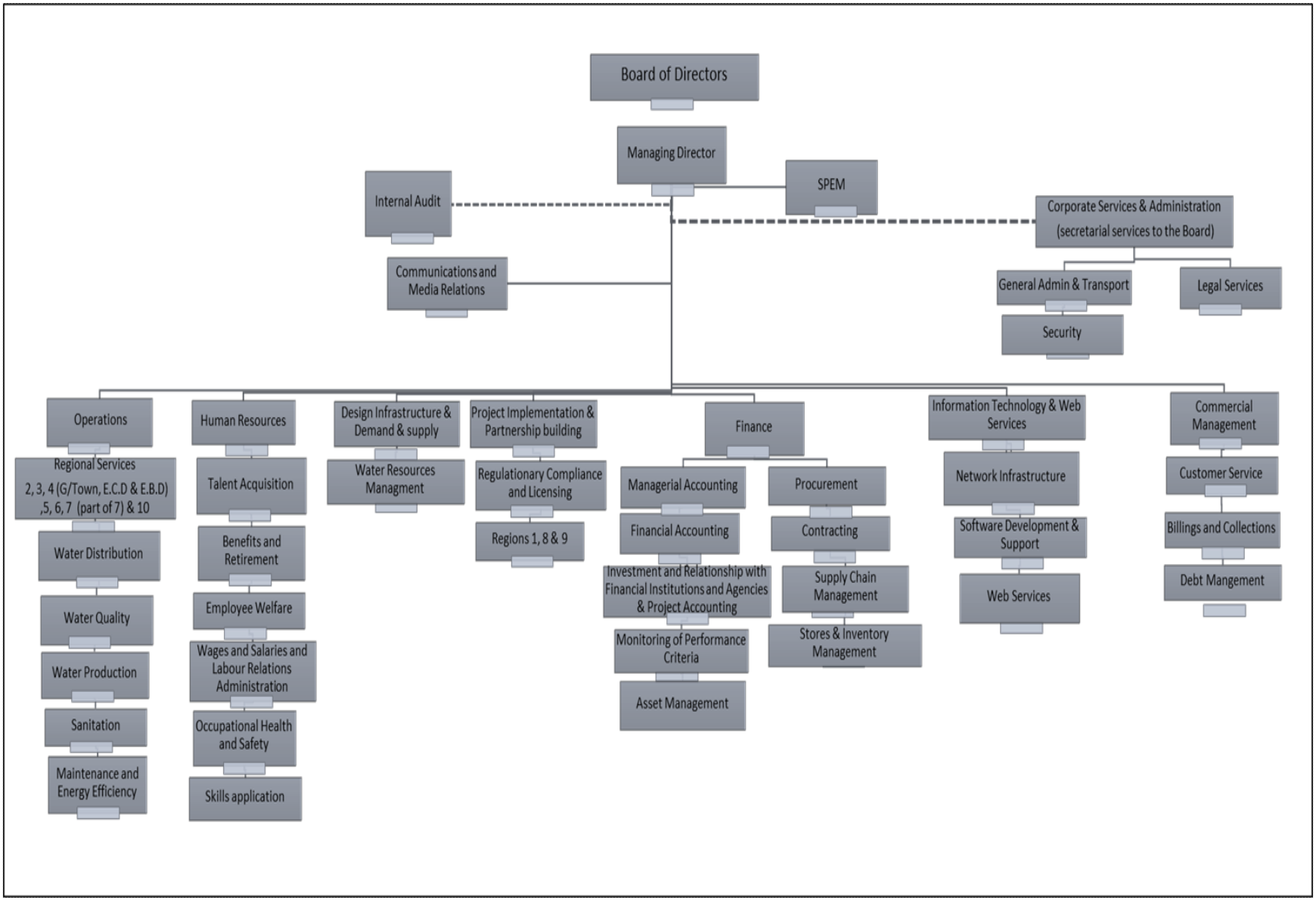
Members of the Corporate Management Team



Members are left to right, Ramchand Jailal, Executive Director of Project Implementation & Partnership Building, Nigel Niles, Corporate Secretary & Executive Director of Corporate Services, Dwayne Shako, Executive Director of Operations (back row), Gail Doris, Executive Director of Human Resources, Lancelot Mars, Head of the Strategic Planning, Evaluation and Monitoring (back row), Marlon Daniels, Executive Director of Commercial and Customer Relations, Joseph Codette, Sr. Technical Advisor (back row), Beverly Fields, Acting Head of the Information Communications Technology, Jaipaul Ram, Executive Director of Finance (back row), Aubrey Roberts, Executive Director of Planning & design and Dr. Richard Van-West Charles, Chief Executive Director.

ORGANIZATION CHART

The organization chart with the positions that support the Corporation's mission objectives is listed on page 14.


Board of Directors
Managing Director
SPEM
Internal Audit
Communications and Media Relations
Corporate Services & Administration (secretarial services to the Board)
General Admin & Transport
Security
Legal Services
Operations
Regional Services 2, 3, 4 (G/Town, E.C.D & E.B.D) ,5, 6, 7 (part of 7) & 10
Water Distribution
Water Quality
Water Production
Sanitation
Maintenance and Energy Efficiency
Human Resources
Talent Acquisition
Benefits and Retirement
Employee Welfare
Wages and Salaries and Labour Relations Administration
Occupational Health and Safety
Skills application
Design Infrastructure & Demand & supply
Water Resources Managment
Project Implementation & Partnership building
Regulationary Compliance and Licensing
Regions 1, 8 & 9
Finance
Managerial Accounting
Financial Accounting
Investment and Relationship with Financial Institutions and Agencies & Project Accounting
Monitoring of Performance Criteria
Asset Management
Procurement
Contracting
Supply Chain Management
Stores & Inventory Management
Information Technology & Web Services
Network Infrastructure
Software Development & Support
Web Services
Commercial Management
Customer Service
Billings and Collections
Debt Mangement

A REVIEW OF THE 2012-2016 PLAN

2.0 Plan Development

The Corporation's previous Strategic Business Plan covered the period 2012 to 2016. The plan was developed with the assistance of the Inter-American Development Bank in July 2012. It succeeded GWI's Turn Around Plan (TAP) which was used to chart the course for the Corporation in prior years.

2.1 Plan Objectives

The major objectives were the achievement of operational break-even in year 2015, reduction of Non-Revenue Water to 35% by 2016, 100% metering of customers by 2015 and the introduction of regulatory and enforcement mechanisms listed in the business license which was issued in November 2012. Additionally, the Corporation expected to improve levels of service to communities, increase coverage for new customers, decommission non-functioning wells and drill new wells, extend distribution and transmission mains, create District Metered Areas, construct and complete new water treatment plants, increase hinterland communities' coverage and conduct an Aquifer Study.

2.2 Key Performance Indicators

The 2012 - 2016 plan had several performance indicators which measured the achievement of departmental targets and organizational objectives. The table below shows a summary of the performance indicators and achievements.

Table 1: **Summary of the Key Performance Indicators**

Indicator	Target	Performance
Break-even	2015	Not achieved
Treated water coverage	75%	50%
Metered coverage	95% (2015)	45%
Hinterland coverage	85%	<80%
Non-revenue water (NRW)	35% (2016)	>60%
Energy efficiency	n/a	49%
District Metering Areas (DMA)	Activation of 142	25 activated[3]
Priority investments - Purchase meters - Purchase pumps, motors and panels	$5.7 billion	$1.5 billion
New Regulatory enforcement	2012	Not achieved

2.3 A General Review

A review of the plan years, indicates that although GWI personnel were aware of the Key Performance Indicators (KPI's), nevertheless there is very little evidence that data gathering and decision-making were tied to the monitoring and evaluation of performances with the objective of target achievement. Consequently, it has been a challenge to evaluate organizational performance against stated goals and objectives. Some examples of this are targets for revenue, billing and collections which were determined by the finance department and transmitted to the commercial department for implementation without reviews and adjustments for

[3] Some are inactive and do not provide date for production planning.

performance variances. References can be made to the data verification of the customer database which is incomplete, the introduction of new tariffs which were not instituted and the use of statistical data (compiled and recorded on the Accountability Framework report) which has not been used for decision-making. Operationally, while there was great emphasis on the creation of District Metering Areas (DMA) and 100% metering, there is very little evidence that these objectives were aggressively pursued. At the end of 2016, 55% of the accounts were unmetered and while there were 410 Domestic Consumption Meters (DCM) which can provide data on the consumption of non-metered customers, this program has not been effective due to the flawed process of measuring input and output and the exclusion of time measurement.

2.3.1 Financial Performance

The state of the Corporation's finances seems to have a limited relationship to the Key Performance Indicators (KPI) for the 2012 - 2016 plan and it is noteworthy that the projected break-even for year 2015 was not achieved. The overall investment amount that was projected was US$155 Million with sources being from the Government of Guyana, international donors, financial institutions and GWI's own revenue. The total funding received by GWI during the 2012 – 2016 period was $13.6 Billion as shown in Table 2 below and this proved to be inadequate for the fulfilment of mission objectives.

Table 2: **Infrastructure Financing 2012-2016**

Years	FY2012	FY2013	FY2014	FY2015	FY2016	Grand Total
GoG	$1,155.000	$1,367.000	$1,844.960	$629.896	$627.204	$5,624.060
IDB	$1,084.448	$1,183.079	$1,223.442	$613.246	$361.350	$4,465.565
GWI	$533.867	$578.676	$772.938	$554.905	$927.289	$3,367.675
EU					$125.190	$125.190
Grand Total	**$2,773.315**	**$3,128.755**	**$3,841.340**	**$1,798.047**	**$2,041.033**	**$13,582.490**

Source: Ministry of Finance, GWI's Finance Dept.

2.3.2 Internal Audit

During the program years, the Corporation's policies and procedures were subjected to various audits to ensure that they were followed and work was satisfactorily performed. These audits, while not identifying any major non-compliance issues, were somewhat flawed since the personnel charged with the execution of verification duties were not fully trained to conduct technical inspections. Hence, the department's effectiveness was constrained to the identification of supporting documentation for the financial approval of payments, especially related to contracted services.

2.3.3 External Audit

The Corporation's finances were subjected to external audits over the plan years. These forensic audits highlighted many issues related to non-conformance with standard accounting practices and indicated the need for major improvements in financial reporting.

2.3.4 Proposed expenditure

The execution of the plan required expenditure in the areas listed hereunder and the table shows the proposed expenditures[4] in billions of Guyanese dollar.

[4] See Section 3.22-Current Projects.

Table 3: **Planned Expenditure**[5]

Indicator	Proposed Expenditure
Water Meter installation	$4.716 Billion
DMA construction and upgrade of service	$1.000 Billion
Pumps, Motors and Panels	$400 Million
Drilling new Wells	$1.750 Billion
30K of Sewerage Infrastructure Rehabilitation	$4.000 Billion
363K of Transmission Mains	$6.145 Billion
636K of Distribution Mains	$8.656 Billion
Construction of Water Treatment Plants	$7.200 Billion

2.3.5 Priority Investments

The Corporation had a priority projection for the purchase of new meters to improve billing. However, the number of unmetered accounts today represent 55% of all accounts with corresponding revenue deficits due to the high consumption and low charges for unmetered accounts. A singular problem regarding meter purchase has been the Corporation's failure to receive the projected G$4.7 Billion, in addition to another G$1 Billion for upgrading existing meters. This can be attributed to the lengthy administrative and procedural procurement process.

2.3.6 Replacing and Upgrading Electrical and Mechanical Units

The Plan also required investments for the critical replacement and upgrading of Pumping and Electrical Units, Electrical Panels, Power Factor and the installation of Variable Frequency Drives. At the end of 2016 many of these items were not procured due to delays in the approval process with the dire consequence of limited spares being available for replacements.

2.3.7 Salinity (intrusion of salt water) into the Aquifer

The plan identified the problem of salinity (salt water intrusion) in the Aquifer due to the close location of wells to the Atlantic Ocean. However, since there is very little evidence offered to support this contention, GWI instituted water quality testing for all wells in geographic proximity to the ocean to determine whether there are any significant levels of salinity and since this type of intrusion is usually barely perceptible and may only become a problem over time, it was felt that testing would offer adequate early warning for corrective measures to be instituted if alarming levels of salinity are found. The Corporation also felt It would be prudent to conduct geological testing of the areas where future wells are to be located to determine salinity. The salinity levels were measured in wells along the coast as part of ongoing efforts to safeguard water quality, and to ensure that these aquifers are protected from saline intrusion from the nearby sea. The following wells were monitored and their corresponding salinity values are reported in the table below.

[5] While there are records showing actual disbursement, the data for comparison is unavailable since disbursement was not tracked by these categories.

Table 4: **Salinity measurements in wells along the Atlantic Coast**

Wells	Salinity: % (or mg/l)	Category of water
Kingston	0 % or (0 mg/l)	Fresh
Turkeyen	0 % or (0 mg/l)	Fresh
Better Hope	0.08 % or (800 mg/l)	Fresh
Friendship	0 % or (0 mg/l)	Fresh
Haslington	0 % or (0 mg/l)	Fresh
Victoria	0 % or (0 mg/l)	Fresh
Unity	0 % or (0 mg/l)	Fresh

The table above shows that 6 out of the 7 wells recorded zero salinity. Better Hope recorded 0.08% which is extremely low and thus it can be concluded that each of these wells have fresh water and there is no saline intrusion at this point. Routine measurements will continue to monitor the salinity content.

2.3.8 Program Indicators

A comparison of the forecasted program indicators for the final plan year is shown in the table below. **No data** indicates that no prior information is available or was lost due to the cyber intrusion.

Table 5 **-Indicators**

Performance Indicator	Description	2016 Target	2016 Actual
NRW	% of volumetric production, unbilled	35%	>60%
Inaccurate accounts	Number of accounts physically verified	100%	N/A
Metered billing	% of customers meters read % of customers billed	100%	61%
Leakage	Number of DMA's commissioned26	26	N/A
Leakage	Estimated % of production lost through leakage based on DMA data	25%	N/A
Metered coverage	% of customers with revenue meters	95%	45%
Domestic Consumption Monitor	% of customer database monitored on un-metered basis	5%	N/A
Water Quality -Treated schemes sampled	% of schemes sampled (source/distribution) per quarter	100%	N/A
Residual Chlorine	% samples at source meeting WHO guidelines on residential chlorine	100%	77%
Residual Chlorine	% samples in distribution meeting WHO guidelines on residual chlorine	100%	45%
Dissolved Iron	% samples at source meeting WHO guidelines on dissolved Iron	100%	71%
Total Choliform	% samples meeting WHO guidelines on total Choliform at source	95%	24%
Fecal Choliform	% samples with zero Fecal Choliform at source	100%	94%
Total Choliform	% samples meeting WHO guidelines on total Choliform in distribution network	95%	16%

Performance Indicator	Description	2016 Target	2016 Actual
Fecal Choliform	% samples with zero Fecal Choliform in distribution network	100%	86%
Water Quality – Untreated schemes sampled	% of schemes sampled (source and distribution) per quarter	100%	No Data
Fecal Choliform	% samples with zero Fecal Choliform at source	100%	91%
Fecal Choliform	% samples with zero Fecal Choliform in distribution network	85%	88%
Hinterland coverage	% Hinterland communities with access to water	80%	71%
Hinterland cost recovery	% recovery of direct operational costs in small town	25%	N/A
Wells Static Levels	% operational Wells monitored quarterly	95%	90%
Pumping levels	% operational Wells monitored quarterly	95%	95%
Specific Capacity	% operational Wells monitored quarterly	95%	80%
Energy Efficiency -Net system efficiency	Average % conversion efficiency of power supplied to hydraulic power output estimated from rolling audit	70%	55%
Wells rationalization	Decrease the number of operational Wells in areas of acceptable levels of service	8	N/A
Sewerage – Disposal Efficiency	100% - Sewer system % unplanned downtime	95%	N/A
	Ratio of volume entering to volume extracted at pump stations	100%	N/A
	Number of overflows on gravity side of system	TBD	N/A
Finance and Commercial	Revenue (G$ Billion)	6.6	5.7
	Collection Efficiency	90%	72%
	Cash Collected (G$ Billion)	5.94	3.37
	O&M Cost (G$ Billion)	6.3	7.92
	Depreciation (G$ Billion)	2.0	1.21
	O&M Cash Expenses (G$ Billion)	4.3	4.97
	O&M Cash Expenses (G$ Billion)	4.3	N/A
	Operating Deficit (G$ Billion)	0.3	4.55
	Government Subvention (G$ Billion)	0.0	2.3
	Remaining Deficit (G$ Billion)	0.0	2.25

2.3.9 Non-Revenue Water

Non-Revenue Water (NRW) featured prominently in the plan and a 35% target was set for its reduction. However, at the end of the plan years, it was still high at >60%. An assessment of the reasons for this failure demonstrates that real losses due to leaks and other types of water usage are not effectively monitored and have contributed to this phenomenon. In many instances, customers have complained that they observed and reported leaks and the Corporation's response seemed to have been inadequate with a low sense of urgency.

Administratively, the Corporation failed to put in place a process for the rapid deployment of personnel to fix leaks or to ensure through inspection that repair work was done satisfactorily. Additionally, regarding commercial losses, there were and continue to be problems with the HiAffinity Program which houses the customer database and contains grave inaccuracies which contribute to billing errors, account adjustments and has a negative effect on the Corporation's financial performance. It has been observed that the inaccuracies of the customer database inhibit a true accounting for water usage and the capture of information on illegal connections and connections to unoccupied or abandoned properties for appropriate action. The plan required the creation of District Meters Areas (DMA's) for the monitoring of consumption and the data would be used for service level decision-making. And, there would be Domestic Consumption Meters (DCM) for monitoring unmetered consumption. However, a review of these programs reveals that insufficient investment and lack of planning and assignment of personnel for the implementation of these programs resulted in them being inadequate and ineffective.

2.3.10 Water Production

Water production was projected to increase during the plan years but there were no detailed plans for increasing customer access, level of service and continuity of supply. There was an absence of planning and design which would ensure the service meets customer expectations and covered more communities progressively over the years. 2016 (end of the plan years) water production was 148 million m^3.

2.3.11 Water Quality

While water quality has been identified as a critical factor for the Corporation's service delivery, the previous plan failed to address quality issues that required speedy identification and remedial action especially in the hinterland areas. Accepting the fact that surface water is most vulnerable to infiltration and can cause water borne diseases and that most of the hinterland areas have surface sources for supply, it was critical for water quality testing processes and timely decision-making should have been accorded greater emphasis. Leaks caused contaminated water to enter the distribution and supply system, especially in instances where lines were submerged in drains or trenches. These problems remained hazardous to water quality and were not addressed adequately.

2.3.12 Treatment Process

The five (5) treatment plants at West Watooka, Wisroc, Linden Power Corporation (LPC), Wismar and Wisroc in the Linden area were not expected to continue operations and there were no plans for their rehabilitation to improve their efficiencies. Instead, the plans were to have them fully replaced with two (2) new plants at Amelia's Ward and Wisroc. GWI obtained evaluations from international experts which state that the treatment processes used in the existing plants are in many instances unsuited for the type of water source in the respective areas. Also, there is criticism regarding the heavy reliance on chemicals such as Alum which must be imported (there is an opportunity to develop local substitutes). In comparison with other water utilities, an example being neighboring Suriname, visits to their plant has shown that there can be less or no reliance on chemical usage when the plants are designed to use natural aeration processes.

A review of the new plants demonstrates problems with design of process and construction and it is evident that GWI was poorly served with technical oversight by the program advisors. Recently, the Government decided that the plants should be rehabilitated and it noteworthy that GWI is expected to finance the costs from its operating budget since the loan financing does not cover rehabilitation costs. Data derived from a Government of Japan funded study shows that the process for treatment using slow sand filtration for groundwater from 'A' sand wells should be of paramount consideration in designing new treatment plants due to the prevalence of 'A' sand wells.

Currently there is approval for the construction of three (3) treatment plants at Diamond, Sheet Anchor and Uitvlugt. However, GWI has concerns that the process design for these plants is not suited for their locations and information obtained from international experts indicate that a different design would permit the use of a less chemical intensive process and the cost of construction and operations would be greatly reduced. Representation regarding this program has been made to the Government of Guyana and the IDB and the corporation is awaiting a final decision.

2.3.13 Aquifer and Wells Performance

The plan addressed the requirement for safeguarding the Aquifer and stressed the need for Wells performance efficiencies and recommended decommissioning of some Wells. However, there is very little evidence that studies were initiated or attention was paid to the Aquifers and Wells locations either for development of infrastructure or during operations. Consequently, no Wells were decommissioned and since limited funds were expended on the maintenance of Wells, their efficiency levels declined over the years.

2.3.14 Sewerage

During the plan years, the Corporation provided sanitation services for wastewater primarily in Georgetown. These households use sewerage services to a limited degree while the areas outside of Georgetown make greater use of Latrines or residential septic tanks for their sewerage services.

2.3.15 Energy Cost Reduction

A review of the plan demonstrates that energy costs were related to the operational hours and affected by power outages due to Guyana Power Limited (GPL) and there was poor planning for the use of alternative energy sources. The fact that there is a Government of Guyana subvention which covers electricity costs seemed to have resulted in few efforts for cost reductions through efficient energy usage.

2.3.16 Hinterland Service Access

The plan highlighted some service operations in hinterland communities. However, commencing in the latter half of 2015, the Corporation's services begun rapid expansion beyond the scope outlined in the previous plan. The service expansion is directly related to reports of water borne diseases and health issues which created the need for testing and interventions to ensure safe water services. Services were expanded in many riverain communities with new wells and improved analysis and quality control of the water supply. New wells were drilled at Mahdia and Princeville, Rupertee, Aranaputa, Wowetta, Marcanata and Kwamwatta and at Silver Hill. A new water supply system was completed in Monkey Mountain. GWI purchased portable filtration units which have been distributed to communities including Kamarang, Kako,

Quebenang, River View and Karrau for use for filtering water and making it safe for consumption. In addition, four larger units, which are named "Lifesaver C2" have been purchased and installed in Kamarang, Kako, Baracara and Tassarene.

The new Project Implementation & Partnership Building department continues its responsibility for certain hinterland regions (1, 7, 8 and 9) and the communities within them which were previously under the control of the Infrastructure Planning and Implementation Department (IPID). Some of the communities are densely and others are sparsely populated and thus the service is tailored to suit. Their water is derived primarily from the rivers and creeks since most persons live along the waterways. They share the land space with miners and the water sources are susceptible to chemical intrusion both in the waterways and from ground seepage. GWI expects that governmental monitoring of mining activity will help prevent these intrusions and it will ensure that through frequent sampling and expeditious interventions, the water supply will be safe for the communities. The operations for these regions are set out in Section 7.0.

2.3.17 Water Treatment

Water treatment for the hinterland communities is planned as follows: Lethem and Mabaruma 100% in 2017, Mahdia, Port Kaituma and Moruca 100% in 2018, Region 1, 15% by 2021, Region 7, 10% by 2021, Region 8, 15% by 2021 and Region 9, 15% by 2021. The percentages are based on the geographic conditions in the regions.

2.3.18 Integrated Water Resources Management

A review of the efforts expended on Water Resources Management reveals that there were no structured processes for coordinating the activities of the various stakeholders. The committee that is expected to provide a forum for discussions and decision-making is non-functional.

2.3.19 Storage

While the production of water continued to increase, there were problems with the supply due to limited storage facilities. Although there were overhead storage tanks, the Corporation seems to have neglected their monitoring and upkeep and their use was largely discontinued and some were dismantled and sold. This was done despite the need for expansion of service access in many communities hence today, inadequate storage is limiting water supply and preventing the regulation of distribution to ensure continuous supply over a 24-hour period.

2.3.20 Asset Management

The need for upgrading the Asset Management process was highlighted by the Auditors, signaling that very little effort was expended in ensuring that the Corporation's assets were properly documented and managed. This continues to be needed and it is expected that it will be addressed in the new plan.

2.3.21 Flood Protection

While it is understood that the Corporation had a Disaster Flood Plan which was used during the last flood emergency, there is no evidence that the plan has been updated and there is a strategy in place for its activation in the next emergency. Special construction was done around pump stations on the coastal areas to ensure protection from flooding of the water production and storage areas. GWI has commenced an inspection of protective measures and will plan and institute measures to protect the infrastructure from flooding in the future.

2.3.22 Plan Monitoring

The Corporation failed to create a department dedicated to monitoring and evaluating the performance indicators for the plan and this lead to poor target achievement or in some instances, difficulty in identifying any achievement. This problem has been addressed with the creation of the Strategic Planning, Monitoring and Evaluation (SPEM) department[6] in the latter half of 2016. The department is tasked with reviewing the 2012 - 2016 plan and preparing a new 5-year plan (2017–2021) with KPI's for monitoring and evaluation to facilitate timely decision-making and enhance organization performance.

2.3.23 Accountability Record

Notwithstanding the issues raised in section 2.3.20 above, data on the plan's Performance Indicators were collected in the format of an Accountability Record, which was compiled monthly. Departments were required to submit data on their performance indicators to the operations department. This process has been streamlined so that the data while it continues to be compiled by the operations department, it is now being reviewed by personnel in the strategic planning, evaluation and monitoring department and discussions are held with department heads and managers regarding performances and variances.

2.3.24 Infrastructure Projects

GWI started several infrastructure projects during the 2012 – 2016 plan years and those that were unfinished at the end of 2016 have been moved to the new plan period. Table 7 shows projects that are expected to be completed in 2017 (year 1 of the new plan period). Others are shown in Appendix P.

2.4 A Summary of the 2012-2016 Plan

In summary, it can be concluded that the Corporation did not achieve any of the major targets set out in the plan. This could be attributed to inadequate funding to meet the mission objectives, major delays in acquiring production resources, low percentage of meters purchased and installed to enhance revenue, failure to implement a rigid leak detection and repairs program, contributing to a high percentage of non-revenue water, inattention to the inefficiencies of the customer information and accounting programs and the need to ensure that the Information Communications Technology ICT programs were safe from cyber intrusions which ultimately caused several intrusions that severely affected the Corporation's operations. Customer debt spiraled to a height of approximately G$5 billion. These elements have been examined and addressed in the 2017 – 2021 Strategic Plan.

[6] See Section 3.7

STRATEGIC FACTORS FOR THE 2017 – 2021 PLAN

3.0 Overview

Following the review of the 2012 – 2016 plan in the previous sections, it is necessary to reference the Corporation's mission as enunciated by government which is to deliver safe, adequate and affordable water and to ensure safe sewerage systems for improved public health and sustainable economic development. GWI must examine the external factors such as governmental processes and plans for water and sewerage services which are required for its operations and the internal organizational changes that have occurred since 2015 when the Corporation's administration under the leadership of a new Chief Executive instituted policies and procedures that were designed to improve service delivery. These are considered critical since they play a significant role in providing organizational focus, direction and structure which are necessary for the plan's success.

3.1 External Factors

The traditional focus of GWI has been on certain urban areas of the country with the exclusion of many and very limited service in the hinterland. The new government has mandated a policy of ensuring equity of access for all regions, hence, GWI's planning for improved service delivery includes the neglected communities and the rural and hinterland areas. This new focus brings certain challenges which the Corporation has identified in its Situation Analysis documentation and plans for program execution have been set out in this strategic plan. Government assistance is expected through The Water Resource Council which is charged with monitoring water quality and this agency is expected to regulate activities in the hinterland areas especially regarding mining to guard against adverse effects on water supply. Government's assistance is also expected through the WSSDP[7] which provides funding for the semi urban and low income urban communities. This funding is critical since the cost of providing services to these communities are not being adequately covered by the current tariff and GWI will seek the approval of the PUC for a special tariff for these communities. These communities have been responsible for their water services and have not been successful in ensuring adequate supply of services. Hence, GWI's expanding role is designed to assist these communities with development infrastructure and this is evidenced by the programs undertaken in various communities[8].

3.1.1 Internal Structure

The Corporation has adopted a new approach to its mission since 2015 to bring service to more communities each year with the ultimate objective of service to all communities. The focus is on service access in each community, level of service to meet 24-hours continuous availability and quality of water to WHO standards for all customers. Hence, GWI has restructured its corporate and operational processes to place greater emphasis on communications with local government institutions such as NDC's and RDC's in each regional area and especially the hinterland. The Corporation is also focused on customer outreach and thus will have its regional staff create relationships with the various local government entities to provide information on its operations, address community concerns and participate in planning programs for the improvement of service in regional communities.

[7] The Water and Sewerage Strategic Development Plan (WSSDP).
[8] See Section 2.3.16

GWI is examining its operational areas and location of wells and treatment plants against the background that Guyana has large areas of surface water and these offer ready sources for water production without over burdening the ground water supply which is very delicate and limited. Ground water is extracted from the aquifer and the Corporation subscribes to the government's policy for watershed management to conserve its supply. Therefore, over the next five (5) years, efforts will continue to conserve and balance the use of ground and surface water sources with appropriate water treatment to meet water quality and demand.

With regards to water quality, GWI adheres to the undermentioned World Health Organization (WHO) international standards for water quality and has quality measurement and intervention methods to ensure adherence to these standards. And, over the next five (5) years the Corporation plans to maintain standards above and beyond the international recommendation.

3.2 International Standards

The Government of Guyana through GWI will demonstrate the fulfilment of its responsibility to provide the people of Guyana with access to clean, safe, and potable water which has been articulated in the MDGs and now in **the 2030 Agenda: Sustainable Development Goals (SDGs)**, "*specifically Goal 6 that speaks to water quality, security, and accessibility*[9]. GWI's new plan will continue to meet the government's water and sanitation sector objectives while adhering to international standards as enunciated by the United Nations as follows:

- achieve universal and equitable access to safe and affordable drinking water for all
- achieve access to adequate and equitable sanitation and hygiene for all
- improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
- substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
- implement integrated water resources management at all levels, including through trans boundary cooperation as appropriate
- protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes
- introduce water harvesting, desalination, water efficiency, wastewater treatment, recycling and reuse technologies
- Support and strengthen the participation of local communities in improving water and sanitation management.

3.3 Guyana's Water Resources

Guyana has abundant surface and groundwater resources for meeting its present consumptive and non-consumptive needs. However, the country has experienced severe droughts mainly in the hinterland, due to climate change and inadequate water management, leading to water shortages. In 2016[10] the availability of renewable freshwater resources for surface and

[9] On September 25th, 2015, countries adopted a set of goals to end poverty, protect the planet, and ensure prosperity for all as part of a new sustainable development agenda. Each goal has specific targets to be achieved over the next 15 years.

[10] United Nation Report (2015)

groundwater was estimated at 4,700 m3 /capita/year which is above the United Nations stress level. The vision for the water sector is: "sustainable water and basic sanitation for all by 2030" which means ensuring that "all people living in Guyana have access to adequate, safe, affordable and reliable water services, practice safe sanitation and hygiene and that water resources are sustainably managed."

3.4 Government's Expectations

The Government of Guyana expects that GWI will assure urban communities will have access to Potable water from 90% in 2016 to 98% in 2021, hinterland and coastal towns from 75% in 2014 to 85% in 2021 and all 100% beyond 2021 with an increase in sanitation service from 1% in 2016 to 45% in 2021.

3.5 Government Funding

Government investment for the water and sanitation sector is estimated to increase to US$30 million, or 0.2% of GDP by 2021. The increased investment contribution will address challenges in the hinterland and coastal water sector through budgetary allocations and grants from about 30% in 2016 to at least 35% by 2017, 40% by 2018, 50% by 2019, 55% by 2020 and 60% by 2021. An overall increase in sector investment to US$30 million per annum for water and sanitation services country-wide will substantially improve service delivery and access to potable water supply for all Guyanese.

3.6 Water Sector Goals

GWI has adopted the following goals enunciated by the Government of Guyana and created a special strategic planning department whose role is outlined in Section 3.6:

To ensure sustainable harnessing, utilization and management of water resources by 2021:

1. Develop a framework for managing and protecting water resources for improved water security and enhanced resilience to climate change;
2. Strengthen water resource planning, decision-making and operational capacity through improved access to knowledge and expertise in integrated water resource management;
3. Ensure that effective institutional coordination and collaborative mechanisms for water resource management are in place; and
4. Strengthen and improve trans-boundary and international cooperation in the management of shared water resources.

GWI seeks to provide access to potable to water, with less chemicals and quality assurance in accordance with WHO standards in addition to the goals enunciated above.

3.7 The Strategic Planning, Evaluation and Monitoring Department

The Corporation created a Strategic Planning, Evaluation and Monitoring (SPEM) department late last year to review the current strategic plan and in collaboration with the various departments, create a new 5-year plan covering the period 2017 – 2021. The department is staffed with personnel who will monitor and gather data on the plan's Key Performance Indicators (KPI), analyze, evaluate and provide departments with information to improve the efficiency of their operations, including the review of billing adjustments. The SPEM department has used a collaborative approach to the review of the 2012 - 2016 and the development of the new plan. Meetings were held with department heads and their staff to examine areas of

responsibilities and various performance indicators for each target or objective. Section 3.0 highlights the critical factors which were addressed in the creation of the new plan.

3.8 Research

The Strategic Planning Department is responsible for creating and administering research projects which will be designed to elicit data from customers to be used for program planning and the delivery of new and improved services. Additionally, GWI will consider a proposal for a new product, bottled water which is an extension of a limited bottled water production is sold wholesale to vendors for resale.

3.9 Communicating Performance Evaluations

The SPEM department will utilize the Blackboard electronic program for communications with departments and regional managerial personnel monthly for the review of data derived from their performance indicators (KPI's and PI's) and quarterly for their situation analysis update. It will allow real-time feedback from managers regarding the information and the changes they will implement to ensure target achievement.

3.10 A Systemic Approach to Creating the New Plan

The Strategic Planning, Evaluation and Monitoring Department (SPEM) has engaged a participative and systemic approach to the creation of the new plan using the Situation/Gap Analysis done by each department which identified the programmatic needs, proposed plans to address them and showed the resources required for achievement. SPEM conducted discussions with department heads, regional managers and other personnel to obtain their input in firstly reviewing the operations of their departments and then the conduct of a rigorous interrogation of the plans and processes that are being used to achieve the Corporation's objectives. The basis is the analysis of operational situations in each region, using the five (5) programmatic areas, determining the factors that are necessary for the elimination of inhibitors and the resources and decisions needed for the implementation of processes towards goal achievement. This approach can best be outlined in a diagrammatic form below showing the development of departmental Logical Frame Analysis from which Work Plans were created, the review of Situation Analysis, review of the Key Performance Indicators (KPI) in the 2012 - 2016 Strategic Plan and discussions with department heads regarding the components and KPI's for the new strategic plan.

3.10.1 Information and Knowledge Management

GWI will ensure that information which is developed from the monitoring of the plan will be used to improve data gathering and knowledge management. The officer in the Strategic Planning department who has responsibility for information and knowledge management will review the data monthly and discuss and transmit information to the respective heads of department for corrective action and to ensure that staff are aware and perform their duties accordingly.

A Schematic: **Creating the new Plan**[11]

3.11 Developing a SMART Plan

The Plan's design inculcates the concept of SMART (specific, measurable, achievable, realistic and time-related)[12]. With an emphasis on targets that fit the above criteria and which are developed with the participation of department heads and regional operations managers. This process will allow the 'buy-in' of personnel (enablers) who will in turn develop their own annual departmental strategic plans derived from the 5-year plan and these will be monitored and evaluated monthly throughout the year. The monitoring will facilitate the gathering of data which will be converted into information, evaluated and discussed with managers for timely decision-making, thus ensuring departmental target adjustment towards the achievement of objectives as set out in the strategic plan.

3.12 The PDCA Concept

Another conceptual framework for the strategic plan design is the utilization of the PDCA (Plan, Do, Check and Act) concept which allows the operationalization of information, its transformation into activities, ensuring that action is effected and performance is achieved. This offers a process for assessing learning in the organization which can occur on three (3) levels namely, operational, tactical and strategic. While the strategic plan will focus on the strategic level, the organization will benefit from operational and tactical planning and decision-making which will be done by department heads and regional managers. The model is very useful for creating targets and performance criteria for the annual departmental plans which will be a subset of the 5-year plan. Additionally, it allows for the identification of Enablers (Managers) who will be tasked with the responsibility for developing work plans (a subset of the strategic plans) and to ensure action and implementation. These persons will be involved in discussions with personnel from the strategic planning department during monthly evaluations and will be tasked with taking corrective action towards target achievement.

[11] See the Learning Process schematic on page 30.
[12] Christian Life Coaching.Co.UK.

A schematic: **The Learning Process**

3.12.1 Ten Attributes of Effectively Managed Water Sector Utilities

GWI will be using the Ten Attributes of Effectively Managed Water Sector Utilities[13] to provide useful and concise reference points for utility managers seeking to improve organization-wide performance. The Attributes describe desired outcomes that are applicable to all water and wastewater utilities. They comprise a comprehensive framework related to operations, infrastructure, customer satisfaction, community welfare, natural resource stewardship, and financial performance.

Water and wastewater utilities can use the Attributes to select priorities for improvement, based on each organization's strategic objectives and the needs of the community it serves. The Attributes are not presented in a particular order, but rather can be viewed as a set of opportunities for improving utility management and operations. Section IV (Where to Begin), provides a basic self-assessment tool to help utilities easily identify needs and opportunities. However, utilities will be able to deliver increasingly efficient, high-quality service by addressing more, and eventually all, of the Attributes.

[13] A research project was done at GWI in 2012 and a repeat study will be conducted during the plan years.

Ten Attributes of Effectively Managed Water Sector Utilities

Product Quality
Produces potable water, treated effluent, and process residuals in full compliance with regulatory and reliability requirements and consistent with customer, public health, and ecological needs.

Customer Satisfaction
Provides reliable, responsive, and affordable services in line with explicit, customer accepted service levels. Receives timely customer feedback to maintain responsiveness to customer needs and emergencies.

Operational Optimization
Ensures ongoing, timely, cost-effective, reliable, and sustainable performance improvements in all facets of its operations. Minimizes resource use, loss, and impacts from day-to-day operations. Maintains awareness of information and operational technology developments to anticipate and support timely adoption of improvements.

Financial Viability
Understands the full life-cycle cost of the utility and establishes and maintains an effective balance between long-term debt, asset values, operations and maintenance expenditures, and operating revenues. Establishes predictable rates—consistent with community expectations

and acceptability—adequate to recover costs, provide for reserves, maintain support from bond rating agencies, and plan and invest for future needs.

Infrastructure Stability
Understands the condition of and costs associated with critical infrastructure assets. Maintains and enhances the condition of all assets over the long-term at the lowest possible life-cycle cost and acceptable risk consistent with customer, community, and regulator-supported service levels, and consistent with anticipated growth and system reliability goals. Assures asset repair, rehabilitation, and replacement efforts are coordinated within the community to minimize disruptions and other negative consequences.

Employee and Leadership Development
Recruits and retains a workforce that is competent, motivated, adaptive, and safe-working. Establishes a participatory, collaborative organization dedicated to continual learning and improvement. Ensures employee institutional knowledge is retained and improved upon over time. Provides a focus on and emphasizes opportunities for professional and leadership development and strives to create an integrated and well-coordinated senior leadership team.

Operational Resiliency
Ensures utility leadership and staff work together to anticipate and avoid problems. Proactively identifies, assesses, establishes tolerance levels for, and effectively manages a full range of business risks (including legal, regulatory, financial, environmental, safety, security, and natural disaster-related) in a proactive way consistent with industry trends and system reliability goals.

Community Sustainability
Is explicitly cognizant of and attentive to the impacts its decisions have on current and long-term future community and watershed health and welfare. Manages operations, infrastructure, and investments to protect, restore, and enhance the natural environment; efficiently uses water and energy resources; promotes economic vitality; and engenders overall community improvement. Explicitly considers a variety of pollution prevention, watershed, and source water protection approaches as part of an overall strategy to maintain and enhance ecological and community sustainability.

Water Resource Adequacy
Ensures water availability consistent with current and future customer needs through long-term resource supply and demand analysis, conservation, and public education. Explicitly considers its role in water availability and manages operations to provide for long-term aquifer and surface water sustainability and replenishment.

Stakeholder Understanding and Support
Engenders understanding and support from oversight bodies, community and watershed interests, and regulatory bodies for service levels, rate structures, operating budgets, capital improvement programs, and risk management decisions. Actively involves stakeholders in the decisions that will affect them.

3.12.2 The Process for Target Setting, Evaluation and Action

The strategic plan identifies the goals and objectives that are necessary for the achievement of GWI's mission. The departments will identify the strategic goals required to achieve the mission and set targets and create work plans for their achievement. The Strategic Planning, Evaluation and Monitoring department will monitor department performance, gather data, evaluate and provide feedback to the departments and help managers identify actions necessary for goal achievement. The departments will implement these actions.

3.12.3 Implementation and Learning

The process of target setting and departmental work planning is designed to facilitate the development of measurements to ensure that targets are achieved. And, it is expected that personnel will learn lessons regarding achievements and failures and use these for repeating or improving their processes to ensure that objectives are achieved in a timely manner and they are effective. This concept and process will be observable in the strategic plan, especially as it relates to the Corporation's strategies to convert from the use of contractor services to the development of in-house personnel capabilities as in the case of well drilling.[14] This Plan recognizes that one of GWI's main challenges is the delivery of meter services, since there is very little supervision of contractor services for meter install and services. The absence of skilled personnel on GWI's staff contributes to this situation since contractor work cannot be properly inspected to ensure that it meets the Corporation's quality standards and consequently, poor work resulting in mal functioning meters have contributed to revenue water losses. The learning and development of skills will alleviate this problem. And, it is expected that information and knowledge will be enhanced through the sharing of information gathered during organizational reviews.

3.13 Identifying Key Performance Indicators

The new plan has several objectives, namely the management of water resources, Georgetown and Regional supply of potable water of the highest quality standards and the delivery of services with financial viability.

3.14 Use of Blackboard Communication

GWI will use Blackboard as a communication process tool to facilitate the flow of information among managers. Managers will interact with each other for the exchange of technical information and receive feedback on target achievement. This media will also facilitate interactions with persons outside of GWI for the dissemination of information about the Corporation's services.

3.15 Infrastructure Works

The Corporation's Infrastructure Planning and Implementation Department (which has been re-organized) had undertaken several projects, namely the water treatment plants at Shelterbelt, Linden, Eccles and Sophia with varying degrees of success since some of these plants are not operational and continue to pose significant challenges for the Corporation to determine the most effective way to make them operational. Consequently, plans are in place to seek technical assistance to find the best solutions for their refurbishment.

[14] This is addressed in Section 3.21.

3.16 Infrastructure Program

GWI's infrastructure projects for the plan years are listed in Table 7 and Appendix P. They were developed through the participatory efforts of the operations, planning and design and infrastructure implementation departments. The projects represent the regional thrust of the Corporation to improve and expand its services in Georgetown, its environs and the hinterland. GWI's IPID was previously responsible for program infrastructure works and on satisfactory completion, these projects were turned over to the Operations Department. However, a review of the capital infrastructure works shows that while some projects were completed and became operationalized, some are still in progress and others were completed but are not turned over to Operations. In the case of non-operationalized projects, the corporation has instituted a process for their operationalization.

3.16.1 WSSIIP Component 3: Institutional Strengthening,

The Corporation has benefitted over the years from funding provided under the auspices of the IDB and these include funding for the current Institutional Strengthening Projects as depicted in the following Table. Ongoing programs will rollover into the new plan.

Table 6: **Institutional Strengthening Projects**

Description	Unit of Measure	Cost (US$)
Operations and Maintenance Manuals	Manuals	$100,000
Non-Revenue Water reduction staff training	Workshops	$250,000
IT Systems (Financial, Commercial and Human Resources integrations	Systems	$240,000
Consultancy to support Tariff structure and database verification	Action Plans	$180,000
Groundwater Management	Action Plan	$200.000
	Total	**$970,000**

3.17 Projects not Commissioned

There are several projects which are near completion or have been completed which must be commissioned[15]. The new Planning and Design Department has begun examining these projects to determine the requirements for their completion or commissioning and to ensure that new planning does not duplicate programs or projects that already funded.

3.18 Infrastructure Funding Sources

GWI expects to fund its operations primarily from three (3) sources, revenue from operations, funding from the Government of Guyana (GOG) and funding from other entities such as the Inter-American Development Bank (IDB) and European Union (EU). The revenue from operations will be derived from billing to metered and unmetered customers who are divided into residential, commercial and government. Funding primarily for capital works will be derived from the GOG and IDB and the EU. The Corporation's focus will be on instituting processes and measures to enhance its internal financial viability and accountability to funding agencies for the efficient usage of their funding. In this regard, the planning of capital works will be in tandem

[15] See Table 7.

with operations so that funding agencies can be assured of sustainability for the projects after completion.

3.18.1 Infrastructure and Capital Loan Program

During the 2012 - 2016 years, the Corporation received loans for capital projects which were guaranteed by the Government of Guyana. While these loans are recognized as inputs for capital works, they are not treated as liabilities (with expected repayment schedules) on GWI's balance sheet since it is understood that the Government of Guyana will repay the loans under the agreed terms. Hence, GWI can consider them as capital infusion by government. Government however expects that GWI will eventually achieve firstly operational and then financial break-even and thus contribute to government revenue which can be an offset for the loan financing it receives.

Regarding the impact of the projects that have been funded by these loans, GWI is faced with a situation where in the past, loans for capital projects were negotiated and approved and funds disbursed for such projects that today seem to be nonfunctional and may not provide the service that was intended. A classic case is the treatment plants at Wisroc and Amelia's Ward in the Linden Township where it has been found that the technical design, construction and functionality of these plants affects their functionality. The plants are not fully operational and the Corporation sought the help of international experts who recommended rehabilitation works with very high costs which must be borne by GWI. The plants are in areas where the water source is ground water and this type of water does not inherently require the kind of treatment that these plants are designed to provide. Their processes are more effective for surface water. GWI will undertake a comprehensive review of the operability of these plants towards finding a solution that would make them functional. In the meantime, the old plant in the Linden area have continued their operations.

Wisroc Treatment Plant/Storage Tank

3.19 Monitoring Infrastructure Projects

The Strategic Planning department will coordinate a team comprised of Design Infrastructure Demand and Supply ("Planning and Design"), Project Implementation and Partnership Building

("Project Implementation"), Operations and Finance (program budgeting) personnel who will plan projects to ensure they have a positive return on investment (ROI). The Management Accountant and the Budget Officer (SPEM) will monitor the use of funds for projects to ensure that the return on investment of funds is sufficient to justify the expenditure.

3.20 Capital Program Budgeting

During 2016, the Corporation changed its operations budgeting format to reflect program budgeting. This allows regional managers to plan their program activities and execute programs in accordance with their funding which is derived from GWI, Government of Guyana or other sources such as IDB and the European Union (EU). Program budgeting offers efficiencies and effective decision making with greater accountability for program execution.

3.21 Contracting Infrastructure Programs

An examination of the operations of GWI reveals that it has great reliance on contracted services. This can be traced to decisions over the years which virtually eliminated in-house capabilities for the execution of many functions such as well drilling, disconnections and reconnections. GWI recognizes that a change of this policy will require proper planning, the identification of skills gap and the development of training programs for staff and this is already being developed by the Corporation. Hence, it is envisaged that it will systemically decrease its reliance on contracted services during the life of the new plan.

3.21.1 Cost Implications for the Non-Use of Contracted Services

While it is expected that the Corporation's costs will be affected with the proposed conversion from the use of contracted services to in-house personnel, nevertheless since the costs for these services are already captured in payments for such services, there are no significant projections for increases in human resources and materials expenses for the conversion plan. Instead, it is projected that cost savings may occur due to better execution of these services by staff who will be subjected to stringent supervision and greater accountability. The greatest impact on cost savings is projected for well drilling and the greatest efficiency will be gained with leak detection and repairs.

3.21.2 Training of Personnel and Supervision of Contracted Services

While GWI will continue to use contracted services, it is concerned with the quality of work and accountability for performance as highlighted in the Forensic Audit[16]. GWI has instituted a process to address these issues including training of corporation personnel to perform supervision. Firstly, it will initiate training for its personnel to perform quality inspections on contracted work and secondly, it will insist that contractors use trained personnel to perform the contracted services. The process for organizing the work of contracted service providers and monitoring performance is outlined in the schematic below.

[16] See Section 3.27

A Schematic: **Infrastructure Works Process**

Commencement of Construction	Monitoring of Construction	Approval and Payment	Construction completion
• Engineering reviews and changes approved	• Gantt Chart monitoring	• Engineering approval for Payments	• Commissioning

3.22 Continuing Current Projects

GWI will ensure that for purposes of continuity, projects undertaken during the previous plan that are not yet completed will be continued under the new plan. These projects will continue with closer supervision and accountability. Although the previous department which had responsibility for all project planning, design, construction and funding is no longer functional and the services have been divided between planning and design and project implementation, nevertheless, the current projects will continue to be the responsibility of the Project Implementation & Partnership Department. One significant project from the previous[17] strategic plan that is on-going is the **Water Supply Sector Infrastructure and Improvement Program (WSSIIP) funded by the Inter-American Development Bank and the European Union "11th EDF"**. See Appendix P for the planned projects that will give efficacy to the new plan.

3.23 Projects Completed or On-going

Table 7 shows projects which have been completed or on-going. GWI will ensure that these projects will provide the infrastructure and services needed for operational objectives.

[17] See Appendix N for some of the projects executed under the previous strategic period.

Table 7: **Infrastructure Projects Completed and On-going**

Item	Project Activity	Cost	Status	Beneficiaries	Comment
1	Supply and installation of 200mm, 150mm Transmission and 100mm Distribution Mains and Service Connection Upgrade in Lamaha Park	17,550,000	100% Completed	500 Residents	This project rolled over and is 100% completed. It catered for the installation of new distribution mains and installation of service connection to customers for the first time
2	Supply and installation of 280mm HDPE Transmission Mains, 150mm PVC Distribution Mains and Service Connection Upgrades along Duncan Street, Campbell Avenue and Dyrey Lane - Between Vlissengen Road and Sherriff Street, Georgetown, Region #4	48,000,000	100% Completed	20,000 Residents	This project was completed in 2016. It catered for the installation of a transmission main from Vlissengen road to Sheriff street to interling the Shelterbelt plant and the Sophia water treatment plants
3	250mm Transmission main along Turkeyen Dam and Pattensen Dam	5,620,000	100% Completed	100 Residents	This project rolled over and is 100% completed
4	Project to effectively remove and dispose sludge at Shelterbelt	8,600,000	100% Completed	5000 Residents	This project rolled over and is 100% completed
5	Completion of Drilling of Well in Sophia	31,600,000	100% Completed	20,000 Residents	40% completed
6	Completion of Construction of Ground Storage Tank at Sophia	33,000,000	75% Completed	20,000 Residents	This project is 75% completed and is expected to be 100% completed by May 2017.
7	Replacement of high voltage switch gears for frequency conversion project in GWI Shelterbelt Office	1,190,000	100% Completed	GWI	This project was awarded and is 100% completed
8	Replacement of transmission and distribution mains and Service Connection Upgrade in Albouystown. Boundaries: Sussex Street - Independence Boulevard and Calendar Street - East Bank Public Road	57,000,000	20% Completed	2000 Residents	The project team has decided to reshape the scope of this project to facilitate the pipe installation and resurfacing of the streets that will be damaged, utilising the money under the contract. The contractor submitted his quote and a Chenge Order is being prepared by Engineer Amanda Ramgobin.
10	Replacement of Distribution Main at Meadow Bank	6,000,000	100% Completed	500 Residents	This project was successfully and is serving over 500 residents
11	Installation of distribution network in North Sophia (area west of University of Guyana Compund, North of Dennis Street and East of Eastern Highway)	13,000,000	100% Completed	500 Residents	This project was successfully and is serving over 500 residents
	Total	**221,560,000**	**92%**	-	

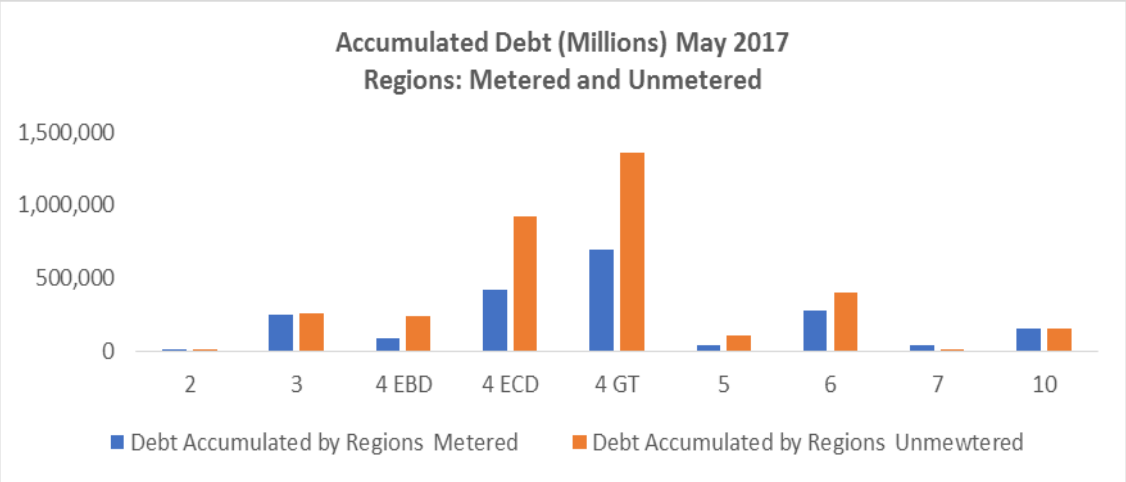
3.24 The Corporation's Financial Health

Another area of major emphasis in the 2012 - 2016 plan was the Corporation's financial health. It was projected that the financial break-even year should have been 2015. And, in anticipation of this achievement, there were certain elements that were highlighted as being necessary for success. One of these is the enactment of the tariff that was approved by the Public Utilities Commission (PUC) and the meeting of the stipulations such as ensuring that the Corporation's customer database is accurate. Another is the reduction of Non-revenue water and the undertaking of capital works programs for the supply and improvement of water services throughout the country. A review of the plan reveals that financial break-even was not achieved and the customer database continues to be problematic since it contains many inaccuracies that affect billing and revenue generation and results in many adjustments to accounts receivables.

3.25 Debt Write-Off - the Balance Sheet

The Corporation's 2015 financial report[18] shows an increased Allowance for Doubtful Debt on the Balance Sheet and this has been the trend for the past years. While he Corporation's board has been approving write-offs for percentages of debt covering several years, the Corporation should move towards a more accepted accounting practice[19] which recommends that a percentage of bad debt should be written-off annually up to the Allowance for Doubtful Debt on the balance sheet. The Corporation's accumulated debt over the years up to December 31, 2016 is $3.6 Billion dollars[20]. And, since the Board of Directors has approved the amount of $495,761,661 as write-off for 2015 from the original (2015) amount of $2,182,572,959, it is recommended that for the 2016 Balance Sheet, the Allowance for Doubtful Debt should be set to cover **$1,812,625,844** (cumulative amount) and this amount should be recommended for the 2016 write-off. The amount covers the last five-years with reduction percentages (see Table 8).

The graph depicts the accumulation of debt in each Region (May 2017)[21].



The following is a proposed debt write-off schedule/strategy.

Table 8: **Debt Amounts and Write-off Proposal for 2012 – 2016**

Year	Debt amount	Percentage write-off	Amount
2016	$709,832,545[22]	25	$77,458,136
2015	$1,834,335,631	50	$917,167,816
2014	$749,586,274	75	$562,189,706
2013	$159,930,345	100	$159,930,345
2012	$95,879,841	100	$95,879,841
Total	**$3,549,564,636**	**n/a**	**$1,812,625,844**

[18] The Audited 2016 Report is not yet available.
[19] GAAP (Generally Accepted Accounting Principles) guidelines.
[20] This amount changes daily due to the payment processing business rules that applies customer payments to the oldest unpaid balance (debt). The Debt Aging Schedule (HiAffinity Program) provides monthly updates of customer debt. See section 19.5.2 – Debt accumulation 2012 to 2016.
[21] Regions 1, 8 and 9 have no debt accumulation since there are no service charges for operations.
[22] The amount prior to write-off was $2,182,572,959.

Based on the proposed write-off ($1,812,625,844) of the accumulated approx. $3.6 Billion customer debt and the collections trend (60% of payments are credited to arrears), it is projected that with a conservative 40% arrears collection rate each year and if rigid controls are enforced to keep customer payments within the 28-day grace period, in approximately three (3) years the debt balance will be significantly reduced. In addition to debt write-off, the customer database will be 'sanitized' to remove errors of duplication of accounts and other issues that will significantly reduce the debt balances on certain accounts. These factors will reduce the debt and provide a more accurate picture of accumulated debt. Going forward, it will be necessary for the Finance Department to use the Debt Aging Schedule to monitor debt each month, report on it in the quarterly, semi-annual and year-end financials and to propose the write-off amounts on customer accounts in accordance with the Allowance for Doubtful Debt on its annual balance sheet. The request for write-off with a schedule of accounts must be presented first to the Finance sub-committee of the Board of Directors and with its approval, to the full Board for its approval.

An examination of the factors that contributed to the large amount of debt reveals that the Corporation, failed to address customer payments to ensure that they stay within the stipulated 28-day period. This includes non-litigation of delinquent customers for whom all efforts to get payment had been exhausted. Consequently, many accounts became delinquent and since there was no debt recovery department (this was disbanded) to monitor the customer Debt Aging Schedule, no proactive efforts were in place for debt management. It is only with the advent of the new Managing Director and his appointment of a Debt Recovery Manager that focus on this issue became prioritized.

3.26 Billing Adjustments

The Commercial Services Department prepares adjustments each month for approved changes made to revenue for the prior months based on actions taken by the Revenue Managers. These changes are due to issues relating to charges for services and have the potential to significantly reduce the revenue amounts that the Corporation may expect based on its billing.

3.27 Forensic Audit

The Corporation's financial statements have been subjected to a Forensic Audit[23] covering the period 2012 - 2015 and there are very significant findings listed in the report. Hence, an objective of the new strategic plan is to ensure that the issues raised in the audit are addressed and remedied in accordance with the auditor's recommendations.

3.28 Reorganizing the Operations Administrative Process

The operations of the Corporation have been redesigned in accordance with the central government's regional administrative structure and the departments have been structured administratively, to cover the ten (10) regions countrywide with an Atlas Zones assignment for services.

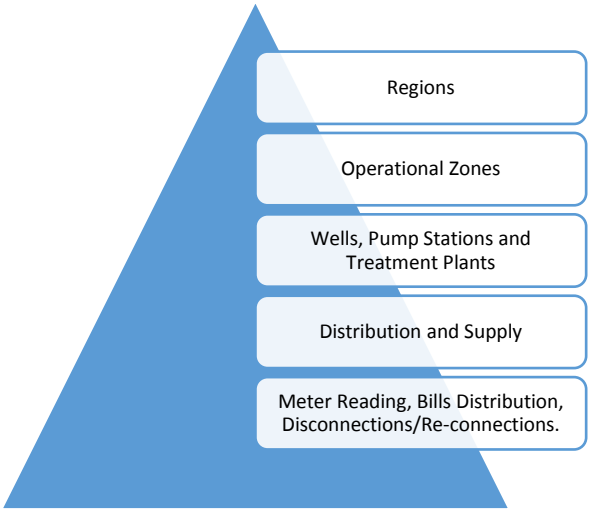
Table 9: **Regional Administrative Grouping**

Regions	Divisions
Region 1, 8 & 9	Hinterland
Region 2	Division 1

[23] See GWI Forensic Audit Report 2012 – 2015 (Ministry of Finance website)

Region 3	Division 2
Region 4	Division 3 – Georgetown, East Bank, East Coast
Region 5	Division 4
Region 6	Division 5
Region 10	Division 3 - Linden

A Schematic: **Regional Administrative Process**



Regional Zones

The Regions have Zones, Wells[24] and Treatment Plants which are color coded on the map on the next page.

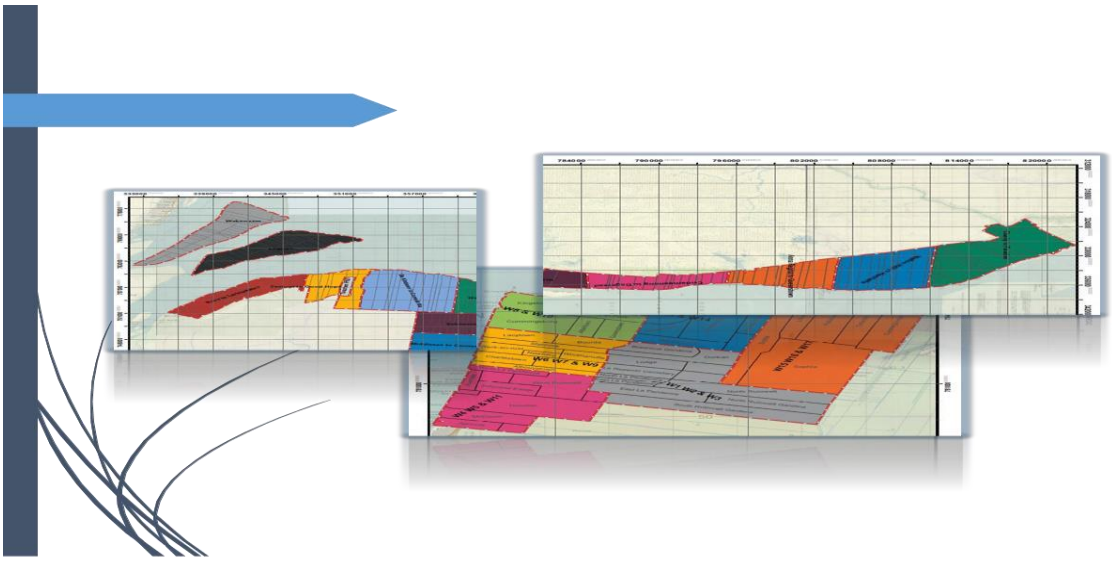
Table 10: **Regions, Zones, Wells and Treatment Plants**

Regions	Zones	Wells	Treatment Plants
1	2	n/a	n/a
2	5	8	1
3	12	31	3
4 – East Coast Demerara	14	20	2
4 – East Bank Demerara	7	16	4
4 – Georgetown	6	20	3
5	6	12	1
6	14	28	4
7	1	0	1
8	0	na	n/a
9	1	na	n/a
10	5	3	5 (2 plants combined)[25]

[24] There are many wells in the hinterland area that receive maintenance assistance from GWI but are not considered part of its production and service responsibility.

[25] Two (2) Plants previously scheduled for decommissioning were put back into production due to problems with the newly constructed replacement plants.

Color Coded Service Areas[26]



3.29 Program Documentation

GWI recognizes the need for a streamlined process to facilitate documentation and reports which are needed by managerial staff for their day-to-day decision making. Hence, the SPEM Department has designed the process flow which provides electronic linkages and inter-operability between various programs which are used by the departments for data gathering and reporting. It allows data that is collected to be entered in a program field and to be carried forward to populate all other relevant data fields. This will ensure efficiencies for data gathering and reporting.

3.30 Reorganizing the Infrastructure, Planning and Implementation Department

The Corporation has restructured the Infrastructure, Planning and Implementation Department (IPID) into two (2) distinct but interrelated departments. There is Design Infrastructure & Demand and Supply, including Water Resources Management and the Project Implementation & Partnership Building department which includes Regulatory Compliance and Licensing and the administration of the Hinterland (Regions 1, 8, & 9). Each department has a director and they will work closely with the operations department in planning, designing and executing new infrastructure works, strictly in accordance with the technical designs and ensure timely delivery in accordance with the Corporation's 5-year strategic plan. The overall consequence of this change will result in better planning, design and implementation of projects which will be operationalized in a timely manner and provide operational sustainability.

3.31 Working with the Regional Administrations

As stated in Section 1.0, GWI's commercial and customer services department will focus on regional government administrative participation and its services will facilitate greater interaction between the Corporation and its customers. GWI's personnel will participate in regional community planning for new communities to ensure that water services are designed and infrastructure works are completed for these communities. The infrastructure will include

[26] The codes denote boundaries

fire hydrants with sprinkler systems for emergency uses. Customer services will have usage of electronic programming to obtain data on service levels, water quality and other demographic information from an App which provides connectivity to the central database. Therefore, personnel will be able to do community outreach programs and address the service needs of customers.

3.32 Mahdia Community Program

One of the hinterland communities that GWI is engaging in this outreach program is Mahdia in Region 8. This community currently receives its water supply from a surface source "Salbora Creek" which is inadequate due to its increased population. GWI has engaged a committee of persons from the community to plan for their water and sewerage needs and to develop a distribution system that fits the needs of the residents and their economic activity which is mining. The program which will be developed for Mahdia will be used as a prototype for other hinterland communities which share similar geographic and economic characteristics.

3.32.1 Other Rural Programs

GWI has changed the organizational process to ensure that community service programs are planned, designed and delivered through the collaborative efforts of various departments, in coordination with the Operations Department. In this regard, the Operations department will initiate discussions regarding either an extension of service or the introduction of a new service in various communities and the Planning and Design and Project Implementations will ensure that the relevant programs are created and funded for service delivery. These activities will be organized under the Corporation's community outreach program.

The Corporation sent personnel and contractors to Oklahoma USA at GEFCO Rig manufacturing facility for training in new well drilling techniques and it entered into a contractual agreement with De Ruiter Grondwaterechniek, a Dutch Firm for drilling new wells using state-of-the-art techniques and the training local personnel in these techniques. This strategy is expected to benefit rural communities and facilitate the expansion of the Corporation's services to these communities.

A case study of GWI's outreach to communities is Jacksonville/Moleson Creek. This is a predominantly farming community located in Region 6, comprising of 14 households. The community was without potable water for the last 22 years and through its collaboration with GWI, it recently benefitted from infrastructure service connections bringing water to the community from the Crabwood Creek Well. This like other rural communities has benefitted from GWI's outreach program to extend supply lines and service connections or drill wells in these communities.

Inauguration of a new water supply service to Molson Creek, Berbice community residents with Minister of Social Protection, Hon. Amna Ally and Managing Director Dr. Richard Van-West Charles.

3.33 Strategic Organizational Changes

The Corporation has made some significant organizational changes to improve water quality, its financial viability and streamline its acquisition of goods and services which are vital to its performance objectives. To this end, it moved the Procurement function from being a separate administrative department and placed it under the Finance Department. Additionally, it has revitalized the Debt Recovery Department to ensure effective debt management to reduce the current debt from approximately five (G$5 billion).

3.34 Planning and Design Infrastructure Process

The administrative process has been changed to place greater emphasis on planning and design in accordance with operational objective. During the plan years GWI expects to expand its operations in accordance with the needs of its stakeholders, government, communities and private developers. The reorganization of the planning, design and infrastructure implementation departments will facilitate the review of regional community needs, planning and design for the services and the implementation of designs which will ensure that services are provided in accordance with the identified needs.

3.35 Examining Infrastructure (Wells) Feasibility

The Corporation plans to conduct a feasibility study to determine the most cost-effective process for well drilling and in this regard, technical assistance will be sought from funding agencies for this program. Additionally, there are several infrastructures works that have been completed but not yet aligned with operations. Hence, an exercise has commenced to identify these projects and plan their commissioning for operations. Additionally, while the Corporation has found that water from 'A' sands require extensive treatments and it would be more advantageous to have 'B' sand wells, nevertheless, it has been observed in the past that the level of production from 'B' sand wells is not as efficient as 'A' sand wells and any attempt to increase their level of production could adversely affect the Aquifers. This situation is being

examined by the Corporation's Hydrologist and the report will be instructive regarding the plans for well locations and drilling. Another factor that is being considered is the drilling of wells in a concentric (ring) formation which will afford greater redundancy to guarantee continuous water production and supply when there is disruption in any specific well production.

3.36 New Revenue Product– Sale of Commercial Bottled Water

GWI is has plans for the introduction of a commercial retail bottled water service[27] initially for the Georgetown area and eventually expanding to the rural areas. It will expand the current embryonic operations at the Poudroyen plant and use a modular planning and infrastructure design for future expansion. It is envisaged that this service will generate revenue for the use of its main production component which is treated water and this will offer several opportunities for sales locally and in the Caribbean.

3.37 Department Programmatic Situation Analysis

At the beginning of 2016, department heads and operations managers developed their annual plans using the Logical Framework Analysis program. They conducted quarterly Situational Analysis reviews of their work plans, evaluated performance variances and made changes accordingly.

3.37.1 Cross Functional Programmatic Areas

Administratively, the Corporation has introduced the concept of five (5) Cross Functional committees with responsibilities for these areas of service delivery. The committees are, Organization and Management, Water Production and Water Quality, Water Supply and Distribution, Sanitation and Revenue and Customer Relations. The committees meet monthly to discuss and review issues and make recommendations to the Corporate Management Team.

3.38 Access to Riverain Communities and Islands

The Corporation is reviewing the program requirements for improved access to riverain communities and Islands as defined by the regional Situation and Gap Analysis. It is proposed that three (3) boats should be purchased for the transport of personnel and equipment especially between the various islands in Regions 1, 2, 3 and 7. It is expected that the cost benefit analysis will demonstrate that it is more feasible to purchase vessels rather than continue to incur high costs for personnel and equipment transport through rental services. The convenience of having three (3) vessels to facilitate operational requirements will be of tremendous benefit to the Corporation. The purchase of All Terrain Vehicles (ATV) for land transport is also being considered since this type of vehicle has proven to be the most suitable for the terrain.

3.39 Disaster Preparedness

In 2005/2006, the low lying coastal areas of Guyana experienced severe flooding. This caused GWI to enter an emergency mode since the water supply for these areas was threatened due to overflows into the water production and distribution systems. This required emergency plans and action to alleviate this dire situation and GWI was forced to shut down its water generation and distribution systems and transport potable water to residents. In recognition of this critical circumstances, it has become necessary to ensure that this situation is never repeated and therefore, the Corporation has created a special team to review plans for such an emergency.

[27] The study was done in 2015.

The team will work closely with personnel from governmental agencies and conduct simulated drills to ensure that the plans are functional and provide the protection needed to safe guard the country's water resources.

3.40 Continuity of Water Production

GWI expects that continuity of water production will be required during a national flood emergency and therefore, it has plans to ensure that all wellheads are sealed to prevent water infiltration. Additionally, emergency storage will be created with overhead or in-ground water reservoirs for the supply of water. These storage reservoirs will be strategically located to ensure that they will be easily accessible when needed.

3.41 Water Transportation – Disaster Relief

It is expected that it will be a challenge to transport water from GWI's locations to distribution points in the communities. Therefore, GWI will purchase various types of tankers to transport water to critical need areas. These will be available for transport of water when there are disruptions in service areas.

THE STRATEGIC BUSINESS PLAN 2017 - 2021

4.0 Plan Objectives

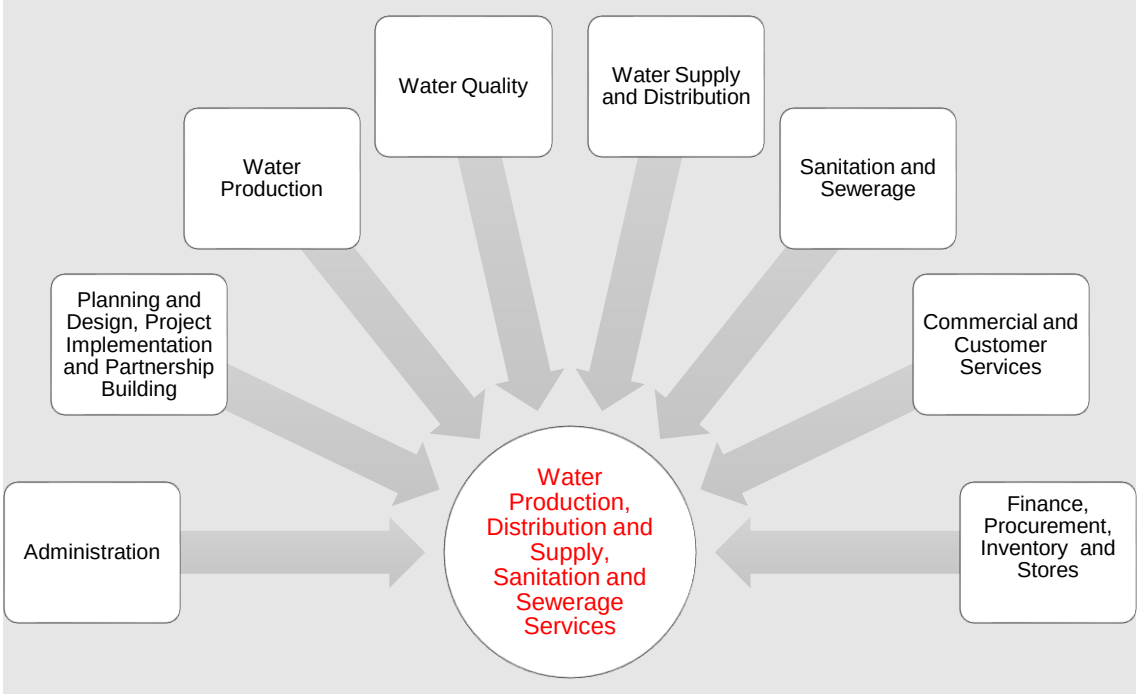
The 2017 – 2021 strategic plan is designed to chart the way forward for the Corporation. It uses data and information from the 2012 – 2016 plan for continuity of operations while focusing on new strategic areas for organizational growth. It reflects the mission objectives enunciated by the new Government of Guyana which was elected in 2015 and can be considered as a **Turn Around Document** for GWI. Its main objectives are as follows[28]:

- To ensure that the government mandate to provide clean and efficient water and sewerage services to the country is achieved.
- To ensure that the Corporation employs personnel who are educated, skilled and knowledgeable in the performance of their functional duties for the fulfilment of the Corporation's mission and objective.
- To ensure that all personnel perform their duties in a safe and efficient manner, observing all required safety standards and regulations.
- To ensure that personnel receive adequate financial remuneration in accordance with government standards.
- 100% accurate customer database.
- Electronic billing and payments.
- To ensure that the Corporation's financial viability is achieved during the life of the plan.
- Reduction of the debt from an excess of 5 billion dollars.
- An increase of active Wells each plan year.
- To ensure that it has Tariffs that are socially acceptable and can contribute to the Corporation's financial viability.
- Maintenance of water quality at 100% of WHO standards each plan year.
- The reduction of non-revenue water (NRW).
- The refurbishment and construction of treatment plants.
- The extension of water and sewerage services to all townships and new communities.
- The development and operationalization of water services to hinterland communities.
- The development of Water Shed Management for the safe, strategic and efficient use of water resources.

4.1 Organizational Functionality

Here is a schematic of the inputs for the organizational functions as outlined in the strategic plan. The administrative support services such as Corporate Services, Human Resources, Strategic Planning, Evaluation and Monitoring, Internal Audit and Public Relations are grouped under Administration.

[28] See the Performance Indicators in the Appendix V.



4.2 Water Resources Management

Guyana Water Incorporated sees its mission as a critical requirement for the government's policy to have an effective water resources management program. This is in keeping with the concept of effective and efficient water resources management. Although Guyana is known as 'the land of many waters', nevertheless, it is understood that water resources are not infinite and require careful management. This is especially relevant when it is observed that ground water can be easily polluted through the excessive use of chemicals and it becomes an expensive proposition for GWI to remove contaminants from water to render it safe for supply to citizens of Guyana. Water resources management is shared with the Ministry of Agriculture's Hydro-Meteorological Department which is responsible for the issuance of permits for Wells drilling.

GWI's concern with water resources management is shared internationally with other water utilities companies. This is highlighted in the report produced by the AWWA[29] in which respondents ranked Renewal & replacement of aging water and wastewater infrastructure, Financing for capital improvements, public understanding of the value of water systems and services, long-term water supply availability, public understanding of the value of water resources, watershed/source water protection, public acceptance of future water and wastewater rate increases, water conservation/efficiency, and cost recovery (pricing water to accurately reflect its true cost) as some of the most important factors that water utilities must consider for its future operations.

GWI is the host of the **Caribbean Water and Wastewater Association (CWWA) Conference** which will be held in Georgetown Guyana in October this year. It is anticipated that the corporation and its contractors will have an opportunity to learn new techniques and processes that have been developed internationally for water production, treatment and quality control.

[29] AWWA (American Water Works Association) Journal - American Water Works Association | November 2016, Volume 108, Number 11

The Corporation is looking forward to the establishment of the much-anticipated National Water Council which will foster closer collaboration between GWI and the national body that is charged with the responsibility for water resources management. The recruitment of a Hydrologist in 2016 provides the Corporation with the skills and expertise to undertake studies to better determine sources and locations of water supply. The findings will be used by the planning and design department for determining the strategic locations of water production services.

4.3 Water Security

A major strategic objective of GWI is to ensure that there is security for the surface water supply sources. The Corporation also draws water from ground sources such as Wells and these must be safeguarded against malicious intrusions that would affect the safety of their supply. It is the open sources of ground water that poses the greatest challenges. This matter has been addressed by government with the creation of the Watershed Management Program and it is expected that all stakeholders such as GWI and other governmental agencies charged with commercial and residential or agricultural water supply are mandated to ensure that their supply sources are secured from malicious intrusions. This extends to the hinterland areas where it is specially required that areas where mining is being pursued should be carefully examined by the government agencies that prospecting licenses or permits should ensure that works and use of chemicals do not enter the surface water supply (creeks or rivers) directly or seep into the ground and enter the supply chain.

4.3.1 Surface Supply Sources – Georgetown and other areas

GWI provides water in Georgetown from a surface source extending from the Conservancy through the Lamaha Canal located near its treatment plant at Shelter Belt and this source is included in the Watershed Management Program. Additionally, the Corporation provides water from surface sources at Linden and Bartica. These locations pose special concerns for water security since they are easily accessible to non- Corporation personnel. Therefore, the Corporation has commenced an exercise to examine the vulnerability of the supply sources and to develop strategies to ensure that unauthorized access is restricted for non-corporation personnel. This concern is addressed in the objectives of the new Strategic Plan.

4.3.2 Planning for Water Production, NRW and Collections

GWI's 2016 water production daily demand was estimated at 0.429 m^3 but, it only produced 0.406 m^3 (94.87%) per day due to factors that are addressed elsewhere in the plan. The trends in water production, non-revenue water and bill collection over the period 2012-2016 are presented in section 5.2.

Table 11: **Operations Statistics**

tem	Unit	2012	2013	2014	2015	2016
Unit Production Cost	US$/m³	0.261	0.253	0.276	0.272	0.224
Potable water access	%	--	--	94[30]	--	90.2[31]
Customer strength	Thousand	160,000	167,523	172,500	176,582	183,370
Non-Revenue Water	%	68	67	63	61	60
Bill collection ratio	%	67.0	51.8	38.6	49.2	72.0

Source: Guyana Water Inc. Strategic Planning Unit

Managing Water Security – Strategic Objective

To ensure that ground and surface water sources are safeguarded against intrusions.

To participate in the Watershed Management Program

To ensure that GWI can deliver safe, adequate and affordable water and ensure safe sewerage systems for improved public health and sustainable economic development

Programmatic (Situation/Gap) Analysis

GWI's administrative process places primary emphasis on the Operations Department's role in water production and service delivery. And, all other departments play a supporting role in the furtherance of the Corporation's mission objectives. In 2016, managers were taught the skills to create their Log Frame and Situation Analysis and in 2017, they created their **Programmatic (Situation) Analysis** which shows the organizational resources and capital financial support that is needed for goal achievement. This this was used to formulate the plans and funding requirements for the new 5-year Strategic Plan. Annual departmental goals will be formulated from the plan[32] and departments will develop work plans and procedures for their efficient functioning to provide the support needed for the Corporation to achieve its strategic objectives. The situation analysis was prepared using the (5) Programmatic Areas as a framework and information and data was gathered in each regional service area and support departments. Performance Indicators which are used to monitor strategic goals achievement have been developed and are listed in the respective sections in this plan.

[30] **Guyana Multiple Indicator Cluster Survey, UNICEF 2014:** Overall, 94 percent of the population use an improved source of drinking water – 99% in urban areas, 93% percent in rural areas, 98% in coastal areas and 71% in interior areas. The situation in Region 9 is considerably worse than in other regions; only 42% of the population in this region get its drinking water from an improved source. Regions 1 and 7 & 8 also have relatively low percentages using improved sources of drinking water, with 81% for Region 1 and 65 percent for Regions 7 & 8, as opposed to more than 90 percent of the population in all other regions.

[31] The Potable water access percentage (90.2%) was calculated using GWI's database information and the Country National Census 2012.

[32] Goals (Strategic Objectives) are summarized and shown in each section.

OPERATIONS DEPARTMENT – GAP ANALYSIS

The departments examined the Corporation's mission objectives and conducted their Gap Analysis which identified the critical elements and showed the requirements for the achievement of their programs objectives. A summary is set out in section below and in each departmental section of the plan. These were used to formulate **budget funding** requirements which are set out in Section 26.

- The **Operations Department's objective** is to provide 212 million m^3 annual water production by 2021 (73% over 2017), improved access in each region and specifically in each community based on their demographics, 24-hour continuity of service, level of service to a minimum of 5 metres, water quality in conformity with WHO standards and sanitation and sewerage services in accordance with government standards for wastewater disposal. Provide 100% metering for all service areas which received treated water and eliminate leaks to reduce non-revenue water.
- The **Design Infrastructure & Demand and Supply Department's objective** is to provide planning and design services for the gaps identified for the supply and demand for services in the regions and communities and the infrastructure to satisfy these service needs.
- The **Project Implementation & Partnership Building Department's objective** is the implementation of all infrastructure projects agreed to by the Board of Directors and the CMT.
- **Each Operational Support department** will perform the following:
  a. **Commercial and Customer Services** will utilize a new customer Information System. Ensure that meter reading and billing are accurate to improve bill payment and improve interaction between customers and the Corporation.
  b. **ICT** will provide services to ensure personnel access and competency to use electronic programs for operations efficiency and protection from Cyber Intrusions.
  c. **Administration** will pursue the approval of new Tariffs for increased financial viability, regulations for service delivery and public relations programs for customer information and education.
  d. **Human Resources** will decentralize its functions to HR Generalists in various regions to facilitate expeditious processing and decision-making.
  e. **Finance** will implement a regional system to improve contractor payments and expedite purchasing and procurement.

Table 12: **Situation Analysis Performance Indicators (Operations)**

Category	Indicator
Access to water	Domestic, Residential or Commercial services
Level of service	A minimum of 5 Metres
Continuity of service	24-hour service
Quality	Maintain international standards
Sanitation and Sewerage	Waste treatment and disposal

5.1 Regional Operations Situation Analysis

The Corporation's operations are grouped in accordance with the country's regional administrative structure. Each GWI regional operations location has zones in which its services are performed and the activities for the regions are effected in accordance with the five (5) functional areas; organization and management, water production and quality, water distribution and supply, sanitation and revenue and customer relations.

5.2 Strategic Focus

The Operations Department will have the following strategic focus for the plan years. Production, distribution, level of service and revenue generation with a reduction in Non-revenue water. The table below shows the planned deliverables and means of verification.

Table 13: **Deliverables and Verification**

Program	Indicator	Means of Verification
Water Production	24-hour availability	Production Downtime Reports
Water Quality	WHO standards	Water Quality Reports
Water Supply	5 Metres – First Floor level	The Service Level Maps
Population and community access	Population and community coverage	Meeting the Sustainable Development Goal
Metering	Percentage of accounts metered	Reports on meter install
Organization and Management	Staff/Customer Ratio	Increased operational efficiency
Non-Revenue Water reduction	>90% Leaks detection and repairs	Reduction in the percentage of Non-revenue water

5.2.1 Water Production

The strategic objective is to be able to provide twenty-four (24) hour supply with 5 Metres (first floor service level) is critical. The demand for 24-hour distribution and supply is affected by the limited hours of supply which causes 90% of the customers to be on the network simultaneously during the limited supply hours. This situation creates large flow volumes and low pressures and irresponsible usage when customers leave their taps on to obtain water during the non-peak hours. Among the benefits of 24-hour coverage is it eliminates intrusions when lines have openings that will allow inflows of contaminated water. To alleviate this situation, GWI planned to increase the hours of distribution from the treatment facilities. This program will require the drilling of additional wells, constructing new treatment infrastructure (Aerators, Filters etc.), more DMA's and aggressive leak detection and repairs to reduce water losses.

5.2.2 Water Service Access

GWI is faced with a unique situation regarding water supply and access for regions and communities within regions. The geography of the country demonstrates that in some regions and communities, households are either densely or sparsely laid out and thus there are challenges firstly in determining the infrastructure that will provide water service (coverage) and secondly the hours for access depending on the economic activities in communities. These issues are being addressed with personnel visits to communities and interactions with RDC's and NDC's to determine the coverage and access needed. The increased production represents

water availability (43% over 2016 to 2021) and is not expected to significantly increase production costs. The current and projected increased coverage is shown in the table below.

Table 14: **Projected Water Distribution by Regions**

Region	Sources Not Distributing 24-hrs	Areas Not Served 24- hrs	% of 24-hrs Distribution				
			2017	2018	2019	2020	2021
2	Lima WTP	Queenstown-Paradise	70%	73%	93%	100%	100%
3	Vergenoegen WTP, Pouderoyen, Fellowship	De Kindren-Ruby, Hague-Union, Vreed-en-Hoop -Versailles	64%	64%	94%	100%	100%
4 EBD	Eccles WTP, Covent Garden WTP , Grove WTP	Eccles - Grove	74%	84%	90%	100%	100%
4 GT	Central WTP	Roxanne Burnham, East & West Ruimveldt	82%	100%	100%	100%	100%
4 ECD	Better Hope WTP, Mon Repos WTP , Friendship well	Plaisance - LBI , Mon Repos - Good Hope, Annadale - Vigilance	74%	83%	92%	100%	100%
5	Cotton Tree WTP	Shieldstown - No. 6	92%	100%	100%	100%	100%
6	Port Mourant , New Amsterdam WTP	Albion - Tain , Garrison Road- Gay Park	69%	81%	81%	100%	100%
7	Bartica WTP	Bartica	0%	40%	40%	100%	100%

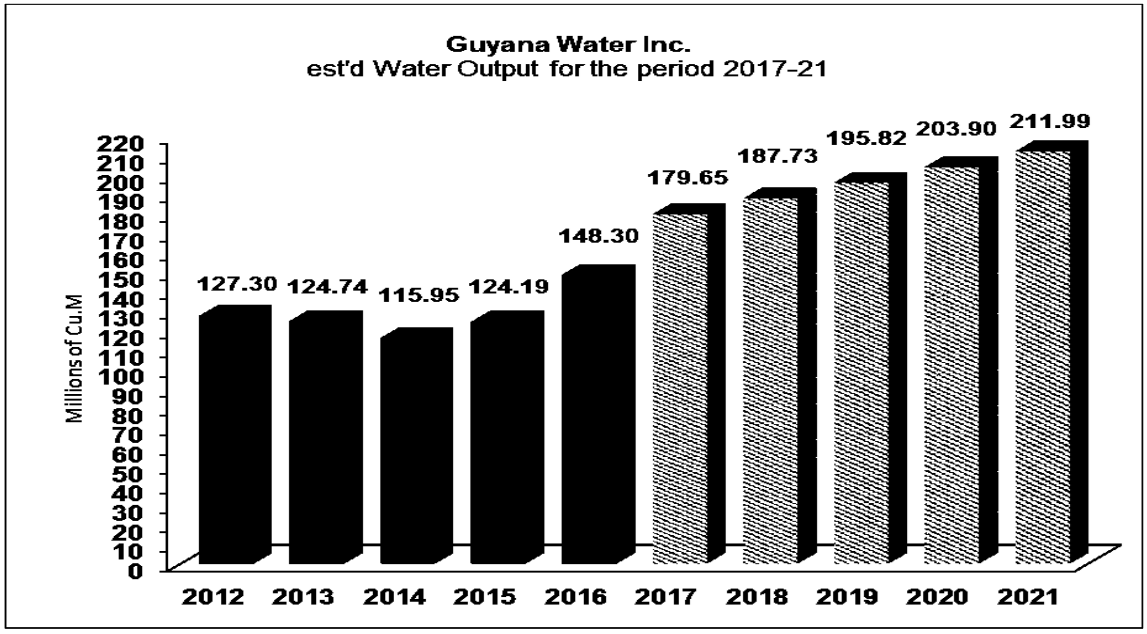
5.2.3 Water Production Projections - Towards Service Equity

Tables 14 and 15 show 100% access by 2020 and the graph shows percentage growth rate. Table 16 shows the annual water production (million m^3) for 2012 – 2016 and projected for 2017 – 2021. These projections are designed to allow GWI to move closer to its ultimate mission goals to ensure **equity of water service** for all Guyanese as enunciated by the government and mandated to GWI. While efforts to ensure that water quality meets internationally accepted standards are paramount for good health, nevertheless it is equally important for the Corporation to ensure that water availability meets customer demand. The Graph on Page 69 shows 2015 and 2016 actual annual production.

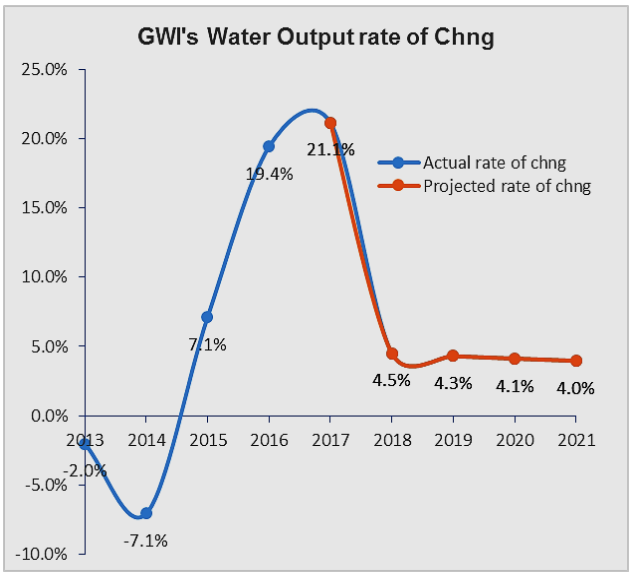
Table 15: Total Percentage Projection of 24-hour access by Regions – 2017, 2018, 2019, 2020 & 2021

All Regions	2017	2018	2019	2020 & 2021
Total	74%	84%	92%	100%

Table 16: **Actual and Projected Water Output**[33].



Source: GWI's Operations Dept., Data on Water Output 2012/16



Assumptions and Infrastructure Required to Support the Projections:

The projections for water distribution (in Table 15 on previous page) are designed to increase the availability of water in these regions, thus eliminating the percentage shortfall in 24-hour availability of service. The projections are however based on the assumptions that all capital investments will be available to ensure that infrastructure for distribution and service lines are in place during the program years. GWI is fully cognizant of the fact that the advantages of increasing production can easily be negated by a failure to address **leaks** and other non-revenue water concerns and these issues are addressed elsewhere in the plan with solutions. Mechanical devices such as **Pressure and Release Valves** and **Variable Speed Motors (**advocated to mitigate the demand for storage)[34] can regulate 'push' in reaction to customer 'pull' during 'peak' and 'off peak' periods and these will be installed in areas as circumstances warrant. Additionally, creating new **DMA's** and properly activating current ones will allow the Corporation to monitor the volume of water entering an area and its output to ensure that increased production is meeting **actual demand** and save on operations costs which will result in revenue enhancement.

[33] See Appendix C1for Projected Output/mns Cu.m for the Strategic Plan Life Cycle
[34] Section 8.14.

5.2.4 Access

GWI traditionally has provided water services based on its organizational divisional groupings. However, it has changed and aligned its services with the regional system of government and seeks to provide access through its infrastructure in each community. Tables 17 and 18 show projected population and community access and treated water distribution respectively.

Table 17: **Population and Community Access**[35]

Region	% Population with access	% of villages within region with access				
		2017	2018	2019	2020	2021
2	79%	58%	66%	76%	83%	90%
3	97%	63%	63%	68%	74%	77%
4	99%	77%	77%	83%	87%	90%
5	98%	69%	69%	74%	78%	80%
6	99%	68%	72%	77%	83%	87%
10	86%	28%	76%	81%	85%	89%

Table 18: **Treated Water Distribution**[36]

Regions	Treated Water Distribution				
	2017	2018	2019	2020	2021
Region 2	100%	100%	100%	100%	100%
Region 3	21%	21%	21%	67%	70%
Region 4EBD	76%	76%	76%	86%	90%
Region 4ECD	36%	100%	100%	100%	100%
Region 4GT	95%	95%	95%	95%	95%
Region 5	47%	47%	100%	100%	100%
Region 6	43%	43%	43%	56%	63%
Region 7 (Bartica)	100%	100%	100%	100%	100%
Region 10	100%	100%	100%	100%	100%

GWI strives to ensure that its water service meets international quality standards always and in instances where the coverage is shown as 100% (Regions 2, 4-ECD, 5, 7 -Bartica and 10); this represent regions where water is distributed from treatment plants and Seaquest is used for the sequestration of iron. **The <100% regions are receiving water that is on par with international quality standards.** GWI plans to have these regions receive treated water in future years. It should be noted however that water produced from 'B' sand wells require less treatment and the process relies on aeration rather than chemicals. Other plans for treatment include the rehabilitation and expansion of the present treatment plants and the construction of three (3) additional plants. The Friendship and Better Hope treatment plants will be rehabilitated and expanded in 2018. The use of Seaquest will be expanded in Region 4 - East Coast Demerara in 2018, Region 3 in 2019, and Regions 5 and 4 - East Bank Demerara in 2020. Three (3) water

[35] See Appendix C – Regional Population data. Region 7 only covers Central Bartica. Regions 1,8 and 9 are covered under the Hinterland Program.

[36] Region 6 will increase in 2020 due to completion of the new Treatment Plant at Sheet Anchor. Region 9 will have Sea quest treatment.

treatment plants will be built in Region 6 – Sheet Anchor, Region 4 – East -Bank Diamond and Region 3 - Uitvlugt.

5.2.5 Coordination of service with other Agencies

GWI is not alone in providing water coverage in the hinterland areas. The government and international agencies also provide water resources such as well drilling by the Brazilian Army in cases of drought, Life Saver water kits and containers for transporting water.

Key Performance Indicators (Water Service)

		Yearly Targets				
Programmatic area	Indicators	2017	2018	2019	2020	2021
Water Supply and Distribution	% of coastal villages with access	63%	70%	76%	81%	85%
Water Supply and Distribution	% of coastal population receiving treated water	57%	70%	74%	85%	86%
Water Supply and Distribution	average hours of distribution (hrs)	74%	84%	92%	100%	100%
Water Supply and Distribution	average level of service (metres)	5	5	5	5	5
Organisation & Management	staff per 1000 connections	5%	5%	5%	5%	5%

Coastal areas refer to villages listed in the 2012 Census within Regions 2, 3, 4, 5, Bartica and Region 10.

DESIGN INFRASTRUCTURE & DEMAND & SUPPLY DEPARTMENT

6.0 Planning and Design Infrastructure Works

The Design Infrastructure & demand & Supply department is responsible for planning and design which was previously performed by the Infrastructure Planning and Implementation Department (IPID). The Operations Department will identify program needs and gaps in the supply of services as they relate to regional and community needs and the planning and design department will conduct feasibility studies, recommend to operations and on approval, plan and design projects for additional infrastructure to meet operational goals.[37] It functions within an administrative group comprised of the Operations, Strategic Planning and Project Implementation & Partnership Building departments. GWI's strategic focus for program delivery and service expansion will address the needs that are defined in the departmental and regional operations situation and gap analysis and the group will ensure that planning and design meets the identified needs.

6.1 Planning and Designing Projects

While this department will plan for major capital-intensive projects[38], it is expected that smaller non-capital projects will continue to be planned and executed by the Operations Department or the Projects Implementation Department. And, regarding capital projects, the department will plan and design these projects in coordination with the Project Implementation Department and in such instances where it is found that there are desired design changes, these can be quickly resolved through discussions with the operations department.

This process will allow GWI to submit proposals for capital infrastructure works to the government and international institutions that are in keeping with its mission objectives. Thus, it can provide the assurance to stakeholders that projects are derived from the collective inputs of the Corporation's operations, planning and design and Project Implementation departments. This is a critical aspect of the Corporation's strategic planning for operations expansion since in the past, several projects were designed without an adequate basis or reference to actual operational situation and gap analysis of needs. There was very little input from communities which would benefit from the projects and consequently, today, some projects do not provide the required services needed in the communities.

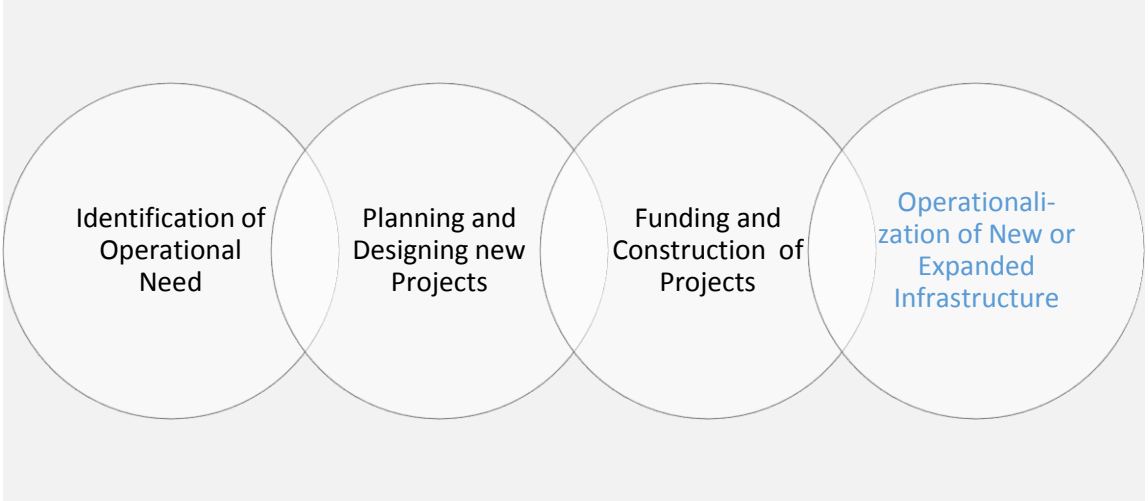
6.2 Evidence based Planning and Design

GWI will use data and information derived from outreach programs, research projects and participation on regional administrative councils to garner information regarding service needs. The information gathered will be discussed among the operations, planning and design, infrastructure and strategic planning departments to derive a consensus on the way forward to increase or introduce new services in communities. Projects will be divided into the expansion of services in current coastal operations areas and the expansion in new areas including hinterland riverain communities. A schematic of the planning and design process is shown on page 58.

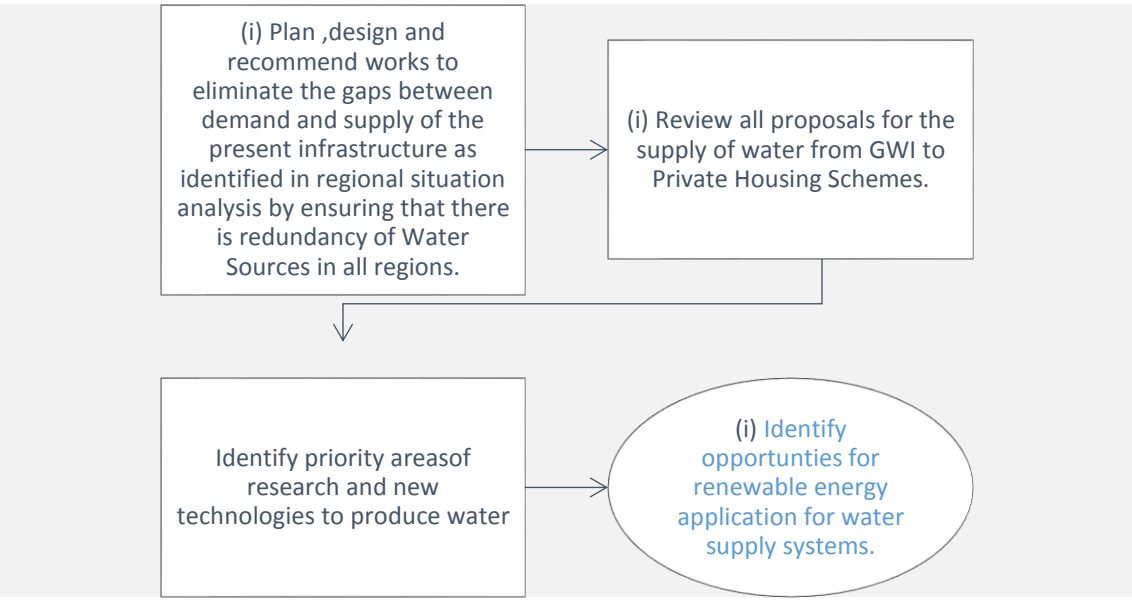
[37] The projects for this plan are set out in Appendix Q.

[38] See Table 49 showing total funding requirements for all capital projects.

A Schematic: **The Planning, Design and Funding Process**

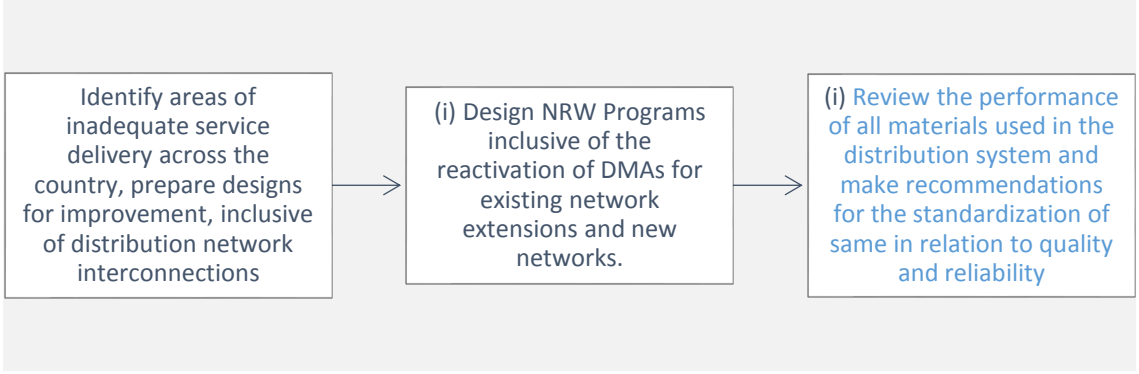


The Planning and Design Department reviewed the programmatic requirements for GWI's expansion of its current service coverage and its anticipation of new services especially for the hinterland areas, with department heads and recommend the plans for program delivery which are set out below.



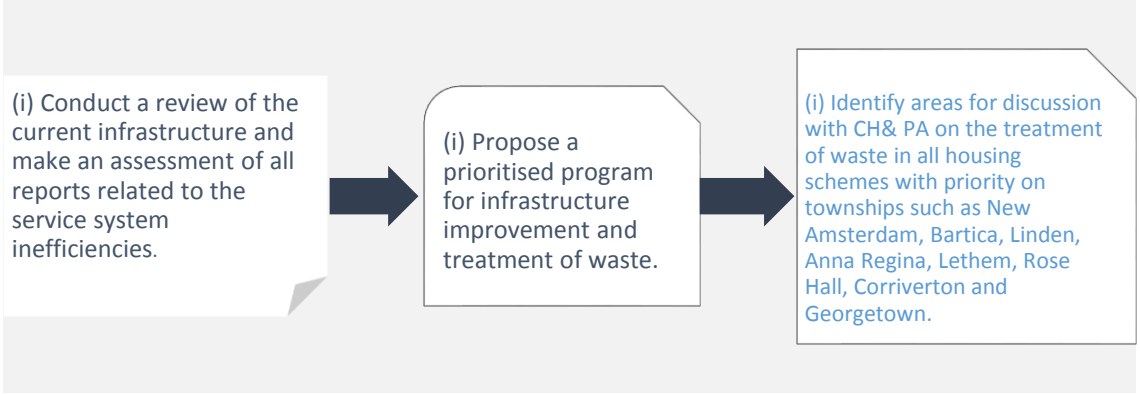
6.2.1 Water Supply and Distribution

The department will perform the following activities.



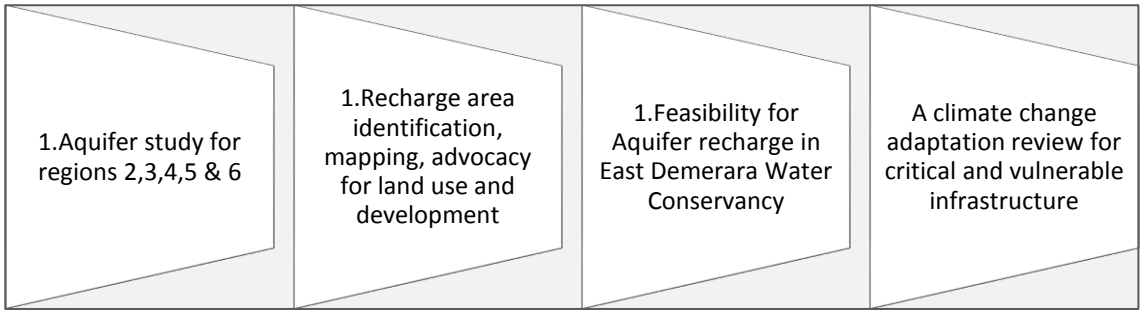
6.2.2 Sanitation and Sewerage

The department will perform the following activities.



6.3 Water Resources and Climate Adaptation

The department will conduct the following:



6.4 Coordination with Project Implementation & Partnership Building

The department will coordinate its planning and designing with the Project Implementation and Partnership Building Department to ensure that designs are modified and adapted to funding requirements and to approve requested changes during construction.

PROJECT IMPLEMENTATION AND PARTNERSHIP BUILDING DEPARTMENT

7.0 Current Hinterland Operations and new Infrastructure Works

The Project Implementation & Partnership Building Department is a replacement of the section of the Infrastructure, Planning and Implementation Department (IPID) that had responsibility for project administration, hinterland operations and project funding. It will continue the administration of hinterlands operations, be responsible for relations with funding agencies and be responsible for all infrastructure projects approved by the Board of Directors or the CMT.

7.1 Hinterland Operations

The department has responsibility for the operations and project implementation of potable water systems within Regions 1, 8, 9 and villages in the upper Mazaruni of Region 7. The Regions are divided into medium sized communities and small towns. The larger towns are Lethem and Mabaruma and small towns are Mahdia, Port Kaituma, Matthew's Ridge and Santa Rosa (Moruca) and Indigenous settlements. The residents in the town have individual service connections while in many communities, stand pipes are set up at strategic locations to serve the population. The following is a table showing their statistics.

Table 19: **Hinterland Communities**

Reg.	No. of communities	Names of Communities	Pop.	No. of Schools	No. of Health Facilities
1	60	Barabina, Baramita, Kamwata, Koberimo	31,306	77	25
7	17	Tasserene, Karrau, Kako, Imbamadai, Jawalla, Parima	20,280	25	27
8	25	Mahdia, Kopinang, Itabac, Kato, Paramakatoi, Monkey Mountain, Maicobe, Orinduk Kanapang, Kurukabaru, Taruka	10,190	12	23
9	64	Lethem, Annai, Bon Success, Culvert City,	23,196	35	56
Total	**166**		**84,972**	**149**	**131**

Table20: **Hinterland Treated Water access 2017-2021**

Functional Areas	Situation	Action
Organization & Management	Staffing is not at the required level	Hire 16 additional staff
Water Production and Quality	Because of the surface source there is a need to provide water treatment	The placement of mini labs to test and monitor water quality and provide treatment recommendation
Water Distribution	Due to the sparse population and location of some communities providing access to potable water is challenging	To create plans for shallow wells, trestles, PV systems, storage tanks and distribution lines
Revenue and Customer Relations	No revenue is received for the service provided	Plan to introduce revenue collection in 2018
Sanitation	The sewerage and sanitation is linked to pit toilets and septic tanks which can contaminate the water supply	To commence discussions with the communities regarding proper sewerage and sanitation to prevent water source contamination

Hinterland	Yearly Targets				
Region	2017	2018	2019	2020	2021
Region 1	32%	48%	63%	78%	93%
Region 7	0%	3%	8%	13%	19%
Region 8	11%	29%	44%	59%	68%
Region 9	20%	30%	45%	60%	75%

Performance Indicator – Water Access for certain regions (based on population)

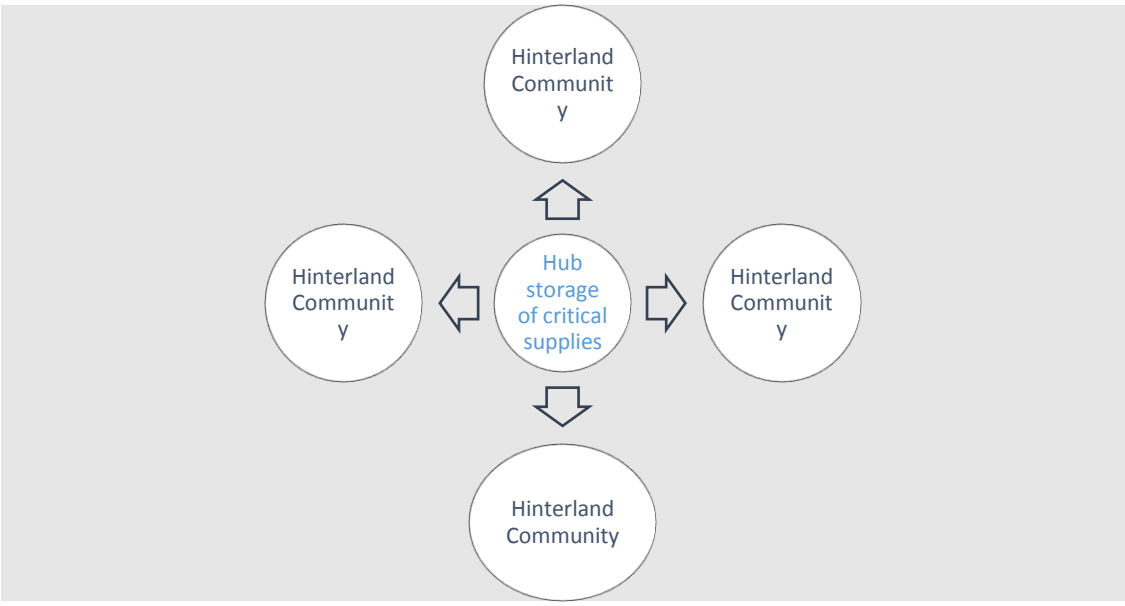
		Yearly Targets				
Programmatic area	Indicators	2017	2018	2019	2020	2021
Water Supply and Distribution	% of population in regions(2,3,4,5,6,Bartica,10) with access to water	97%	97%	98%	99%	99%

7.2 Operations Costs, Funding and Quality Control

GWI's average monthly operation cost for Mabaruma, Port Kaituma, Mahdia and Lethem is eight million dollars (G$8,000,000). This cost does not include Moruca, Region 1 since they receive services operated by the Village Council. It is anticipated, the operation cost will increase with the operations at Matthew's Ridge and Moruca. GWI however receives government's financial assistance from the Hinterland budget for the installation of distribution systems, drilling of Wells and purchase of materials. The department personnel will visit hinterland communities and examine their water sources such as rivers, and creeks to conduct water quality tests especially at health and school institutions. Samples will be sent to mini laboratories to facilitate expeditious interventions for treatments or the issuance of advisories for safe water usage. Thereafter, in conjunction with the planning department, a program will be created to address service needs including preparing for disaster relief when there are droughts or flooding. GWI

plans to have emergency supplies located and stored strategically in certain (Hub) communities ready for rapid deployment to surrounding communities as shown in the schematic below.

Schematic: **Rapid Response Program**



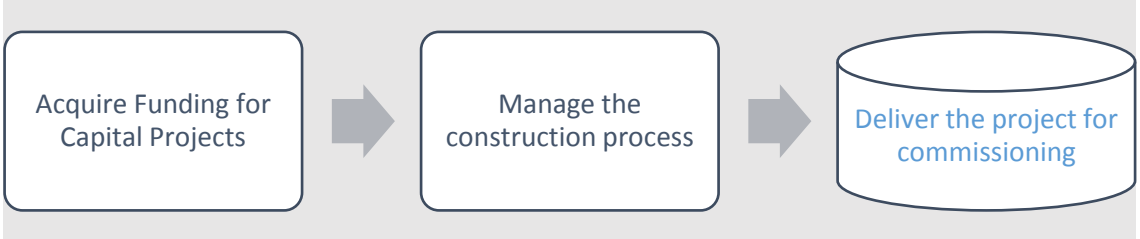
7.3 Central Housing and Planning Authority and Private Schemes

GWI reviews and approves housing plans for the Central Housing Planning Authority to ascertain the infrastructure required for water and sewerage services and enters into contractual agreements with private developers for infrastructure works on their housing schemes. It is envisaged that with the expected rapid pace of housing development anticipated for the future years, this activity will increase and the Corporation will consider this as an additional revenue source.

7.4 Managing Construction

This department will manage the construction process to ensure that it conforms to the designs and upon completion will be functional. Engineers will inspect and certify each stage of construction and approve payment for contracted services. The department will ensure that work has been satisfactorily completed and the projects are ready for commissioning and hand over to the Operations Department.

Schematic: **Construction Process**



7.5 Identification of Funding

The Infrastructure works will be planned, designed and executed with funding (Tables 21 and 22 below) that is procured from various sources. These will include governmental programs which are designed to provide funding for certain types of communities. Currently, the Corporation engages communities in partnerships for capital contributions for infrastructure works and it is envisaged that going forward, every effort will be made to engage funding entities on behalf of these communities.

Table 21: **Projected Funding -Functional Areas**
Allocation of Financial Resources under the WSSDP 2017-2021 (G$blns)

Functional Areas	**Recurrent Cost**		**Capital Cost**		**Total Cost**	
Water production & Quality	$8,873.97	21%	$18,615.0	45%	$27,488.97	32.9%
Water Distribution & Quality	$8,451.4	20%	$16,133.0	39%	$24,584.40	29.4%
Organization & Management	$15,212.52	36%	$1,572.1	3.8%	$16,784.62	20.1%
Sanitation	$5,493.41	13%	$2,482.2	6.0%	$7,975.61	9.5%
Finance & Revenue	$4,225.7	10%	$2,565.2	6.2%	$6,790.90	8.1%
Grand Total	**$42,257.00**	**100%**	**$41,366.52**	**100%**	**$83,623.52**	100%

7.5.1 The Need for new Funding Commitments

GWI's Capital funding requires an additional US$80 million dollars (Guy $16.3 billion dollars) more than the committed funding from the Government of Guyana and IDB for the plan years. The Corporation will pursue access to special sector funding with the government and international agencies. Additional funding details are listed in section 26.1.

Table 22: **Funding Sources and the projected gap**

Source	**Total** Amt. (US$mn)	**Total** Amt. (G$bln**)**	**Average per/ann.** Amt. (US$mn)	**Average per/ann.** Amt. (G$bln)	**%**
Development Partners	$31.861	$6,531.54	$6.3722	$1,306.31	15.8
Central Government	$59.132	$12,122.18	$11.827	$2,424.436	29.3
Guyana Water Incorporated	$31.029	$6,361.00	$6.206	$1,272.20	15.4
Unfunded/gap/deficit	$79.765	$16,351.80	$15.953	$3,270.361	39.5
Grand Total	**$201.788**	**$41,366.52**	**$40.358**	**$8,273.30**	**100.0**

7.6 Current Infrastructure Works

The Infrastructure Works that are currently being executed and those that were completed and are to be operationalized are listed in Table 7.

7.7 New Infrastructure Projects and Funding

The infrastructure plans for the program period are set out in Section 27.0 and the capital budget is shown in Appendix T. It is expected that these projects will be revised based on evaluations and changes due to new situations that affect organizational or stakeholder needs.

7.8 Monitoring Capital Funding Disbursement

The Corporation recognizes that the disbursement of funds for capital projects is critical for successful completion. Hence, it has adopted a process that allows careful monitoring of each development and construction stage by engineers assigned to the projects in accordance with the Gantt Charts. The engineers will oversee the work of the Clerk of Works and they will be responsible for supervising and approving the preparation of Payment Requests from contractors.

Annual Key Performance Indicators (Project Implementation and Partnership Building)

	Programmatic area	Indicators	2017	2018	2019	2020	2021
1	Water Supply and Distribution	% of hinterland population served	80%	80%	80%	80%	80%
2	Organization & Management	% of projects on schedule	100%	100%	100%	100%	100%
3	Organization & Management	Proportion of project budget disbursed	TBD	TBD	TBD	TBD	TBD

WATER PRODUCTION

8.0 Water Production

Based on the water production requirements set out in the regional situation analysis, the operations department must create a strategy for the aggregate supply of water in accordance with GWI's mission objectives. This includes an examination of current water sources, quality and levels of service. The Corporation derives its water supply from ground sources (wells) and surface sources such as streams and creeks. There are 137 active wells and others that are either inactive or are producing low volumes of water and were listed under the previous strategic plan for de-commissioning. The ages of these wells are listed hereunder.

Table 23: **The Age of the Wells**

Year drilled	<1971	1971 - 1990	1991-2001	2002-2017
# of wells	12	44	18	30
% of wells	12%	42%	17%	29%

The exact or approximate ages of 76% (or 104) of the wells is recorded. The table shows a breakdown of the number of wells by the years drilled.

GWI is re-examining its decision regarding de-commissioning of wells and has plans to keep low functioning wells in production and use them for water supply when customer demand is reduced during the night time. An examination of the efficiency levels of existing wells shows that during 2016, the average was 50%, indicating that there is tremendous room for improving efficiencies. This points to the process of maintaining wells and the technology used for this critical operation.

GWI uses contracted services for wells maintenance and the process and technology used seems greatly inefficient and costly when compared with technology and costs for international firms. In this regard, GWI signed a contract this year with the Dutch firm De Ruiter Grondwaterechniek to drill three (3) new wells at Sophia, Diamond and Sparendaam along the coastland. This contract allows the Corporation to adopt a new approach to contracting for wells drilling and fits its interest in having its personnel and private contractors trained in well drilling and development using state-of-the-art technology better suited for Guyana's geological environment.

8.1 The Challenge of Drilling Wells

GWI recognizes the challenge of drilling wells, especially with the use of contracted services for this process and it has identified factors such as the need for technical knowledge to perform correct drilling techniques (a skill not available in Guyana) and the lack of such knowledge and ability of its personnel to supervise contractors, over pumping of wells and no redundancy of wells. It is the Corporation's plan to overcome these with the contracting of services with international well drilling firms, training of local contractors and their personnel and the eventual purchase of well drilling rigs to be operated by GWI personnel who will provide greater value for the investment.

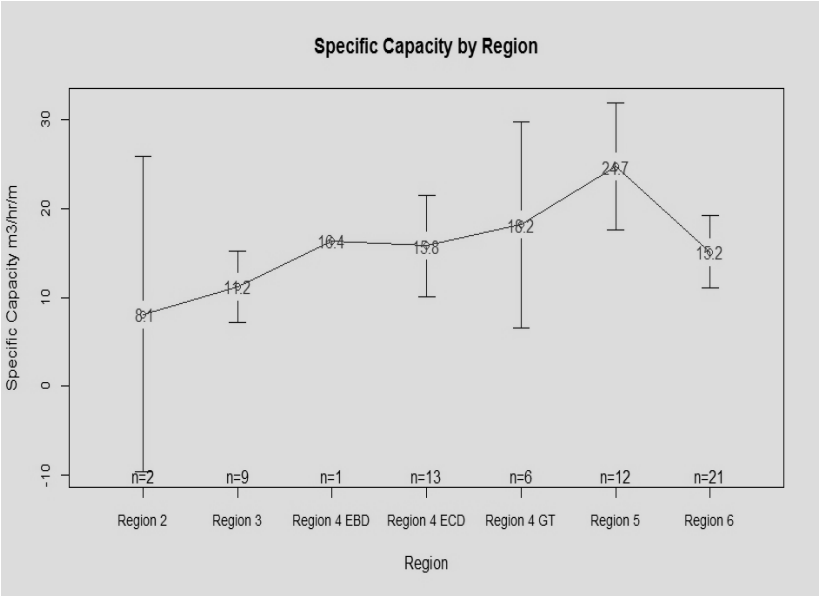
8.2 The Well Drilling and Construction Program

The Corporation has developed plans for the creation of well fields in geographic areas identified in its Capital Funding Program with the objective of replacing aging wells, addressing redundancy and ensuring that new wells are drilled in geographic areas and at depths that are suited to the operational needs and require less water treatment, thus reducing operational costs. The inefficiencies of the existing wells is set out in the following sections.

A Pump Station at De Hoop

Well Performance

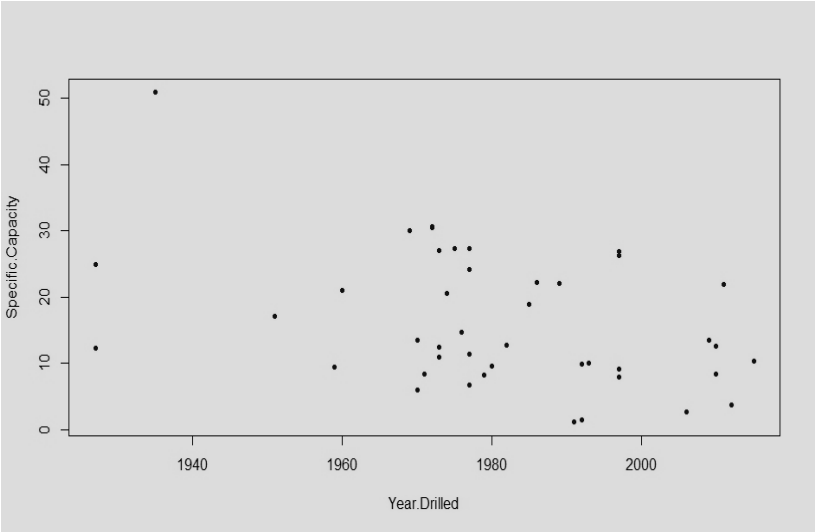
This graph shows the specific capacity (performance) for wells in regions 2 to 6.



This Figure shows *the average specific capacity with 95% confidence intervals of the wells by region. The number of wells measured (n=) within each region is denoted at the bottom of the graph.*

Wells - Year Commissioned and Performance

This graph shows the year in which wells were commissioned and their operational performance.



This Figure *shows the overall specific capacity of the wells measured by the year in which the wells were drilled. There seems to be a slight declining trend in the specific capacity as the year's increase.*

There are 137 wells in operation however, the specific capacities of only 64 of these wells were calculated. The specific capacity being a measure of the well performance is calculated from the static/dynamic levels and production rate of the well. When the static and dynamic levels are unknown, the specific capacity cannot be calculated.

The average specific capacity by regions as shown in Figure 1 is a measure for the number of wells that were monitored. Figure 1 shows that the wells (measured) in Regions 5, 4-GT and 4-ECD have on average higher overall specific capacity than the other regions, there is however no statistical significant difference in the average specific capacity of wells by regions. Since only 50% of the wells were not monitored it is possible that in those regions with a higher average specific capacity where a greater proportion of wells were measured bias was introduced leading to those regions having a higher average specific capacity for those wells monitored within the region.

The Figure above shows a scatter plot of the specific capacity measured for the wells against the year in which the wells were drilled. There seems to be a slight downward trend in the specific capacity with the increase in year drilled, suggesting that older wells have better specific capacity and by extension better performance than newer wells. This trend however is not backed up statistically, and more data is required for further analysis.

A statistical model of the specific capacity of the measured wells using the year drilled and the region in which they are located as predictors of specific capacity demonstrated that these were not significant indicators of specific capacity. There may be better (by far) more relevant predictors of specific capacity that have not been considered and should be considered in such a model.

It is unacceptable that only 50% of the wells within GWI were monitored in 2016, hence it is important that a greater percentage of these wells are monitored in 2017 and going forward. It was reported that there are some wells where the measuring instruments cannot access the

well to take the static and dynamic levels; hence no specific capacity can be calculated for those wells. Despite the foregoing challenge, it is still possible with proper planning in coordination with the well maintenance schedule for these measures to be taken.

8.3 Aquifer Levels and Wells Performance

An examination of the Aquifer Levels in Guyana reveals that potable water comes primarily from groundwater in 'A' sand aquifers which is high in iron content and requires treatment before distribution and supply to customers. Water is also derived from 'B' sand aquifers which requires very little treatment prior to distribution and supply to customers.

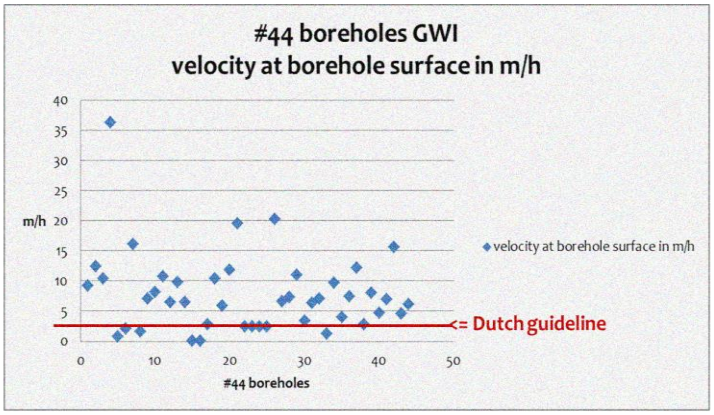
The Corporation is faced with an inventory of wells (Wells) which are aging or were developed with technical deficiencies. Consequently, their efficiencies indicate the need for a comprehensive review of the Aquifer Levels and the current and future locations of wells. While, it was stipulated in the 2012 – 2016 plan that several wells were to be de-commissioned, it has been found that to maintain the current level of water production and services to various communities, it is not feasible or recommended that wells should be de-commissioned on the scale proposed and therefore, no active plan is in place for de-commissioning wells. However, it is recognized that while the low efficiencies of some wells make them less than financially viable, it is considered a greater advantage to keep them operational while efforts are being undertaken to improve their efficiencies. These wells can be used for production during low consumption periods.

The 2012 - 2016 plan references the preliminary studies that were done to determine saline/freshwater boundaries and recommends that additional studies are necessary since observations have shown influences of tidal fluctuations on Wells levels in Region 6. The effects of climate change with intense rainfall events, the protection of transmission corridors and the cost of surface water treatment plants were discussed and based on these, it is submitted that efforts should be ongoing to determine an effective means of ensuring that the aquifer levels are conducive for water supply.

8.4 Wells Efficiencies

In early 2017, a preliminary sample survey[39] was conducted by a consultant[40] to determine Wells efficiencies and the graph on page 67 shows that in comparison with the baseline efficiencies for wells in the Netherlands (Dutch), a large percentage (72%) of the Wells (sample) were over pumping water, leading to inefficiencies and increased costs for screens and operations, resulting in higher energy costs. The report surmised that a main reason for the over pumping can be traced to the high demand for production output which may be driven by leaks in the distribution system.

[39] Data was drawn from 44 Wells.
[40] The Consultant (Theo Smith) reviewed Non-revenue water determinants.



8.5 Guyana's Experience

GWI considered the survey report in relation to its operations and focused on the process for determining the dynamic and static levels of the wells to ensure that they are not being over pumped. The process is to take dynamic reading during the operations hours of the pump and thereafter the static level after the well has experienced a period of inactivity during the period when the preventive maintenance is being done at the well site. The readings allow the Corporation to ensure that each well's pumping levels is controlled to prevent over pumping since the recharge time is known and the condition of the Aquifer.

Notwithstanding the above, GWI in consideration of this phenomenon and to increase wells efficiencies while striving for cost reductions, has decided to launch an aggressive leak identification and timely repairs program to ensure that wells pumping, especially in areas where treated water is produced, will be reduced in keeping with real demand and is not driven by leaks which contributes to NRW and wastage. Another factor to be considered is the use of well fields. Where multiple wells with a production of no more than 100 cu.m per/hr. can replace singular large wells, whose production are over 300 cu.m per/hr. This will reduce the issue of high pumping velocity as referenced to in the Dutch Report on Guyana.

8.6 Continuation of the Study

The Corporation has also decided to expand this study to cover all remaining Wells and the Strategic Planning Department was tasked with the responsibility for the design and conduct of the study. It is expected that the data derived from the study will be correlated with the known data on wells efficiencies and their ages. This will provide GWI with an analysis of the state of all wells and the data can be used to plan well operations, decommissioning of wells and determining where new wells should be in conjunction with the Hydrological studies that are conducted by the Hydrologist and in keeping with the information derived from community outreach meetings regarding service and supply needs.

A program will be initiated to identify the pumping capacity of all Wells, ascertain the customer base and expected consumption for each Wells and determine the expected production quantity that should satisfy customer demand. Data will be gathered from field investigations regarding leaks or commercial customer usage towards the determination of the expected demand and the lowest cost of production.

8.7 Hydrological Studies

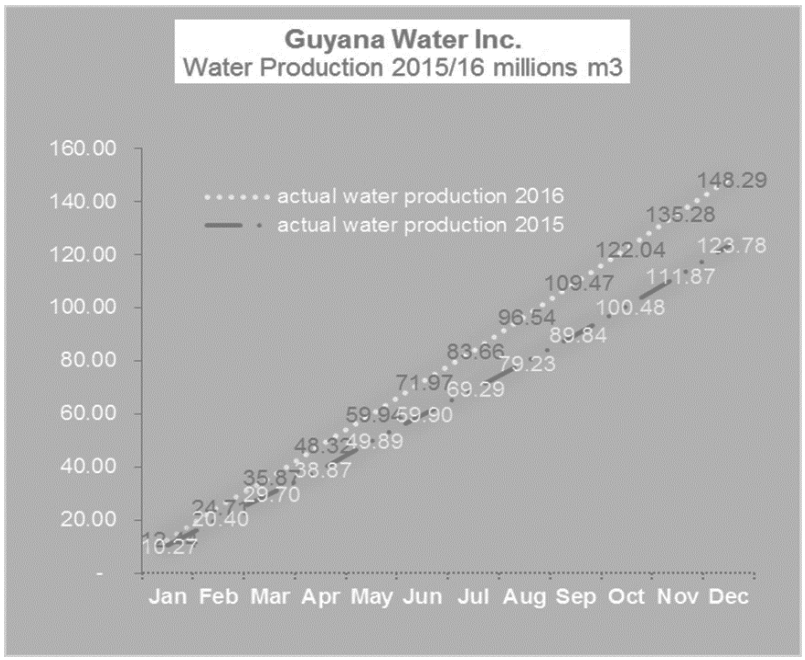
GWI obtained the services of a hydrologist in 2016 who performs duties regarding the collection and evaluation of the soils in the regions, with special reference for areas where operations have dictated the drilling of wells and their development. The placement of wells will influence the design of treatment plants and improve the quality of water from the well source.

Table 24: **Location of Water Sources**

Regions	Water source	Treatment Plants	Location of Well/ Treatment Plant	Location of surface treatment Plant
2	Well	1	Lima	
3	Well	3	Pouderoyen, Fellowship and Vergenoegen	
4 – Georgetown	Surface water (Conservancy and Well)	3	Sophia and Central Ruimveldt	Shelterbelt Conservancy
4 – East Bank	Well	3	Eccles, Coven Gardens and Grove	
10 – Linden	Surface water (Dakarie Creek and Demerara River) and well	5	Amelia's Ward	Wisroc, Wisma, West Watuka (Dakarie Creek) and LPC Demerara River
4 – East Coast	Well	2	Better Hope and Mon Repos	
5	Well	1	Cotton Tree	
6	Well	4	New Amsterdam, Port Mourant, Queenstown sand No. 56 Village	
7 – Bartica	Mazaruni River	1	Bartica	Mazaruni River

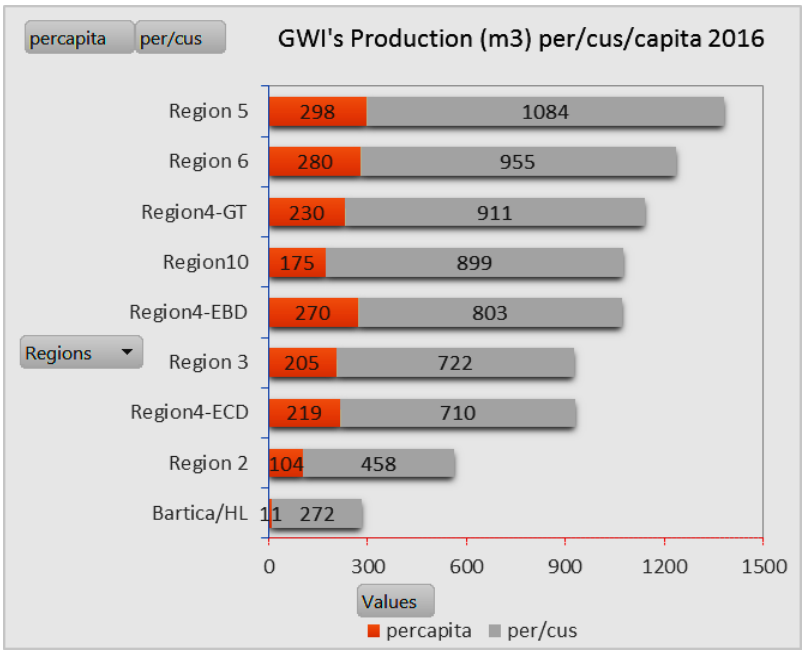
8.8 Production Output

Commencing in 2012 and continuing over the subsequent years, the Corporation had declining levels of water production up to 2015, as a strategy to reduce non-revenue water. This trend was reversed in 2016 (see graph on page 71) with the new emphasis on striving to provide 24-hour service access. To understand the nature of this decline we must look at the factors of production. Water production comes from surface sources (streams and creeks) or ground (Aquifers) and is pumped from wells or stations to treatment plants for distribution through mains to supply lines which take water to customers. Water is produced from 137 Wells and some of it is processed by 24 Treatment Plants and distributed through transmission lines. It is planned that during the 2017 – 2021 years, in keeping with the identified service needs of communities, the regions will have 9 new wells in its service areas, 3 new treatment plants at Sheet Anchor, Diamond and Uitvlugt. The emphasis on the de-commission of wells in the previous plan will be reversed since it has been proven that a better strategy will be the refurbishing of old wells along with the introduction of new wells. The Planning and Design Department in coordination with the Operations Department will be engaged in targets setting while the Project Implementation Department will be concerned with the execution of work for new wells and treatment plants, especially for new townships and communities. These wells and treatment plants will be designed for 'green technology' in keeping with the government's objective of having a 'green environment'. The Project Implementation Department will also be engaged in identifying existing transmission lines which were laid and develop processes to link them to existing distribution and supply lines which will undoubtedly lead to improved efficiencies in water delivery and levels of service.



Comparison of Water Output 2015 & 2016

This graphs shows the total water production output for 2015 and 2016. Annual projections for 2017–2021 are shown on page 54.



8.9 Wells Efficiencies

During the next five (5) years, GWI plans to improve well operating efficiency through refurbishment and the adaption of new drilling techniques with the assistance of international experts. It also intends to facilitate the capacity building for local contractors to engage in wells drilling through training agreements with international organizations. GWI plans to use the services of the Hydrologists extensively for the correct identification of soils, rock formations and other geological factors that will impact on the technical design of the drilling process. The well drilling effort is expected to be assisted by the Brazilian Government which has agreed to provide the services of military personnel for well drilling in the Hinterland during 2017.

8.9.1 Technical Design and Monitoring of Drilling Operations

The Corporation has changed it approach to the monitoring of well drilling and development to ensure greater coordination and control over the process. The design and planning department will be involved in the hydrological studies review and determination of the most feasible site for drilling and it will be responsible for the technical specifications which will be used for the procurement of contractor services for well drilling. The Project Implementation will take responsibility for supervision and technical problem-solving during drilling and will certify the stages of development to the final commissioning and hand over to operations.

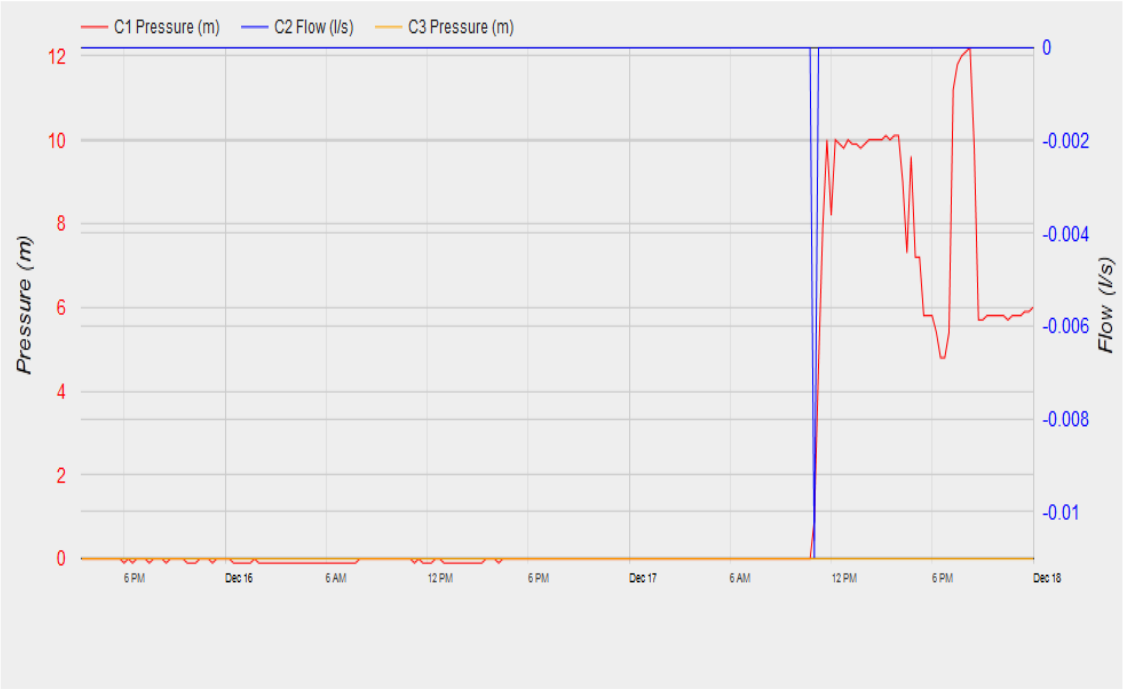
8.10 Levels of Service -Wells

The levels of service for each area will be carefully examined and through the active involvement of personnel in the various communities, the Corporation will strive to provide levels of service in keeping with the professed needs of each community. However, while it is ideal that water should be provided uninterruptedly over a 24-hour period**,** nevertheless in recognition of the challenges[41] for such a commitment, it will be a more achievable objective for the Corporation to strive to provide levels of service[42] with planned movement towards full 24-hour service over time. In this regard, the levels of service for each region will show the expected plans for production and distribution.

The Corporation has a very useful tool (Loggers) which can aid in decision-making for production levels. It provides regional managers with data on demand and production during operational periods and can highlight period of constant or fluctuating production, which can be indicative of factors such as power outages that affect level of service. Additionally, an examination of demand and production ratios can demonstrate losses due to leaks that are contributory to NRW. Hence, it is planned to expand the use of Loggers for all production operations and systems will be developed to provide data in a timely manner for decision-making. The following depicts the data that can be derived from the Loggers Program.

[41] The Corporation relies on the Guyana Power Limited for electricity for operations.
[42] The Corporation will produce water from wells with limited capacities.

Div 3 GT|Shelter Belt Output Phone: 0115926007357 Site ID: D3_1_30 From: 15Dec2016 15:30 To: 18Dec2016 00:00 (15 Mins)

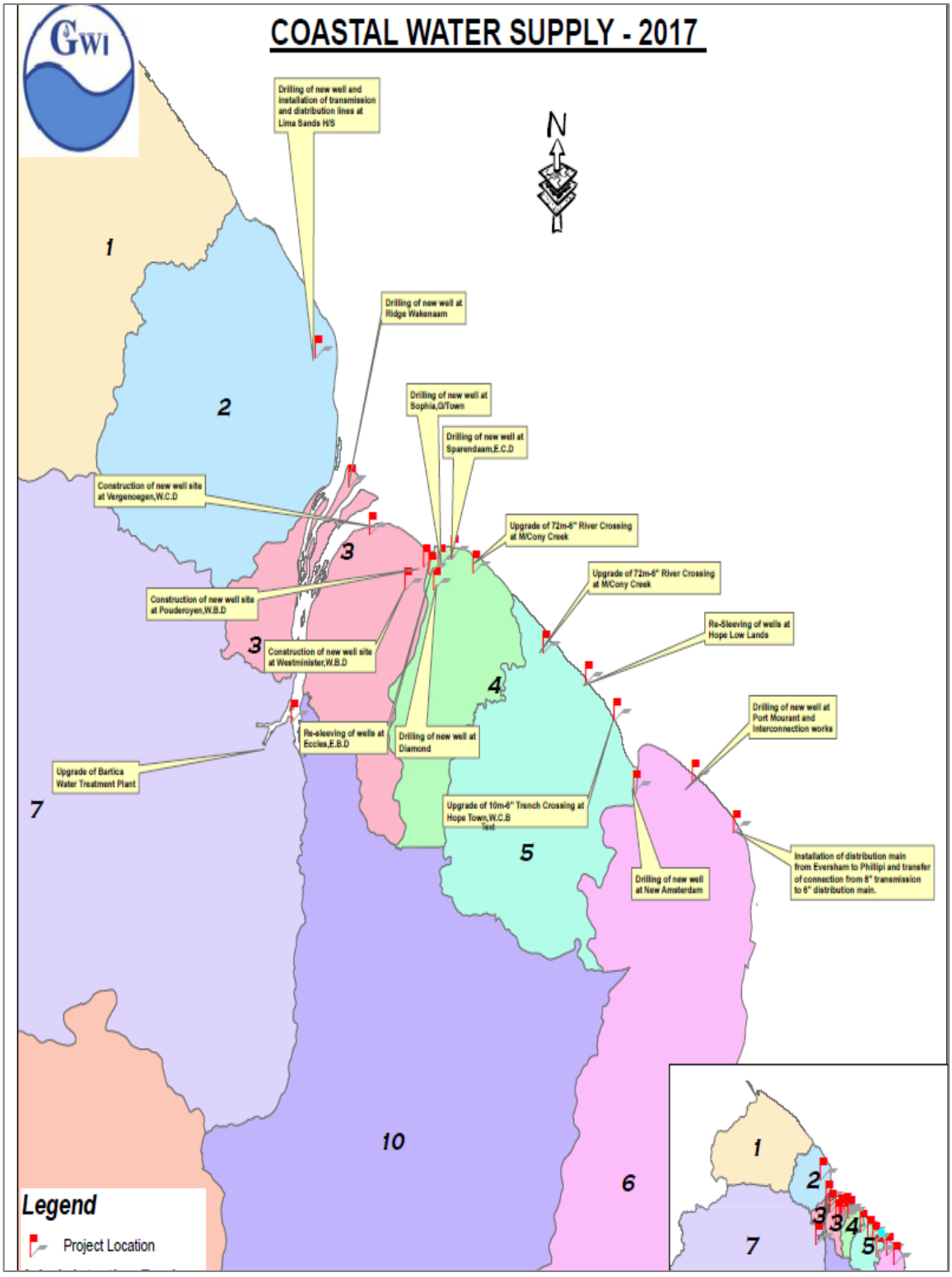


Data Statistics

Channel	Max.	Min.	Volume (Average)	Meter Read (18Dec2016 00:00)
C1 Pressure (m)	12.2	-0.1	(1.826)	-
C2 Flow (l/s)	0	-0.011	-0.01 m³ (0)	429496.718 m³
C3 Pressure (m)	0	0	(0)	-

8.11 Water Production – Coastal and Hinterland Geographic Areas

GWI's mission is countrywide and the maps for the Coastal and Hinterlands areas listed below and on the following page show its service supply and distribution areas. The maps differentiate the various regions which are color coded and GWI's operations in these regions are sub-divided into zones with groupings of wells, pump stations and treatment plants.


COASTAL WATER SUPPLY - 2017
GWI
N
Drilling of new well and installation of transmission and distribution lines at Lima Sands H/S
Drilling of new well at Ridge Wakenaam
Drilling of new well at Sophia,G/Town
Drilling of new well at Sparendaam,E.C.D
Construction of new well site at Vergenoegen,W.C.D
Upgrade of 72m-6" River Crossing at M/Cony Creek
Upgrade of 72m-6" River Crossing at M/Cony Creek
Construction of new well site at Pouderoyen,W.B.D
Re-Sleeving of wells at Hope Low Lands
Construction of new well site at Westminister,W.B.D
Drilling of new well at Port Mourant and Interconnection works
Re-sleeving of wells at Eccles,E.B.D
Drilling of new well at Diamond
Upgrade of Bartica Water Treatment Plant
Upgrade of 10m-8" Trench Crossing at Hope Town,W.C.B
Drilling of new well at New Amsterdam
Installation of distribution main from Eversham to Philipi and transfer of connection from 8" transmission to 6" distribution main.
1
2
3
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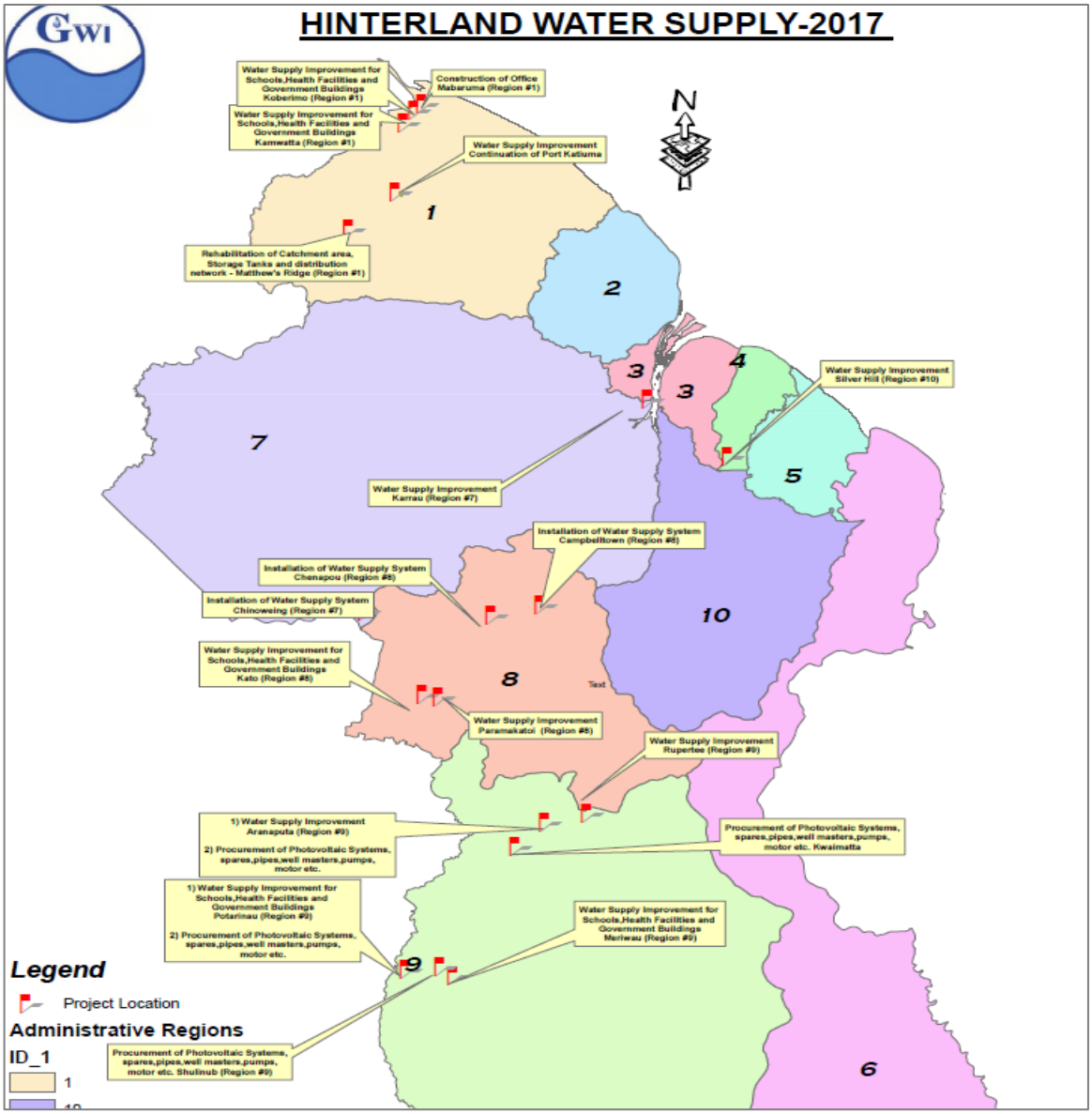
Legend
Project Location



MAPPING AND ZONING SERVICE AREAS

8.12 The Atlas Zoning Map

GWI created an Atlas Zoning Map which provides information for all departments for decision-making and will provide information for customers regarding services advisories and operations. The Map shows the zoned areas in which personnel including contractors will operate. The services will be tracked via the GIS program and this will provide greater accountability for service performance. The zoning will be used for leak identification and repairs, meter reading, bill delivery and customers will be provided with information regarding the sources of their water supply, i.e. which wells are providing water production in the respective zones. In addition, it will display information such as the number and locations of treatment plants, number of customers, institutions (hospitals, health clinics and schools) and personnel assigned to perform these services. The System will be fully functional in 2017.

It will be available on Kiosks in regional offices for customer access to the system and facilitate the use of cellphones or computers to access information, report leaks and eventually view their accounts and pay their bills. GWI plans to publish water service levels on its website for customer information and this data will be available for review by decision-makers via an electronic program that displays information on an 'Atlas' on cellphones and tablets. GWI will assign contractors to zones for leak detection, repairs, disconnections and reconnection services. The Atlas Zoning Chart is shown in section 3.28. The zones define the boundaries that will be used for determining financial cost centers.

8.13 Georgetown Service

The Corporation has examined the level of service for the Georgetown area and plans to increase its service level to 24-hour in all areas. Currently there are 9 wells which last year provided 9,595,154 m^3 of water, representing 40% of the service needs while the remaining 60% is supplied from a surface source, the East Demerara Conservancy. There are three (3) treatment plants, Sophia, Shelter Belt and Central. Based on the current demand, it is expected that GWI can increase its production capacity easily. However, the major challenge will be the storage of water to regulate its distribution. Currently, there are plans to upgrade and drill new wells and since water is distributed through service connections which are aged, there is some concern that increasing the supply distribution would lead to major leaks.

There is a major rehabilitation program planned for the City of Georgetown which provides services to 34,000 customers to address the aged distribution system. In addition to the three (3) existing treatment plants at Central, Sophia and Shelterbelt, one (1) more plant is planned for North of the City. Regarding the existing distribution and service lines, it is planned to replace the asbestos lines in the Atlanticville network, replace the lines in "C" Field Sophia, add lines and service updates inn Alexander Village, Rasville and Church Street and complete a 'ring' main upgrade for the entire city, over the 5-year plan years.

GWI has examined its production levels and current storage capacity and concluded that it will be necessary to build additional storage facilities to store water which can be distributed in response to demand. In addition, it is envisaged that to mitigate the problem of the dry season which lowers the surface supply, six (6) additional wells would be drilled possibly along the shelterbelt areas which will be interconnected to ensure continuity of supply. Also, GWI is envisaging that in a few years with the new oil economy, there will be rapid expansion of business and service needs in the Georgetown areas and thus there will be a need for rapid service expansion.

8.14 Water Storage

In prior years, GWI had overhead water storage tanks in various locations but in the absence of a discernable maintenance program, many of these tanks become inoperable and have been stolen and abandoned. While it is understood that the proliferation of customer's 'black tanks' is a phenomenon that will not disappear in the short run, it is felt that the feasibility of refurbishing existing tanks and the construction of new tanks should be investigated since they can play a pivotal role in regulating service supply and contribute to energy cost reductions. Therefore, it is proposed that a special team of persons can be assigned to inspect and recommend refurbishment efforts for these tanks. Water produced from wells could then be pumped into the tanks for storage and can be released with gravity feed during the low demand periods (nights) without pumping water directly from wells to the distribution systems. This

would result in lower operational energy costs for wells which will only produce water to replenish the overhead tanks.

8.15 Expanding Storage

The distribution of water is hampered by inadequate storage and this is critical in the Georgetown areas, notably at the Central Ruimveldt Station. The absence of adequate storage restricts the availability of water and the Corporation's ability to provide 24-hour full service in all areas of the city. Consequently, GWI proposes to build more storage facilitation as shown below during the plan years.

A storage Tank at Bartica

8.15.1 Overhead Tanks and Variable Speed Motors

While it is stated above that GWI should investigate the feasibility of refurbishing overhead tanks, it should be noted that over the years, the Corporation as the intension to use variable speed motors to regulate water flow in the absence of storage tanks. These motors have react to the 'pull' of consumption which changes the motor speed to 'push' more water in times of increase/decree se demand. Correspondingly, during periods of low demand, the motor's speed changes to lower 'pull' on the wells and thus conserve water supply. Hence, their use is justified. However, notwithstanding the advantage of variable speed motors, the Corporation is also examining the erection of overhead tanks from durable plastic materials for use in the hinterland areas where small communities are subjected to annual droughts.

8.16 Water Production in the Programmatic Areas (Situation Analysis)

The Indicators (on the following page) which are derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives.

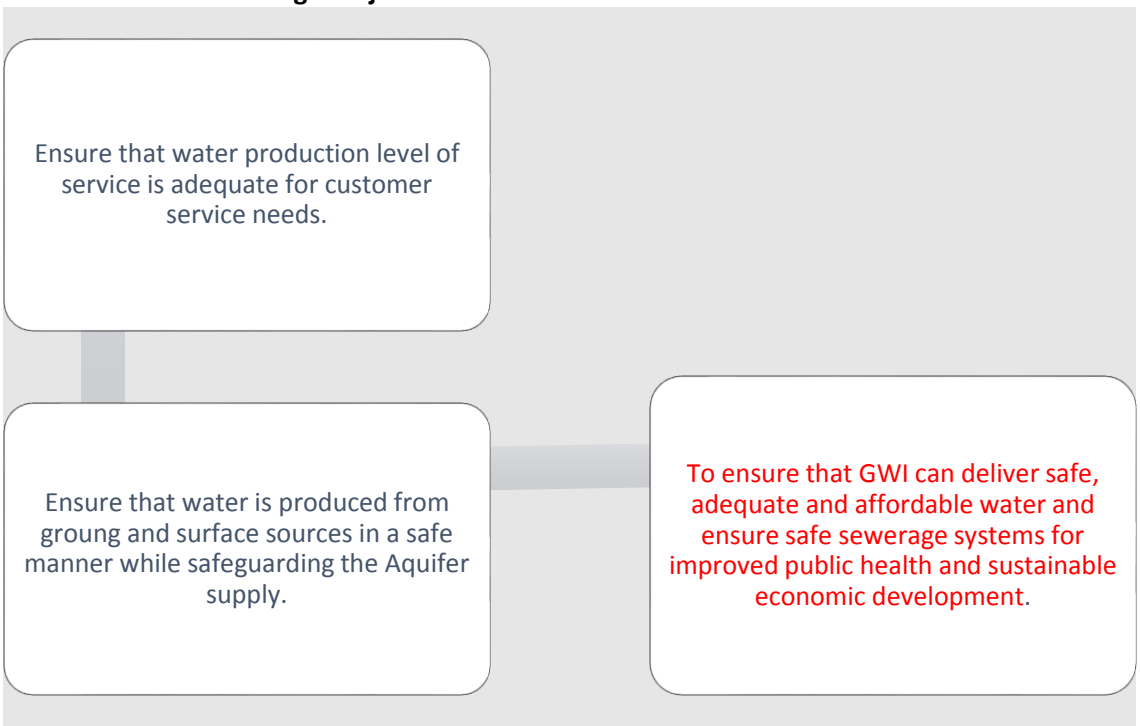
Situation Analysis (summary) Requirements

INDICATOR	2017	2018	2019	2020	2021
Supply of treated water	To provide 45% of treated water to customers.	To provide 45% of treated water to customers.	To provide 45% of treated water to customers.	To provide 60% of treated water to customers.	To provide 65% of treated water to customers.
24-hour level of service.	To provide 24-hour level of service to >70% of all customers.	To provide 24-hour level of service to >78% of all customers.	To provide 24-hour level of service to >82% of all customers.	To provide 24-hour level of service to 100% of all customers.	To provide 24-hour level of service to 100% of all customers.

Annual Key Performance Indicators (Water Production – million m^3)

Programmatic area	Indicators	2017	2018	2019	2020	2021
Water Production	Total Water Produced (m3)	179.65	187.73	195.82	203.9	211.99

Water Production Strategic Objectives



WATER QUALITY

9.0 Water Quality

Throughout Guyana, water is supplied to the various communities through two main sources namely, well water from 'A' and 'B' sand wells and surface water from rivers, creeks, springs and canals. These sources have inherent characteristics which require respective treatment and monitoring to address the following parameters: pH, turbidity, color, iron, aluminum, total coliforms and E. Coli etc. The Corporation has 24 treatment plants which supplies water to 45% of its customers along the coast and 137 wells from which water is distributed directly to the network without first passing through a treatment facility. There are also clear water springs in the hinterland locations from which water is distributed directly to the network in a similar manner to the wells.

9.1 The Water Quality Department

GWI reorganized its Scientific Services department to allow institutionalizing the importance of water quality testing at all levels and the use of instrumentation and standards enforcement. The process as depicted below, shows the investigation of water quality, use of reports from lab testing and complaints or requests for testing to do sampling, testing, reporting and the adoption of appropriate interventions for quality control to ensure adherence to international standards.

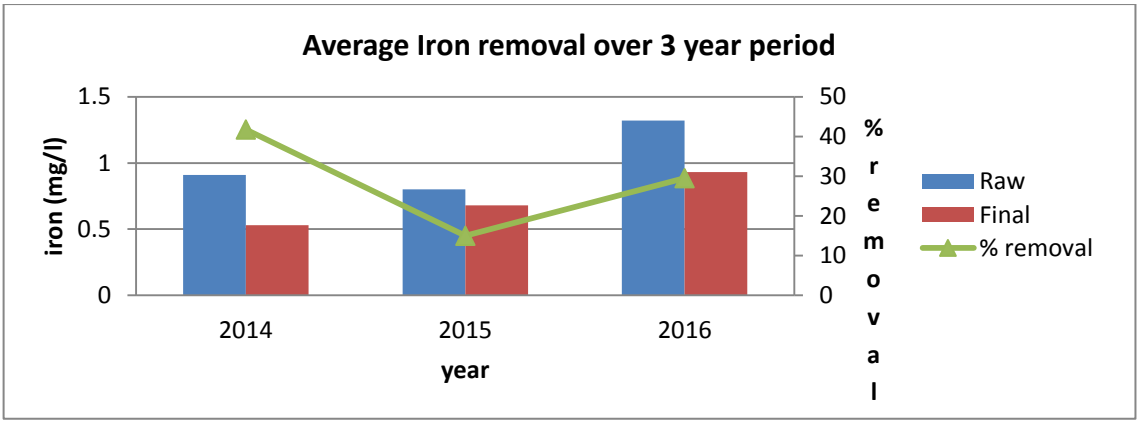
9.2 Dissemination of Information

The Corporation believes that the sharing of information on water quality is important to its stakeholders (government and citizens) and thus will do so via interaction of its personnel with the RDC's and NDC's, customers. It will use Blackboard to publish information which will also be available on its website.

9.3 The Importance of Water Quality

The quality of water is interrelated to its source and GWI processes and treats water to ensure its quality meets both national and international standards. Ground water's iron content is the greatest significant factor of concern for consumers and the Corporation has sought to address this concern with the use of chemicals. Water derived from surface sources is more easily contaminated from several sources and thus requires greater monitoring and use of treatments.

An examination of the previous strategic plan reveals that the Corporation has focused on the issue of salinity in the water supply especially in areas where its wells are closely located to the ocean. While it is difficult to ascertain the extent of this issue, since there are no data from testing to offer conclusive evidence that this intrusion into the water supply is indeed occurring, nevertheless, and in recognition of the fact that some wells are located near the ocean, it is planned to begin monitoring the water sources from these wells to determine whether there are any traces of salinity that can be attributed to sea water infiltration and if this is detected, corrective measures will be implemented to remedy this situation. Data depicted below shows that iron removal over the last year has been lower than WHO recommended standards.



While the Corporation has strived over the years to ensure that it provides water quality that meets the World Health Organization standards, as previously stated, its goal is to surpass minimum standards and thus, it has recently re-organized the laboratory services to place greater emphasis on water quality that will exceed basic standards. The department has been renamed, Water Quality with the continued objective of ensuring that customers receive water that has less iron concentration and is free from pathogens and other bacteria that can cause illness and death. The table below shows iron concentration in water produced from wells in Georgetown.

Table 25**: Iron concentration in well water at the Shelter Belt Compound**

Samples taken over a 1 yr period.	**Wells and their iron concentration (mg/l)**				
	WELL# 1	WELL#3	WELL# 4	WELL#6	WELL#7
1	1.38	NA	0.18	0.11	1.12
2	1.56		0.1	0.18	1.82
3	1.59		0.08	0.15	NA
4	1.71		NA	0.17	
5	1.70	1.45	0.09	0.16	
6	1.63	1.65	0.10	0.15	2.06
7	1.59	1.62	0.15	0.34	1.88
8	1.53	NA	0.03	0.15	1.79
9	1.64		0.06	0.18	1.95
10	0.73		0.10	1.02	1.13

11	1.42		0.10	0.12	1.85
12	1.54		0.15	0.19	1.78
13	1.57		0.11	NA	1.87
14	1.65		0.14	2.00	NA
15	1.13		0.88	NA	1.28
16	1.61		NA		2.01
17	1.29			1.78	
18	1.48			1.81	
19	1.33	1.48		NA	1.54
20	1.48				1.77
Average (mg/l)	**1.48**	**1.55**	**0.16**	**0.57**	**1.70**

The Corporation is also concerned with the current treatment process for ground water which is subjected to chemical processing that first adds and then removes chemical additives prior to distribution. Instead, the new focus will be on the use of gravity flows to aerate the water, monitoring quality always and move it to the distribution network without chemical interventions. Conversely, for surface water which contains many contaminants due to its locations, greater emphasis is necessary to ensure that contaminants are removed prior to its distribution. Hence, greater emphasis will be placed on suitable design of treatment plants for minimum chemical usage.

9.4 Ground Water Treatment Plants at Central and Sophia

Central and Sophia water treatment plants (WTP) are conventional treatment plants designed primarily for iron removal. Both plants have identical process flow whereby the raw water is fed from nearby wells to the multiple tray aerators for aeration, then to the retention tanks, followed by filtration in rapid gravity sand filters then to storage and distribution. It has been observed that the iron removal efficiencies of the plants are unsatisfactory with Sophia having more alarming results than central WTP.

At the Sophia WTP, the average raw water iron is 1.25mg/l while the final water iron concentration is 0.95 mg/l (as at Feb 2017) with a fluctuation of about 0.2mg/l over the different months. This indicates an overall iron removal efficiency of only 24% which is quite unsatisfactory. For the Sophia WTP to be compliant with the required final water iron concentration of less than 0.3mg/l (recommended by WHO); then the removal efficiency will have to be at least 77%.

The water quality department is now reviewing the functions of the various treatment processes with the aim of identifying the shortcomings and consequently make interventions that will mitigate the issues detected. Ground Water Treatment Plants Central and Sophia Water treatment plants (WTP).

9.4.1 Surface water Treatment Plants - Shelter Belt

Shelter Belt water treatment plant is served by a supply of approximately 60% surface water and 40% ground water. The surface water is taken via canals fed by the east demerara conservancy while the ground water is taken from wells in the shelter belt compound.

9.5 Chemical Treatments

GWI uses Sea-quest which is a NSF certified sequestrant for use in drinking water. It is used to sequester the iron in the water, preventing it from oxidizing and thus reducing its impact of staining, clogging etc. This results in clearer more aesthetically favorable water to residents. All Wells with iron levels above 0.3 mg/l require treatment and the Corporation intends to expand the use of sea-quest to cover all the required area. It will however pursue the research of other technologies for iron removal or iron mitigation.

The Corporation places great emphasis on informing its customers and citizens regarding chemicals use in the treatment process. Hence, it plans to publish water quality data and make it available for display via an 'Atlas' App (created by GWI) on customer cellphones.

9.6 Aeration and water contamination

In such instances where treatment plants use aeration towers for water treatment, it is necessary to ensure that where the aerators are in open environments and are subject to contaminations from airborne elements, there is adequate protection to ensure water quality using chlorine chemical to remove any contaminants that may enter due to open air aeration.

9.7 Sanitation

Routine wastewater quality monitoring is now under the purview of the water quality department, and as such, critical parameters will be monitored by the laboratory. GWI will increase its role in ensuring that the construction of septic tanks is done in accordance with public health regulations and specifications and conduct public awareness programs.

9.8 Water Quality Processing, Control and Testing

The process for testing and controlling water quality will be administered by the water quality department through the functions of quality control personnel both in Georgetown and in the regions. Since treatment plant operators are primarily concerned with the quality of water input and output to customers and are required to make interventions based on lab test results and the directives from the scientific officer or lab supervisory staff, it is planned that these operators will be re-classified and trained to carry out critical water testing and to ensure that reports are sent to Georgetown in a timely manner and decisions regarding treatments are received and instituted in an expeditious manner.

The plan's focus on water quality places emphasis on the careful and efficient testing and monitoring of water to identify and eliminate water contaminants which affect color, smell and can cause water borne diseases which will result in illness and death. In addition to the current testing methods, the department plans to introduce other testing procedures, methods, scope and special equipment to deal with various quality issues. In addition, the department will use automatic electronic testers to record tests results with greater expediency and this will allow critical interventions in a timely manner for improved water quality.

A rigorous quality control program has been designed and is being implemented in stages in the laboratories. This quality control program involves the calibration and accuracy checks of each method and respective equipment to ensure its accuracy levels daily. It also caters for the environmental and storage conditions of the test equipment and materials. The aim is to have the laboratory certified based on **ISO 17025 standard by 2018**, to guarantee confidence, reliability and accuracy in the results generated from the laboratory. To achieve this, staff training is required. The involvement of the Guyana national bureau of standards (GNBS) is also required to achieve our local certification which will be followed by our ISO international certification.

9.9 The use of Mini Labs

Currently water is being produced on various limited schedules however, it is the Corporation's projection to have it available on a 24-hour basis for supply to customers. The quality of this water must be monitored continuously and it is for this reason that **mini labs are being set up countrywide.** The mini labs will monitor more frequently to monitor operational efficiency and quality assurance of the water supplied. This will require added staff, especially field staff, and an increased supply of reagents to facilitate the volume of tests. This quality information gathered from these min labs will be used by management to continuously monitor and evaluate the individual treatment processes to improve the overall system. It will also serve to arrest any deviation from quality guidelines before it escalates.

This approach is being rolled out in each region at each treatment plant across the country. Currently such labs are already set up in Region 4 Georgetown, Region 6 and Region 10. Other treatment plants have also been provided with equipment to increase the monitoring of parameters such as iron and micro-B. Mini labs will be built in each region and will be fully equipped with the requisite equipment and reagents to adequately monitor water quality on a frequent basis. This will guarantee effective and efficient treatment, confidence among operators and ultimately improved water quality which will bring increased customer satisfaction.

9.10 Equipment and Reports

The equipment used for quality testing will be monitored by the Georgetown office and it will receive reports on calibrations and other matters that are necessary to ensure their efficient performance. This office will be responsible for ensuring that state-of-the-art equipment is available and used in the monitoring process.

9.11 Treatment Process and Quality Control

The Georgetown office will ensure that chemicals and processes used for water treatment are in accordance with the Corporation's policies and procedures and that new process or chemicals are fully tested and will meet quality standards when they are used. The design of treatment plants and the processes for treating water will be in accordance with international standards and GWI will ensure that staff who are required to operate treatment facilities are functioning in accordance with standard operating procedures.

9.12 Treatment Plants

GWI has 24 treatment plants which have a heavy dependence on chemicals in the treatment process. This is a factor of the design of these plants where it has been found that a failure to design the plants with recognition of the need for little or no chemicals for the treatment of

ground water was unfortunately ignored and instead, the plants are processing both surface and ground water with the same degree of chemical dependence. A report submitted by an international expert[43] regarding the drinking water supply at Linden, addressed the anxiety of the residents concerning planned developments upstream on the Demerara River that is their main source of water supply.

9.12.1 Examining the operations of the WTP's at West Watooka, LPC and Linden

The consultant observed that the use of five (5) treatment plants producing a combined amount of 19,000 m^3 per day for an urban township of 30,000 persons is ineffective and costly. Hence, it suggested to have a NRW approach towards reducing demand so that WTP output can be reduced to an economical level. Additionally, the final goal would be the reduction of the number of WTP's and investment in a transmission line from Amelia's Ward to the Linden Power Company area and increase the production at Amelia's Ward. A cost benefit analysis for the operations of the four (4) wells should be conducted to determine which should be abandoned. The consultant also recommends that the West Watooka WTP should be refitted to treat ground instead of surface water.

9.13 Treatment Plant Operations

The operations of treatment plants are currently being performed by plant operators whose primary job focus is on the production levels of the plants. However, in keeping with GWI's new focus on water quality, it is envisaged that these operators will be required to understand and perform quality control tests, report findings and adopt interventions as advised by the laboratory personnel so that the output of the plants can be closely aligned with the water quality standards that are expected by the Corporation. This will require the training of plant operators and certification and recertification to ensure that they possess the required knowledge and skills to perform quality control duties. In this regard, the Corporation plans to obtain the services of treatment plant technical assistance personnel to reorganize the processes at each plant and ensure that the personnel can perform the required duties. This reorganization will be in tandem with the planning and designing of new plants.

9.13.1 The Central Ruimveldt Treatment Plant

The design and construction of the two (2) Treatment Plants at Wisroc and Amelia's Ward in the Linden Township offers problem lessons on design and construction and it is uncertain whether they will become fully operational. These plants are contrasted with the Central Ruimveldt Plant which is fully operational and is expected to have increased production through the construction of a water storage facility to provide 24-hour distribution and supply.

[43] Theo Smit was on a Consultant assignment at GWI during 2017.

Central Ruimveldt Treatment Plant

9.13 Treated Water Storage

The treatment plants currently do not operate to full capacity due to limitations for water storage. Their processing levels are operated in consort with the demand of customers and GWI recognizes that they can operate more efficiently if they have storage tanks for distribution in response to customer demand. GWI has begun examining the feasibility of constructing tanks for water storage from these plants.

9.14 Designing New Treatment Plants

The role of the infrastructure planning and design department is critical for the design of treatment plants that are less reliant on the use of chemicals and more reliant on the use of natural processes such as aeration which can be achieved through careful design. However, in such instances as in the case of the existing plants where there is extensive use of chemicals (based on inefficient designs), every effort will be made to change the process flow and use local filter media and thus eliminate the over reliance on imported chemicals and materials.

Therefore, in consideration of lessons learnt from these and existing operational plants and a rigorous review of their design and operational efficiencies by international experts who conducted workshops in November 2016 for plant engineers and support staff, the future planning will ensure the correct design of plants based on the quality of the water and the most efficient and state-of-the-art process for their projected locations.

The Corporation's strategy is to firstly identify the regional area where water service is to be provided, next determine the (new and expanding) customer base, the source of water, i.e. surface of ground, the quality of water and finally determine the type of treatment that will be needed to produce water for the residents and businesses.

9.15 Treatment Process – Water Source

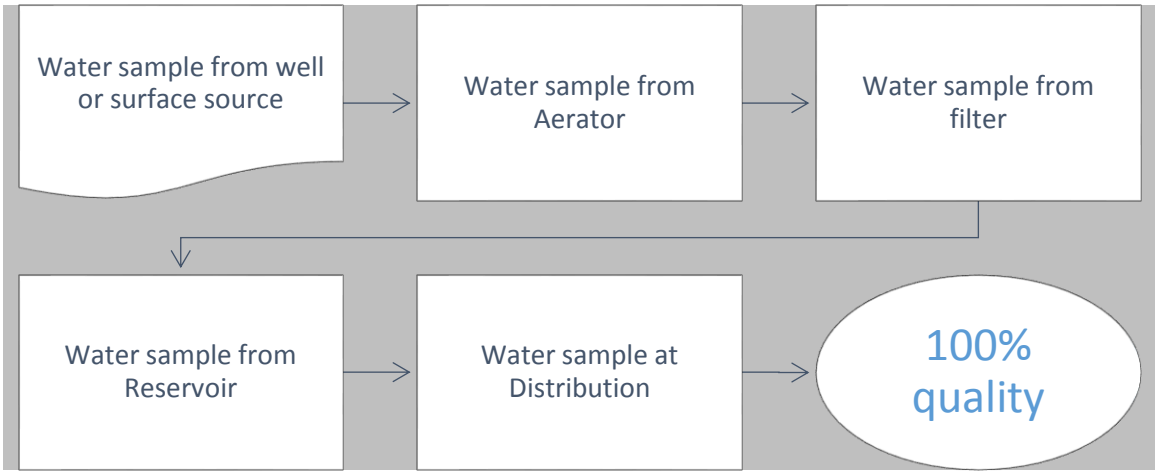
GWI is cognizant of the fact that its water sources derive from surface and ground. Consequently, each source poses unique challenges regarding water treatment and therefore, it will focus on the expansion of its treatment processes regarding water from 'A' of 'B' sands and the other factors that relate to the aquifer from which the water is derived.

The water in the distribution is evidently a product of that which leaves our production sites. In 42% of our plants, this water is fully compliant with the core WHO parameters for microbial safety and acceptability by customers. To sustain this quality, residual chlorine must be maintained in the distribution and flushing must be done to prevent recontamination due to bacterial re-growth and build-up of iron, turbidity and suspended material etc.

The frequency of monitoring has been intensified by the water quality department both in the distribution and in storage tanks of the schools and health centers to evaluate the consistency of the water quality. This exercise was conducted in various regions, where it was found that water stored in tanks for prolonged periods (typical of schools, hospitals and health centers) are often more contaminated than water at the stand pipes. As such, we have engaged the respective ministries of education and health apprising them of this situation and encouraging the urgent cleaning of the tanks at different time intervals to prevent regrowth.

Sampling of water at every section of the process is critical to ensuring water quality at the WHO standard and GWI uses processes as demonstrated on page 86 to satisfy this important requirement.

A schematic: **The Sampling Process**



9.15.1 Filters for Hinterland and Riverain Communities

With respect to the hinterland areas, where accessibility to potable water has been a challenge, the water quality has been monitored from the various sources used by the residents. These sources, because they are open to the environment, unprotected from intrusion, animals and possible sources of contamination, have presented very high numbers of microbial contamination. Conventional treatment such as coagulation-flocculation; filtration, aeration etc. has been a challenge and as such, mitigating the levels of health based parameters, has been the focus. Studies were conducted on different filters which remove the turbidity and microbial loads from the water sources. These studies included the effectiveness and robustness of several filtration technologies including: solar bags, sawyer filters, and Life saver filters etc.

9.16 Testing during the Distribution Process

The water quality can become compromised in the distribution process if regular flushing isn't done. The Quality department has intensified monitoring in the distribution networks, currently in Georgetown and Region 5 and this will be done in all the regions, with the aim of analyzing the chlorine residuals, turbidity spikes and microbial re-growth. These parameters indicate when flushing is necessary, and the need for added protection against microorganism. Recent analyses in the distribution in Georgetown show that iron is still an issue of concern and as such, iron removal technologies must be prioritized in the rehabilitation of the Shelter Belt water treatment plant.

9.17 Wells

There are 137 Wells which supply water. However, the water from 102 of these is supplied without passing through a conventional treatment plant. The wells are from A-sands (prevalent) and B-sands (limited) where the latter type wells produce water with low iron content typically within the WHO recommended guidelines. Most of the wells are A-sand and thus have a characteristic high iron content (above 0.3 mg/l) which has contributed to staining in homes and build-up of iron deposits in the distribution system. GWI is addressing high iron content phenomenon with the use of Sea quest. This is an additive chemical which has been very effective in treating water with high iron content. In areas where it is used, customers have given very favorable comments on the color of the water and the fact that they do not experience the staining of their clothes and ceramic tiles in showers and other areas which resulted from the use of water with a high iron content. GWI plans to introduce this chemical in more communities which receive water from 'A' sand wells.

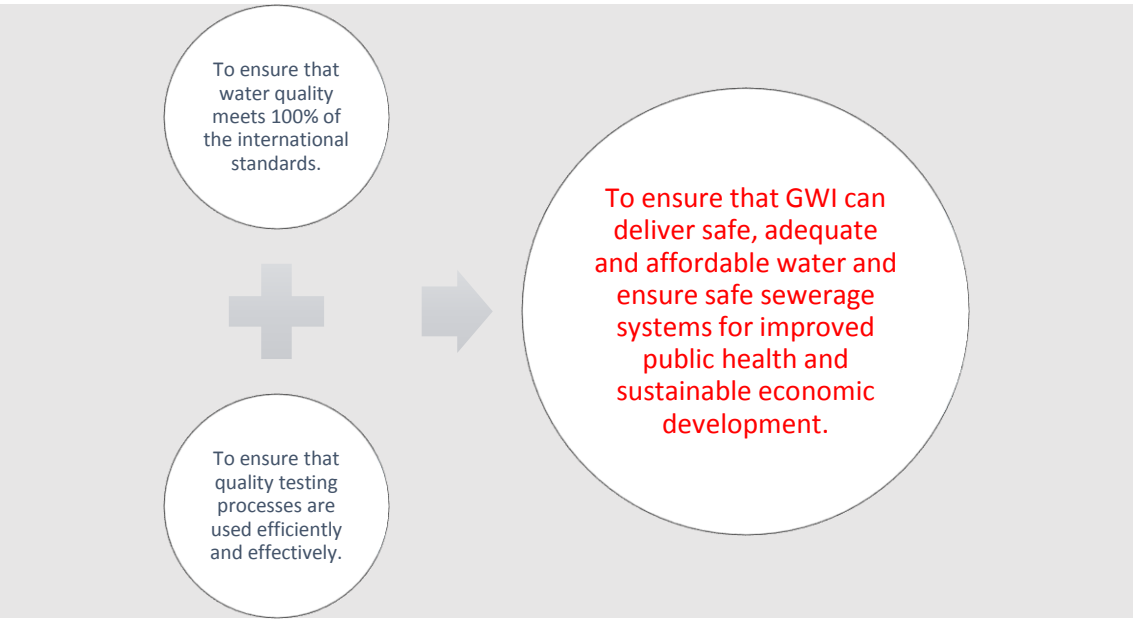
9.18 Water Quality in the Programmatic Areas (Situation Analysis)

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives.

Situation Analysis Requirements (Water Quality)

Indicator	2017	2018	2019	2020	2021
Water quality testing	Ensure that 100% of water produced is tested.	Ensure that 100% of water produced is tested.	Ensure that 100% of water produced is tested.	Ensure that 100% of water produced is tested.	Ensure that 100% of water produced is tested.
Compliance with quality standards	Ensure 100% WHO quality compliance	Ensure 100% WHO quality compliance	Ensure 100% WHO quality compliance	Ensure 100% WHO quality compliance	Ensure 100% WHO quality compliance
Healthcare institutions and school protocols	Ensure that all testing protocols are followed.	Ensure that all testing protocols are followed.	Ensure that all testing protocols are followed.	Ensure that all testing protocols are followed.	Ensure that all testing protocols are followed.
Treatment Plants	Ensure that all treatment plants are operating at 100% efficiency.	Ensure that all treatment plants are operating at 100% efficiency.	Ensure that all treatment plants are operating at 100% efficiency.	Ensure that all treatment plants are operating at 100% efficiency.	Ensure that all treatment plants are operating at 100% efficiency.

Water Quality Strategic objectives



Annual Key Performance Indicators -Targets (Water Quality)

Programmatic area	Indicators	2017	2018	2019	2020	2021
Water Quality	% of schedules samples taken	100%	100%	100%	100%	100%
Water Quality	% of samples taken meeting guidelines (water leaving facility)	100%	100%	100%	100%	100%
Water Quality	% of samples taken meeting guidelines (in distribution line)	100%	100%	100%	100%	100%

WATER SUPPLY AND DISTRIBUTION

10.0 Supply and Distribution

GWI has a vast array of supply lines for its water distribution network in all its service areas. In some instances, the distribution lines are aged since they were laid over several years and have not been properly maintained, thus leading to defects and contributing to leaks. In some areas such as the Township of Linden, the distribution lines are parallel to other lines that have been used by other water utility companies related to the history of the Township as a 'Corporation Town' which had its own water supply which was provided by the Bauxite Corporation that operated in that area some years ago.

10.1 The Georgetown and other areas Distribution Network

The City of Georgetown has distribution lines that are aged and thus the Corporation is preparing a comprehensive infrastructure works study to determine the best plans for the replacement of lines. This is critical since the service demands of the city is in tandem with all Capital Cities which have a large portion of the population, businesses and faces ever increasing demands for 24-hour service. In addition, the Corporation has developed plans for the expansion of distribution lines in service areas outside of Georgetown as set out in the Situation Analysis. The City has many asbestos lines which will be removed during the plan years.

10.2 Special Institutions

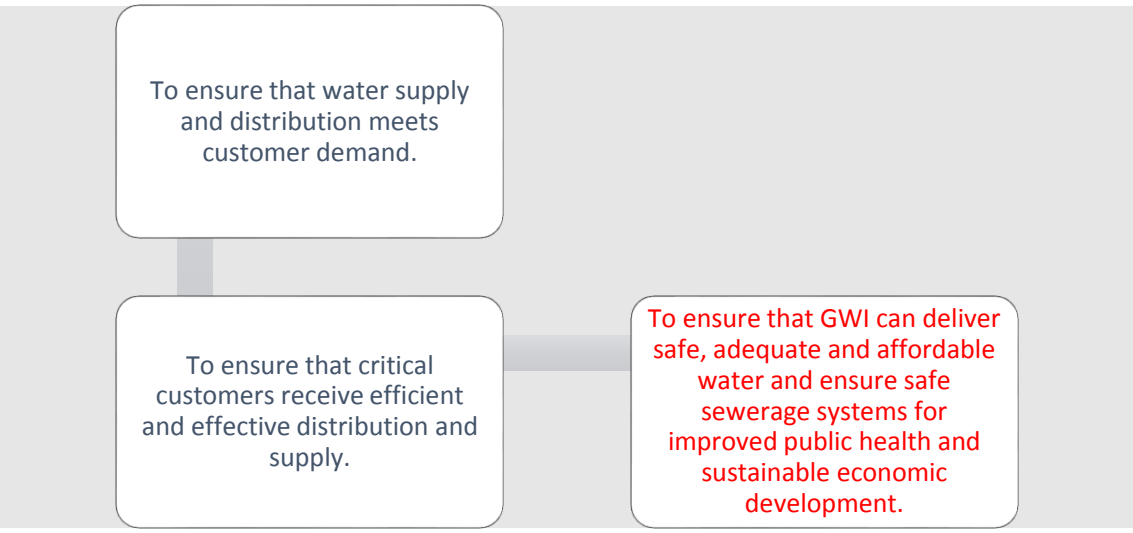
The plan identifies institutions in communities such as hospitals, health clinics, schools and places where children and the elderly reside as deserving special considerations for water services. The availability of regular, clean water is critical especially in healthcare and for school children to practice good health habits such as hand washing and using safe potable water. Hence, the performance indicators facilitate the monitoring of service levels in communities that have hospitals, clinics and schools.

GWI will institute procedures to help the regional administration and institutional management for schools and health clinics or hospitals to monitor the quality of water which students or patients access, which most often is received indirectly from GWI through 'black tanks' that store water which is dispensed to the clientele or from reservoirs for hospitals. Tests conducted on these tanks demonstrate alarming levels of contaminants which can affect users of water stored in these tanks. Therefore, GWI is considering an approach to government for a partnership with personnel from the Ministry of Health and Ministry of Education to create and enforce regulations for the cleaning and monitoring of these tanks, until GWI's level of service makes their usefulness obsolete. With regards to reservoirs for hospital water supply, it is expected that their universal precautions procedures will ensure that water quality is at the highest quality level. Additionally, GWI will deploy monitors to ensure that it can track water levels in the reservoirs.

10.3 Water Distribution in the Programmatic Areas (Situation Analysis)

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives.

Water Supply and Distribution Strategic objectives



Key Performance Indicators – Targets (Water Supply and Distribution)

Programmatic area	Indicators	2017	2018	2019	2020	2021
Water Supply and Distribution	% of special institutions with adequate supply of potable water	100%	100%	100%	100%	100%
Water Supply and Distribution	% of coastal villages with access	63%	70%	76%	81%	85%
Water Supply and Distribution	% of coastal population receiving treated water	57%	70%	74%	85%	86%
Water Supply and Distribution	% of hinterland population receiving treated water	19%	31%	45%	58%	70%
Water Supply and Distribution	average hours of distribution (hrs)	24	24	24	24	24
Water Supply and Distribution	average level of service (metres)	5	5	5	5	5
Water Supply and Distribution	% leakages fixed within required time frame	95%	95%	95%	95%	95%

SANITATION AND SEWERAGE

11.0 Sanitation

GWI currently operates 24 sewerage pumping stations in Georgetown under the Georgetown Sanitation Improvement Program (GSIP) and 12 for the Urban Sewerage and Water (USWS) and plans to build 2 plants in Georgetown during the plan years. Its operating license dictates that it should operate at 98% sewerage disposal efficiency however, currently there is no data to measure its operating efficiency[44]. The sewer pump stations operate against fixed systems and the operating points are relatively constant and pumps are sized to ensure sewerage disposal at the stations. Waste water is discharged directly into the rivers.

GWI's operating license dictates that it operate at 98% sewerage disposal efficiency which is understood to mean that 98% of the generated sewerage must be discharged at all times and with the configuration of two stations within every ward of the sewer, the system discharge efficiency will be approximately 98%.

In 2010, the Government of Guyana signed the Cartagena Convention Protocol on Land Based Sources of Pollution and agreed to the regional effluent limitations on domestic sewerage, hence GWI is required to examine the primary source of raw water treatment that it uses and consider the creation of treatment plants accordingly. This process is comprised of screening, aerobic digestion and sludge separation to achieve the standards on suspended solids, bio-chemical oxygen demand, fecal Choliform, fats, oil and grease floatables.

GWI operates and maintains two (2) interconnected sewerage systems in the City of Georgetown. One system serves Central Georgetown while the other serves the Tucville community. The systems are dub-divided into 24 separate sub-basins to permit gravity flows within each sub-basin. These are comprised of yard or collecting sewers, street sewers, a pump station and forced main into which each station discharges. In areas not served by the sewerage system, wastewater is disposed by septic tanks. Outside of Georgetown, the greater percentage of sewerage is disposed by septic tanks and other configurations.

Georgetown sewerage service

11.1 Service

The Georgetown Sanitation Improvement Project has completed an upgrade of 24 plants and approval is being sought for 4 additional upgrades. These will undoubtedly significantly improve the service currently being provided to customers and the expansion of services

[44] The need for measuring instrumentation is being addressed in the new plans.

to new communities. There is a need for a tracking system to provide data on the operational efficiencies of the plants. The data can provide managerial personnel with the tool to make timely decisions when blockages occur.

11.2 Planned expansion of the Georgetown Service Area

The expansion of the services of the Georgetown Sewerage system will encompass the following:

- The construction of a wastewater treatment plant designed for the optimum utilisation of its bi-products, whilst effectively treating all sewage collected from the capital city of Georgetown and its surrounding villages.
- The re-engineering of an existing sewage collection station at Tucville, thereby increasing its capacity, and capability which will allow for the disposal and subsequent treatment of sewage from the neighbourhood, along with sludge collected from cesspit and septic tanks outside of the sewerage area and brought to the facility by sewage tankers.
- The elimination of the current non- hygienic and environmentally degrading manner under with the sludge from cesspit and septic tanks are extracted and disposed.
- The extension of centralized sewage systems (Georgetown and Tucville systems) into communities outside of the current sewer area and other areas outside of Georgetown, with a focus on new government and private housing schemes. The intention is to replace on-site treatment (septic tanks), where practical, with central WWTP which are more superior in their operation.
- The establishment of municipal wastewater treatment especially in the new towns, in keeping with the country's green initiative.
- The provision of basic sanitation facilities, utilising low-cost, low-maintenance wastewater treatment initiatives within the country's hinterland regions.
- Collaboration with the local authorities in all the regions on matter of sanitation.
- Collaborated arrangement with the Ministry of Health in the formulation of action programs/plans designed to eliminate the spread of tropical diseases associated with to poor and/or inadequate access to sanitation services.

11.3 Approvals for Septic Tank Construction

GWI whilst not having the authority for approval of septic tank designs and sizing, is currently reviews construction plans for septic tanks. Our focus therefore should be to seek the authority to either approve individually or collaboratively the design and construction of septic tanks with the local government entities within the regions. Priority should also be given for the management of septic tank sludge, which includes established procedures for the de-sludging of septic tanks and the environmentally appropriate disposal of the extracted sludge.

The Corporation will also propose for the creation of a specially designated site for sludge disposal which will facilitate processing for treatment and bio-waste energy products. Additionally, GWI will propose the construction of shared tanks in housing communities for cost containment. Finally, it will maintain a roster of sanitary plumbers for referrals to customers for private services.

11.4 Wastewater Treatment outside of Georgetown

The Corporation considers the treatment of wastewater outside of Georgetown with equal importance and wishes to have equity of service for the residents in outlying communities. Therefore, the Haag Bosh Sanitary Landfill, located behind the community of Eccles, or an area

around the old Mandela dumpsite, behind Mocha village or another suitable area is being considered for the construction of a drying bed or another suitable wastewater facility for the disposal and treatment of sludge removed from septic tanks and in the future, from wastewater plants. This area was considered for the construction of a lagoon, stabilization wastewater plant, or drying beds built to accept septic tank waste which will be treated through this low-cost method which will also provide polishing before discharging into nearby waterways. The drying beds however are a superior choice and can be incorporated into the lagoon system which will provide treatment from the liquid waste released from the drying beds during the drying process.

11.5 Residential and Commercial Sewerage Tanks in the Hinterland

GWI is concerned with residential and commercial sewage septic tanks and wishes to ensure that they are properly designed and serve to efficiently process sewage and wastewater to prevent health hazards. Therefore, it will work in partnership with the Bureau of Standards, the Public Health Department of the Ministry of Health and Georgetown Municipality and rural townships to ensure that citizens can have access to properly designed plans for tanks, obtain approval for residential and commercial building permits and construct tanks accordingly. In this regard, the Corporation's personnel have benefitted from technical training in the design of sewerage tanks and will be engaged in public awareness programs.

GWI is also concerned with wastewater disposal in hinterland areas and has identified the Kwakwani community within the White Sands area south of the Coastal Plains for study. It is proposed to engage a consultant to conduct a rapid assessment of the impact of the effluent discharge from the anaerobic tank and to determine the best low-cost alternative treatment plant that would be most suitable for this area. The funding for the wastewater treatment plants is being considered through the Guyana Wastewater Revolving Fund (GWRF) and the Caribbean Regional Fund for Wastewater Management.

11.6 Wastewater Laboratory Capability

GWI does not provide wastewater treatment and thus it does not conduct laboratory testing of wastewater. However, it intends to create laboratory testing facilitation over the plan years to allow for the continuous testing of the effluent to ensure adherence to established standards.

11.7 Education and Litigation for sanitation regulations non-compliance

GWI will provide information and participate in forums to educate persons on safe and legal sanitation practices. However, in such instances where it is observed that there are flagrant and willful violations of sanitation regulations, the Corporation will pursue legal actions to ensure compliance.

11.8 Sanitation and Sewerage in the Programmatic Areas

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives[45].

[45]Capital investments are listed in Section 27.

11.9 Education and Litigation for sanitation regulations non-compliance

GWI will provide information and participate in forums to educate persons on safe and legal sanitation practices. However, in such instances where it is observed that there are flagrant and willful violations of sanitation regulations, the Corporation will pursue legal actions to ensure compliance.

11.10 Sanitation and Sewerage Programmatic Areas Situation Analysis

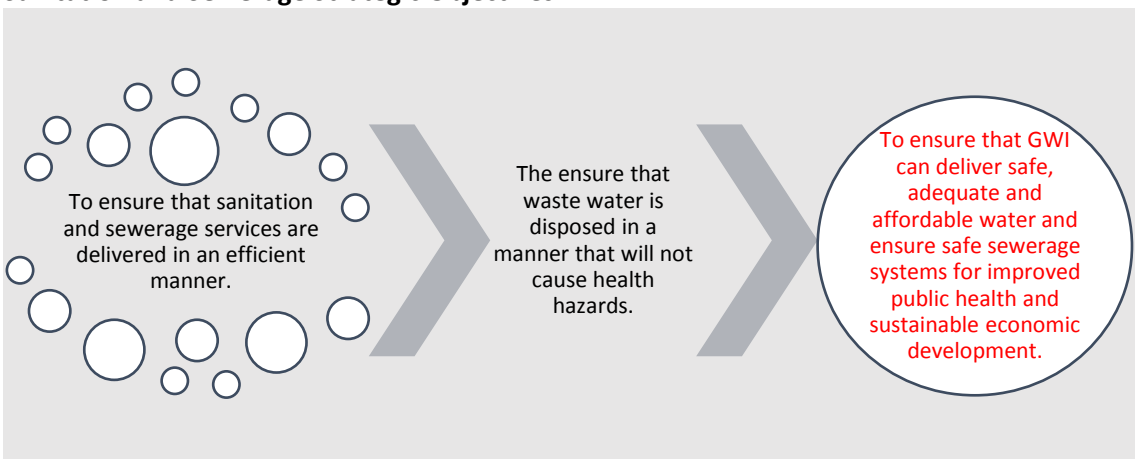
The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives[46].

INDICATORS	2017	2018	2019	2020	2021
Operation and maintenance of the Georgetown Sewer Sewerage system To greatly reduce the incidences of sewage overflows	To ensure that all stations operate according to planned hours and the network is free of obstructions .	To ensure that all stations operate according to planned hours and the network is free of obstructions	To ensure that all stations operate according to planned hours and the network is free of obstructions	To ensure that all stations operate according to planned hours and the networ k is free of obstruction s	To ensure that all stations operate according to planned hour, and the networ k is free of obstruction s
The extensive use of the Georgetown Sewerage System	Filed investigation , Customer perspective, Plan and design processing systems	Review of design, and analysis of field studies Project Initiation – conception and Commencemen t of projects	Project execution and close out in Festival City and North-East La Penitence	Monitoring and Evaluation	Project audit and impact assessment
Sanitation in the rural areas/regions	Field Investigation	Execution of projects' in Region 9 and 10- (Kwakwani)	Monitoring and evaluation of completed projects and Execution of Sanitation projects in region 8	Monitoring and evaluation of completed projects Field study and execution	Monitor and evaluation and impact assessment.

[46]Capital investments are listed in Section 27.

INDICATORS	2017	2018	2019	2020	2021
				of possible projects in regions 7	
Establishment of Sanitation oversights in all the regions	Revision and amendment of the regulations, acts and license to give GWI authority and responsibility for sanitation countrywide	Establishment of structure, facility, etc. for control and execution of sanitation programs	Capacity building and collaboration with other agencies	Monitoring and evaluation	Impact assessment
Targets Georgetown Sewer System	Station availability – 75% Reduction of sewerage complaints – 25% Timely Clearing of complaints – 75%	Station availability – 80% Reduction of sewerage complaints – 30% Timely Clearing of complaints – 80%	Station availability – 85% Reduction of sewerage complaints – 35% Timely Clearing of complaints – 85%	Station availability – 85% Reduction of sewerage complaints – 40% Timely Clearing of complaints – 90%	Station availability – 85% Reduction of sewerage complaints – 40% Timely Clearing of complaints – 90%

Sanitation and Sewerage Strategic Objectives



ORGANIZATION SUPPORT FOR OPERATIONS OBJECTIVES

12.0 The role of the non-operations departments and the Strategic Planning Department

This section of the strategic plan outlines the role of each non-operational department and their support for operations. In addition, the strategic plans of each department are reflective of the situation analysis for the operations department which in turn provide the blueprint and plans for the corporation's improvement and expansion of services. The performance indicators will be monitored monthly via the submission of reports to the Strategic Planning Department. The Strategic Planning Department will perform monitoring and evaluations functions and provide feed-back to departments regarding the achievement of their objectives. Monthly reports from the Strategic Planning Department will be forwarded to the Managing Director for transmittal to the Board of Directors.

12.1 Human Resources Talent Acquisition and Retention

The Human Resources department is responsible for the acquisition of Talent and retention of personnel who are required for the administration of the Corporation's operations. The situation analysis has been used to project the staffing needed in each department to fulfil their mission objectives during the program years. The current staffing level is 813 employees who comprise the senior and middle managerial, supervisory, technical and rank and file positions. The department will however ensure that the Corporation has the correct staffing level for its operational efficiency and it is recommended that in developing countries such as Guyana, the staffing level should be well below the ratio of 12 (considered to be an inefficient mix). Thus, using the recommended formula, the current ratio, based on an approximate customer base of 160,000 and current staffing is at 813 and this translates to five (5) staff persons per 1,000 customers served. This is at the benchmark in the industry of <5 and the staffing level is expected to increase to 880[47] over the life of this plan to support the Corporation's objectives. While the increase would move the average ratio to 5.5 of the recommended range for the current customer base, it is expected to move to a lower positive number with the expected increases in customer base and service expansion in urban and rural regions.

Human Resources Situation Analysis

Functional Area	Situation	Action
Organization & Management	Inadeqaute staffing in number and s	a).Recruitment of persons with the required skills b) Identification of current staff for promotions
	Inadequate skill levels for the operation department	Design and administered appropriate training programs
	Personnel failure to adheard to safety policies and procedures	Design and administration of safety programs
	Delays in processing Human resources matters	The assignment of HR generalist to regional offices
	Human resources management information processing	Acquisition and use of a new HRMIS

[47] Staffing increases are projected in Operations with the conversion from contracted services to in-house personnel.

12.1.1 Assignment of Generalists to Regional Areas

The department plans to assign personnel to provide generalists services in the regions while continuing to provide services from Georgetown. This will ensure that HR services are more readily available to facilitate decision-making at the regional level and provide employee access and processing for HR related employee matters.

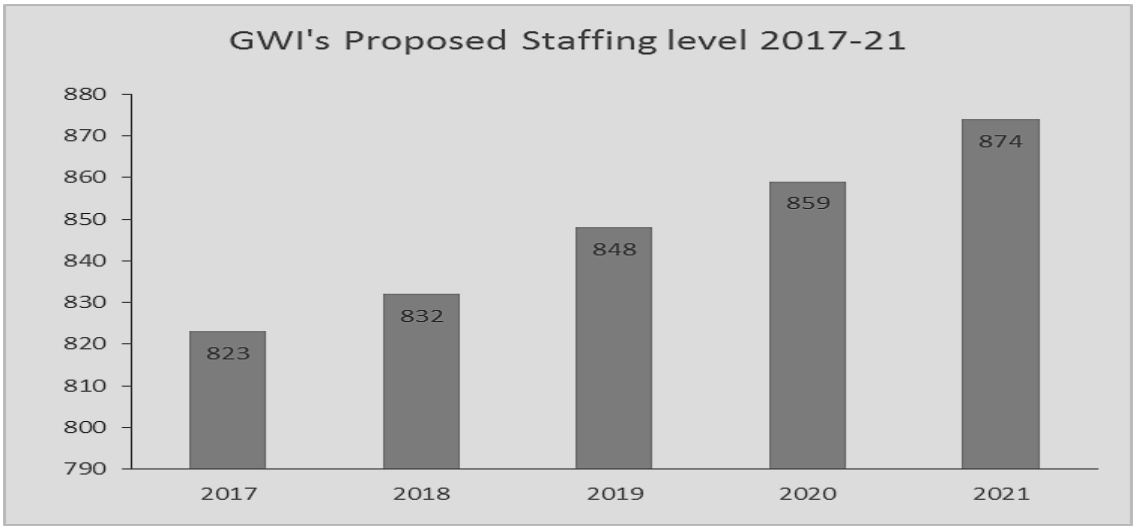
12.2 Strategic Staffing

The Human Resources department is responsible for the identification of the skills and technical expertise which are needed for the performance of tasks identified as key performance indicators in the Strategic Plan, in conjunction with department heads. It is anticipated that in the first year of the plan (2017), the heaviest amount of recruitment will occur to ensure that GWI is adequately staffed to achieve its objectives. This is due to the strategy for decreasing contracted (out sourcing) services and developing in-house capabilities with the recruitment of additional staff. During the Plan years, the staffing is projected to grow within a 2% range, accounting for attrition and turnover while keeping within the recommended industry average for staffing a similar sized entity.

Table 26**: Staffing levels**

The current and projected staffing levels[48] required for the plan's performance are as follows:

Departments	**2017**	**2018**	**2019**	**2020**	**2021**
Audit	8	8	8	8	8
Commercial Services	28	28	28	28	28
Corporate Services	24	24	24	24	24
Finance & Procurement	31	31	31	31	31
Human Resources	9	9	9	9	9
Planning & Implementation	19	19	19	19	19
ICT	15	15	15	15	15
MD & Administration	17	17	17	17	17
Operations Administration	672	681	697	708	723
Grand Total	**823**	**832**	**848**	**859**	**874**



[48] Projections show a 2% increase for Operations staffing each year.

12.3 Staffing Re-organization

The plan highlights several changes in the administration of the organization's services, especially in relation to regional customer services. Therefore, it is envisaged that changes will be made to the organizational staffing and although it is not expected that the overall numbers of personnel who are listed in 1.6 will change dramatically, nevertheless, staff will be re-assigned from Georgetown to regional offices to perform, human resources, IT, and bill printing duties.

12.4 Industrial Health and Safety

This Human Resources department has a specialized division with the responsibility for safety. The division is tasked with ensuring that all operations are performed by personnel who have been trained in proper safety procedures and that they are equipped and wear required safety gear. Since GWI personnel routinely perform tasks that have a high degree of safety requirements, the department has acquired the services of two (2) new officers who will be visiting, inspecting and monitoring various worksites to enforce safety rules and procedures. They will also review contracts for safety requirements and monitor contractual works for safety adherence. They may recommend the termination of contracts that violate safety standards.

12.4.1 Compliance with Governmental Safety Standards

The safety officers will be assigned to a cluster of regional offices to monitor and ensure that safety standards are enforced. This will include the administration of safety committees to review practices, adherence to the Corporation's policies regarding Personal Protective Equipment (PPE), ensure that mandatory safety training and inspection is done in accordance with OSH Act, Part III, Section 23, (18) to (23). Provide annual plans which are prepared and implemented to target the high-risk hazards identified in the Hazard Identification and Risk Assessment Protocol. Review and continually improve the Occupational Safety and Health Management System (OSHMS), with the objective of improving OHS performance. Provide hazard identification preventio9n, detection and control. This department will prepare quarterly situation analysis showing safety requirements in conjunction with each department. Safety issues that require corporate decision-making will be presented to the Organization and Management Cross-Functional Committee.

12.5 Human Resources Statistics

The Corporation does not gather statistics regarding loss days due to industrial illness and accidents. However, it plans to acquire electronic programs for human resources management information and industrial health and safety and these will be used to document and in conjunction with the Statistician (SPEM), assess and analyze statistics for industrial health, staff planning and training to support the Corporation's objectives.

12.6 Training and Knowledge Management

The Human Resources department in conjunction with the Strategic Planning, Evaluation and Monitoring Department shares responsibility for liaising with the various departments for the identification of knowledge gaps and the development of training programs to provide personnel with the knowledge and skills required for their respective job functions. This will satisfy the learning concept advocated elsewhere in this plan. In this regard, the knowledge management officer (SPEM) will work with the training coordinator to develop training programs based on needs identified in the functional job descriptions and such programs will be administered in support of the organizations strategic objectives. The number of persons and

the requisite skills levels needed for GWI's operations will be determined by the department situation analysis Gap Analysis and will be used for recruitment and planning training.

12.6.1 Developing Technical Knowledge

The Corporation has identified a critical knowledge gap especially in relation to the technical expertise of engineering staff. This affects the design, planning and monitoring of technical services especially in wells drilling. GWI plans to evaluate the knowledge and skills level of all engineers and to assign senior personnel to the design and planning and Project Implementations. Additionally, the senior engineers will be tasked with mentoring and reporting on the knowledge, aptitude and performance of junior engineers who are recruited without practical work experience. This intervention serves a two-fold purpose; (i) it provides for the retention and sharing of knowledge and (ii) it ensures that junior engineers will achieve a predetermined standard of performance in the shortest possible time. This will be facilitated through the establishment of a performance improvement programme (PIP) architecture with set benchmarks and milestones for knowledge, aptitude and performance evaluation.

Training and the development of knowledge for quality inspection of the work of contractors has been identified as a strategic requirement for the Corporation, especially because services such as metering are currently being performed by contractors. The Corporation expects to complete its metering of 100% of all services to reduce non-revenue water and the quality of meter installation can affect their performance. Therefore, it will intensify the training of its own personnel to inspect contract work and eventually have staff perform this service.

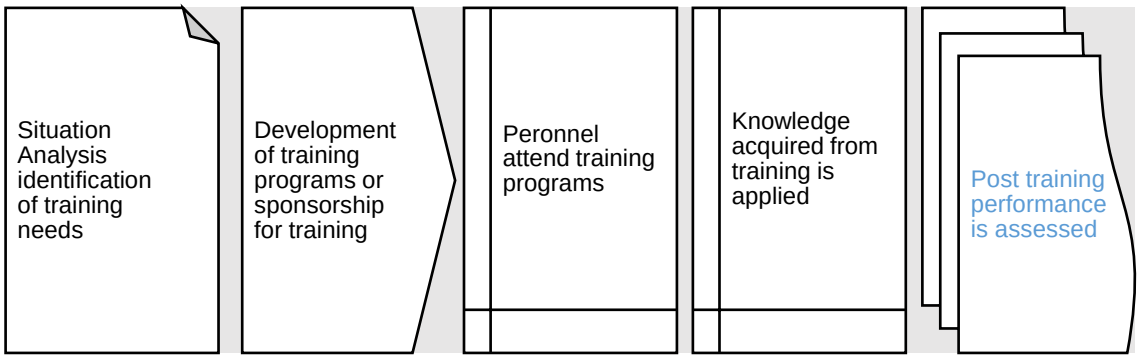
12.7 Succession Planning

The Corporation has commenced a review of its current succession planning program towards ensuring that it sets out the step-by-step process for personnel to have upward mobility. It will ensure that adequate training is provided and pay is aligned with the succession program.

12.8 Knowledge Management

The following is a schematic of the knowledge management process commencing with the identification of training needs and culminating with post training assessment to determine applicability or the need for additional training. GWI will benefit from personnel who will be able to share lessons learned from their situation/gap analysis, the programs and activities instituted to address these issues using 'best practice' methods and networks with Guyanese in the Diaspora.

Knowledge Management Process



12.9 Wages and Salaries Administration

The Human Resources department is responsible for developing, maintaining and administering a wages and salaries program that adequately rewards personnel for their job activities. The department plans to initiate a new Job Evaluation Program to rank jobs and place them on the comparable government pay scales. This is listed as a performance indicator for the department.

12.10 Benefits

GWI's employee benefits are critical for the well-being of its employees and this includes having a contributory pension plan with defined contributions. While benefits such as health, dental and optical coverage is provided by government regulation through the National Insurance Scheme, the Corporation recognizes that employee death (industrial or non-industrial) can pose severe hardships on surviving family members. Consequently, the Corporation intends to introduce Group Life Insurance coverage to pay death benefits to families without placing strenuous financial demands on the Corporation. Employees will have the option to voluntarily purchase supplemental insurance with group coverage rates to increase their coverage. Retirees will also have the option to voluntarily continue their coverage by paying 100% at group rates.

12.11 Performance Evaluations

GWI's human resources policy requires the conduct of performance evaluations annually. However, the performance evaluations have not been effective predictors of performance, hence the Corporation has introduced Functional Job Descriptions which denotes the specific functional tasks that each job requires, the timelines for their execution and the evidence of their performance. These functional job descriptions will be used for performance evaluations.

12.12 Employee Welfare

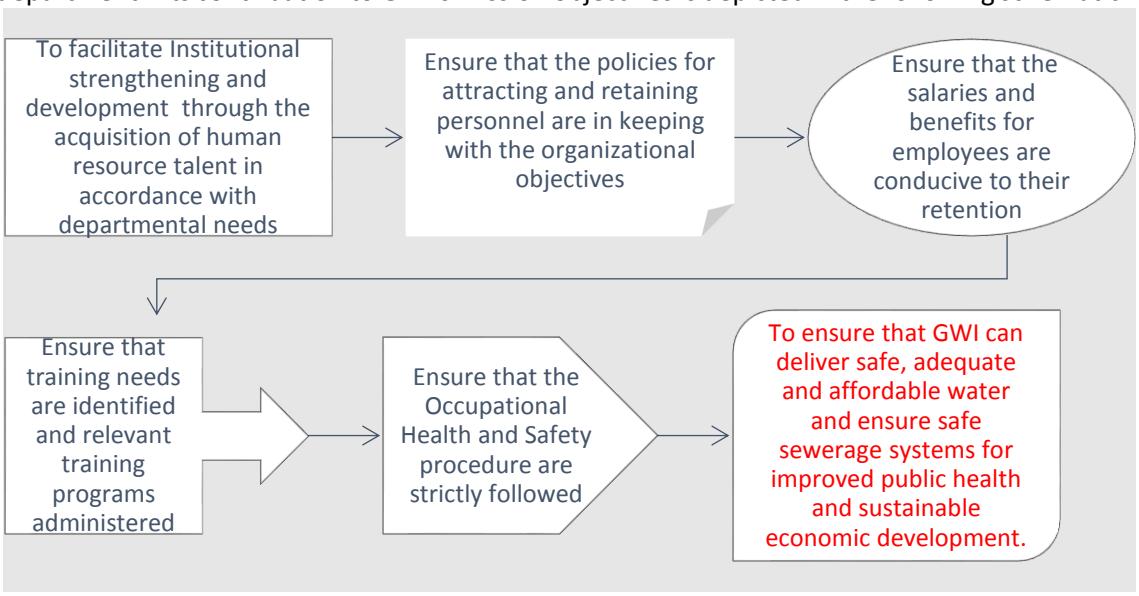
The Corporation created a new Welfare Officer position in 2017 to focus on employee welfare matters. The officer is responsible for examining issues which are social in nature such as health related, housing and interactions with governmental social service agencies. While these are not related to the Corporation's operations, nevertheless can have a negative impact on employee performance.

12.13 Administering Retirees Benefits

The Corporation has benefitted over the years from the dedicated services of its retirees and it is considering various programs that would provide benefits to retirees. Foremost is a partnership with the Ministry of Housing for the development of a Housing Program which will offer affordable housing to retirees. Additionally, it is planned that a dedicated person (Welfare Officer) will be appointed whose responsibility will be for assisting current and retired employees with access to governmental agencies to obtain services.

Human Resources Strategic Objectives

The Situation Analysis Indicators are combined to form the strategic objectives for the department. Its contribution to GWI's mission objectives is depicted in the following schematic.



CORPORATE SERVICES

13.0 Corporate Administration

The Corporate Services Department provides legal and administrative support for the Corporation's mission and objectives. During the life of the strategic plan, the department will continue the pursuance of the objectives (section 1.3) listed in the previous strategic plan. The department is tasked to engage state and governmental entities to develop procedures for the enforcement of GWI's right to obtain payment for debts incurred by homeowners prior to the grant of a transfer of property (see section 5.2). The Corporation is experiencing a critical issue regarding blocked sewerage and this is having a tremendous financial impact on the sewerage operational costs. The Corporation is seeking help from the government to prosecute and enforce payment of penalties for the blocked sewerage system.

13.1 Administrative Services

This department is responsible for the provision of general administrative services including corporation vehicles acquisition, maintenance and usage by staff personnel. The department also coordinates cleaning services for all administrative offices and arranges corporate functions.

13.2 Procurement Bid Administration

The Corporate Services Department is charged with the responsibility for coordinating procurement bid administration with the finance and procurement department. This includes the custody of documents and ensuring that the Procurement Act and the Corporation's policies and procedures for Bids are strictly followed to ensure transparency and equity.

13.3 License Requirements

GWI is expected to function within its license stipulations which has certain targets for the benefit of the citizens of Guyana. In fulfilment of this, the corporate department is expected to monitor the license target performance and ensure that variances are addressed and corrective actions are taken to ensure compliance.

13.4 Debt Recovery and General Services Litigation

The department is charged with the responsibility for legal litigating for the recovery of debts owed by customers. Therefore, it will have access to electronic data and reports from the Debt Recovery department which will facilitate the preparation of filings in the pursuance of litigation. Additionally, it will pursue litigations for customers who violate sanitation regulations.

13.5 Customer Compliance Certifications

The department has responsibility for monitoring persons who require Compliance Certification prior to the legal transfer of property ownership. In this regard, the department will access the customer database and query customer payment histories so that challenges or approvals can be granted for compliances or the preparation of legal action against property transfers when the customer is in debt to the Corporation.

While it is recognized that the debt recovery targets are in tandem with the operational responsibilities of the various departments, nevertheless, their non-achievement will be significant for compliance and requires every effort to have successful litigation for debt recovery.

13.5.1 Liaison with the Credit Info Agency

GWI will liaise with the Credit Info organization to access customer information which will aid in preparing litigation for delinquent arrears. The organization will provide information for the update of records which are used to determine credit wordiness of consumers.

13.6 Corporate Buildings

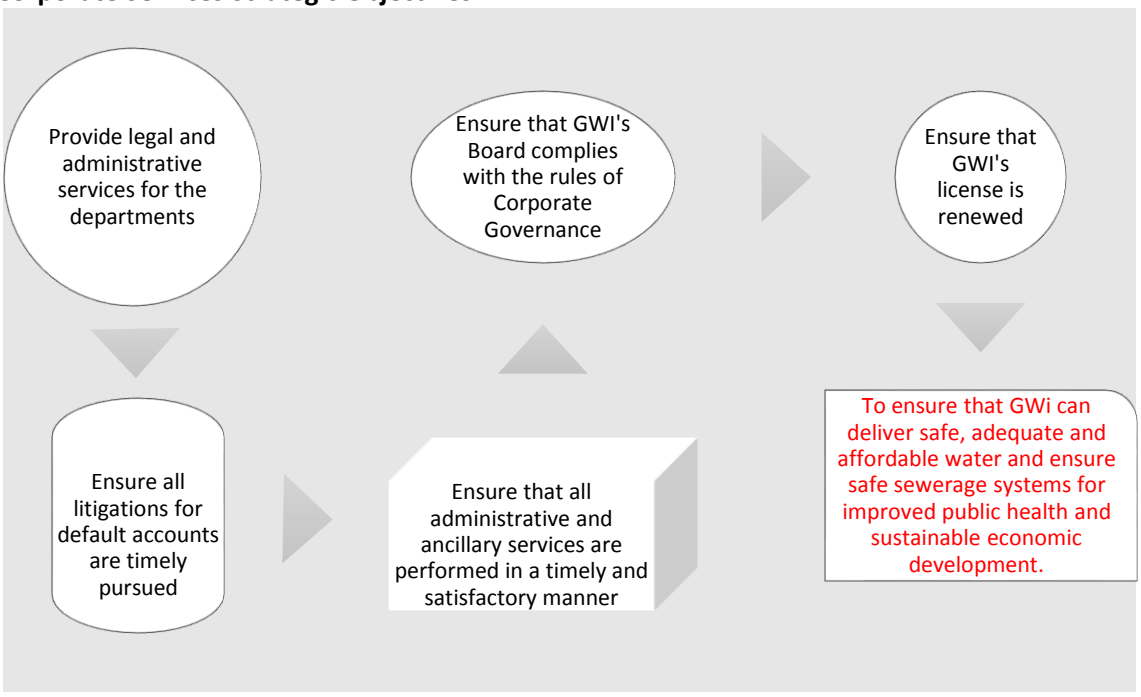
This department is responsible for the maintenance of all corporate buildings. Its Situation Analysis of the current state of buildings indicates the need for a comprehensive inventory and the development of plans for refurbishment, new furniture and fixtures and in some instances, acquisition of new buildings either by lease or construction for adequate accommodation of the staff to perform their duties in a safe and habitable environment.

13.7 New Corporate Head Office

GWI currently has several corporate offices located in different buildings around the city and it is planned to construct a building which will house its main executive and administrative as well as key administrative support offices. The plans for this structure are being designed and it is expected that funding will be secured and construction and occupancy will occur during the plan years.

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives.

Corporate Services Strategic Objectives



PUBLIC RELATIONS

14.0 Public Relations Programs

This department is responsible for presenting GWI's programs to the public using various media such as a radio, TV, print and press conferences. It is also responsible for school outreach programs aimed at educating school children regarding water usage and conservation. Programs to highlight the Corporation's efforts to develop technical expertise for its personnel through the signing of technical service agreements with international entities are also brought to the public's attention through the department's press releases and facilitation for media presence at signing ceremonies during which they can obtain information on the agreements.

14.1 Programs - Commercial and Customer Services

The Public Relations Department although not being under the commercial and customer service department[49] also plays a vital role in customer awareness campaigns to bring notices to communities regarding service disruptions and planned efforts to alleviate water shortages with distributions by water tenders. Additionally, it plays a vital role in communicating the Corporation's efforts to help customers manage their payments and arrears by conducting campaigns and promotions in the various regions.

14.2 On-Air Programs

One of the department's most effective programs is the On-Air Program on 94.1 FM which showcases the programs for Georgetown and allows customers to have on air interaction with administrative and technical managerial staff to obtain information and voice their concerns over issues of service and quality.

Personnel providing Customer information -On Air at 94.1 FM

14.3 Information Displays

GWI will create Information Program Vignettes that will be displayed on closed circuit TV's located in the public areas of regional offices. These will be used to project information for

[49] The Public Relations Department reports to the Managing Director.

customers related to the Corporation's policies, advisories, promotions and employee awards and achievements.

14.4 Hinterland Programs

In recognition of GWI's outreach to the hinterland communities and in keeping with its mission, the Public Relations Department is charged with the responsibility for developing specific community awareness programs for the respective communities. In this regard, the department will work closely with regional media organizations to present the Corporation's programs in a manner that provides the greatest effectiveness.

14.5 Sewerage and Sanitation Information

The Department will conduct public awareness programs to ensure that households practice proper sewerage waste disposal. This is considered critical for the maintenance of sanitary conditions in communities and can greatly improve the services they receive.

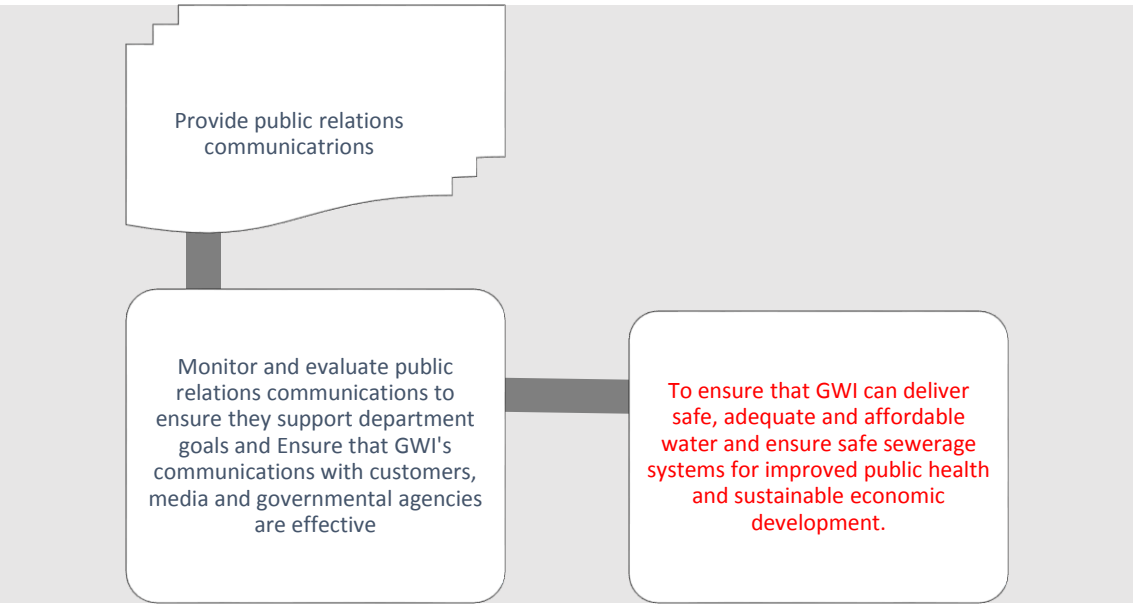
14.6 Website Information Program

This department along with the Customer Relations Department carries the responsibility for the Corporation's website. The site is designed to provide information on GWI's operations, offer interactivity for customer communications and serve as a repository of technical information regarding water and sewerage for public access. The website content and operations is facilitated by an Editorial Committee which overseas content and ensures that information and data that is published is in accordance with the Corporation's policies and procedures.

14.7 Public Relations Support for Programmatic Areas

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives.

Public Relations Strategic Objectives



INFORMATION COMMUNICATION TECHNOLOGY

15.0 Information Communication and Technology

The Information Communication and Technology department is responsible for providing computer software, hardware, a network and communication platform and Cyber Security support for the Corporation's business activities. The strategic plan will focus on the implementation, integration and interoperability of the various electronic programs for improved and efficient organizational performance which were identified in its Gap Analysis and Situation Analysis. The current Financial Information Management System (FIMS), Oracle EBS, which is used for financial management and reporting will have an interface with the new Customer Management Information and Billing System (CMI&BS) which will be selected. The current CMI&BS (HiAffinity) will be replaced because of the many disadvantages which are set out in Appendix J. This integration will eliminate the need for manual and delayed transmission of financial information from the CMIS&BS to the FIMS for the timely preparation of the Profit and Loss and Balance Sheet.

ICT Situation Analysis

Functional Area	Situation	Action
Organization & Managem	Issues with personel connectivity to programs	Review and evaluate IT services to ensure they support department needs
	Cyber security intrusion	To monitor intrusion programs and take timely preventative action
	The inability of staff to effectively use electronic programs	Coordinate training programs with departments
	Lack of competence	To ensure that staff study and become certify to perform their duties

ICT Infrastructure Upgrade for Optimized Performance

15.1 Computer Hardware

In keeping with the current technology trend, ICT has transitioned from independent Servers (physical boxes) to virtual servers residing on a single Storage Area Network (one physical box with multiple drives). This technology lends itself to redundancy, efficient management, administration and better disaster recovery, thereby minimizing the loss of production time due to program issues.

During the plan years, the department will systematically address all issues identified in its Gap Analysis. Servers will be upgraded with sufficient resources (memory, disk space, etc.) to provide adequate capacity for additional applications and services such as the Geographical Information Systems (GIS), new Process Control and Instrumentation Systems and Human Resources Management Information System. The ICT Department will be equipped with the necessary hardware spares to effect repairs and reduce time significantly.

15.2 Network

The current network infrastructure is being revamped with the reengineering and redesign of the entire network by installation of new cabling, routers, switches, servers, greater bandwidth inter location and the introduction of virtualization (new technology) to meet the operational demands of the various departments. This new network infrastructure will provide for faster and reliable transmission of information and will cater for additional services such as Voice over IP Communication. This added service will reduce costs for inter office telecommunications. Users of critical business applications and services such as the CMI&BS and work order system will be able to execute their functions in significantly reduced time with ease resulting in improved customers satisfaction and overall improved efficiency of the Corporation.

15.3 Business Application Implementation Services

The ICT Department will play a major role in the implementation of a new CMI&BS[50]. This implementation will require services such as installation and testing of hardware, integration with hardware (Cheque scanners, bill printers, reporting printers, etc.), data migration to the new Application, and integration with GIS, HRMIS, FIMS, the Corporate Intranet and a new Reporting Portal to be developed in-house by ICT Programmers.

15.4 Training for Business Continuity within the Business Applications

The ICT department recognizes that there is a need for perpetual training of personnel to efficiently and effectively use the Business Applications. In this regard, the ICT department will facilitate setup and Orientation of selected trainers within the respective departments. These trainers will be selected based on experience and competence and will be responsible for ensuring every user of the subject application is trained and evaluated on a constant basis. This intervention will provide for knowledge sharing and transfer thus promoting business continuity.

15.5 Disaster Recovery (DR) and Contingency Plan

The continuity of GWI's business is contingent on the ICT Business Critical Applications and Systems being available 24 x 7 to users. The ICT Department is mandated to ensure that such applications and services are available and in the event of disruptions due to unforeseen and unavoidable circumstances, that the time for resumption of these services is minimal. Additionally, preservation of the company's data is a priority. Because of the criticality and dependence on ICT Services, Infrastructure, the business applications and data, this disaster recovery plan will be implemented in 2018. An offsite Disaster Recovery (DR) site will be setup and data for business-critical systems will be synchronized daily. This DR site will also host images of all System Configurations so that if a Server or System becomes inoperable, restoration can be done immediately, reducing time for re-installation and configuration. The Corporation's Library of Digital Data (LDD) will be archived at the DR location for protection and security if the primary site is affected by malware. The DR site would also be setup to operate as a scaled down version of the primary site which will allow for some degree of continuity in an emergency.

[50] The CMI&BS is a Customer Information Program being used at the Guyana Power Limited. See Appendix V for a comparison of its functionality advantages over the current HiAffinity Program.

15.6 ICT Support, Research and Development Innovations

The ICT Department recognizes the importance of providing timely and efficient support. To do so effectively, all ICT Staff members will be trained to the level of competence within their specific technical areas and a professional Help Desk System (HDS) will be operationalized. The HDS will manage, track and report on all support requests from users across GWI. The HDS performance report will be used for Staff performance appraisals.

The department is responsible for maintaining all databases and business applications. This requires it to play a supporting role for the various departments to ensure that personnel have authorized restrictive access. Reports generation is also a critical function of these applications and ICT is required to provide technical assistance as needed.

The ICT department is also charged with the responsibility for developing new and innovative interactive communication processes for GWI personnel to receive, transmit and share information and ideas in real time. ICT will be implementing a Share Point Portal which is a collaborative medium that will facilitate a new "real time" culture within the Corporation. This culture revolution will result in improvements in communications and remove isolated silos of knowledge and information which hamper the sharing of resources.

The Corporation's website is being re-designed to offer greater information and customer interactivity for account review, submission of meter reading, bill payment and receipt and bill printing. The website will offer customers a forum via the Live Chat Applet to interact with Customer Services Representatives in real time. This initiative will significantly minimize the response time in comparison to the present methods thus resulting in greater customer satisfaction. The website will also provide for a Water Experts Exchange Forum where GWI's technical personnel can communicate and share ideas with their counterparts around the Globe. Visitors to the website will be able to obtain up to date information on GWI's plan and Services.

The website will facilitate a Mobile Application which will be available to customers. The Mobile Application will provide access to GWI's database for its personnel to review data while they are mobile and allow customers to submit meter readings, report leaks and query their balances and pay their bill prior to the due date. This will improve customer satisfaction tremendously and improve GWI's daily cash flow.

15.7 Cyber Security

The Corporation has experienced several cyber-attacks over the past years which have resulted in loss of data and disruption of its operations. To mitigate these threats, the Corporation has engaged the services of consultants to recommend improvements on cyber security and infrastructure upgrades and their recommendations are being implemented. The Corporation has also begun reviewing its user and access policies for personnel to ensure that only authorized personnel can access programs. In this regard ICT with the expert assistance of the Cyber Security Consultant will develop a Collection of Standard Operating Procedures and Policies which will govern the use and operation of ICT in GWI. These policies are expected to safeguard or minimize future intrusions and will be updated during the plan years to ensure their effectiveness.

15.8 Cyber Intrusion Prevention

Having considered the foregoing issues regarding cyber security breaches, GWI is in the process of implementing state of art intrusion detection and prevention systems to mitigate the threats

of cyber security breaches. These programs will monitor program access, detect intrusion attempts and alert GWI personnel to take remedial action. Additionally, they will ensure that only authorized access is granted to systems, applications, data and the ICT Infrastructure in general.

15.9 Staffing and Restructuring

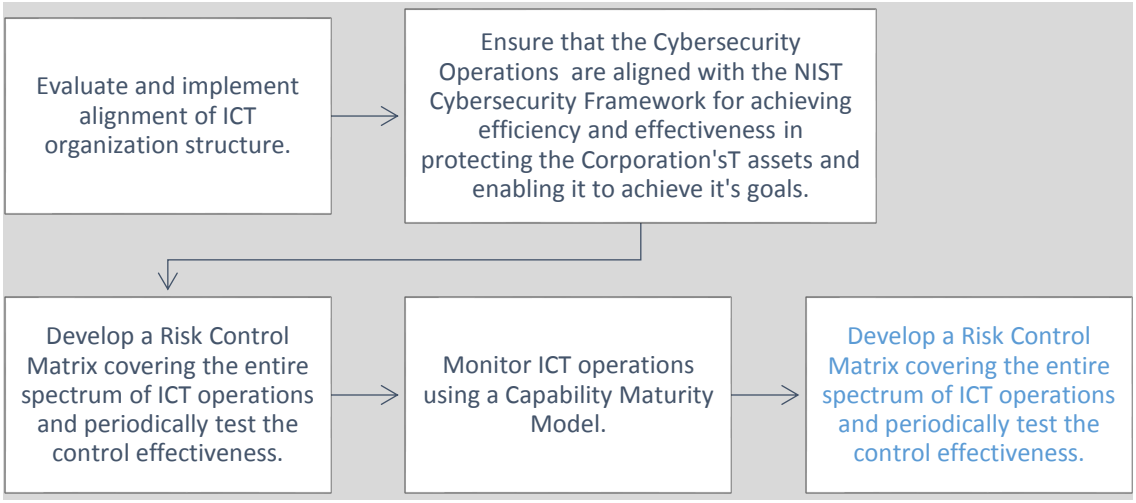
To meet the growing demands and changing approach of the business, ICT recognizes the need to restructure its' staffing organization. This structure will comprise units for each area of ICT operation namely; Network and Communications, Cyber Security, Application Implementation, Development and Support, Hardware Maintenance and Support, Systems Administration and ICT Core Services Operation. This organization of Technical personnel will ensure that expert knowledge and capacity is developed by subject area and at a later stage job rotation will be done to ensure knowledge sharing and integration of the subject areas. At the Technical Support level, Technicians will be dispatched to every Regional Office to render expeditious on premise support.

15.10 ICT Training to Competence and Certification

ICT is a composition of People, Process and Technology. The most important aspect of this trio is human capital. A core competence gap analysis was done to identify the training needs and a training requirement schedule has been prepared to ensure that all ICT personnel will be trained to the level of certification required to support the operations.

15.11 Recommendations

GWI engaged the Services of an IT Consultant Service[51] and it will implement their recommendations listed below.

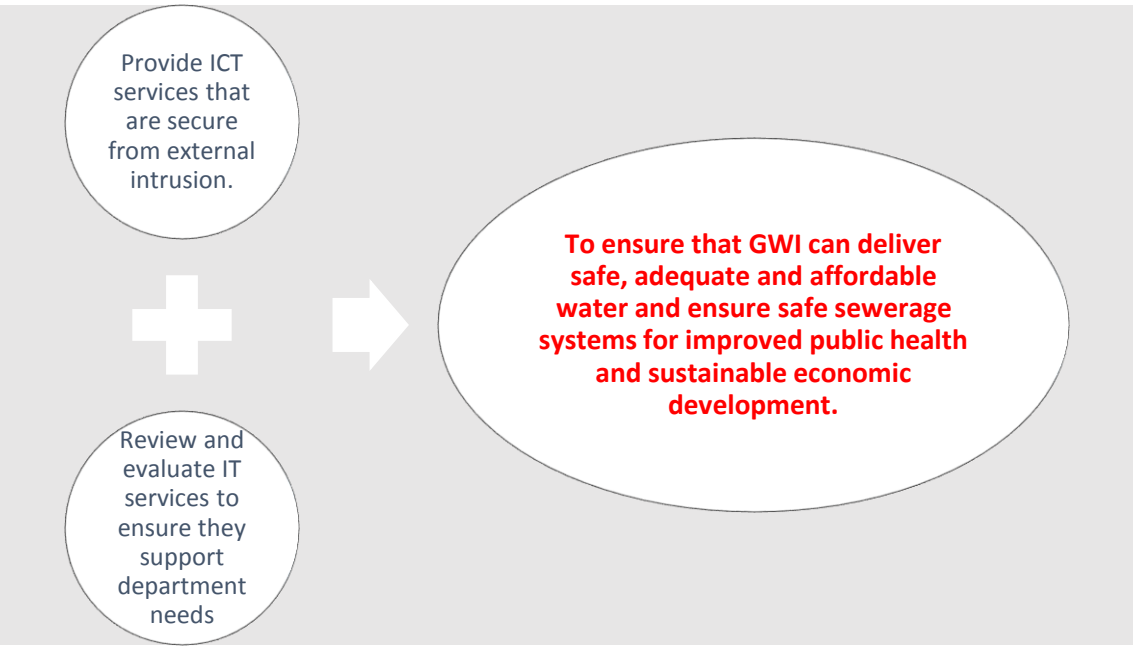


ICT support for Programmatic Areas

The Indicators (on the next page) derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives.

[51] See FernHill Associates Report.

ICT Strategic Objectives



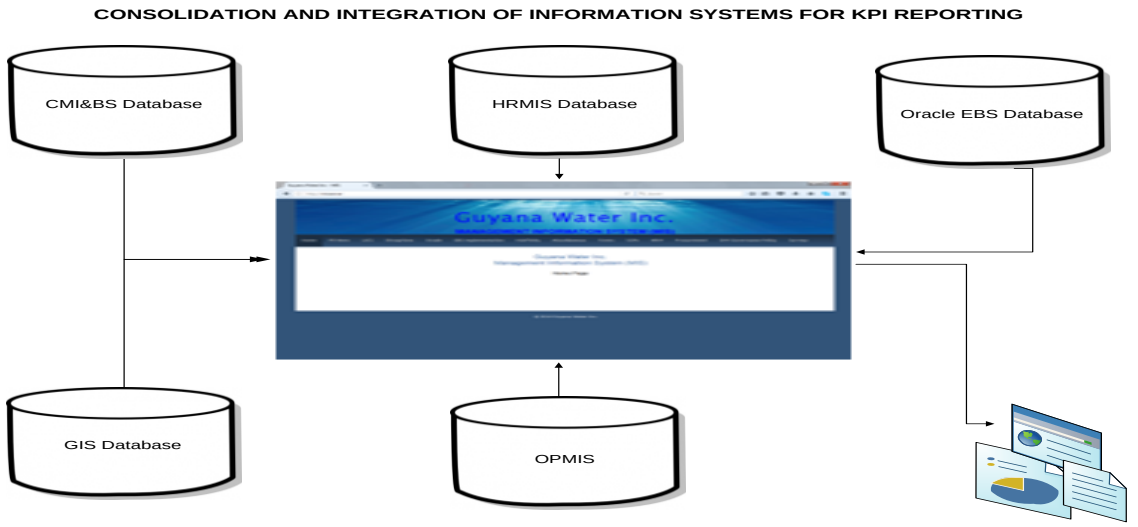
ELECTRONIC PROGRAM DATA PROCESS

16.0 Electronic Program Data Process

GWI has various processes for documenting administrative and operational activities and it has been observed that the creation of reports is both time consuming and requires the use of ITC staff. To alleviate this problem and to improve the efficient creation of information for timely decision-making, the process has been enhanced with the linkage of all data via an electronic program data set as demonstrated in the schematic diagram below. This will facilitate the input, collection, transmission and review of data in a timely and efficient manner (data entered in one area will populate several reports) and consequently decision-making will be facilitated.

The data that is generated in various departments, especially regarding the operational processes will be linked to other departments and ultimately tied to the financial performance and expectations of the Corporation. The data necessary for the monitoring and evaluating of the KPI's will be entered directly into the reports and thus there will be greater integrity for the information since it will not be subjected to transcription and other types of errors.

The process will also facilitate the linkage of GIS data for meter reading, leak identification and repairs and the verification of work activities performed with visual evidence that can be used for payments approval. The following is a schematic of the process:



GWI has a Customer Management Information and Billing System (HiAffinity), a Financial Information System (Oracle EBS) and several data sets located in electronic programs that operate as silos across the Corporation. These systems and data sets are not integrated and therefore cannot be used for consolidated reporting without extensive manual work and effort.

16.1 Customer Management Information and Billing System (CMIBS)

GWI has been using the HiAffinity Customer Information and Billing System to manage customer accounts and deliver the requisite services. A review of this system has revealed many areas of deficiencies which in turn promote inefficiencies in the operational performance of the Commercial Services Department as evidenced by the inaccurate database, lack of automated work flow systems, lack of integration with the Financial Information System, lack of efficient reporting systems and the heavy reliance on third party solutions for core functions. This plethora of deficiencies has resulted in poor quality and untimeliness of information needed for key business decisions, degradation/erosion of customer confidence, manual monotonous processes.

16.1.1 New Customer Management Information and Billing System (CIS)[52]

The Corporation has reviewed and identified a new Program which will replace HiAffinity. It is being used by another government utility, Guyana Power Limited and has state-of-the-art features which will facilitate efficient customer recordkeeping, processing data and billing, reports and integration with the Oracle Financial Program. It is expected that the program will be operational mid-2018.

16.2 Integrating the Customer Information and Financial Information Systems

The Customer Information and Financial Information Systems operate on different platforms with different data bases and there is no integration between the two systems. The practice of manual input of journal entries to update the General ledger with data from the Customer Information System is demanding in terms of resources and time and is plagued with errors. This does not promote timely, accurate and efficient reporting. This problem persisted for many years denying Management the requisite information in a timely manner to make critical

[52] CIS Infinity is a Canadian company product. Costs are included in the Strategic Investment program.

decisions. Going forward, the Corporation will integrate the systems and daily automated batch updates will be done. This information would be used for forecasting and planning amongst other benefits.

16.3 Operations Management Information System (OMIS)

The Operations Department has been collecting data of various operating parameters and in various areas of operation. Data about Water Quality, Levels of Service, Energy Consumption, Leak Management and Response Time Analysis, Service Disruption, District Metering Area, Domestic Consumption Meters and Water Production has all been collected and kept for many years in disparate data silos. Some were kept in Excel Spreadsheets on individual desktop computers, some in the Log Sheet Information Capturing System and other bits in access database. To produce a monthly management report which captures all this information requires a substantial amount of manual work (every month) to consolidate the various data sets. These parameters are either themselves, performance indicators or they are part of performance indicators which are vital to the success of the strategic plan. It is therefore incumbent upon the SPEM Department to lead a project which addresses the issue of consolidation of these data sets and implementation of a system for input and output of data and information respectively.

In consultation with the various units or areas of operation, the SPEM department and ICT department will be engaged in developing an OPMIS (Operation Management Information Management System) which will be complete with forms/interfaces for entry of data at the Regional Offices and a reporting functionality. Operational and Management reports such as production performance, disruption, energy consumption, non-revenue water due to wastage and leakage will be developed for managers at the regional offices. Each Manager would have access to their respective Performance Evaluation Reports at any given time. The SPEM (Strategic Planning, Evaluation and Monitoring) Unit will have access to a library of Performance Evaluation Reports. These reports will be used monthly to evaluate the performance of every department or unit within the Corporation.

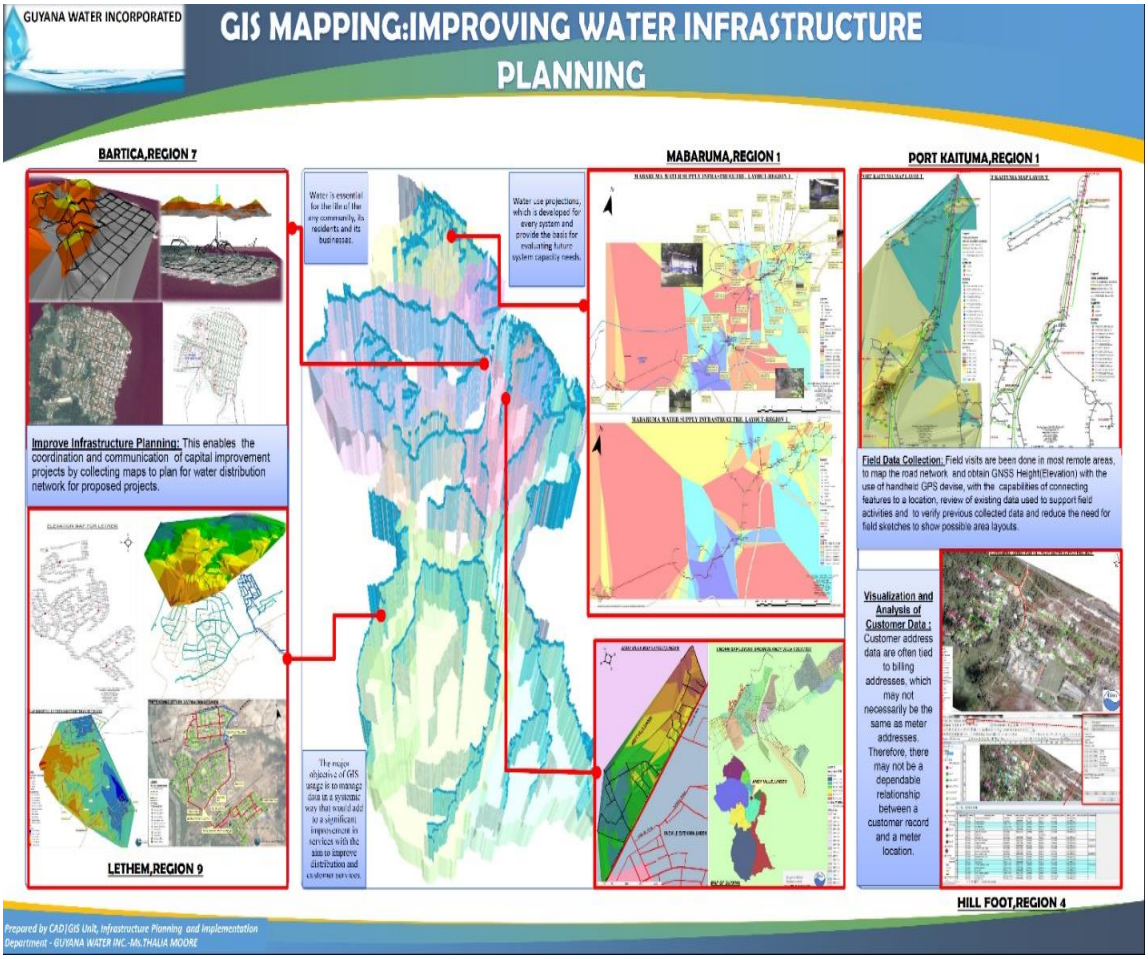
16.4 Human Resources Management Information System (HRMIS)

The Human Resources department is operating in a fully manual mode and will be introducing a Human Resource Information Management System. This will allow the processing of recruitment, payroll, benefits, training and industrial safety for all employees. It will also facilitate the decentralization of human resources management specialists to perform duties at regional locations. The program will allow payroll processing in the Human Resources Department with an interface with Oracle for the payment of salaries by the Finance Department. Time and Attendance will be administered via electronic entries regionally and employees will be able to view their benefits. Occupational Safety and Health data and reporting will be facilitated by the program.

16.5 Geographical Information System (GIS)

GWI has a geographically spread network of infrastructure which delivers water to all our customers. The schematics and coordinating data for this infrastructure is either in the form of hard copies or electronic files which are not consolidated to provide intelligent information. Sourcing and securing cadastral and coordinating data proves to be a time consuming and laborious task therefore, GWI will implement a GIS which will be complete with an authoritative repository of information of all assets for all its infrastructure. This GIS solution will be used to

effectively plan for maintenance replacement and growth of infrastructure, network analysis (system tracing and hydraulic modelling), introduce dynamic interaction between field and office workers and provide for real time information flow, access to geospatial data to allow for collaboration between office staff and field workers as shown below.

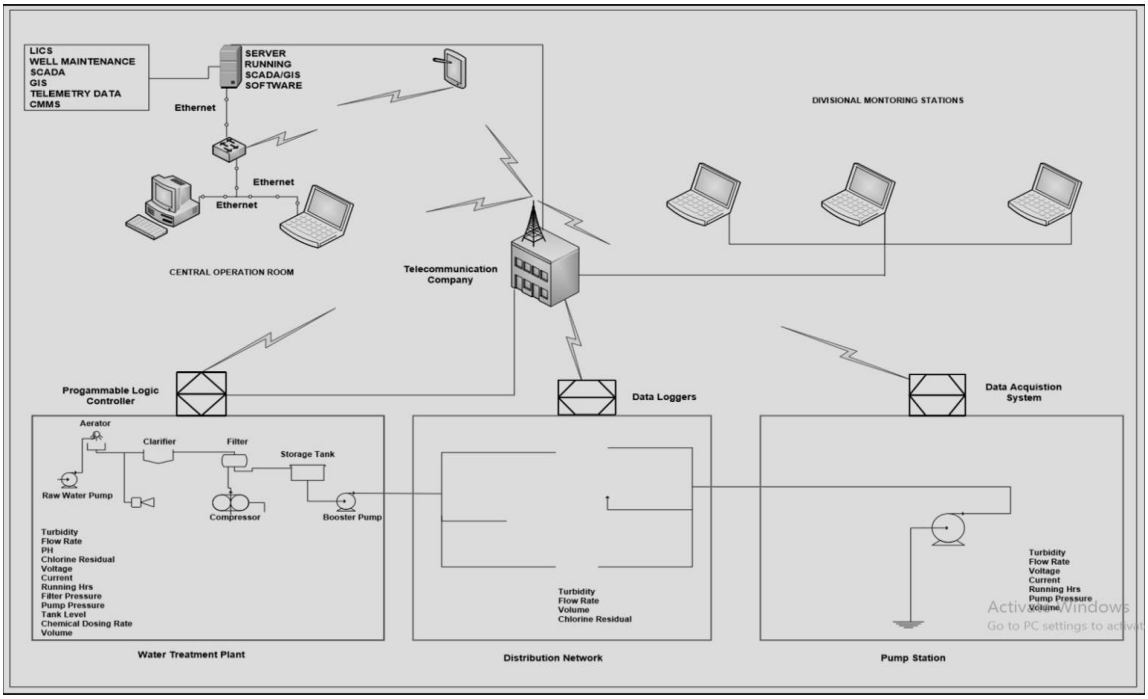


16.5.1 Reorganizing the GIS Functionality

GWI plans to expand the role of the GIS personnel to provide organization wide services and this will be better facilitated by placing this functionality under the strategic planning, evaluating and monitoring department.

16.6 Instrumentation

GWI currently has 24 water Treatment Plants (WTP) and there are 137 wells stations and 25 sewerage pump stations operational. The equipment used by these plants and stations, such as pumps, water meters, valves, pressure gauges, transmitters analyzers, motors, loggers programmable logic controllers (PLC) are monitored to obtain performance indicators for the various systems. Data is collected hourly or daily and manually entered in the LICS program and summary reports are generated and sent to managers. Additionally, a telemetry system provides data twice daily on a HWM website mainly for pressure and flows for various parts of the system. The data collected from these methods are stored in various servers. The following is a schematic of the instrumentation process.



16.7 Consolidated Reporting

The Strategic Planning Evaluation and Monitoring Department of GWI has a mandate to evaluate the performance of each unit for every area of the operation/business monthly. To do so effectively, it recognizes the need for an efficient reporting mechanism. The data required to derive information to measure performance is resident in various Information Systems and would require a tremendous amount of manual work and effort to consolidate and deduce performance per indicator. The SPEM Department together with the ICT Department will develop a solution which provides a common reporting interface primarily for reporting on performance. This solution will constitute various libraries of base reports for every unit as well as a library of reports which the SPEM Department will use to execute its functions effectively.

Annual Key Performance Indicators (ICT) – Targets

	Programmatic area	Indicators	2017	2018	2019	2020	2021
1	Organisation & Management	% program unscheduled downtime duration in excess of 2 days	5%	4%	3%	2%	1%
2	Organisation & Management	% of users inability in excess of 1 day to access to business apps or ICT servcies e.g email services	5%	4%	3%	2%	1%
3	Organisation & Management	% threats actioned measured from various level i.e. IDS,Spam filtering, EPPS)	100%	100%	100%	100%	100%
4	Organisation & Management	% compliance with preventative maintenance schedule	100%	100%	100%	100%	100%
5	Organisation & Management	% compliance with ICT support response time	90%	90%	95%	95%	98%

COMMERCIAL AND CUSTOMER SERVICES AND REVENUE

17.0 Commercial and Customer Services

The Corporation's commercial and customer services department was reorganized to facilitate electronic interaction for customers to receive information regarding level and quality of service, access their accounts, pay their bills and report service issues. The objective of this department is to ensure that billing is accurate, that it is delivered to customers in a timely manner and payment is received promptly as is depicted in the schematic below. An electronic program with an App for access via cellphones and Tablets will be available for use by the Corporation's personnel. The program will display regional data such as levels of service, quality, demographics etc. for information sharing and decision-making. It will also have an interactive feature for customers to access data regarding their account, enter meter reading, review their bill, make their payment and generate bills and receipts.

Customer Services and Revenue Situation Analysis

Functional Area	Situation	Action
Revenue & Customer Relations	Inaquirate information in the customer database	Replacement of HiAffinity with a new CSIS
	Inacquracy with meter reading data	The training of staff and increased supervision
	Bill delivery	New procedures to verify bill delivery
	Adjustments to customer bills	Monitoring and supervision of data entry
	The high volume of customer billing queries	Providing customers with an electronic means for billing information, meter reading, submission of readings and bill payment
	The number of accounts for which no charges are generated	Instituting procedures to verify accounts prior to billing generation

A Schematic: **The Billing Cycle**

17.1 Customer Information Service Program

GWI will replace the current HiAffinity Customer Information Service Program which has proven over the years to be inadequate and less cost effective for the expansion and usage needs for customer service personnel. It is planned to replace the program with one that has greater adaptability for usage by utilities companies and allows interactivity with other programs, including the Oracle program used by the Finance department.

17.1.1 Data Verification

The Corporation is cognizant of the inaccuracies in the current customer database and expects to have these addressed so that data that is migrated into the new program. Therefore, it plans to launch an exercise to perform customer data verification which will be completed prior to the launch of the new program.

17.2 Regional Deployment of Staff

Customer service personnel will be deployed regionally to interact with communities and manage customer accounts towards ensuring and encouraging timely payments to keep accounts current and help customers manage their accounts to avoid arrears. The Corporation has launched several exercises in the past to improve database accuracy without much success, hence the plan has set a performance criterion for the conduct of a database exercise to eliminate duplicate data and enter new or corrected data from regional field verification teams into the current database. This will ensure that the database has **100% accuracy**.

17.3 Community Customer Interaction

The department is developing customer outreach programs to determine through customer satisfaction surveys, the needs of customers and to ensure that they are provided with the desired services. The Strategic Planning department will work in conjunction with the commercial department for the gathering and analysis of customer satisfaction survey data. The information will be used by commercial services, customer services and regional revenue managerial personnel to plan and implement improvements in customer services.

The department was restructured to improve the quality of customer service interactions, introduce and follow new standards for levels of service to speed up the processing of complaints, emphasize more customer awareness, conduct analysis of customer complaints and responses and improve the relationship between customers and the Corporation. The has assumed responsibility for staff functions of the regional staff and will work in tandem with regional managers to ensure that customer services are performed in accordance with the Corporation's expectations.

Community outreach at Bartica

17.4 Regional Revenue and Collections Targets

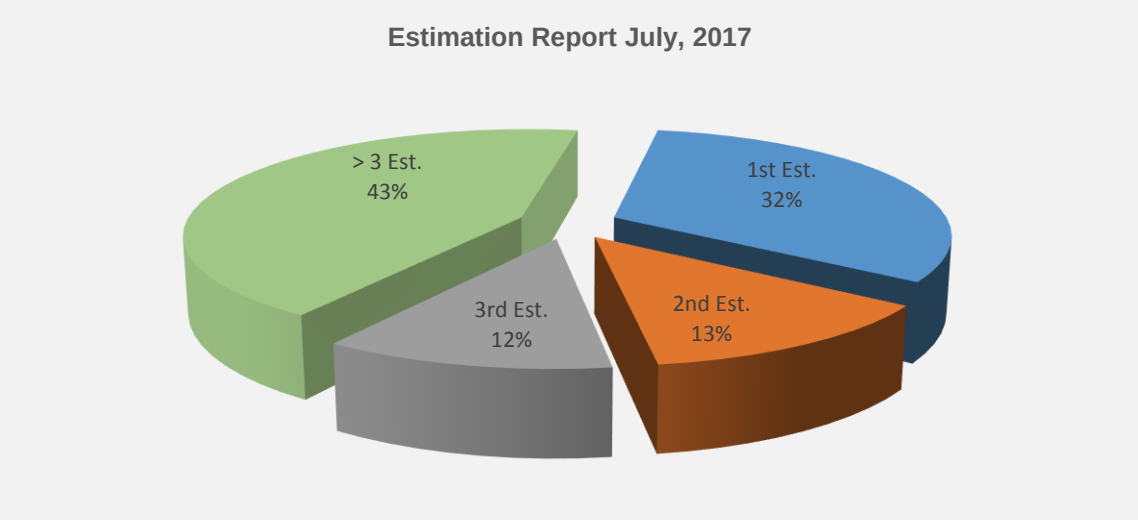
This department is responsible for the preparation of annual regional revenue and collections targets (in conjunction with the SPEM department) which will be communicated to regional managers. The targets[53] will be reviewed monthly by the department and SPEM and adjustments will be made quarterly.

17.5 Value-Added Tax (VAT)

The Government of Guyana has introduced a Value-Added Tax (VAT) of 14% on water consumption charges when such charges exceed $1,500 per month, effective from January 1, 2017. The application of VAT is on the total customer bill when the bill is greater than $1,500 and while it will not increase the revenue of the Corporation, nevertheless, the Corporation must create policies and procedures for its collection and this will necessitate careful planning and implementation. VAT is charged on the current monthly bill; hence, the Corporation must consider the effects of estimated billing and adjustments and ensure that VAT payments are accurate and reconciled with the government reporting regulations.

17.5.1 VAT and Adjustments Charges

GWI is concerned with estimated meter readings and other issues that result in billing adjustments. The charges on customer's bills determine VAT charges and these are reported to government. However, in instances where adjustments are made to billing, VAT must be adjusted accordingly, which results in over or under payment. The following Pie Chart demonstrates the percentages of estimated reading for all regions. GWI will aggressively ensure that there is accuracy in meter reading to avoid estimated and adjustments charges.



17.6 The Call (Information) Center

The Call Center department receives information from customers and ensures that it is sent to the relevant personnel for action. It is a valuable resource for customer feedback and is used for disseminating notices regarding billing inquiries and past due payments.

The data recorded by this Center will be analyzed by the SPEM department and information will be created and sent to the operations and commercial departments for action. Additionally,

[53] See Appendix C for 2017 targets.

personnel in this section will perform customer outreach activities to contact customers for service verifications. They will also administer online satisfaction surveys.

17.7 The National Census – Customer Base

A review of the National Census[54] shows that the Corporation's customer base is significantly lower than the census in most population areas. Therefore, the Corporation will use the National Census listing for buildings in each regional area to update its database, with the assumption that buildings represent possibly one or more service connections and the service connections can be translated into the number of customers that require services.

17.8 Expansion of the Customer Base

GWI plans to expand its current customer base (2016) to align with the population in the communities shown in the National Census. The expansion is especially relevant to the fulfilment of its mission to provide safe water to all communities including the hinterland. Expansion will also be related to offerings of new services in communities that previously did not have this service. Customer relations personnel will ensure that all new communities and new service recipients are placed on the Corporation's database.

17.8.1 Hinterland Communities

The Corporation will focus on the needs of hinterland communities and develop strategic plans for equity in water production including the assignment of customer relations staff with responsibility for ensuring that member of the communities are aware of the Corporation's programs and through their interactions, address community concerns with the service. Personnel from the Planning and Design Department will visit various communities to conduct feasibility studies and in conjunction with the residents and their community organizations, develop plans for their water services. It is expected that development works will be funded through capital funding provided by agencies with funding specially designated for community development or international agencies. Additionally, technical assistance programs will be used to plan and develop infrastructure requirements for water production (pumping and storage) and distribution.

17.8.2 Water Quality in Hinterland Communities

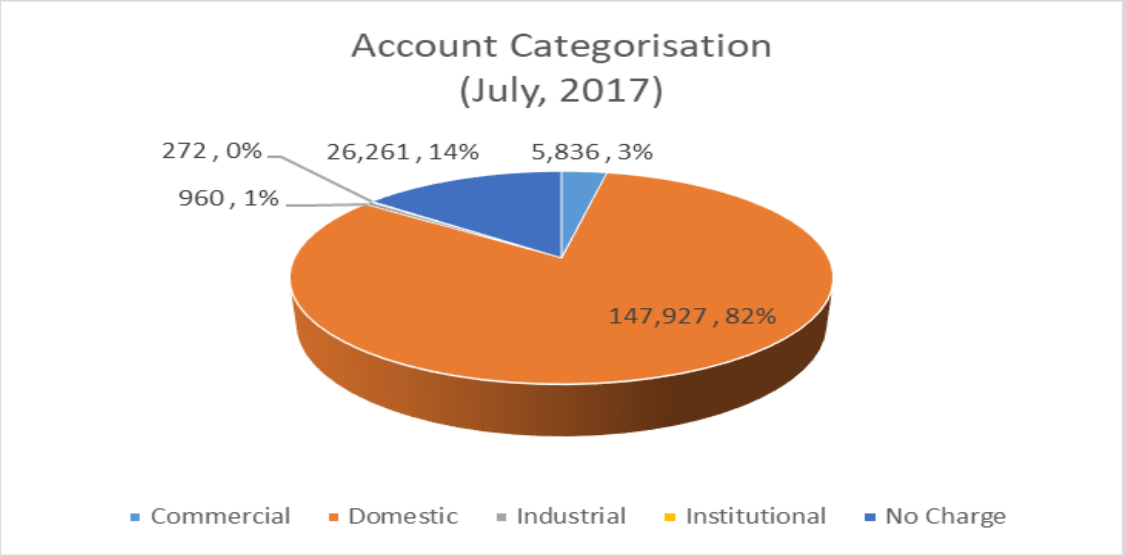
GWI places great emphasis on ensuring that the quality of water received by persons in hinterland communities is of the same standard as all other service areas. Special attention is given to the challenges posed by agriculture and mining activities which are performed near the surface water sources. And, it is hoped that with strict governmental regulations enforcement and community participation, the water sources (rivers and streams) will be less subjected to pollution from these activities. GWI personnel will participate in community planning discussions to ensure that developmental plans are cognizant of the Corporations role in providing water to meet resident's needs.

17.9 Classification of Accounts

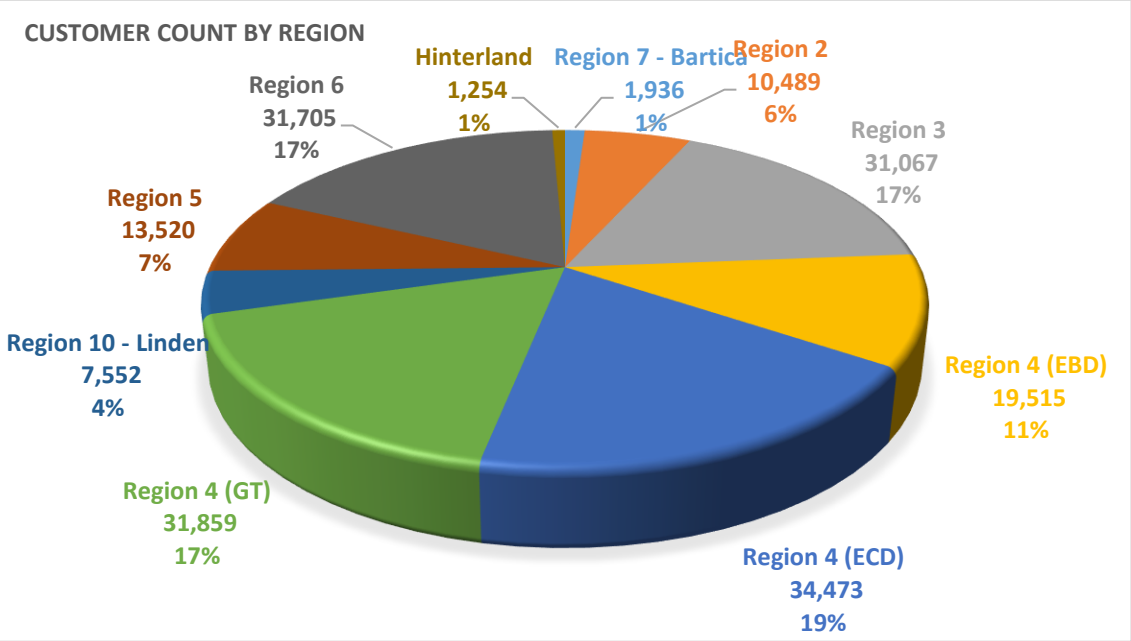
The Corporation's customer accounts are classified according to Commercial, Domestic, Industrial, Institutional and 'No Charge' as shown in the Pie Chart below. GWI's objective is to

[54] Government of Guyana Population and Housing Census 2012.

ensure that 'No Charge" accounts are processed to categorize them for billing prior to the billing cycle and thus reduce or contain the percentage within <5% of all accounts.

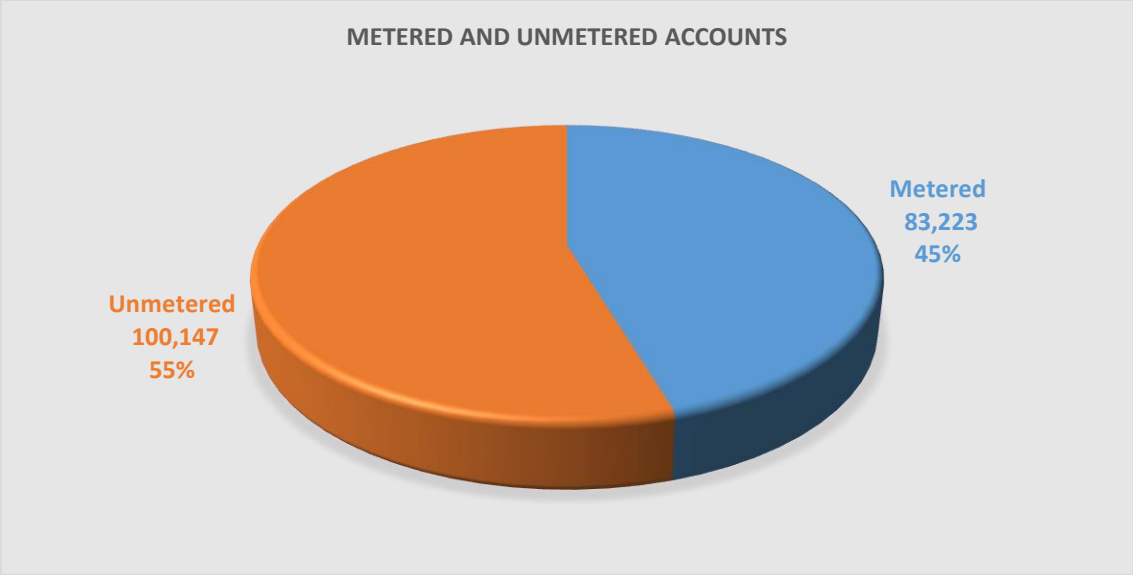


Customer Base year-12/2016



17.10 Expansion of Metered Coverage

The Corporation's current (2016) customer meter coverage is shown below and it plans to expand its coverage to ensure that all areas where service is provided with treated water has metered coverage. Section 10.1 provides details of the planned program for expansion.



17.11 Tariffs (Pricing)[55]

An analysis of the data[56] on both metered and unmetered customers for usage shows that unmetered accounts are billed using the basic minimum consumption of 12 m^3 but the actual consumption is closer to 25 m^3. This creates the justification for a request to the PUC for a new Tariff covering unmetered accounts. Notwithstanding this, the Corporation plans to meter 100% of its accounts to better reflect actual consumption and this should have a positive impact in reducing NRW since it is felt that real production losses can be reduced with an expansion of metering especially in areas where treated water is supplied.

The data on the average consumption of metered customers when compared to unmetered customers in both treated and untreated areas provides an analytic basis for the determination of both metered and unmetered consumption. This is further highlighted in section 18.0 where it has been found that based on comparisons between the average cost of producing one (1) m^3 of either treated or untreated water which is $64 and compared with the average Tariff which is $94 for the same categories, the Tariff is $30 higher than the cost of production and analysis demonstrates that the average cost per customer is $70, which is $20 lower than the average Tariff. While the foregoing does not demonstrate adverse revenue, nevertheless GWI contends that the fulfilment of its new mission for equity of service in all regions and considering the special circumstances for persons in hinterland communities where it is estimated that 47% of have access to water, the cost is not covered by any significant revenue, hence there is justification for a request to the PUC for special tariffs covering respective communities.

17.11.1 Sewerage and Sanitation Tariff

GWI is concerned with the current all-inclusive tariff charges for sewerage and sanitation, especially since it plans to expand its services to include upgrades, rehabilitation and construction of new facilities for sewerage and sanitation covering urban, rural and hinterland communities. Currently, sewerage and sanitation charges are fixed and while there are no breakout figures for the services, it can be assumed that GWI's overall adverse financial position

[55] The current Tariff.
[56] Data is in HiAffinity Reports

can be greatly improved with additional charges for the services which are provided. Hence, the Corporation plans to discuss a change in the tariff structure with the PUC to allow a two-tiered tariff with fixed (basic current charges) and a percentage charge (e.g. 10% of water consumption charges) for actual usage. This can be justified since consumers will be charged for the basic service connection and pay for actual usage in tandem with their water usage which activates the corporation's wastewater processing system. In the case of non-usage of the sewerage system, only basic charges will incur for maintenance of the service connection.

17.11.2 Fixed Charges (unmetered accounts)

The Corporation is concerned with the large percentage (55%) of unmetered customers who are on a fixed charges tariff. GWI has conducted a financial analysis and determined that these customers use approximately 70% of water produced and only pay 30% of charges which reduces revenue significantly. This has relevance for non-revenue water since an analysis has shown that the fixed tariff is based on a lower anticipated consumption while, consumption is much higher. These accounts are targeted for metering which will move them into the metered tariff charges categories and thus their impact of revenue will be positive.

17.12 Customer Classifications

The Corporation currently lists approximately 183,370 (one hundred and eighty-three thousand, three hundred and seventy) customers in its database but an examination of the database reveals that this number appears to be inaccurate and is closer to 160,000 (one hundred and sixty thousand) even though some exercises were conducted in the past years to ensure an accurate customer database count. The customer count is not fully reflective of the number of residences or businesses that receive services, therefore a new exercise has been planned to include the use of GIS mapping to correctly identify customers and 'cleanse' the database. This will produce data which will be used for accurately calculating the number of customers in the database and allow for their correct classifications for Tariffs application. Additionally, the Corporation has begun offering incentives for persons who are receiving services and are not in the database to come forward and sign-up for services and avoid the penalties for illegal usage of services.

17.13 Expansion of Service Access

The most recent census report[57] shows that currently, GWI's customer base is 90% of census households. Therefore, the Corporation plans to expand the customer base to cover the remaining 10% and concurrently, to expand the current metered base from 45% to cover the 55% unmetered customers, especially in areas where treated water is provided. The expansion is projected to significantly improve the Corporation's revenue.

17.14 Customer Incentives for Water Conservation

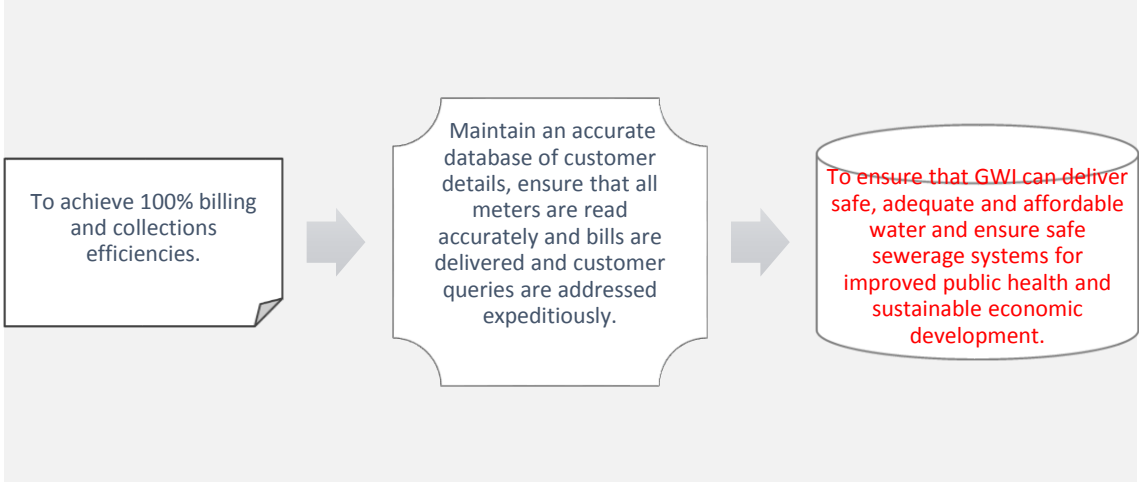
GWI in its efforts to reduce non-revenue water and improve production efficiencies will consider the feasibility of offering customers incentives to conserve water with reductions on their water usage as observed through data on usage.

[57] Bureau of Statistics, Population and Housing Census 2012.

Commercial and Customer Services Support Programmatic Areas

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives[58].

Commercial and Customer Services Strategic Objectives



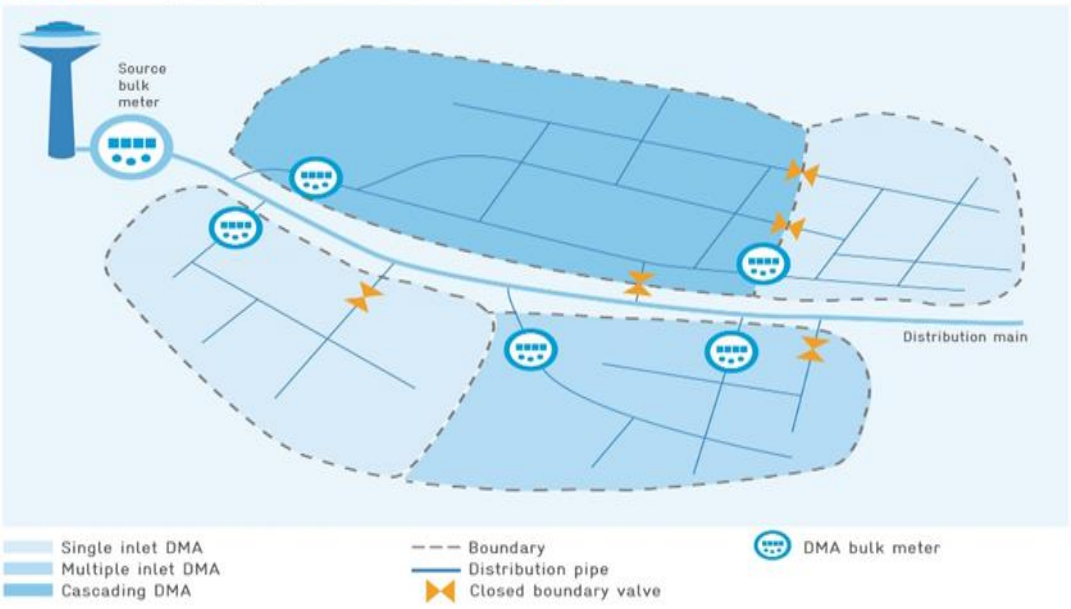
17.15 District Metering Areas Program (DMA)

The District Metered Area (DMA) is an isolated geographic area in which the consumption of a specific number of customers is measured and reconciled with the inflow and /or outflow of water into the area. The transmission and distribution system is fitted with valves that defines boundaries in which flow into and out of the specified area is measured. The readings from the bulk meters when compared with the actual (or estimated) customer consumption gives an indication of the losses due to leaks or illegal consumption. GWI employs the use of data loggers, which reads the bulk meters in real time and transmits these readings to a central hub for use by its engineers. There were at the end of 2016 approximately 15 active DMAs whose implementation has seen marked reduction in water losses within the areas where they were activated and properly monitored. For the DMA program to be expanded and sustained, adequate human and technical resources must be readily available. Over the years GWI has grappling with not having enough data loggers for use on all the DMAs, thus the activating and monitoring of DMAs had to be reduced. There is also the need for relevant personnel to regularly monitor the DMAs to get accurate data of water loss. Also, there is the need for DMAs to have approximately 100% metered customers in the designated areas, thus the need for resources to make this a reality.

The previous strategic plan advocated the use of District Metering Areas (DMA) as a critical element for planned leakage control and the reduction of non-revenue water. GWI is examining this program and the newly formed planning and design department is tasked with the responsibility for examining and recommending to the Operations Department the areas that are most suitable for the placement of the meters which will provide data on consumption to be used for planning services. The placement of these DMA's in metered areas will provide data on non-revenue water, thus contributing to water loss control.

[58] Capital investments are listed in Section 27.

Figure 6.2 Typical layout of DMAs, based on [22]



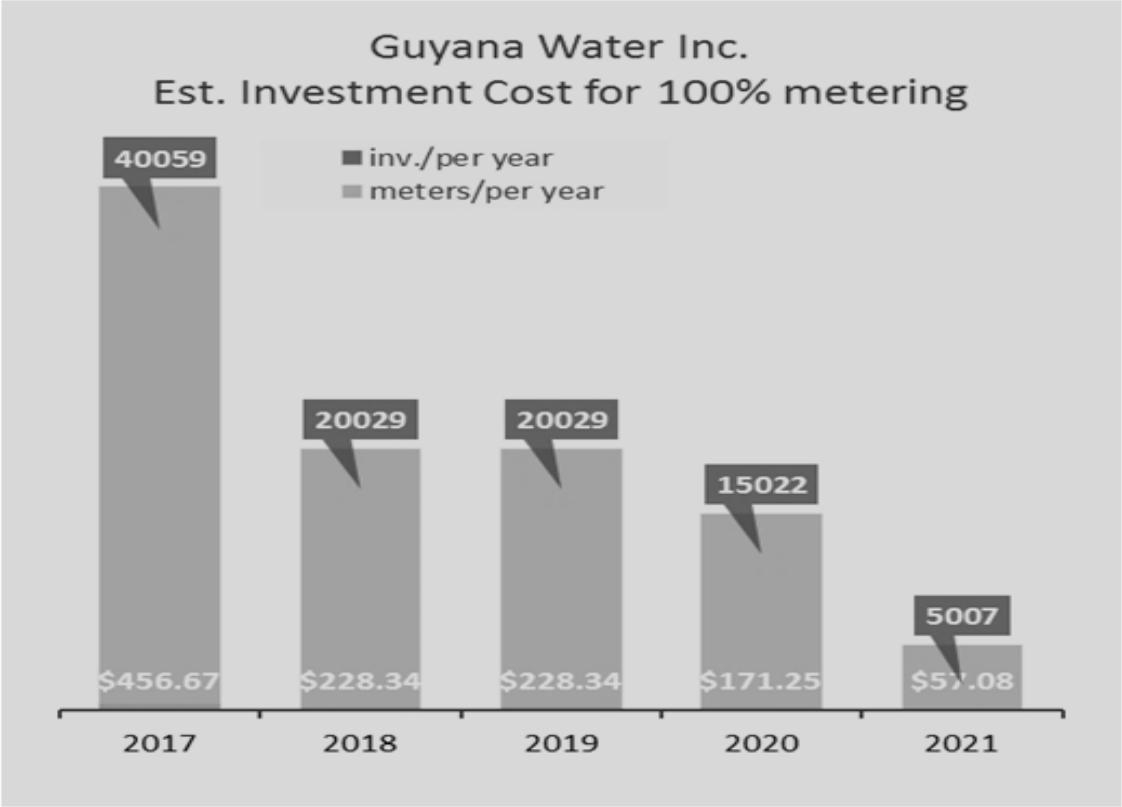
Sourced from a web publication

17.16 Domestic Consumption Monitors (DCM) Program

One of the critical factors regarding non-revenue water is the monitoring of consumption for unmetered customers. GWI has recognized this in the past and addressed it with the placement of 410 Domestic Consumption Monitors (DCM) in various areas to provide data on consumption by unmetered customers. The usefulness of these monitors (meters) continue to be vital and although the Corporation plans to have 100% metering of all accounts, nevertheless until this is achieved, it is considered prudent to continue to monitor the unmetered accounts. Consequently, an exercise has been initiated to identify the current placement of these meters, ensure that they are being read and the data is captured for analysis. In consideration of the cost of new meters, the Corporation surmises that it would not be feasible to provide all new meters for this process when costs can be realized with the use of some refurbished meters. While the data is not used for billing, it will be collected and transmitted to the strategic planning department for analysis to determine appropriate levels of service.

17.17 Meter Install, Removal, Refurbishment and Deployment

It is the Corporation's intention to ensure that all areas where treated water is provided will have meters. It will ensure that meters are serviced for maximum efficient performance and that they are removed from service when faults are detected. In such instances, a replacement will be issued and installed on the account to ensure that it remains in the classification for metered tariff. The meter that is removed will be classified as inactive in the customer database and assigned to stores inventory for meter refurbishment. It will be sent to the meter test bench and after refurbishment (if possible), inspection and certification it will be sent to the stores inventory. This process will allow compliance with government regulations which requires inspection and certification by the Bureau of Standards for new and refurbished meters.



17.18 GWI's Metering Program 2000-6/2017

METER INSTALLATION_YEAR	years				
Regions	2000-2004	2005-2009	2010-2014	2015-2017	Grand Total
Region 10-LIN	14	68	3793	639	4514
Region 2	6	3898	1231	493	5628
Region 3	924	1940	5898	3337	12099
Region 4-EB	431	965	3535	2743	7674
Region 4-EC	41	4133	5013	7041	16228
Region 4-GT	2115	2648	8184	6158	19105
Region 5	105	1629	1127	1710	4571
Region 6	78	1214	10665	2663	14620
Region 7-BAR	23	2	1210	243	1478
Regions 1,8,&9				157	157
Grand Total	3737	16497	40656	25184	86074

Guyana Water Inc.: Metered Accounts in DATABASE 2000-2017 JUNE

Metered Customers/Accs yrs Regions/Zone Name	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Region 10-LIN			8	6				1	19	48	1221	421	388	924	839	545	32	62	4514
Region 2	2	2	2			1	12	263	1182	2440	913	71	158	17	72	49	272	172	5628
Region 3	65	550	215	37	57	23	66	26	101	1724	1274	720	309	351	3244	2124	304	909	12099
Region 4-EB	4	80	31	139	177	39	6	125	18	777	347	272	137	91	2688	1319	786	638	7674
Region 4-EC	12	21	7		1	77	51	1821	133	2051	1357	731	322	244	2359	3967	1545	1529	16228
Region 4-GT	1775	116	221	2	1	1	115	1453	860	219	1517	485	404	1020	4758	2938	2342	878	19105
Region 5	2	11	15	20	57	165	4		73	1387	232	180	183	408	124	186	755	769	4571
Region 6		9	46		23	4	19	16	259	916	1294	169	145	1683	7374	1182	933	548	14620
Region 7-BAR		2			21				2			3	5	317	885	210		33	1478
Regions 1,8,&9																	156	1	157
Total	1860	791	545	204	337	310	273	3705	2647	9562	8155	3052	2051	5055	22343	12520	7125	5539	86074
% change		-57%	-31%	-63%	65%	-8%	-12%	####	-29%	261%	-15%	-63%	-33%	146%	342%	-44%	-43%	-22%	
Mean	310	99	68	41	48	44	39	529	294	1195	1019	339	228	562	2482.6	1391.1	792	554	8607.4
Median	8	16	23	20	23	23	19	125	101	1152	1248	272	183	351	2359	1182	755	593	6651

Metered Customers/ yrs Regions/Zone Na	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Region 10-LIN	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	1.4%	0.5%	0.5%	1.1%	1.0%	0.6%	0.0%	0.1%	5.2%
Region 2	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	1.4%	2.8%	1.1%	0.1%	0.2%	0.0%	0.1%	0.1%	0.3%	0.2%	6.5%
Region 3	0.1%	0.6%	0.2%	0.0%	0.1%	0.0%	0.1%	0.0%	0.1%	2.0%	1.5%	0.8%	0.4%	0.4%	3.8%	2.5%	0.4%	1.1%	14.1%
Region 4-EB	0.0%	0.1%	0.0%	0.2%	0.2%	0.0%	0.0%	0.1%	0.0%	0.9%	0.4%	0.3%	0.2%	0.1%	3.1%	1.5%	0.9%	0.7%	8.9%
Region 4-EC	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.1%	2.1%	0.2%	2.4%	1.6%	0.8%	0.4%	0.3%	2.7%	4.6%	1.8%	1.8%	18.9%
Region 4-GT	2.1%	0.1%	0.3%	0.0%	0.0%	0.0%	0.1%	1.7%	1.0%	0.3%	1.8%	0.6%	0.5%	1.2%	5.5%	3.4%	2.7%	1.0%	22.2%
Region 5	0.0%	0.0%	0.0%	0.0%	0.1%	0.2%	0.0%	0.0%	0.1%	1.6%	0.3%	0.2%	0.2%	0.5%	0.1%	0.2%	0.9%	0.9%	5.3%
Region 6	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.3%	1.1%	1.5%	0.2%	0.2%	2.0%	8.6%	1.4%	1.1%	0.6%	17.0%
Region 7-BAR	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.4%	1.0%	0.2%	0.0%	0.0%	1.7%
Regions 1,8,&9	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.2%	0.0%	0.2%
Total	2.2%	0.9%	0.6%	0.2%	0.4%	0.4%	0.3%	4.3%	3.1%	11.1%	9.5%	3.5%	2.4%	5.9%	26.0%	14.5%	8.3%	6.4%	100.0%

Source: GWI, Customer Information System “HiAffinity Database”

Table 28: **Estimated Targets for Installing Meters 2017-2021**

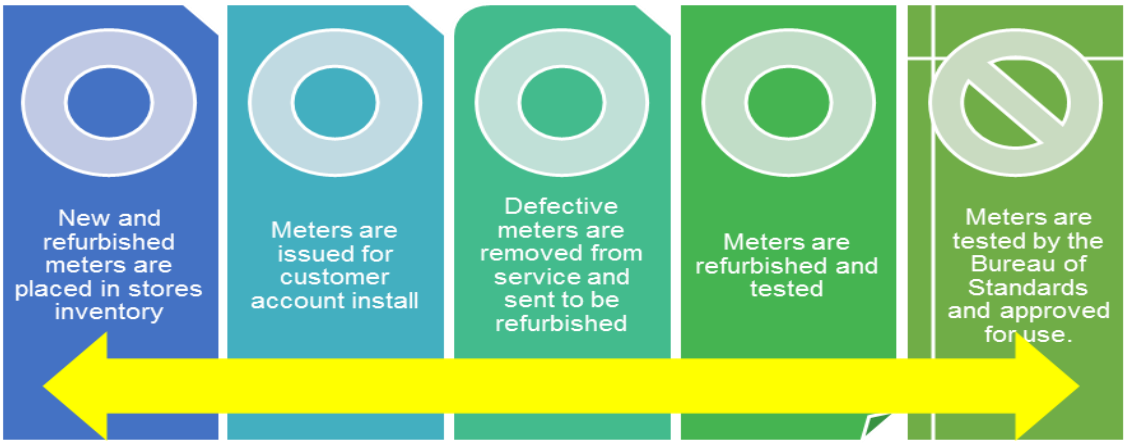
Regions	FY2016	Planned Metering Programme					TUMC	2016	projected increase annually					W A.UM
		FY2017	FY2018	FY2019	FY2020	FY2021			2017	2018	2019	2020	2021	
Region 2	**5567**	1969	985	984	738	246	**4922**	**53.1%**	18.8%	9.4%	9.4%	7.0%	2.3%	4.9%
Region 3	**11875**	7677	3838	3838	2879	960	**19192**	**38.2%**	24.7%	12.4%	12.4%	9.3%	3.1%	19.2%
Region 4-GT	**18933**	5170	2585	2585	1939	646	**12925**	**59.4%**	16.2%	8.1%	8.1%	6.1%	2.0%	12.9%
Region 4-EBD	**7538**	4791	2395	2395	1797	599	**11977**	**38.6%**	24.6%	12.3%	12.3%	9.2%	3.1%	12.0%
Region 4-ECD	**15345**	7651	3826	3826	2869	956	**19128**	**44.5%**	22.2%	11.1%	11.1%	8.3%	2.8%	19.1%
Region 5	**3941**	3832	1916	1916	1437	479	**9580**	**29.1%**	28.3%	14.2%	14.2%	10.6%	3.5%	9.6%
Region 6	**14249**	6982	3491	3491	2618	873	**17455**	**44.9%**	22.0%	11.0%	11.0%	8.3%	2.8%	17.4%
Region 7-Bartica	**1447**	219	120	150	0	0	**489**	**74.7%**	11.3%	6.2%	7.7%	0.0%	0.0%	0.5%
Region 10-LIN	**4172**	1352	676	676	507	169	**3380**	**55.2%**	17.9%	9.0%	9.0%	6.7%	2.2%	3.4%
Region 1,8,9-H/l	**156**	357	168	320	255	0	**1100**	**12.4%**	28.4%	13.4%	25.5%	20.3%	0.0%	1.1%
Total	**83223**	**40000**	**20000**	**20181**	**15039**	**4928**	**100148**	**45.4%**	**21.8%**	**10.9%**	**11.0%**	**8.2%**	**2.7%**	

Regions	FY2016	Estimated Programme Out-turn 2017-2021											W A.M
		FY2017	FY2018	FY2019	FY2020	FY2021	FY2016	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	
Region 2	**5567**	7536	8520	9505	10243	**10489**	**53.1%**	71.8%	81.2%	90.6%	97.7%	100%	6.7%
Region 3	**11875**	19552	23390	27229	30107	**31067**	**38.2%**	62.9%	75.3%	87.6%	96.9%	100%	14.3%
Region 4-GT	**18933**	24103	26689	29274	31213	**31859**	**59.4%**	75.7%	83.8%	91.9%	98.0%	100%	22.7%
Region 4-EBD	**7538**	12329	14724	17120	18916	**19515**	**38.6%**	63.2%	75.5%	87.7%	96.9%	100%	9.1%
Region 4-ECD	**15345**	22996	26822	30647	33517	**34473**	**44.5%**	66.7%	77.8%	88.9%	97.2%	100%	18.4%
Region 5	**3941**	7773	9688	11604	13041	**13520**	**29.1%**	57.5%	71.7%	85.8%	96.5%	100%	4.7%
Region 6	**14249**	21231	24723	28214	30832	**31705**	**44.9%**	67.0%	78.0%	89.0%	97.2%	100%	17.1%
Region 7-Bartica	**1447**	1666	1786	1936	1936	**1936**	**74.7%**	86.1%	92.3%	100.0%	100.0%	100%	1.7%
Region 10-LIN	**4172**	5524	6200	6876	7383	**7552**	**55.2%**	73.1%	82.1%	91.0%	97.8%	100%	5.0%
Region 1,8,9-H/l	**156**	513	681	1001	1256	**1256**	**12.4%**	40.8%	54.2%	79.7%	100.0%	100%	0.2%
Total	**83223**	**123223**	**143223**	**163405**	**178444**	**183372**	**45.4%**	**67.2%**	**78.1%**	**89.1%**	**97.3%**	**100%**	
mean	**8322**	12322	14322	16341	17844	18337	note: cumulative metering percentage/yr						
median	**6553**	10051	12206	14362	15979	16518							
max	**18933**	24103.4	26821.8	30647.4	33517	34473							
min	**156**	513	681	1001	1256	1256							

notes**

1. TUMC: total number of unmetered customers
2. metered accounts baseline 12/2016
3. weighted average metered accounts (W/A.W)
4. weighted average unmetered accounts (W/A.UM)

The Metering Process:



17.19 Re-organizing the Meter Testing Functions and Process

An examination of the current location and the equipment used in the meter testing section reveals that there is a need for upgrading this section. Therefore, GWI has plans to seek technical assistance and funding for the expansion of the location and the purchase of new state-of-the-art equipment and the training of personnel to upgrade the service. It is envisaged

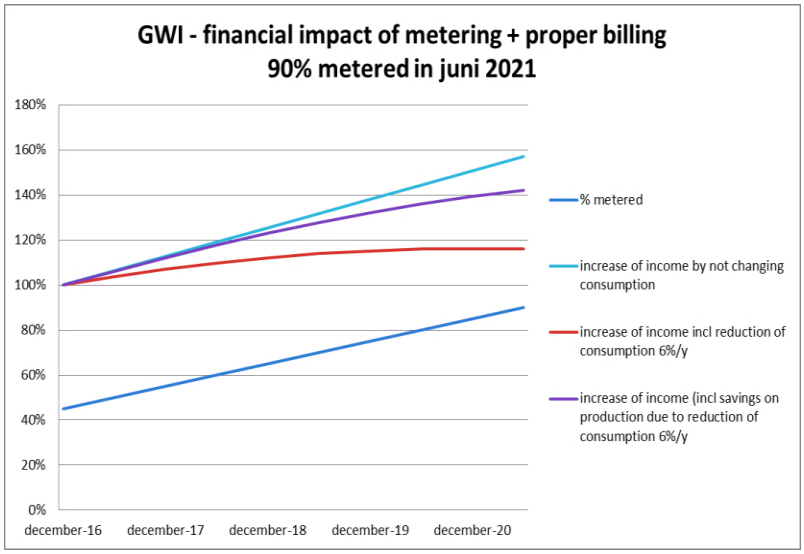
that technical assistance will be obtained for the assignment of a technical expert to perform on-the-job training and streamline the process for testing and refurbishing meters.

17.20 Introducing Electronic (Smart) Meters

The Corporation plans to introduce electronic (smart) meters for deployment in certain areas where it is felt that the meters would be most effective in providing accurate data on consumer usage and mitigate issues regarding meter reading accessibility. These meters will allow data to be gathered remotely via handheld devices, tablets or transmission towers located in communities and the data will be uploaded into the database for billing generation. The cost of this program is factored into the operational costs and its benefits are projected with increased revenue in the preceding section.

17.21 Metering Reduction in Water Consumption and Production

GWI envisages that with the introduction of metering towards the goal of 100% account coverage, there will be reductions in water consumption and correspondingly, production levels will decrease. Previously unmetered customers will realize that their water consumption is strictly monitored and their billing will reflect their consumption. And, while it is expected that this will result in a decrease in revenue, nevertheless, it is also projected that the revenue decrease will be offset by decreased in production costs since less water will be pumped for distribution. The changes in revenue and production costs will also be affected by leak control. The following graph depicts reductions and costs savings using 2016 data[59].



17.22 Electronic Billing and Collections (Payments)

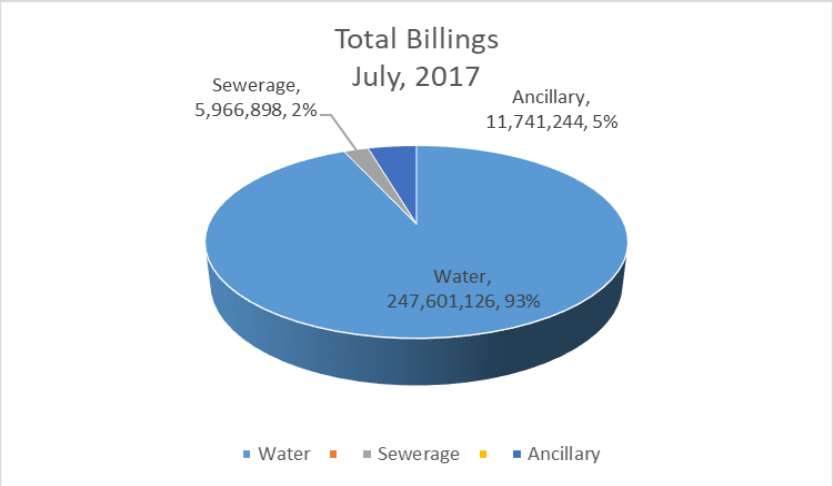
The Corporation currently generates centralized billing based on actual meter readings from staff or customers. However, it is planned that electronic programs will be acquired to facilitate decentralized billing and allow customers to access their account to enter meter reading and generate their bill. The meter reading and billing efficiencies are set out as performance indicators in this plan.

17.23 Billing Metered and Unmetered Accounts

While it is cognizant of the financial value of metering all accounts, the Corporation is aware that 100% metering will be achieved over a period and therefore, the situation of having a mix of metered and unmetered accounts will persist for some time. This necessitates planning for billing and ensuring that billing is generated, distributed and adjustments to billing are all completed within the Corporation's stipulated processing period. This in turn will ensure that

[59] Data and graph produced by Theo Smith – Consultant, March 2017 presentation.

customer payments are received within the billing due dates. The financial variations between metered and unmetered accounts and their effects on revenue is critical and the data is used for determining billing and collections revenue targets.

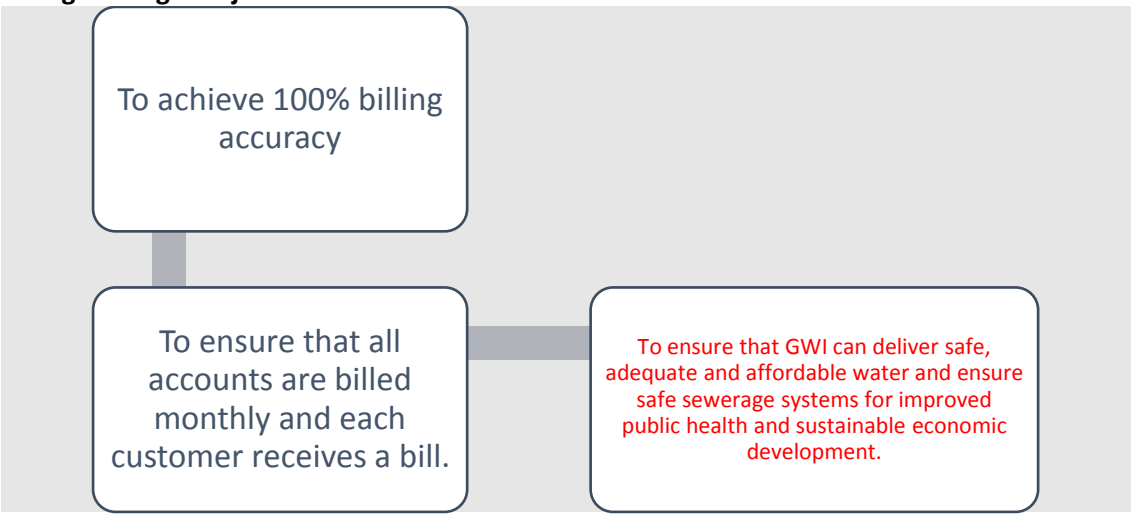


17.24 Total Billing
The following Pie Chart shows the total billing (July 2017) with percentages for water services (93%), sewerage (2%) and ancillary (5%).

Organizational Performance: Situation Analysis Requirements

INDICATORS	2017	2018	2019	2020	2021
Meter reading and data entry	Ensure that 100% of all meters are read and data is entered accurately in the database	Ensure that 100% of all meters are read and data is entered accurately in the database	Ensure that 100% of all meters are read and data is entered accurately in the database	Ensure that 100% of all meters are read and data is entered accurately in the database	Ensure that 100% of all meters are read and data is entered accurately in the database
Queries and adjustments	Ensure that 100% of queries are investigated and addressed prior to the next billing generation	Ensure that 100% of queries are investigated and addressed prior to the next billing generation	Ensure that 100% of queries are investigated and addressed prior to the next billing generation	Ensure that 100% of queries are investigated and addressed prior to the next billing generation	Ensure that 100% of queries are investigated and addressed prior to the next billing generation
No charge accounts	Ensure that <5% of accounts are designated as 'no charge'.	Ensure that <5% of accounts are designated as 'no charge'.	Ensure that <5% of accounts are designated as 'no charge'.	Ensure that <5% of accounts are designated as 'no charge'.	Ensure that <5% of accounts are designated as 'no charge'.

Billing Strategic Objectives



17.25 Projected Billing for Metered Customers

It is projected that all customers who receive treated water will be metered. This objective will necessitate the acquisition of funds[60] for the purchase of new meters and cover the cost of installation.

Table 29: **Billing and Collections Projections (2017 – 2021)**

Description	2017	2018	2019	2020	2021
New Services	8234	8646	9078	9532	4009
Billing ($blns)	$4,301.43	$4,547.23	$5,047.43	$5,602.64	$6,218.93
Collection ($bln)	$4,096.60	$4,547.23	$5,047.43	$5,602.64	$6,218.93
Col. efficiency	95%	100%	100%	100%	100%

Organizational Performance: Situation Analysis Requirements

INDICATORS	2017	2018	2019	2020	2021
Billing generation	Ensure that 100% of all accounts are billed	Ensure that 100% of all accounts are billed	Ensure that 100% of all accounts are billed	Ensure that 100% of all accounts are billed	Ensure that 100% of all accounts are billed
Bill distribution	Ensure that 100% of bills are distributed	Ensure that 100% of bills are distributed	Ensure that 100% of bills are distributed	Ensure that 100% of bills are distributed	Ensure that 100% of bills are distributed
Distribution verification	Conduct 10% verification	Conduct 10% verification	Conduct 10% verification	Conduct 10% verification	Conduct 10% verification

17.26 Collections Efficiency

Collections activities will be expanded to permit online and electronic payments and thus improve collection efficiency which is currently at 30%. A review of the Corporation's collections demonstrates that approximately 70% of all payments represent arrears and thus only 30% are

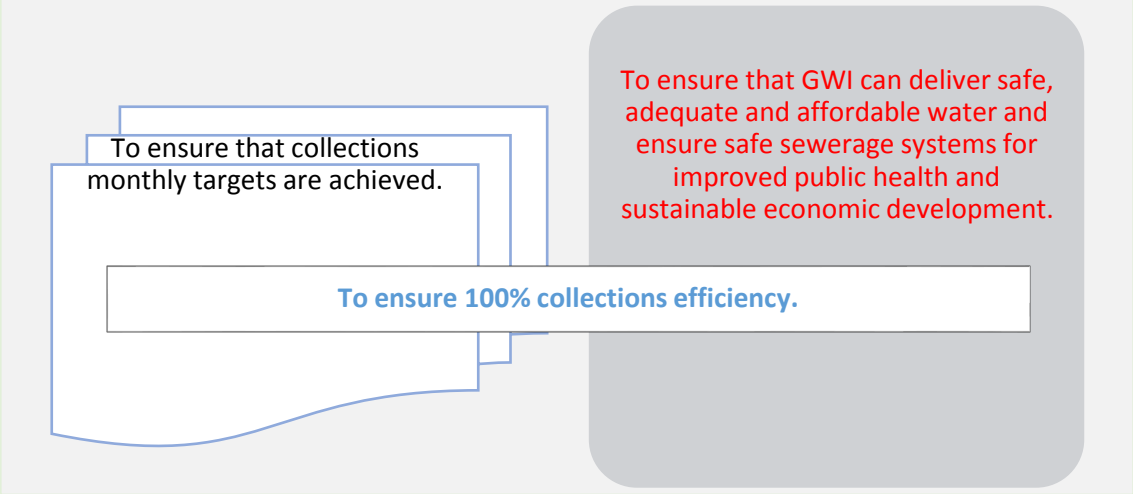
[60] See Section 27.

credited to current payments. This points to the need for improved collections efficiencies. Consequently, efforts must be made to reach out to customers and encourage them to pay their accounts within the 28-days payment cycle. The efficiency of collections is listed as a performance indicator and its baseline is set at >90% of billing[61] within the billing cycle.

17.27 Reporting Billing and Collections data to the Finance Department

Monthly Reports on Billing and Collections are prepared and sent to the Finance Department for entry in the Accounts Receivables (AR) and Billing Adjustments are sent for prior months. The billing adjustments are monitored by the Strategic Planning Department and they are subjected to 'ad hoc' auditing by the Internal Audit Department.

Collections Strategic Objectives



17.28 Collection (Payment Agencies)

The Corporation has contractual relations with several entities namely, Mobile Money, Sure Pay, Bill Express, Republic Bank, Bank of Nova Scotia, GBTI, Citizens Bank and the Guyana Post Office Corporation which collect customer payments on its behalf. It has been found over the years that these entities provide convenience of service through their locations and operating hours to facilitate customer payments. Their collections represent 27% of total collections annually. And, while it is considered strategic for GWI to examine the rationale for customers to use these services, it is felt that the low cost of these services (GWI and customers both pay a transaction fee for their services) currently outweigh any advantages that would be derived from a discontinuation of the contracts and the expansion of GWI payment offices. However, the Corporation will continue to examine the cost-benefits of this arrangement and expects that with the introduction of its customer mobile payment services, there eventually will be very little need for the services of these entities.

[61] See Performance Indicators in Appendix W.

Situation Analysis (summary) Requirements

INDICATORS	2017	2018	2019	2020	2021
Collections at GWI locations	Ensure 100% collections	Ensure 100% collections	Ensure 100% collections	Ensure 100% collections	Ensure 100% collections
Collections at Bill Payment Centers	Ensure 100% collections	Ensure 100% collections	Ensure 100% collections	Ensure 100% collections	Ensure 100% collections
Promotions to improve collections	Conduct 4 quarterly promotions annually	Conduct 4 quarterly promotions annually	Conduct 4 quarterly promotions annually	Conduct 4 quarterly promotions annually	Conduct 4 quarterly promotions annually

PRODUCTION COSTS AND REVENUE

18.0 Water Production Cost and Revenue Performance 2016

The analyses of water production cost and revenue/tariff performance is geared towards policy and decision-making regarding expenditure management and control (programme budgeting) and reducing NRW and hence income performance. All other costs (operations) are not factored into the analyses, including other income such as bulk water sales, earnings from investment holdings, interest bearing accounts, and the disposal of assets are not considered. Regarding electricity cost for Reg. 10-LIN and Bartica/Hinterland the analysis used an estimated electricity cost per meter cube of water production to ensure a more robust comparison across regions is achieved.

In 2016, GWI expended approximately $3.470 billion dollars to produce and distribute/supply 148.301 million m³ of water to 183,370[62] customers. The Corporation's cost was $18,556/per customer on average to provide safe, treated potable water, compared to revenue collection of $18,390/per customer on average. The areas with the highest cost per customer were: Regions 7, 1, 8, & 9: $42,553, Reg. 5: $24,332, Reg. 10-LIN: $23,398, Reg. 2: $22,328, Reg. 4-GT: $22,131 and Reg. 4-EBD $21,953 compared to the areas with the highest revenue collection per customer/connection: Reg. 4-GT: $34,681, Reg. 10-LIN: $20,331, and Reg. 2: EBD $17,475.

In addition, GWI recorded a monthly national average cost of water production of $1,546/per customer; with Regions. 7, 1, 8 & 9, Reg. 5, Reg. 10-LIN, Reg. 2, Reg. 4-GT, and Reg. 4-EBD all being above the national average cost. The national average revenue collection was $1,532/per connection; with Reg. 4-GT (+89%), and Reg. 10-LIN (+11%) above the national average. The national average monthly billing was $1,542/per customer, with Reg. 4-GT, and Reg. 10-LIN recorded the highest billing.

The highest Per capita cost of water production by regions was as follows: Reg. 5, Reg. 4-EBD, Reg. 4-GT, and Reg. 2. However, Regions 1, 7, 8, & 9 had the lowest per capita cost and Region 4 – EBD had the highest Per capita revenue collection. This data is shown in the graph on the next page.

[62] This is based on the database in HiAffinity however, the database contains inaccuracies.

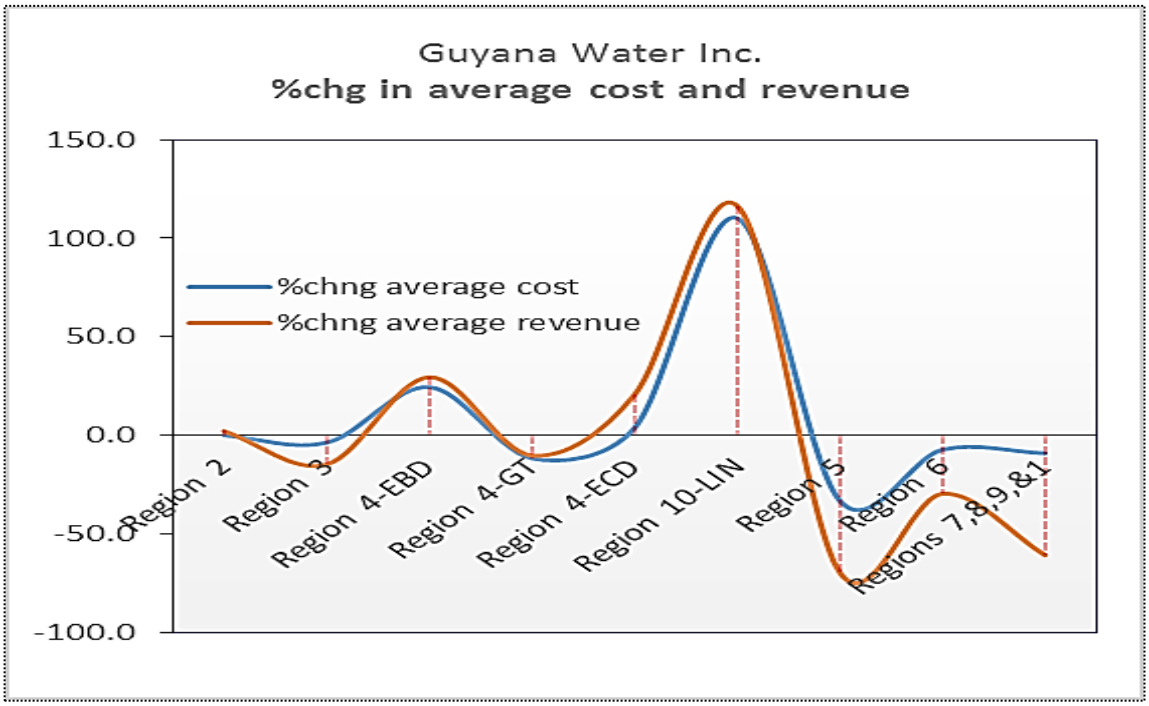
Table 30: **Cost and Revenue Analysis 2016**

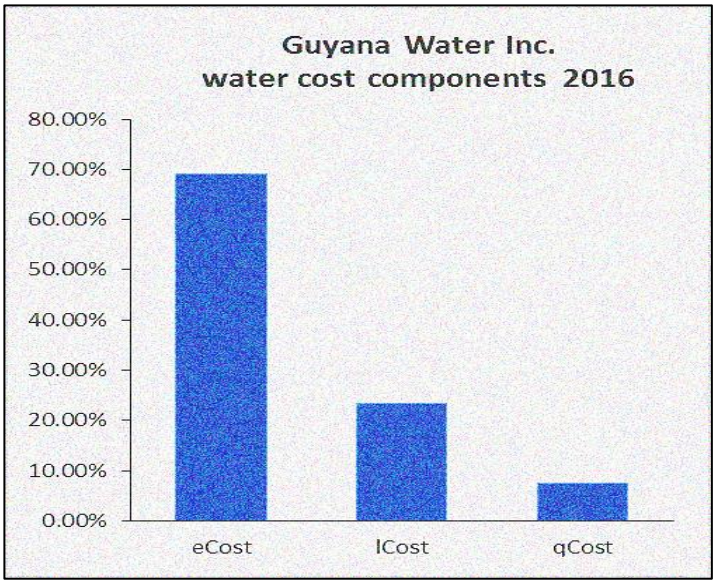
Regions	2015 ac/m3	2016 ac/m3	2015 ar/m3	2016 ar/m3	Marginal cost	Marginal rev.	Effcy pos.	difference AC	difference AR	difference ARC5	difference ARC6	%Chg Acost	%Chg Arev	Cos.Rv cr/m3	Rank
Region 2	$49.8	$49.8	$37.4	$38.2	$47.5	$338.3	**$290.8**	**$0.0**	$0.8	-$12.4	-$11.6	0.0	**2.2**	**712.2**	**1**
Region 3	$22.8	$21.9	$21.5	$19.2	$17.7	$7.5	-$10.2	**-$0.9**	**-$2.4**	-$1.3	-$2.8	-3.7	-11.0	**42.2**	**6**
Region 4-EBD	$22.3	$27.7	$19.2	$20.1	$202.0	$51.1	-$150.9	$5.4	$1.0	-$3.1	-$7.6	**24.4**	**5.0**	**25.3**	**8**
Region 4-GT	$28.0	$24.8	$37.5	$38.0	$8.2	$40.7	**$32.5**	**-$3.3**	$0.5	**$9.5**	**$13.3**	-11.7	**1.4**	**495.1**	**2**
Region 4-ECD	$21.0	$21.8	$17.2	$20.1	$32.6	$61.0	**$28.4**	$0.8	$2.9	-$3.8	-$1.7	**3.7**	**16.9**	**187.2**	**3**
Region 10-LIN	$4.7	$9.8	$21.2	$22.5	$37.0	$29.5	-$7.5	$5.1	$1.3	**$16.6**	**$12.7**	**110.3**	**6.2**	**79.8**	**5**
Region 5	$34.3	$22.9	$20.3	$12.9	-$10.6	-$8.9	**$1.8**	**-$11.4**	**-$7.4**	-$14.0	-$10.0	-33.2	-36.5	**83.3**	**4**
Region 6	$14.8	$13.7	$20.6	$16.0	$10.6	$2.9	-$7.7	**-$1.1**	**-$4.6**	**$5.9**	**$2.3**	-7.4	-22.4	**27.1**	**7**
Regions 7,8,9,&	$157.1	$142.7	$81.6	$39.4	$110.3	-$55.3	-$165.6	**-$14.4**	**-$42.2**	-$75.5	-$103.3	-9.2	-51.7	-50.1	**9**
Total	**$23.8**	**$22.5**	**$24.2**	**$22.7**	**$15.6**	**$15.2**	-$0.4	**-$1.3**	**-$1.4**	**$0.3**	**$0.2**	**-5.4**	**-5.9**	**97.2**	
mean	**$39.4**	**$37.2**	**$30.7**	**$25.2**	**$50.6**	**$51.9**	**$1.3**	**-$2.2**	**-$5.6**	**-$8.7**	**-$12.1**				
median	**$22.8**	**$22.9**	**$21.2**	**$20.1**	**$32.6**	**$29.5**	**-$7.5**	**-$0.9**	**$0.5**	**-$3.1**	**-$2.8**				
max	**$157.1**	**$142.7**	**$81.6**	**$39.4**	**$202.0**	**$338.3**	**$290.8**	**$5.4**	**$2.9**	**$16.6**	**$13.3**				
min	**$4.7**	**$9.8**	**$17.2**	**$12.9**	**-$10.6**	**-$55.3**	**-$165.6**	**-$14.4**	**-$42.2**	**-$75.5**	**-$103.3**				

NH: National Household Stats AC/m3: average cost/m3 AR: average revenue ARC5: average rev-cost2015
CB: Customer Base AR/m3: average revenue/m3 AC: average cost ARC6: average rev-cost2016

Note**

1. Average cost of water production decreased by ($1.7/m3 [-6%]) compared with 2015
2. Bartica/Hinterland saw the largest nominal decrease in AC $16.5/m3, followed by Reg. 5
3. The Corporation's AR declined by 5.87% /2016, but gross revenue increased by +11%
4. Reg. 4-ECD saw the largest change (16.9%) in AR, followed by Reg. 10-LIN, Reg. 4-EBD…
5. GWI cost recovery efficiency index [8.7% ($8.7)] recovery on every dollar expended
6. The division with the largest variable cost/m3 is Reg. 2, which reflects the lowest positive recovery rate [+27%]
7. GWI recorded decreases in both AC & AR. However, the rate of decline is (>) regarding AC. This will assist the organization in achieving a positive financial state in the future





The graph illustrates the percentage contribution of the major components of water production: eCost: Electricity cost, lCost: Labour cost, qCost: water quality cost. The graph above indicates that average cost/m3 of water production is relatively constant across regions. However, variable cost fluctuates substantially across regions mainly due to the number of wells, treatment plants, hours run, and water production. The Corporation has conducted an analysis of the 2016 production costs for projecting costs for the 2017 – 2021 plan.

FINANCIAL MANAGEMENT

19.0 Financial Management

This Strategic Plan examines the financial resources, liabilities and equity of GWI and sets out data and information that will demonstrate its expected financial viability over the plan years. The examination is centered on determining the cost per m^3 of water produced, including all inputs and its contrast with the revenue that is expected to cover production costs, finance current operations and service liabilities while maintaining financial viability.

The information and analysis will demonstrate that the Corporation can have a reasonable degree of expectation that it will have break-even for its operational costs in year 2021. This is contingent on the expansion of the customer base, debt write-off and cost containment measures resulting in production efficiencies a great reduction in non-revenue water.

The Corporation was subjected to a Forensic Audit covering the period 2012 - 2015. The findings of the audit highlighted several areas including the need for timely filing of Annual Reports in accordance with the Companies Act, the presentation of receivables in the financial statements in compliance with IAS 32, 39, and particularly IFRS 7 which stipulates the careful preparation of the financial statements to ensure that they reflect the true financial state of the Corporation. GWI has begun addressing these issues as a matter of urgency since they can potentially impact its financial reporting and thus inhibit the Corporation's Board of Directors from obtaining a true picture of the financial health of the Corporation. Additionally, it potentially will not provide the Managing Director with financial data and information to aid efficient and effective decision-making. Consequently, the items highlighted in the audit have been designated as KPI's for the finance department.

Situation Analysis Requirements

Functional Area	Situation	Action
Organization & Management	Processing of contractor payments	Decentralization of payment processing and approval to regional offices
	Staffing to process contractor payments in the regions	The assignment of payment processing duties to regional staff

19.1 Staffing, controls and use of Processing Program

The Audit refers to issues that relate to the processes and competencies of the personnel in this department and thus GWI has instituted measures to address the number of personnel and their access and use of the Oracle program to produce accurate financial information the financial state of the Corporation.

19.2 Decentralizing Contractor Payments

GWI has decided to decentralize contractor payments to ensure that the approval process for satisfactory work is linked to payments approvals and check issuance. The department will institute accounting procedures using the Oracle Program to facilitate this process and contractors will benefit from a process that does not require them to travel to Georgetown for payment processing.

19.3 Reducing the Debt

Another significant aspect of the Corporation's financial performance is its debt collections which currently is reflected as 70% of all current payments and the total debt is approx. 3.6 Billion dollars accumulated over several years. There is a proposal in Section 2.3 to significantly reduce this debt amount with an aggressive write-off in 2016 and the use of standard accepted accounting practices for debt write-off each year. This would ensure that the debt amount is kept within acceptable limits, thus reducing the Allowance for Doubtful Debt on the balance sheet for subsequent years. The Corporation has set a KPI for debt reduction and expects to achieve its objective of <5% debt of revenue each year during the Plan period. The finance department will also ensure that uncollectable debt is listed on a schedule based on information which is provided monthly from the Debt Aging Schedule. This schedule will be used for the annual write-off which will be presented to the Board of Directors for approval annually.

19.4 Finance Department support for Programmatic Areas

The following Indicators derived from the Situation Analysis have been identified as key performance requirements for the plan years and they define the department's strategic objectives[63].

Finance Strategic Objectives

To ensure that GWI has financial viability

To ensure that its financial statements reflect the true performance of the Corporation.

To ensure that GWI can deliver safe, adequate and affordable water and ensure safe sewerage systems for improved public health and sustainable economic development.

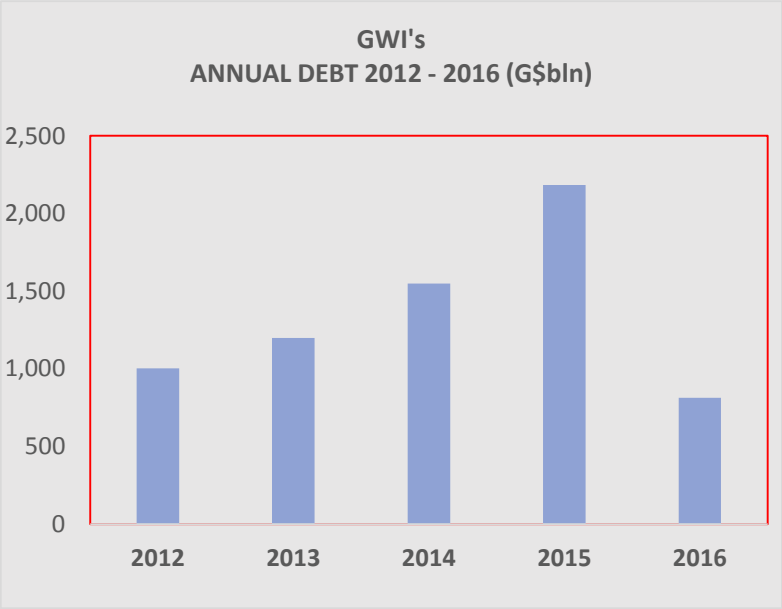
19.5 Debt Management

The Debt Recovery Department which reports directly to the Managing Director is tasked with debt management and it has targets that will be monitored under the plan[64]. Currently, collections and payments management is inefficient to the extent that 70% of all payments represent debt payments and the remaining 30% is current payments. Thus, the Corporation is virtually managing its current operations from debt financing. The department plans to do customer outreach via call-center operators and debt recovery officers will encourage customers to pay their bills within the 28-day period and customers who currently have large debt balances will be encouraged to sign payment plans for the liquidation of their arrears. However, in such instances where all efforts to get customers to address their debt balances have failed, the Corporation has a policy to pursue litigation. A report on accounts which cannot be litigated will be sent to the finance department each month for inclusion in a schedule of accounts to be written off. The Performance Indicator for debt management has a <5% arrears baseline.

[63] Capital Investment requirements are listed in Section 27.
[64] See the Performance Indicators Appendix W.

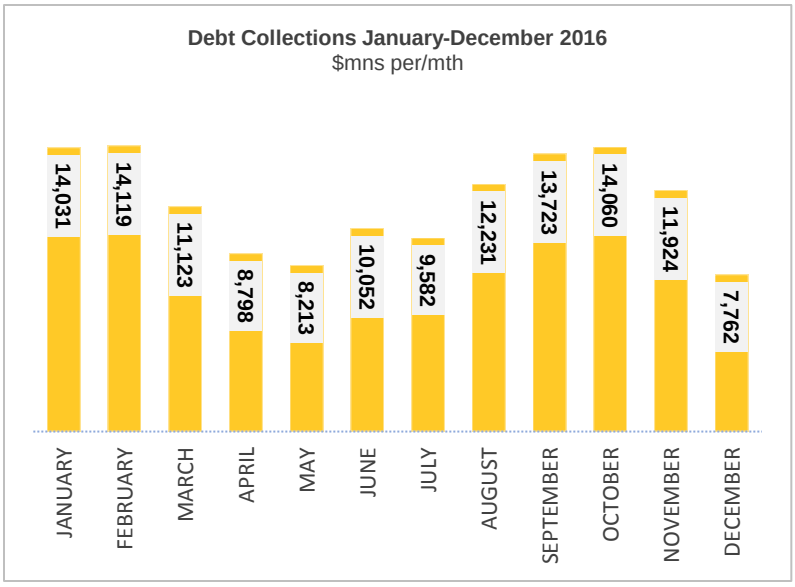
19.5.1 The Debt Accumulation

During the past years, the Corporation has accumulated customer debt in increasingly significant amounts with a spike in 2015 which is attributed to the energy and focus by the Corporation on accurate reporting (due to the appointment of a Debt Recovery Manager). However, since 2016 there was a smaller increase in comparison with the previous years (see Table below). This can be attributed to the strategies and programs the Corporation has instituted to ensure that the increase is halted and change the current collections mix which shows 70% of collections are arrears payments, to have more current payments.



19.5.2 A 2-Tier Approach for Debt Reduction

The Corporation has instituted a two-tiered approach for its debt reduction. Firstly, it has conducted a vigorous strategy for the recovery of arrears since October 2015 and the graphs below show the accumulation of debt over the period 2012 - 2016 and collections during 2016. The second activity is the previously stated plan for a debt write-off policy and process that confirms to accounting conventions with annual write-offs approved by the Corporation's Board of Directors.



19.5.3 Debt Collections

The graph illustrates the collections of debt arrears in tandem with the Corporation's aggressive debt management policy to reverse the increasing trend as shown in the graph above. A review of the data shows that the approach is yielding satisfactory results with a significant decline in arrears and increase in customers who are in arrears and have signed payment agreements which stipulate that current payments must be made along with arrears.

The Debt Recovery Manager, head office and regional debt recovery officers ensure that the strategy continues to function efficiently and effectively. This is demonstrated in the monthly Debt Aging Report that is produced in HiAffinity and distributed to the Financial Accountant and Debt Recovery Manager for monitoring aged debt.

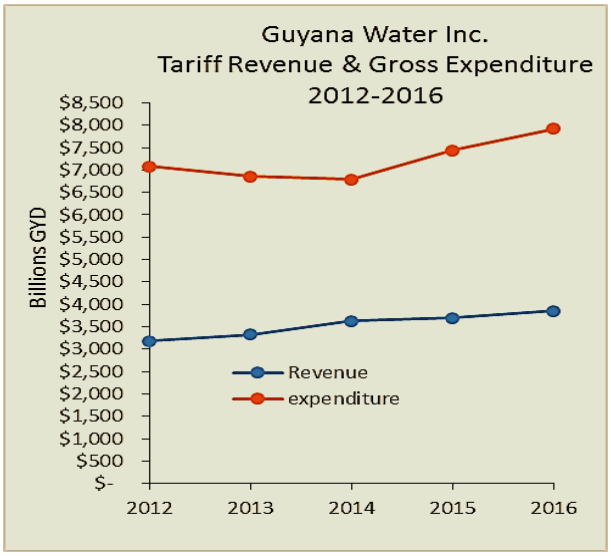
Situation Analysis Requirements

The needs identified in the regional situation analysis were used to create the data show below.

INDICATOR	2017	2018	2019	2020	2021
Debt management	Ensure that <5% of accounts are in arrears monthly	Ensure that <5% of accounts are in arrears monthly	Ensure that <5% of accounts are in arrears monthly	Ensure that <5% of accounts are in arrears monthly	Ensure that <5% of accounts are in arrears monthly
Debt reduction	Ensure that 10% of the total debt is reduced	Ensure that 40% of the total debt is reduced	Ensure that 60% of the total debt is reduced	Ensure that 90% of the total debt is reduced	Ensure that 90% of the total debt is reduced

19.6 Revenue and Expenses

A review of the Corporation's revenue and expenses for the periods 2010 - 2016 (see below) shows the adverse relationship between revenue and expenses which is reflected in the Corporation's poor financial performance over the years. The data shows that revenue has been practically level at $3.5 billion dollars while expenses have been towering (100%) above revenue at an average of $6.5 billion dollars, except for 2011 when expenses soared due to the debt write-off. The Corporation has not performed with any degree of financial efficiency and there is a continuing reliance on the Government of Guyana for an electricity subvention and loans guarantees to finance capital works. Loans are not factored into GWI's finances for repayment and thus their payment schedule is not listed. However, the use of the funds to purchase and finance capital items and services requires efficient use of the funds and demonstration of revenue gains for their usage.



To understand the factors that contribute to the Corporation's financial under performance, the budget accountant will conduct budget reviews with variance analysis each month and together with the budget and finance officer (SPEM) discuss performance variances with department heads and regional managers to institute corrective measures for improved financial viability.

19.6.1 A Review of Revenue and Expenses 2012-2016

The revenue trend beginning from 2012 ($3.1 billion) climbed steadily to 2016 ($3.8 billion) but remains approximately 50% of expenses. Hence, the gap between revenue and expenses offers opportunities for the Corporation to explore strategies for reducing operating costs and increase revenue.

19.7 Operating Cost Efficiencies

Over the next five (5) years, the Corporation expects to become financially viable. It has initiated processes to determine its 'true' cost of production by generating data on the regional costs for operating wells, treatment plants and ancillary services. Additionally, it is examining the factors that cause such a high level (>60%) of non-revenue water with the ultimate objective of reducing it to the lowest percentage. The efforts in this regard are set out in the Performance Indictors. The following table demonstrates the financial impact caused by water loss ($3.9 billion) in 2015 and 2016.

Table 30: **Data on the Estimated Financial Loss in 2015/2016**[65]

Financial Calculation ($) 4 liters = 1.05 gallons/per second: small leak	**Financial Calculation ($) 20 liters = 5.28 gallons/per second: large leak**	**Volume metric Calculation (meter cube loss) 4 liters = 1.05 gallons/per second: small leak**	**Volume metric Calculation (meter cube loss) 20 liters = 5.28 gallons/per second: large leak**	**Guyana Water Inc. Financial Impact 2015**	**Guyana Water Inc. Financial Impact 2016**
$185,142/average cost per month (per small leak)	$933,120/average cost per month (per large leak)	1,964,152.34 m^3 /water loss on average per month	264,792.27 m^3 /water losses on average per month	$362,167,078 MN/average per month	$463,992,055 MN/average per month
$2,896 billion/ average per year 2015	**$1,047 billion/ average per year 2015**			$3,944 blns /average financial loss year 2015	$5,568 blns /average financial loss year 2016

19.8 Analyzing and Setting Revenue Targets for 2017-2021

The projection for the new plan's revenue targets begins with an examination of the premise and assumptions which were used for the 2012 – 2016 years. The plan stated that the projected water production for the end of the 2012 - 2016 period could surpass the averaged total production of 130,000,000 m^3 or 130 x 10^6 cubic meters in 2016. It assumed that at 35% NRW, the 2016 annual operational and maintenance budget would be G$6.3 billion which meant that there would have to be billable volume of 65% x 130 x 10^6 cubic meters or 84.5 x 10^6.

The Corporation is cognizant of the fact that while the 2012 – 2016 plan placed great reliance on efforts to reduce NRW and had a projection for reduction to 35%, nevertheless, events and data reviewed over the plan years have consistently demonstrated that emphasis should have been on a more realistic acceptance that NRW reduction will be gradual and will be dependent on the removal of certain inefficiencies before reductions can be realized.

[65] Table values are representative of production cost (at factor cost which is approximately 60% of production cost is electricity)

Consequently, GWI is examining areas of inefficiencies in its operations and will be aggressively pursuing the expansion of its customer base (aligned with the national 2012 Census), expansion of services to new and existing communities, 100% metering of unmetered accounts, especially in areas where treated water is produced and effecting expeditious leak repairs. These will ensure that water production matches real customer demand, resulting in reduce non-revenue water and increase revenue water.

19.8.1 Projecting Production Volume and Revenue 2017-2021

Based on the volume of water production which is projected for the 2017 – 2021 years, (2017 – 148 million), (2018 – 162 million), (2019 – 185 million), 2020 and 2021– 202 million respectively) and assuming NRW for each year is as stated in Table 30, the billable volume of production would yield revenue as follows: 2017 – $4.3 million, 2018 - $5.4 million, 2019 - $6.8 million, 2020 - $8.1 million and 2021 - $8.8 million. The revenue projection will have to be adjusted to account for collection percentages etc., hence the projection that is stated in Table 31.

19.9 Projected NRW Decreases

The plan is projecting that NRW will decline over the next five (5) years, as set out in the following table. Correspondingly, it is expected that revenue water will increase and have a positive impact on GWI's revenue each year.

Table 31: **NRW Reduction Projection -2017 to 2021**

Component	2017	2018	2019	2020	2021
% loss	64%	60%	56%	52%	48%

The projected reduction in NRW is dependent on the following:

- The HiAffinity 2016 customer base is listed at 183,370, however, it is estimated that the base is closer to 160,000 and this is 90% of the current national household census. Hence, GWI plans to expand the customer base to 100% of the national census by 2021.
- There will be 100% metering of all treated and untreated areas service to be completed by 2019.
- There will be a realignment of commercial customers with the Tariff.

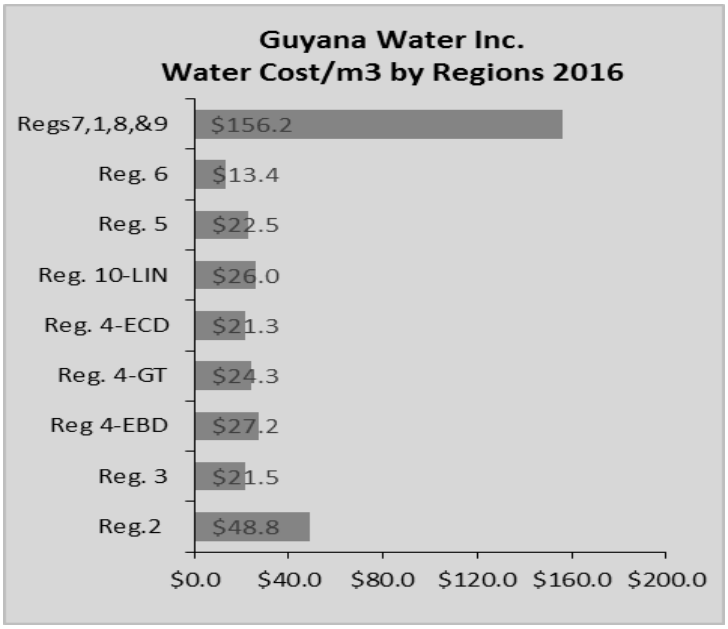
The data derived from the use of the above assumptions is set out in the tables below:

Table 32: **Projected Billings/Revenue 2017 – 2021**

Financial Categories	FY 2017	FY 2018	FY 2019	FY 2020	FY 2021
Billings ($blns)	$4,301.43	$4,647.23	$5,047.43	$5,602. 64	$6,218.93
Collection efficiency	95%	100%	100%	100%	100%
Customer Base	172,919	181,565	190,644	200,176	204,185
New Customers	8,234	8,646	9,078	9,532	4,009
Billings per/cus. /ann.	$23,745	$25,045	$26,476	$27,989	$30,457
Billings per/cus. /mth.	$1,979	$2,087	$2,206	$2,332	$2,538
Billings per/cus. /day	$66	$70	$74	$78	$85

Table 33: **Treated and Untreated Water Costs (Regions)**

Regions	Treated	Untreated	Total
Region 2	$38.43	$28.79	$67.22
Region 3	$70.00	$21.27	$91.27
Region 4-EBD	$50.04	$19.62	$69.66
Region 4-GT	$26.44	$36.86	$63.30
Region 4-ECD	$49.08	$17.20	$66.29
Region 5	$0.00	$25.75	$25.75
Region 6	$41.04	$23.25	$64.29
average	**$39.29**	**$24.68**	**$63.97**
median	**$41.04**	**$23.25**	**$66.29**



Graph: Average Cost/m³

The financial data in the graph above shows a comparison of average production cost per m^3 for all regions/divisions (treated and untreated water), while the average Tariff for the same category is $94.00/$m^3$. Thus, it can be surmised that the average Tariff covers the cost of production.

19.10 Major Cost Factors (Electricity and Seaquest)

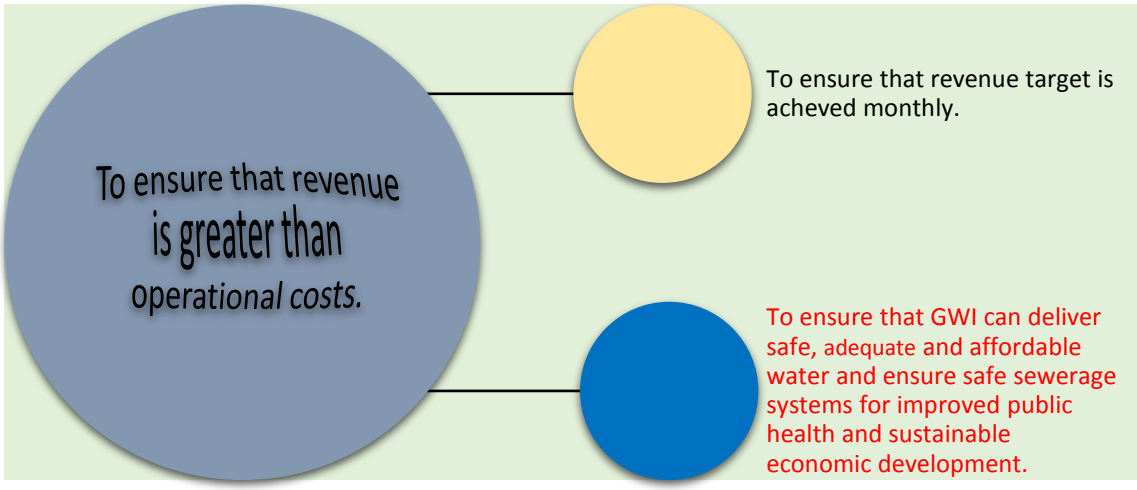
While the Corporation is projecting an increase in human resources costs over the life of this new plan and increased revenue in areas where customers are receiving treated water and are metered, it needs to focus costs due to additional water treatment with the use of Seaquest (treatment chemical) and electricity costs which represents a large portion of its operational costs. The data in the table below shows the treated water costs (Electricity and Seaquest – a treatment agent).

Table 34: **Treated Water Costs**

Regions	Total Water production in m^3		Electricity cost (G$mn)	Seaquest Total cost (G$mn)	cost per m3/utilising seaquest on ave.	cost per m^3 using electricity			cost per m^3 using electricity + Seaquest		
	Treated	Untreated				Treated	Untreated	Total cost with elect.	Treated	Untreated	Total cost per m^3
Region 2	1.87	2.91	$93.31	$42.60	$8.90	$19.60	$19.43	$39.03	$28.50	$28.33	$56.83
Region 3	4.10	13.90	$348.83	$160.19	$8.90	$19.39	$19.38	$38.77	$28.29	$28.28	$56.58
Region 4-EBD	5.36	9.93	$277.21	$136.10	$8.90	$18.14	$18.13	$36.26	$27.04	$27.03	$54.07
Region 4-GT	14.54	9.70	$503.55	$215.72	$8.90	$20.75	$20.82	$41.57	$29.65	$29.72	$59.37
Region 4-ECD	7.36	15.52	$376.20	$203.65	$8.90	$16.49	$16.42	$32.91	$25.39	$25.32	$50.71
Region 10	5.72	0.00	$0.00	$50.96	$8.90	$15.65	$0.00	$0.00	$24.55	$8.90	$33.45
Region 5	1.62	9.31	$143.53	$97.25	$8.90	$13.26	$13.12	$26.37	$22.16	$22.02	$44.18
Region 6	7.63	14.72	$392.55	$199.00	$8.90	$17.57	$17.55	$35.12	$26.47	$26.45	$52.93
Total	**48.20**	**75.99**	**$2,135.17**	**$1,105.47**	**$8.90**			**$17.19**			**$26.09**
mean	6.02	9.50	$266.90	$138.18	$8.90	$17.61	$15.61	$31.26	$26.51	$24.51	$51.01
median	5.54	9.82	$313.02	$148.15	$8.90	$17.85	$17.84	$35.69	$26.76	$26.74	$53.50
max	14.54	15.52	$503.55	$215.72	$8.90	$20.75	$20.82	$41.57	$29.65	$29.72	$59.37
min	1.62	0.00	$0.00	$42.60	$8.90	$13.26	$0.00	$0.00	$22.16	$8.90	$33.45

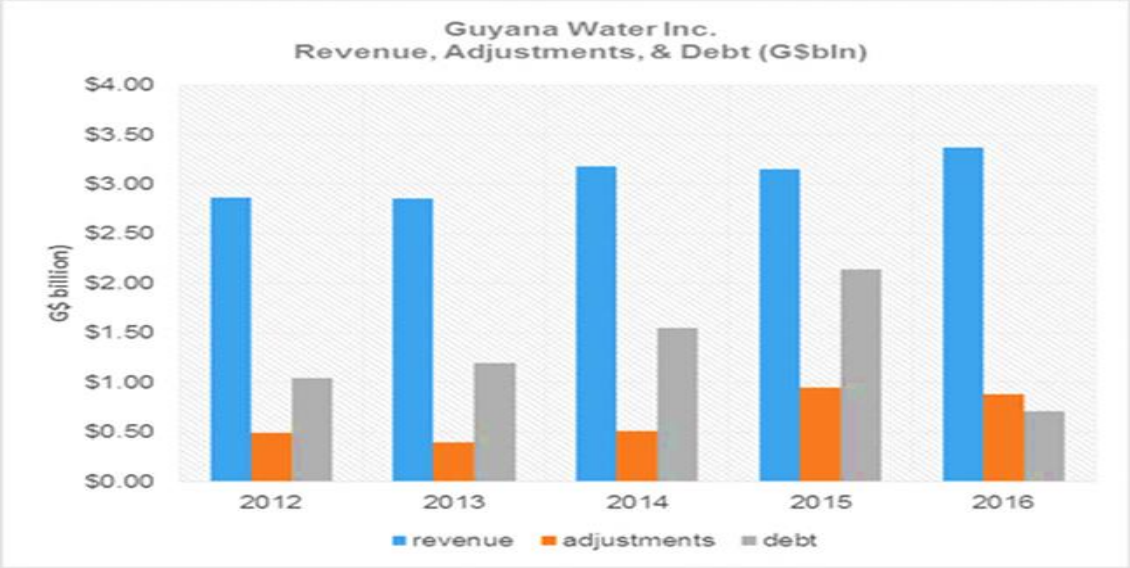
The total average cost for the use of Seaquest is $8.90/ m^3 and combined with electricity costs (average $17.19) for all regions, total cost (Seaquest and electricity) is $26.09/$m^3$. The total cost of producing both treated and untreated water for all regions is $64.00 when all other costs are factored. This compares favorably with the average tariff of $94.00.

Revenue Strategic Objectives



19.11 Revenue and Collections Targets for 2017 -2021

The strategic planning department will work in conjunction with the commercial services department to review the projected revenue and collections target for each plan year and set the monthly targets which will be transmitted to the regional managers and revenue managers for inclusion in their goals and targets planning document.



19.12 Revenue, Adjustments, Payments and Debt

The financial position of GWI in 2015[66] was adversely affected by the large amount of customer debt which represents approximately 70% of its current collections. This situation is unsatisfactory and thus plans are in place to increase revenue by expanding the customer base, 100% metering, more efficient processing of adjustments within the billing cycle and offer debt management services to delinquent customers.

19.13 Analyzing Billing and Revenue

A statistical analysis of the billing data compares billing for metered and unmetered accounts with the customer base, bills that were generated, delivered, undelivered bills, expected revenue and actual collections for the requisite billing periods. The analysis references the fact that billing is done on the accrual basis (customers are billed for services received during the prior service period and collections (payments) are received within a 28-due date after billing is generated and delivered to customers. It is recognized that certain bills are generated for 'high' credit and debit balances and these are not delivered to customers but are held for investigations. Additionally, accounts are put on 'no charge status' when they are being investigated and no bill is generated for these accounts. Here, the critical concern is to ensure that all accounts under query or which are on 'no charge' classification have their investigations completed prior to the next billing. Since some investigations result in adjustments[67] to accounts, it is also important that these adjustments are made prior to the next billing generation.

19.14 Metered and Unmetered Accounts contribution to Revenue

The Corporation's revenue is a function of its production of water, its customer consumption, its billing (metered and unmetered and accounts on 'no charge'), its billing delivery, undelivered bills and payments (collections). These factors combine to determine the expected monthly revenue and actual revenue for each region. They provide a factual basis for setting monthly

[66] See GWI 2015 Audited Financial Statements.
[67] The Corporation has engaged the services of an Adjustments Consultant to streamline this process.

revenue targets and performance variances analysis. However, when any of these are not executed efficiently, the accuracy of billing becomes questionable and may result in adjustments to revenue or non-payment of bills by customers.

19.15 No Charge and Fixed Charges Accounts

No charge accounts and accounts for which no bills are sent to customers represent non-revenue water (currently at 70% of total production) and when combined with fixed charges accounts which data has shown, represents 55% of customer accounts. The data also shows that metered accounts represent 34% of revenue while unmetered accounts represent 55% of total customer base. Unmetered accounts consume an average of 32 m^3 of water per month which is 11 more m^3 of water than metered.

19.16 Reviewing Unmetered Fixed Charges

The Corporation will be examining the consumption of water by unmetered customers who are on fixed charges tariffs to determine their consumption levels and the correct charges that should be applied for water usage. Unmetered accounts represent 51% of billing and the following table demonstrates that customers with metered accounts pay approximately 4.9 times more annually for service than unmetered customers. Table 36: **Metered and Unmetered Payments**

Type of account	Annual payment	Variance
Metered	$36,862	4.9 times unmetered accounts
Unmetered	$8,900	

19.17 The Case for Increasing Fixed Tariffs

Using an extension of the data above, it is worthy of note that non-revenue for unmetered customers translates into a deficit financial position for the Corporation. Therefore, a case can be argued for increasing the fixed tariff for unmetered accounts while the Corporation pursues its strategy to meter all accounts. It is expected that the act of raising the fixed charges (tariff) will have a corresponding effect of reducing water consumption for these accounts and result in reduced production costs with lower production volumes.

19.18 Accounts Receivables

Another area of importance is accounts receivables. Currently, the accounts receivables data is prepared in the HiAffinity Program by the Commercial and Customer Services department and sent to finance to be entered in the Oracle accounting program. This process has been identified as a challenge for accurate financial reporting and therefore, the Corporation is moving to a direct upload (inter-operability) process between the program used by commercial and customer services and Oracle. The commercial and customer services department also produces billing, collections and payments reports and Performance Indicator targets have been set for their monitoring by strategic plan personnel. Adjustments to Accounts Receivables due to changes to customer accounts are discussed elsewhere in the plan.

19.19 Accounts Payables

Turning its attention to the other side of the balance sheet (Liabilities), the Corporation plans to streamline its Accounts Payables in accordance with the recommendations in the Forensic Audit with payment schedules prepared to ensure smooth expensing and use of funds so that cash flow is not adversely affected. It will use an Ageing Schedule of its vendors and supplier

payments. It will liaise with regional operations managerial personnel who will have Accounts Payables Clerks assigned to process contractor and other payments.

19.20 Debt/Equity Ratio

GWI carries on its balance sheet the loans that it received from international agencies whose repayment is guaranteed by the Government of Guyana. While the corporation is not burdened with treating loans as liabilities which must be repaid, it must be concious of the fact that it is financing its capital purchases and operations through debt (leveraging) and does not escape the financial requirements for ensuring that loans financing is used to generate revenue that justifies its infusion. Using the data available from the audited 2015 financial report[68], it is observed that the Debt/Equity Ratio is 0.427 (2015) and 0.428 (2014)[69]. The Corporation must ensure that its Debt/Equity Ratio is positive (<1) so that it maintains financial viability, can achieve break-even[70] and eventually be able to make contributions to the government. Being able to demonstrate a positive relationship between the uses of assets derived from loans and the revenue generated will demonstrate efficient use of resources.

19.21 Operational break-even

With regards to **operational break-even**, the finance department is responsible for budgeting and estimating financial performance. Therefore, the strategic plan has a performance indicator projection/target for the achievement of operational break-even in the year 2021, along with other targets for baseline performances in accordance with operations program budgeting, monitoring and reporting on variances. The achievement of operational break-even is critical since the Corporation's principal (sole) shareholder is the government, acting on behalf of the citizens of Guyana and it has an expectation that the annual subvention that it provided for electricity charges should be decreasing over the life of the plan. This is an especially important concept since government does not want to be placed in the position of having to provide direct funding to meet the Corporation's budget shortfalls, when it already funds capital projects and act as guarantor for loans (funding) from international organizations. Government would like to know that GWI can re-pay these loans when payment is due. The Tables below show the annual subventions over the last five (5) years and the projections for their reduction when break-even is achieved.

Table 37: **Government of Guyana Subvention**

Year	2012	2013	2014	2015	2016 est.
Subvention	$1.25 blns	$0.98 million	$2.47 blns	$1.74 blns	$2.63 blns

Table 36: **New Five (5)-Year Government subventions projections**

Year	2017	2018	2019	2020	2021
Subvention	$2.63 blns	$2.60 blns	$2.4 blns	$2.2 blns	$2.1 blns

19.22 Break-Even Analysis (Modeling)

An analysis was done to determine break-even and the operational costs to produce one (1) m^3 (meter cube) of water generally and the disaggregated cost of producing treated and untreated water. It also examined the revenue that is derived from receivables based on the existing

[68] 2016 Report is unavailable.
[69] See Appendix H.
[70] Projected for 2021.

Tariffs. Thereafter, modeling projections were done to obtain the level of revenue that is required to cover the cost of operations.

The modeling has determined the break-even point with variances and assumptions as follows:
1. The current database with reduced operating costs and the existing Tariffs.
2. An increase in the database (projection of new customers) with reduced operating costs and the existing Tariffs.
3. An increased database with reduced operating costs and new Tariffs.

Based on the above, it is felt that an acceptable projection is that operational break-even should occur in year 2020 based on two scenarios. Firstly, there are financial efficiencies that increase revenue over expenses and the secondly, there is the assumption that the government subvention will cover the significantly reduced projected deficit amount ($-960 million) in 2021.

The Corporation will ensure financial viability in its regional operations, to the extent that it is planning to meter all treated areas to 100% in 2017 and all current non-treated areas which have high iron contents in their raw water will have applications of Seaquest[71]. The water with high iron content has an adverse effect on the performance of meters and ultimately their useful life. However, treating the water will allow metering in these areas and positively increase revenue. The following table illustrates the revenue impact for the foregoing process on regional operations. Region 4 Division 3 Georgetown shows a break-even position in 2019, Division 3 East Bank in 2021, Division 3 East Coast in 2020, Region 6 Division 5 in 2021, Region 7 Bartica in 2020 and Region 10 Division 3 Linden in 2021. All other regions and divisions will require financial subventions to bring them to break-even during the plan years.

Table 37: **Operational Break-even Projections – Regions**

	Break-even analysis				
	2017	2018	2019	2020	2021
Region 2- Div 1	-$209.009	-$171.202	-$120.624	-$78.358	-$32.373
Region 3- Div 2	-$333.653	-$281.595	-$211.221	-$152.691	-$88.877
Region 4- Div 3-GT	-$167.323	-$76.898	$38.757	$137.439	$243.817
Region 4- Div 3-EB	-$156.676	-$114.789	-$59.949	-$13.664	$36.471
Region 4- Div 3-EC	-$131.687	-$81.548	-$16.799	$38.200	$97.606
Region 5- Div 4	-$238.495	-$218.855	-$190.505	-$167.608	-$142.312
Region 6- Div 5	-$312.026	-$240.065	-$145.168	-$65.341	$21.254
Region 7- Bartica	-$12.278	-$8.343	-$3.230	$1.101	$5.784
Region 10- Div 3-LIN	-$173.799	-$126.132	-$63.798	-$11.159	$45.846
Region 1, 8 & 9- HINT	-$49.664	-$48.094	-$45.340	-$43.288	-$40.934

19.23 A Review of Financial Performance 2012-2016

GoG currently provides a subsidy for the cost of electricity and substantial capital expenses of the sector. These expenses are borne by the Government of Guyana either through budgetary allocations or through GWI internally generated revenue. GWI, for example, pays personnel emoluments from its internally generated funds. The Government of Guyana contribution to water resource management and to the hinterland and towns sub-sector have been low, with Water Sector Strategic Development Plan 2012-2016 variations between budgeted and actual allocations reaching as high as 68% in 2016. The expenditure deficit impacts the performance of

[71] A chemical agent for the sequestration of iron in water.

the sector adversely, creating delays in implementing planned interventions, critical maintenance and creating operational inefficiencies.

Budgeted and Actual Expenditure 2012-2016 (G $bln)

Description	2012	2013	2014	2015	2016
GoG Approved Budget	**$2,582.23**	**$2,775.23**	**$2,935.00**	**$2,099.69**	**$3,435.39**
GoG Actual Releases	$2,239.45	$2,550.08	$3,068.40	$1,243.14	$1,113.74
GWI Actual Expenditure	$533.87	$578.68	$772.94	$554.91	$927.29
TOTAL	**$2,773.31**	**$3,128.75**	**$3,841.34**	**$1,798.05**	**$2,041.03**

Source: Ministry of Finance, National Budget Estimates, GWI, FS

GWI operations are likewise, hampered by limited financing for investments and the renewal of assets. As a result, the Corporation has been restricted in providing expanded services to its customers. It is worthy to note that the urban water consumers pay considerably higher tariffs for water services than other areas. GWI's revenue and expenditure trends are presented in the table below.

GWI Revenue and Expenditure Trends 2012-2016 (G$blns)

Item	2012	2013	2014	2015	2016
Revenue/Income	**$3,182**	**$3,331**	**$3,632**	**$3,702**	**$3,889**
Sale of water	$3,102	$3,247	$3,540	$3,631	$3,793
Other Income	$0.080	$0.083	$0.091	$0.071	$0.096
Expenditure					
Operating expenditure					
Production	-$2,763	-$2674	-$2,648	-$2,900	-$2,929
Transmission/Boostering	-$0.921	-$0.891	-$0.882	-$0.966	-$0.976
Distribution	-$1,487	-$1,440	-$1,425	-$1,561	-$1,577
Commercial Marketing	-$0.085	-$0.082	-$0.081	-$0.089	-$0.090
General Administration	-$1,842	-$1,783	-$1,765	-$1,933	-$1,952
Sub-total	**-$$7,085**	**-$6,858**	**-$6,789**	**-$7,436**	**-$7,511**
Non-operating Expenditure					
Operating Surplus/(Loss) Before Interest and Exchange Loss	**-$3,903**	**-$3,528**	**-$3,158**	**-$3,735**	**-$3,622**
Loans Interest	--	--	--	--	--
Exchange Loss	--	--	--	--	--
Net Operating Surplus/(Deficit)	-$3,903	-$3,528	-$3,158	-$1,997	-$2,022
Income surplus/(Deficit) Balance b/f	--	--	--	--	--
Prior Year Adjustment	-$0.494	-$0.399	-$0.516	-$0.950	-$0.883
Balance c/f	--	--	--	--	--

Source: Income and Expenditure Statement from GWI, 2012-2016

The fiscal data presented in the table above indicates that GWI consistently incurred deficits between 2012 and 2016. A review of the Corporation's operations indicates that decision-making regarding the availability of services in some communities and non-collection of revenue from others contributed greatly to the financial deficits.

The Government of Guyana has instituted **lifeline tariffs and subsidies** as a means of improving access to water services by **low income persons.** These measures have been poorly targeted in the past and as a result, the subsidies did not fully benefit persons in that economic strata.

Sector financing is still skewed towards "new infrastructure" with little attention to post construction and incremental costs by implementing agencies. An analysis of investments in the hinterland and towns water sector demonstrate that investments in new facilities accounted for 58% of investments in the hinterland and towns subsector as compared to 48% for rehabilitation works. The absorptive capacity of the sector agencies and the private sector in utilizing investments in the sector is weak owing to human, procurement and other logistical constraints. Financial resource allocations for water and sanitation activities also tend to be low at the regional level.

Within the current framework of the Water and Sanitation Programme, hinterland communities and certain towns continue to benefit from highly subsidized cost of operation and maintenance of water facilities, in sharp contrast with urban consumers served by GWI. While GWI has carried out major rehabilitation work and replacement of some existing water facilities, very little substantial provision had been made in the Sector Investment Programme 2012-2016 for rehabilitation and replacement of existing facilities. This situation is a challenge for sustainable water service delivery. Hence, GWI will discuss the possibility of implementing community contributions to capital cost with the relevant governmental agencies.

In future, the water sector will require increased financial investment from the Government of Guyana and other non-traditional sources of financing to ensure sustainable financing of the sector as traditional aid from Development Partners begins to decline with Guyana's attainment of lower middle-income status. GWI, the sole urban water service provider, will be expected to operate as a viable financial entity by significantly reducing its losses from non-revenue water and increasing internally generated revenues. The Government is also expected to increase the required financing for planned investments in the urban water sub-sector. GWI's overall financial projections for the plan period 2017 – 2021 are shown in the table below:

Table 38: **Financial Projections 2017-2021**

Financial Categories	**Audited 2015**	**est. 2016**	1 **2017**	2 **2018**	3 **2019**	4 **2020**	5 **2021**	6 **2022**	7 **2023**	8 **2024**	9 **2025**	10 **2026**
GROSS INCOME (real p.a	**$5,427**	**$6,479**	**$6,947**	**$7,197**	**$7,597**	**$8,023**	**$8,519**	**$8,796**	**$9,255**	**$9,514**	**$9,813**	**$9,843**
Revenue - (est. rev. p.a)	$3,618	$3,387	$4,097	$4,547	$5,047	$5,603	$6,219	$6,336	$6,773	$7,210	$7,687	$7,895
Total Other Income	$71	$462	$250	$250	$250	$220	$200	$460	$482	$504	$526	$548
Total Non Operating Income	$1,739	$2,630	$2,600	$2,400	$2,300	$2,200	$2,100	$2,000	$2,000	$1,800	$1,600	$1,400
OPERATING COST	**-$7,570**	**-$7,918**	**-$8,094**	**-$8,237**	**-$8,491**	**-$8,610**	**-$8,825**	**-$9,023**	**-$9,223**	**-$9,427**	**-$9,633**	**-$9,199**
1. EMPLOYMENT COST	-$1,208	-$1,551	-$1,676	-$1,709	-$1,743	-$1,778	-$1,814	-$1,850	-$1,887	-$1,925	-$1,963	-$2,002
2. PREMISES COST	-$2,734	-$2,964	-$3,024	-$3,060	-$3,097	-$3,134	-$3,171	-$3,209	-$3,248	-$3,287	-$3,326	-$3,366
3. SUPPLIES & SERVICES	-$597	-$1,164	-$1,257	-$1,276	-$1,295	-$1,314	-$1,334	-$1,334	-$1,334	-$1,334	-$1,334	$1,420
4. TRANSPORT COST	-$63	-$103	-$160	-$200	-$250	-$312	-$328	-$344	-$361	-$379	-$398	-$418
5. OFFICE & ADMIN. COST	-$280	-$265	-$279	-$292	-$307	-$322	-$339	-$355	-$373	-$392	-$411	-$432
6. OTHER COST	-$2,688	-$1,870	-$1,700	-$1,700	-$1,800	-$1,750	-$1,840	-$1,930	-$2,020	-$2,110	-$2,200	-$2,200
Depreciation	-$1,740	-$1,532	-$1,500	-$1,500	-$1,700	-$1,700	-$1,800	-$1,900	-$2,000	-$2,100	-$2,200	-$2,200
Provision for bad debts	-$496	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Adjustment Previous Year	-$453	-$337	-$200	-$200	-$100	-$50	-$40	-$30	-$20	-$10	$0	$0
NOL bef. subv.	**-$3,953**	**-$4,531**	**-$3,997**	**-$3,689**	**-$3,444**	**-$3,008**	**-$2,606**	**-$2,687**	**-$2,450**	**-$2,217**	**-$1,947**	**-$1,304**
P&L bef. subv (real p.a.)	**-$3,882**	**-$4,069**	**-$3,747**	**-$3,439**	**-$3,194**	**-$2,788**	**-$2,406**	**-$2,227**	**-$1,968**	**-$1,713**	**-$1,421**	**-$756**
Net Operating Loss	**-$2,143**	**-$1,439**	**-$1,147**	**-$1,039**	**-$894**	**-$588**	**-$306**	**-$227**	**$32**	**$87**	**$179**	**$644**

GWI's revenue collection forecast for the New Strategic Plan period 2017-2021 is projected to increase by approximately 11% per annum. This represents an increase of approximately $600 million per annum excluding ancillary charges. The gap in revenue is estimated to be a sum of $1.2 billion per annum representing key accounts, sewerage, and ancillary services. It is therefore expected that 2017 gross revenue collection will be approximately $6.479 billion. The

expected savings from efficiencies derived from the lowering of production costs (leaks repairs, increased metering and less costly processing of treated water) and increased revenue leads to the projection that the expected deficit of $68 million will be either eliminated or allow the lowering of government subvention and make the 2021 break-even year acceptable for managerial and financial accounting.

Another set of factors that can increase revenue and virtually eliminate the 2021 $306 projected deficit is an increase in the customer base from the current 183,370 by an additional 12% in 2017 and 5% each succeeding year (in keeping with the census average increases annually) to match the population census for households. Also, an increase in the fixed charge and a restructured tariff would show an average of $520 million/year for all customers receiving potable water and the new customer count[72] is estimated to provide $1.12 billion in additional revenue. These factors are estimated to increase revenue with a projected break-even point at year 2021.

19.24 Financial Reports

The finance department is expected to prepare and submit monthly financial reports to the finance sub-committee of the Board of Directors and to the full board at its monthly meeting. Financial reports will also be submitted to the Board of Directors quarterly and the annual audited financial report will be submitted to the Board of Directors not later than the first quarter of the New Year. The approved audited annual financial report will be sent to the Minister of Communities for presentation to Parliament not later than nine (9) months each year in accordance with the corporate governance requirements.

[72] Guyana Household Census 2012, Bureau of Statistics

PURCHASING AND PROCUREMENT

20.0 Purchasing and Procurement

The Corporation has restructured its procurement and purchasing department and placed it in the Finance Group for better financial control and operational efficiency. Under the 2012 - 2016 Plan and with the old administrative structure, there were many delays in the purchase and procurement of critical items of supply which adversely affected the operational efficiency of the departments. Additionally, in keeping with the recommendation made by the forensic audit team, the department's procedures for reviewing, documenting and ensuring that approvals are given for tender awards must be revamped to offer more transparency and efficiency. The department controls an annual budget of Guy$3.0 Billion dollars with a stores inventory of approximately Guy$1.2 Billion dollars.

Purchasing and Procurement Situation Analysis Summary

Functional Area	Situation	Action
Organization & Management	The delay in obtaining critical non capital items	The use of requisition purchases with programme budgeting
	Delay in procuring critial capital items for operations	Assistance from the Board of Directors with the National Procurement Tender Administration Board

20.1 The Procurement Process

The Procurement approval process has proven to be especially challenging for the acquisition of critical items such as motors and pumps which are essential for operations. Hence, GWI is reviewing its suppliers of such items and will engage the National Procurement Agency to have expedited procurement.

20.1.1 Purchasing Data

The table below shows data (during a 10-month period)[73] on the purchasing process and the time lag for the receipt of critical items needed for the Corporation's operations. While it is noted that the greater number of items (4221) were obtained within 30 days, nevertheless the other items (such as pumps and motors) which although smaller in number, represent critical items that took more than 30, 60 and 90 days for their receipt. The time lag is exacerbated by lack of clear differentiation between regular purchases which would normally be governed by budget allocations for each department and the procurement of capital items in accordance with the policies and procedures in the Procurement Act.

Table 39: **Purchasing - Critical Supplies (2016)**

Requisitions	Number of days
<30 days	4221 – mainly fuel and small purchases
>30 days	342
>60 days	155
>90 days	93

[73] Data was compiled from Oracle in 2016.

Purchasing is subject to the controls developed by the Corporation for budgeting for the acquisition of supplies whose useful life and value are outside of the definition for capital items. Consequently, departments can obtain purchases from suppliers, verify the items, authorize vendor payment and ensure that proper accounting is done for the payment for the items by Accounts Payable personnel in the Finance Department. The Corporation expects that the streamlined approach to purchasing will ensure that purchases are done expeditiously and efficiently.

20.2 Procurement effects on Operations

Capital items which are classified by value and useful life are subjected to the procurement process, involving the creation of Requests for Procurement, bidding and awards of contracts or approvals for the procurement of items or services. It is worthy of note that GWI has seen its operations severely hampered by the non-procurement of critical supplies due to administrative inefficiencies in the procurement process. This is highlighted in the process for 'sole sourcing' and the desire of the Corporation to have on-going approval for procurement from industry suppliers that have a track record for the supply of certain goods in keeping with the technical requirements for operations. Here again, the Corporation expects that a streamlined approach to the granting of 'sole source' classifications for its critical suppliers and the emphasis on technical specifications for bid approvals and awards will eliminate this constraint on operations.

20.3 Payment Processing

Payments for contracted services are processed by this department and new procedures have been introduced to ensure that payments are processed in a timely manner. The regionalizing of the processing of contractor payments will greatly assist with removing the backlog and improve processing efficiency.

Purchasing and Procurement Strategic Objectives

20.4 Purchasing and Procurement Programmatic Areas (Situation Analysis)

The following Indicators derived from the Situation Analysis define the department's strategic objectives.

INDICATOR	2017	2018	2019	2020	2021
Purchasing and Procurement Efficiency - <$10 million	Requisitions processed >90% within 3 days	Requisitions processed >90% within 3 days	Requisitions processed >90% within 3 days	Requisitions processed >90% within 3 days	Requisitions processed >90% within 3 days
>$10 million - <$20 million	As above	As above	As above	As above	As above
>20 million – Reviewed and approved by The National Procurement Board	Requisitions processed >90% within 5 days	Requisitions processed >90% within 5 days	Requisitions processed >90% within 5 days	Requisitions processed >90% within 5 days	Requisitions processed >90% within 5 days Requisitions processed >90% within 5 days
Tendering – local items - <$10 million	>90% within 10 days	>90% within 10 days	>90% within 10 days	>90% within 10 days	>90% within 10 days
Tendering – local items - >10 m <$20m	>90% within 20 days	>90% within 20 days	>90% within 20 days	>90% within 20 days	>90% within 20 days
Tendering – local items - >$20m	>90% within 45 days	>90% within 45 days	>90% within 45 days	>90% within 45 days	>90% within 45 days
Approval and Award	>90% within 21 days	>90% within 21 days	>90% within 21 days	>90% within 21 days	>90% within 21 days
Tendering – Foreign	>90% within 14 days	>90% within 14 days	>90% within 14 days	>90% within 14 days	>90% within 14 days

Key Performance Indicators – Purchasing and Procurement

	Programmatic area	Indicators	2017	2018	2019	2020	2021
1	Organisation & Management	% of purchasing items processed within 5 days	90%	90%	90%	90%	90%
2	Organisation & Management	% of items valued under 10M procured within 15 days	90%	90%	90%	90%	90%
3	Organisation & Management	% of items valued between 10M and 20M procured within 25 days	90%	90%	90%	90%	90%
4	Organisation & Management	% of items valued in excess of 20M procured within 66 days	90%	90%	90%	90%	90%

ASSET AND INVENTORY MANAGEMENT

21.0 Asset Inventory

GWI has restructured its asset management processes. The procurement department is responsible for asset management using the Oracle financial program extensively. This will allow better control over the acquisition of assets and inventory for financial accountability. It will also allow for easy identification of assets, analysis to determine the correct assets needed for operational support, life cycle analysis to facilitate options selections, risk and criticality assessments, and integration of asset data and implementation of the basic elements of asset management.

21.1 The Asset/Equity Ratio

GWI obtains loans funding for the purchasing and procurement of capital items for its operations and maintains a significantly large inventory of supplies. Therefore, since the Government of Guyana guarantees these loans and it is the sole shareholder of the corporation, it is prudent to examine the Asset/Equity Ratio to determine efficient use of the resources. While there is no recommended ratio for determining the ideal inventory, maintaining a high ratio can indicate that GWI has taken on debt funding to acquire assets whose use is not yielding positive revenue. GWI's Asset/Equity Ratio is 4.80 (2015) and 5.49 (2014)[74]. The corporation will ensure that it generates more revenue with fewer assets to show efficient use of its assets. Additionally, it will conduct a review of its Inventory annually to ensure that items whose useful life is fully depreciated can be sold or gifted and procurement and purchases are closely aligned with planned maintenance schedules.

21.2 Monitoring Asset Inventory

The Corporation's Geographic Information System (GIS) program will be used to monitor inventory and facilitate maintenance planning, identification of asset locations and ensure the availability of spares and supplies. It will also allow for the regional decentralization of inventory to make supplies readily available for operations.

Asset Management Strategic Objectives

[74] See Appendix H.

21.3 Asset Standardization

The asset identification and inventory process will ensure that there is standardization in the purchase or procurement of supplies to minimize carrying large varieties of stocks. This will result in lower inventory costs and greater availability.

21.4 Preventative Maintenance

The Preventative Maintenance program will assure that asset items for maintenance are readily available for planned and preventative maintenance which will greatly contribute to a decrease in down-time for maintenance operations. The program will monitor equipment usage and highlight preventative maintenance schedules. See Departmental Performance Indicators below.

INDICATOR	2017	2018	2019	2020	2021
Operations inventory	Ensure that inventory supplies are processed <3 days	Ensure that inventory supplies are processed <3 days	Ensure that inventory supplies are processed <3 days	Ensure that inventory supplies are processed <3 days	Ensure that inventory supplies are processed <3 days
Mini inventory stores	Create and monitor mini stores	Ensure that mini stores are operated efficiently	Ensure that mini stores are operated efficiently	Ensure that mini stores are operated efficiently	Ensure that mini stores are operated efficiently

FINANCIAL AUDIT

22.0 External Audit

GWI's financial reports are subject to an annual audit by the Government of Guyana Auditor General in accordance with the financial regulations. An audit firm is appointed by the Board of Directors for a period of three (3) years and its report is presented to the board annually. The report is also sent to the office of the Auditor General. During the plan years, the finance department will be expected to ensure that audits are completed within the stipulated timeframe, findings are addressed and the annual financial report is approved by the Board of Directors within the first quarter of each year.

22.1 Internal Audit

GWI's internal Audit department is charged with the responsibility for reviewing organizational procedures to ensure that they adhere to the Corporation's policies and procedures. It has an identified role regarding the strategic plan since it performs a monitoring, investigating and reporting function and although its reports are sent to the Managing Director and the Board of Directors, nevertheless it is envisaged that performance matters which are relevant to the SPEM department will be transmitted to the department via the Managing Director for appropriate corrective action. A review of the comments made by the external auditors (2015 report) indicates that internal audit should have greater focus on examining the Corporation's financial processes to ensure timely, accurate and authenticated preparation of financial reports.

Internal Audit Strategic Objectives

To ensure that all financial policies and procedures are followed	To monitor and report on all discrepancies in the processing of financial matters	To ensure that GWI can deliver safe, adequate and affordable water and ensure safe sewerage systems for improved public health and sustainable economic development.

OPERATIONS COSTS

23.0 Cost Centers

In the quest to reduce operational costs, it is the Corporation's objective to create financial cost centers for tracking and reporting water production, distribution and sewerage operations or service costs. Initial data from the Table below offers an insight into the regional cost of water production. This is useful for building cost centers which will be centered on Regional Cost Centers initially and eventually segmented to Wells as Cost Centers.

ENERGY USAGE

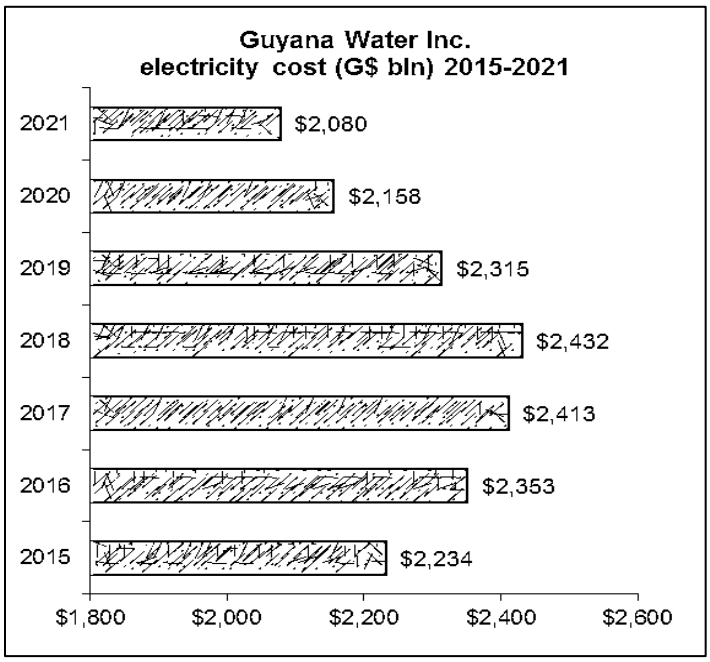
24.0 Electricity Costs, Alternative Sources and Reduction Efforts

The Corporation's energy costs (electricity) represents approximately 37% of its operating costs. This is very significant since it relates to the cost of production of every cubic meter of water regardless of the revenue derived. And, since the Corporation has a high percentage (>60%) of

non-revenue water, this cost assumes great significance and directs the Corporation towards finding ways and means of reducing its electricity costs.

In 2012 GWI experienced less than 29 % efficiency for the electrical energy supplied to electrical motors that were used in the Corporation's operations and during 2014 and 2015 upgrade works were done at some of the regional locations with the installation of higher effcient pumping systems but, these gains were eliminated due to the unavailability of spare parts for motor maintenance. To the extent that the average monthly energy consumption is 3,500 MWH from the operation of 137 wells and 24 water treatment plants. And, GWI now pays $240 million monthly and requires a government subsidy to offset this cost.

With this large electricity bill and continuous operation there is a need for us to operate at higher efficiencies and for the period 2017/2021 considerable energy savings will be realized if an approach of energy efficiency and alternative energy is applied to the various facilities in GWI. There are several aspects of energy costs such as the process design for treatment plants that have a heavy reliance on processing with the addition of chemicals and the use of equipment that is energy inefficient. The following diagram demonstrates the energy costs which are borne by government.



The above demonstrates actual and projected declining levels of expenses and this is a positive financial trend for the Corporation, hence it is examining ways to reduce the high-energy costs for its operations, including the designing of treatment plants that will be less dependent on chemical usage, retro-fitting existing equipment and purchasing equipment that is more energy friendly, the use of solar, wind and co-generation technology to capture and recycle the energy produced during operations. It is expected that with the introduction of alternative types of energy processes there will be significant reductions in the energy costs and thus the government subvention for energy will be correspondingly reduced.

24.1 Traditional Energy Sources

GWI's operations is plagued with service disruptions due to power outages from the Guyana Power Limited (GPL). This is affecting the efficiency and in some instances the life cycles of pumps and motors which are critical for operations and are very costly to replace when they are damaged. Additionally, their replacement is subjected to a procurement process that is slow and itself inefficient thus causing corresponding issues regarding energy usage inefficiencies.

24.2 Situation Analysis

The Corporation plans to reduce energy usage with the replacement of fluorescent light with LED equivalent and to Install Inverter type air conditioner units and lighting motion sensors in all restrooms. The table below shows the plans and financing ($Guy.) required.

Table 40: **Building lighting**

Reduction in energy usage in offices			
Year	Activity	Amount	Investment
2017	Replace all Fluorescent Lights with LED type in all offices		$7,000,000
2017	Install motion sensors in all lavortory facilities		$300,000
2018	Install inverter type air conditioning units	20	$7,000,000
2019	Install inverter type air conditioning units	15	$5,250,000
2020	Install inverter type air conditioning units	15	$5,250,000

GWI recognizes that wells and treatment plants offer opportunities for large reductions in energy uage and costs and this can be accompliished by stabilizing the power supply with the purchase of current balancers and the use of variable speed drives. The table below shows the plans and financing required.

Table 41: **Wells and Treatment Plants**

Reduction in energy usage Well Stations & Water Treatment Plants			
Year	Activity	Amount	Investment
2017	Investing in stable power supply	2	$10,000,000
2018	Investing in stable power supply	15	$75,000,000
2018	Investing in efficient pumps	25	$100,000,000
2018	Investing in variable speed drives	14	$84,000,000
2018	Investing in generators	10	$70,000,000
2019	Investing in efficient pumps	15	$60,000,000
2020	Investing in efficient pumps	15	$60,000,000
2021	Investing in variable speed drives	14	$84,000,000

GWI is also concerned with energy usage increases due to incorrect sizing of pipes in the supply and distributionn network. This is being corrected with careful ordering of pipes in accordance with the correct specifications. Also, as mentioned in section 8.0, many wells are aged and thus their operating efficiencies are declining, contributing to increased energy usage since larger motor are now required to maintain extraction volume. This has led to the necessity for usage of larger well screens. The table below shows the plans and financing required.

Table 42: **Wells Maintenance**

Reduction in Energy Losses in Wells			
Year	Activity	Amount	Investment
2018	Well maintenance works	15	$60,000,000
2019	Well maintenance works	15	$60,000,000
2020	Well maintenance works	15	$60,000,000
2021	Well maintenance works	15	$60,000,000

24.3 Developing Alternative Energy Sources

The Corporation has organized training programs for its personnel in energy conservation, such as solar technology installation and has mandated that energy reduction efforts such as the conversion of lighting in offices should be the first step in the adoption of new energy conservation measures. This will be followed by the design of infrastructure to use alternative energy sources.

24.4 Alternative Energy Plan 2017/2021

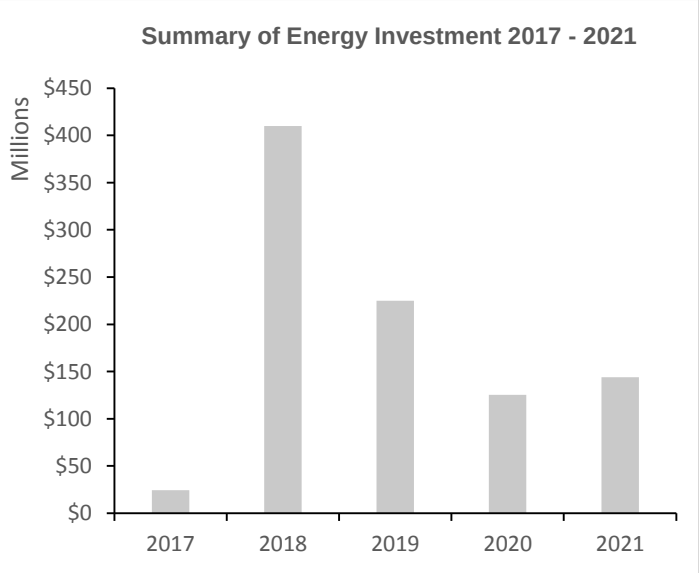
GWI is looking towards the future with the development of alternative energy sources. It proposes to use a hybrid of solar, generators and electricity from the Guyana Power Limited. The table below shows the plans and financing required.

Table 43: **Alternative Energy Program**

Alternative Energy Program			
Year	Facility	Amount	Investment
2017	Central Store	1	$7,000,000
2018	Anna Regina, Bachelors Adventure	2	$14,000,000
2019	Central Ruimveldt	1	$100,000,000

Table 45: **Summary of Energy Investment Required by GWI**

Year	2017	2018	2019	2020	2021
Funding ($mn)	$24.300	$410.000	$225.000	$125.250	$144.000



The total amount required to purchase energy efficient equipment and supplies is approx. **G$0.9 billion.**

Departmental Performance: Situation Analysis Requirements -Energy efficiency

INDICATOR	2017	2018	2019	2020	2021
Energy Efficiency Program	Ensure that energy usage is at 100% efficiency	Ensure that energy usage is at 100% efficiency	Ensure that energy usage is at 100% efficiency	Ensure that energy usage is at 100% efficiency	Ensure that energy usage is at 100% efficiency
Alternative Energy Program	Ensure that the alternative energy program reduces lighting and comfort energy costs by 25%	Ensure that the alternative energy program reduces lighting and comfort energy costs by 50%	Ensure that the alternative energy program reduces lighting and comfort energy costs by 75%	Ensure that the alternative energy program reduces lighting and comfort energy costs by 100%	Ensure that the alternative energy program reduces lighting and comfort energy costs by 100%
Preventative Maintenance Program	Ensure that the preventative maintenance program produces 100% equipment efficiency	Ensure that the preventative maintenance program produces 100% equipment efficiency	Ensure that the preventative maintenance program produces 100% equipment efficiency	Ensure that the preventative maintenance program produces 100% equipment efficiency	Ensure that the preventative maintenance program produces 100% equipment efficiency

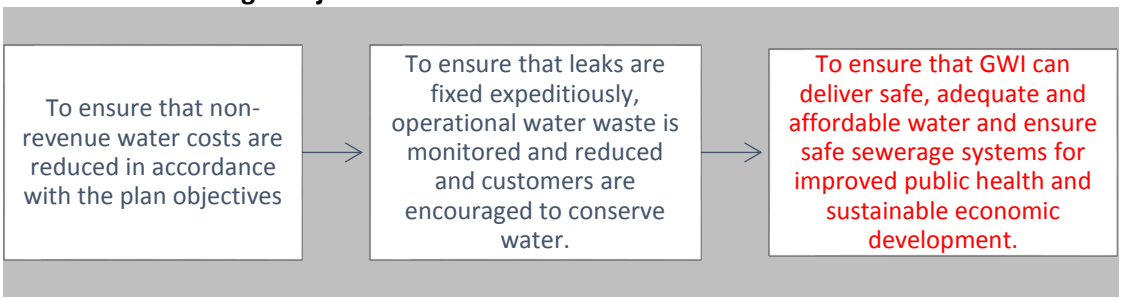
NON-REVENUE WATER

25.0 Non-Revenue Water (NRW)

Non-Revenue Water (NRW) represents a significant aspect of financial loss for the Corporation and thus deserves special attention. While the current strategic plan has a performance indictor which stipulates the reduction of non-revenue water, nevertheless because of the complex nature of NRW, it is felt that it is more feasible to target its gradual reduction during the life of the plan. Hence, the Corporation will examine the need for the services of a consultant to examine NRW and plan intervention strategies for its reduction. The preliminary information submitted by a previous consultant (Inception Report) states that the Corporation needs to know the physical location and condition of pipes, valves, connections, and service connection lines since this data will be required for the design of a hydraulic network optimization, including network zoning; planning and executing leak detection campaigns and the assignment of personnel to perform pipe and service connections replacement.[75].

The Corporation is also focused on the operational factors that produce non-revenue water and has created new monitoring processes for the speedy identification of water loss through leaks (see graph and data on Page 159 and 160 on major and minor leaks in 2016) and faulty connections, introduced public awareness efforts to ensure that leaks are promptly reported and assigned specialist service crews to attend to leaks which have a financial impact on the Corporation. The proper sizing of service connections is very important since as demonstrated in the picture on Page 160, incorrect sizing with the use of connectors are often the cause of leaks when work is not done properly.

Non-Revenue Strategic Objectives



25.1 Strategic Actions to reduce NRW

The Corporation will ensure that the following actions are taken to reduce non-revenue water.

Reduce leakage in the transmission and distribution system:

- Review and prioritizing and expanding the DMA's
- Use of zoning Atlas App to monitor and ensure that all leaks are fixed in a timely manner. Use of zoning Atlas App to monitor and ensure that all leaks are fixed in a timely manner.

[75] The Corporation has a proposal from a consultant who has submitted an Inception Report with the parameters for the study.

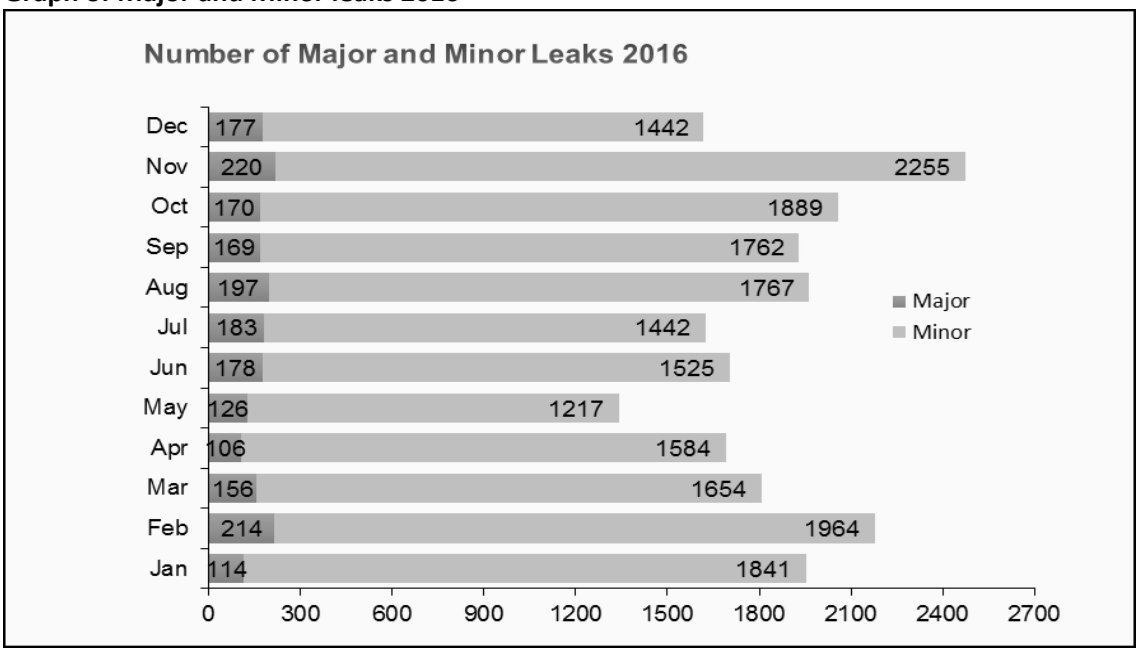
Management of country-wide consumption and demand:

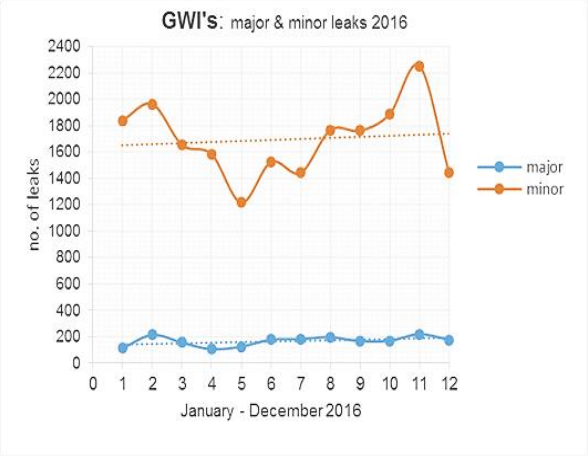
- •100% metering of all accounts.
- •Accurate and 100% billing and collections.
- •Debt management and enforcement of disconnections.
- •Public Relations programs to encourage water conservation.

Reduction of Commercial losses:

- •Ensuring that the customer database is 100% accurate.
- •Conducting customer conservation awareness programs.
- •Ensuring that quality measures for meter reading, bill delivery and adjustments are practiced and enforced.
- •Minimizing the issuance of estimated bills.

Graph of Major and Minor leaks 2016





25.2 Real and Commercial Losses

Understanding real loss and commercial losses are critical factors related to NRW, where **real loss** focuses on leak detection and repairs, improving service connections and increasing meter coverage, while **commercial loss** is focused on improving the accuracy of the customer database through a verification exercise. Concomitant with these is the expectation that meter reading will be done accurately and efficiently. There is another issue related to billed unmetered consumption and the difference between the 10 m^3 charged to each unmetered customer and the actual amount of approximately 30 m^3 that more accurately reflects the volume of water that is consumed but not paid for by the unmetered customers. Back washing and flushing the transmission lines, while being necessary operational activities, nevertheless represent potential sources of NRW since the volume of water utilized for these activities is not normally measured and can contribute to significant water losses if the processes are not carefully monitored and controlled. In this regard, greater emphasis will be placed on the supervision of these activities by managerial personnel to reduce water losses.

Water loss - faulty connection (above)
An overflowing customer storage tank (below)

25.3 The Prevalence of 'Black Tanks'

The severe curtailment of GWI's service countrywide during the past years gave rise to a phenomenon of 'Black Tanks' where almost every household and businesses have them to ensure continuous supply of water. These tanks although being able to provide 'push' gravity fed water to buildings, nevertheless require a pump to 'push' the water up to the tank which also receives rain water from rooftops. The control of water in these tanks has become critical with the increased level of service being provided by GWI and water overflow on customer's premises

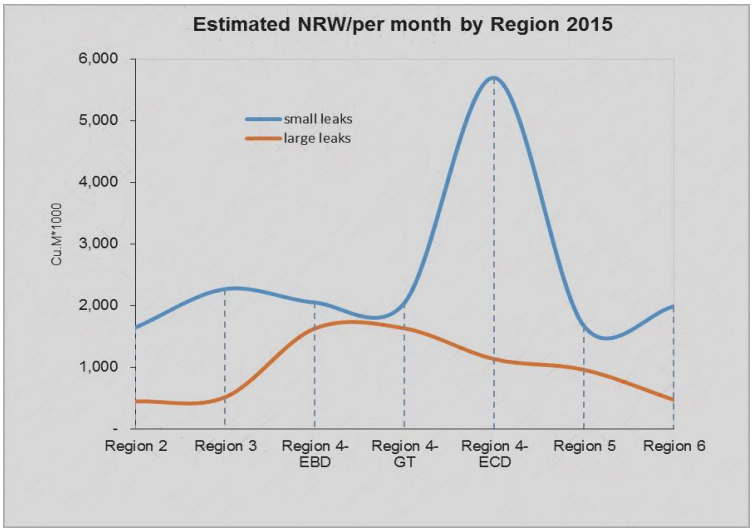
(as demonstrated in the picture below) due to faulty valves on the tanks can contribute greatly to water loss and in the case of unmetered premises, the loss is not captured for revenue. Hence, it is felt that GWI's distribution demand can be reduced with the control of water loss from the overflows. However, while it is GWI's objective to provide levels of service that will eventually allow customers to eliminate these tanks, its current strategy is to help customers control their usage and avoid overflows which contribute to NRW. Therefore, GWI's policy is to supply 'shut-off' valves to customers to avoid overflows. And it expects that with increased levels of service this will eventually eliminate customer need to have pumps to deliver water to their tanks or the 2nd floor levels.

25.3.1 Quality Issues with Customer Tanks

The Corporation recognizes that its contractual responsibility ceases at the point where water service is delivered to the meter or the point where the customer's house connection is attached to the Corporation's supply lines. However, it has social and public health responsibilities and concerns regarding the quality of water that customers receive in their homes via these tanks. There is concern with the quality of water that emanates from these tanks that are connected to the meter (on the customer side) or GWI's supply line (unmetered connections) and the water supplied to houses or businesses. GWI's treated water is often compromised due to the state of these tanks and the fact that the chlorine residual effects dissipates and defeats the process that is designed to deliver treated water that is free of microbial contaminants to customers for cooking, drinking and other household uses. It is envisaged that the eventual phasing out of these tanks will eliminate this issue.

25.4 Water use by the Fire Service

GWI's mission includes the provision of water for use by the Fire Service in each community through access to fire hydrants. This makes it a requirement that the Corporation must have a mechanism to monitor water usage by the fire service and there must be collaboration between the two entities. Consideration is being given to the use of monitoring devices to gather data on hydrant usage and render an accountability for non-revenue water used for civic services. The monitoring plan must include data on regular maintenance of hydrants by the fire service which will include flushing of the hydrants and the Corporation must be confident that access to the hydrants is restricted to authorized personnel.



25.5 Strategy to reduce Non-Revenue Water (leaks)

The data illustrates water loss for 2015 through leaks that were either unreported or there were delays in reporting or fixing leaks as demonstrated in the graph. In recognition of the financial impact of leak losses, the Corporation has created a strategy to address leaks (25.6).

25.5.1 Physical Loss

The regional offices will assign both GWI and contracted personnel to respond to reports on leaks. The reports will be documented and work orders created for the dispatch of personnel to fix leaks. A GPS tracking system will be used to identify the location of the leak and images will be uploaded into the system to verify that leaks have been fixed. Leak reporting, monitoring and fixing will be featured as a key performance indicator to ensure that they are reported and fixed in a timely manner. It is also recognized that there are other sources of losses such as back washing and the flushing of transmission lines which are being addressed to reduce losses.

25.5.2 Commercial Loss

Regarding commercial losses, the Corporation will focus its attention on its customer base, the correct classification of customers, the application of tariffs relevant to customer service category, monitoring accounts that are classified as 'no charge' or for which no bills are generated and bills generated with 'high debit or credit balances'. This is critical since these result in non-payment for water services and thus contribute to non-revenue water. Policies and procedures will be instituted to ensure that all accounts are correctly classified and billing and delivery is done with utmost urgency to ensure customer payments are received within the due dates. The statistics show that while there are 49% metered customers, 8% are coded for 'no charge', hence only 41% are captured for revenue.

The Corporation generates centralized billing based on actual meter readings submitted by staff. It is planned however that electronic programs will be acquired to facilitate decentralized billing and allow customers to access their account to enter meter reading and generate their bill. This will be expanded to permit online and electronic payments and thus improve collection efficiency.

25.6 Proposed Intervention – Rapid Response Team

GWI will create rapid response teams in each region to address Loss Reduction. This dedicated team will focus on the identification of leaks and provide rapid responses to fix leaks. This strategy will ensure that loss reduction is given priority, especially since other issues such as attending to customers without water service and damaged mains while being critical, tend to normally get priority attention with very little effort being directed to fixing leaks. This is shown in the customer reports and service records regarding the length of time it takes for the identification and response to fix leaks.

25.6.1 Creating DMAs

In addition to the above strategy, GWI is proposing the creation of DMA's with a ratio of 1:300 (one (1) DMA for every 300 customers) in certain regions and communities with variations for network configuration. These areas will be metered and in such instances where metering is not yet possible, the calculations based on the Data Loggers will include assumptions to achieve realistic consumption.

Table 45: **Proposed DMAs**

Year	Number of Customers to be targeted	Proposed DMA(minimum)	Number of Data Loggers	Remarks
2017	10,000	34	34	Currently there are 12 DMAs for about 3,000 accounts. Ratio – 1:250
2018	15,000	40	40	Ratio – 1:375
2019	15,000	40	40	Same as above
2020	15,000	40	40	Same as above

FINANCING THE PLAN 2017 – 2021 AND BEYOND

26.0 Financing Modalities and Resource Application Structure

A multi-faceted approach to resource mobilization and application will be developed using internationally established methods of resource allocation and prioritization techniques for the financing of water and sanitation infrastructure by Guyana Water Utility through the Guyana Government, International Development Partners, and GWI. Its recommended that resources such as GWI's finances, central government, donor resources (loans: Policy and Project Base) be utilized to heightened productive infrastructure, whilst other corporate resources (Mining, Forestry, Oil and Gas) and/or other sectors, including grants (NGOs) or technical co-operations be utilized for the implementation of small scale/low cost infrastructure and pilot projects in the areas that exhibits high levels of unemployment and poverty "specifically, rural and the hinterland communities" of Guyana. This model or approach will not create any undue burden on the beneficiaries, and allow the Guyana Government to have greater scope in its intervention into the sector and improve allocative efficiency of scarce budgetary resources.

The core infrastructural financing/investment expenditure gaps identified in the water and sewerage sector requires the use of substantial concessional financing that necessitates a feasibility studies, including Internal Rate of Return, Net Social Benefit, and Net Present Value calculations. The Guyana Government/GWI is required take a proactive approach to the decision-making process for the use of resources that attracts debt/interest financing, international programming. The contracting of resources must contribute towards achieving optimal returns/benefits for the citizen of Guyana. Preferential consideration should be given to areas with high population density, income strata, and socio-economic activities to ensure returns can be guaranteed and justifiable for the use of concessional finances that lead to enhanced socio and macro-economic outcomes.

Aid modality	Conditionality	Earmarking	Accountability
Government Base System	Macro & Budget	None or national	Gov't systems
Sector Base System	Sectoral	National	Gov't systems
Basket arrangements	Sectoral	Real within sector	Blend of govt and donor systems
Projects using govt. systems	(Sector &) project	Real to project	Blend of govt and donor systems
Projects using parallel systems	Limited (due to low govt. ownership)	Total (real)	Donor
Projects through NGO's	Limited (due to low govt. ownership)	Total (real)	Donor/NGO

Note** GBS: Government Base System, SBS: Sector Base System

FINANCING THE SECTOR INVESTMENT PROGRAM

26.1 Capital Investment Programme 2017-2021

Table 46: **The various sources of financing for the implementation of SP2017-2021**

Source	Total Amt. (US$mn)	Total Amt. (Gyd$bln)	Average per/ann. Amt. (US$mn)	Average per/ann. Amt. (Gyd$bln)	%
Development Partners	$31.861	$6,531.54	$6.3722	$1,306.31	15.8
Central Government	$59.132	$12,122.18	$11.827	$2,424.436	29.3
Guyana Water Incorporated	$31.029	$6,361.00	$6.206	$1,272.20	15.4
Unfunded/gap/deficit	$79.765	$16,351.80	$15.953	$3,270.361	39.5
Grand Total	**$201.788**	**$41,366.52**	**$40.358**	**$8,273.30**	**100**

26.2 Government and Development Partners' Financing

The Government of Guyana will continue to bear the cost of investment expenses for the water sector over the plan period. The Government of Guyana is projected to make an annual average contribution of US$11.827 million (or the equivalent of G$2.424 billion) to the sector and will also assist in raising an additional US$79.76 million (or the equivalent of G$16.35 billion) from Development Partners through grants and loans, NGOs, and other sectors.

THE STRATEGIC INVESTMENT PROGRAM (SIP) 2017-2021

The capital investment programme envisaged to achieve the targets set out in the New Strategic Plan and by extension advancing the Government's mission towards realising **Goal 6 of the United Nations, Sustainable Development Goals (SDGs): Ensure access to water and sanitation for all** will be financed by the Government of Guyana, International Development Partners, and Guyana Water Incorporated. The overall capital investment programme for the medium term or next five (5) years is estimated to cost G$41.017 billion. Of this amount approximately 60.1% (G$24.67 billion) is committed resources with an existing financial gap of 39.9% (G$16.35 billion). In relation to the financed portion of the total capital investment programme 49.1% (G$12.1 billion) is expected to be funded by the Guyana Government (directly via the national budget), 26.5% (G$6.532 billion) is currently committed by the Inter-American Development Bank/European Union Blended Financial Mechanism, and 24.1% (G$6 billion) to be financed by the water utility.

Water Production, Distribution, and Quality: The sum of G$20.718 billion (or 84%) of the strategic investment programme for the life cycle of the New Strategic Plan will be utilised to heighten Water Production, Water Supply, and Water Quality within the Water Sub-sector. In this regard, GWI will be contructing three New Water Treatment Plants **in Regions 3, Region 4-East Bank Demerara, and Region 5** under the **Water Supply and Sanitation Infrastructure Improvement Program (GY-L1040 – GY-X1003)** with funding from the Inter-American Development Bank and European Union. The total cost of this program is G$6.518 billion. Additionally, the on-going aquifer study that will be concluded by the end of 2017 will be utilised in-part to determine future strategies in well drilling and contibute to the corporation decision as to what types or specify particular wells "A and/or B Sands" and specific hydrological/geographical location and/or zone to improve water quality and supply. This intervention will play a critical role in assisting and promoting the corporation efforts in its cost reduction strategy for water treatment/chemicals over the long term.

Specifically, **Region 4-Georgetown capital financing from WSSIP is earmarked for works in 2018**. These include the upgrading of transmission main from Shelterbelt to Kitty Pump Station, and the rehabilitation of Shelterbelt reservoir. However, Georgetown ramains a high periority area for ring main upgade and extension. In addition asbestos pipelines must be removed and replaced with the utmost urgency. The design and construction a Water Treatment Plant in North Ruimveldt to service Turkeyen, Sophia, Liliendaal, North and South Ruimveldt, and Cummings Lodge is also given priority.

Under the Central Government financed capital programme "**Public Sector Investment Programme** - thru the National Budget Financial Instrument", several wells will be drilled and operationalised in an effort to ensure redundancy, continuity and an improved level of service within a number of zones across the country. In 2018, the utility will be moving aggressively

towards the procurement of drilling equipment to reinstall resident capacity within the corporation for well drilling in the short to medium term. This initiative will reduce the cost of well drilling dramatically and will be bolstered by a number of engineers and senior technical staff within GWI that already recieved training in advanced well drilling techniques in Oklahoma State, USA during 2016/17. GWI will also be rehabilitating and installing new distribution mains across the coastal belt and hinterland regions of Guyana in an effort to ensure service is maintained and expanded to communities and packets of our populace which has been without access to potable water for decades. In light of expanding our coverage and accessibility a consultancy firm and/or individual consultant will be engaged to conduct a feasibility study for the design and construction of a water treatment facility/plant to ulitise the aboundant surface water supply from the Hope Canal to supply approximately 38% of the coastal population with potable water by 2021.

With special emphasis on water quality, GWI has commenced the strengthening of its water testing and 24 hours monitoring capabilities. Given the strong emphasis on Water Quality, the corporation will be constructing a number of mini-labs across the country in an effort to improve our surveillance of the quality of water being distributed, including the monitoring of water borne infections/disease in collaboration with the Ministry of Public Health. GWI also envisages to acqiure ISO Certification of its Central Water Quality Lab for testing and monitoring of water by 2021.

Sanitation: In the Sanitation Sub-sector a sum of G$1.48 billion (or 6%) of the strategic investment programme is expected to be expended for the period of the Strategic Plan. A substanital portion of these resources will be utilised by the corporation for the rehabilitation and expansion of Waste Water Treatment Systems in Georgetown and New Towns. Additionally, GWI will be rehabilitating and expanding the Ruimveldt Waste Water Treatment Plant. See Appendix for all activites/projects to be executed within the period of the strategic plan.

Finance and Revenue: A sum of G$1.529 billion (or 6.2%) of the strategic investment programme will be utilised in the areas of Finance and Revenue and the corportion envisages rhe expansion of its revenue collection and a reduction of NRW over the period of the strategic plan. This will be aided by the New Customer Information and Billing System. The corporation plans to aggressively expand procurement and installation of water meters Country-wide. We will be installing in excess of 95,000 meters during the implementation cycle of the new plan. In 2017, GWI planned to commence meter installation of approximately (40,000, MC/67.3%), 2018 (20,000, MC/78.1%), 2019 (20,181, MC/89.1%), 2020 (15,039, MC/98%). In addition, GWI will continue to install and monitor District Metering Areas (DMAs) in a number of zone that exhibits relatively low Level of Service (LOS). Given, these initiatives it is projected that the corporation will increase billings, current revenue collection, and reduce te debt accumulation.

Organisation and Management: A sum of G$937 million (or 3.8%) of the strategic investment programme is envisaged to be expended within the cycle of the Strategic Plan to address challenges in the Organisation and Management of the Corporation in a coherent and comprehensive manner during the cycle of the plan. ICT Infrastructure expansion, training of staff at all levels of the orgamisation, maintaining cyber security programmes are expected.

Table 47 shows the projected allocations for funding for each region according to the five(5) functional programatic areas and Table 48, the expected revenue. The graph below shows the financing distributed by functional areas.

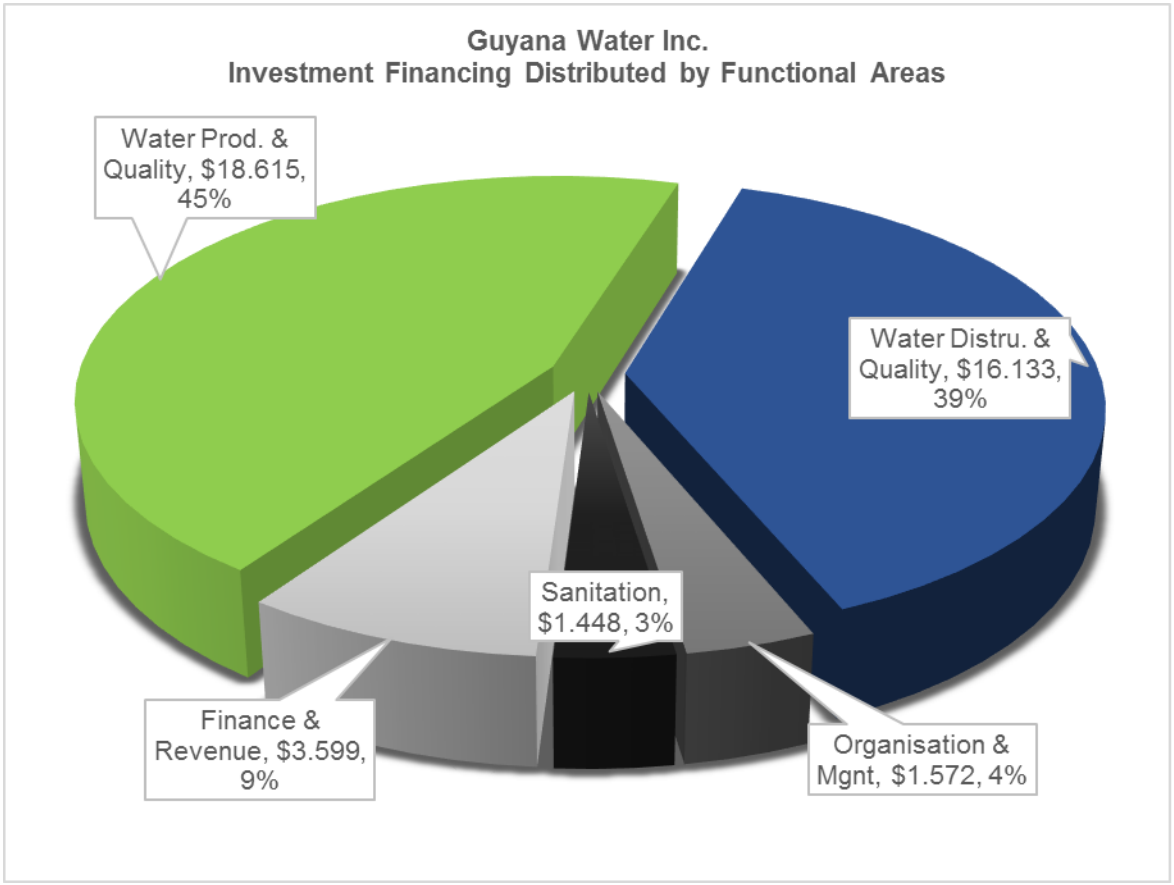
27.1 Capital Investment Program 2017-2021 (Required)

The following table shows the capital investment funds listed by regions and the graph shows functional areas funding.

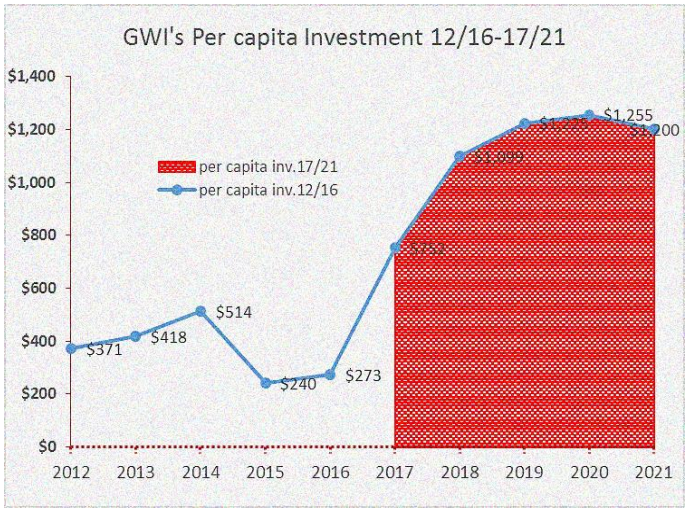
Table 47: **Funding Allocations - Regions**

Regions	2017	2018	2019	2020	2021	Total
Reg2	$0.338	$0.493	$0.549	$0.563	$0.539	$2.482
Reg3	$0.450	$0.657	$0.733	$0.751	$0.718	$3.309
Reg4-EB	$0.563	$0.822	$0.916	$0.939	$0.898	$4.137
Reg4-EC	$0.732	$1.068	$1.191	$1.220	$1.167	$5.378
Reg4-GT	$1.576	$2.300	$2.564	$2.628	$2.514	$11.583
Reg5	$0.394	$0.575	$0.641	$0.657	$0.628	$2.896
Reg6	$0.619	$0.904	$1.007	$1.033	$0.988	$4.550
Reg10	$0.506	$0.739	$0.824	$0.845	$0.808	$3.723
HL	$0.450	$0.657	$0.733	$0.751	$0.718	$3.309
Total	**$5.628**	**$8.216**	**$9.158**	**$9.387**	**$8.978**	**$41.367**
mean	$0.625	$0.913	$1.018	$1.043	$0.998	$4.596
median	$0.506	$0.739	$0.824	$0.845	$0.808	$3.723
max	$1.576	$2.300	$2.564	$2.628	$2.514	$11.583
min	$0.338	$0.493	$0.549	$0.563	$0.539	$2.482

Functional Areas	2017	2018	2019	2020	2021	Total
Water Prod. & Quality	$2.53	$3.697	$4.121	$4.224	$4.040	$18.615
Water Distru. & Qualit	$2.195	$3.204	$3.572	$3.661	$3.501	$16.133
Organisation & Mgnt	$0.214	$0.312	$0.348	$0.357	$0.341	$1.572
Sanitation	$0.197	$0.288	$0.321	$0.329	$0.314	$1.448
Finance & Revenue	$0.490	$0.715	$0.797	$0.817	$0.781	$3.599
Total	**$5.628**	**$8.216**	**$9.158**	**$9.387**	**$8.978**	**$41.367**
mean	$1.126	$1.643	$1.832	$1.877	$1.796	$8.273
median	$0.490	$0.715	$0.797	$0.817	$0.781	$3.599
max	$2.532	$3.697	$4.121	$4.224	$4.040	$18.615
min	$0.197	$0.288	$0.321	$0.329	$0.314	$1.448



The graph below shows per capita investment expenditure for the periods 2012-16 and projections for 2017-21.



27.2 Aligning the Budget with Funding Sources

The Corporation has aligned all departmental and regional program budgets with funding sources for programs execution. The planning and design staff has been tasked with the responsibility for ensuring that all works are planned with Gantt Charts to show milestones for completions and the implementation staff will be responsible for milestone completions which are verified before disbursements are done. The Budget and Finance Officer in the SPEM Department will liaise with the personnel responsible for payments. The Corporation's Infrastructure Program Budget for 2017[76] is set out in Table 22. Programs which are incomplete from 2016 are carried forward to 2017.

27.3 Funding Non-Capital and Capital Programs

GWI expects to fund its operations over the next five (5) years with funds primarily from its revenue. However, it will continue to require funds from the Government of Guyana, IDB and the EU, for capital infrastructure works and projects. The revenue GWI expects to generate over the five (5) year plan period is shown in the table below and the capital funding that will be required is shown on page 171.

27.4 Revenue Projection 2017 – 2021 and beyond

GWI finances its capital projects with loans from international agencies and thus it is financially prudent to demonstrate the efficient use of funding to acquire assets which will contribute towards overall financial viability. This can be demonstrated by the achievement of operational break-even which is projected for 2020 - 21 as shown in the table on page 170.

[76] See APPENDIX Q for 2016 Funding.

Table 48: **GWI's Revenue Forecast 2017-2021**

Regions	yearly forecast					cummulative forecast 2017-21				
	fy2017	fy2018	fy2019	fy2020	fy2021	fy2017	fy2018	fy2019	fy2020	fy2021
Region 2-Div. 1	$210	$234	$255	$271	$286	$210	$444	$699	$970	$1,256
Region 3-Div. 2	$545	$607	$662	$703	$742	$545	$1,152	$1,813	$2,516	$3,258
Region 4-GT	$1,279	$1,424	$1,553	$1,649	$1,742	$1,279	$2,703	$4,256	$5,904	$7,646
Region 4-EBD	$415	$462	$504	$535	$565	$415	$877	$1,381	$1,916	$2,482
Region 4-ECD	$638	$710	$774	$822	$869	$638	$1,348	$2,123	$2,945	$3,814
Region 5-Div. 4	$258	$287	$313	$332	$351	$258	$544	$857	$1,189	$1,540
Region 6-Div. 5	$598	$666	$726	$771	$814	$598	$1,264	$1,989	$2,760	$3,575
Region 7-BAR	$33	$36	$40	$42	$44	$33	$69	$109	$151	$195
Region 10-LIN	$168	$187	$204	$216	$229	$168	$355	$558	$775	$1,003
Region 1,8,9-Hinterland	$4	$4	$5	$5	$5	$4	$8	$13	$17	$23
Total	**$4,148**	**$4,616**	**$5,034**	**$5,346**	**$5,648**	**$4,148**	**$8,763**	**$13,797**	**$19,143**	**$24,791**
mean	$415	$462	$503	$535	$565					
median	$336	$374	$408	$434	$458					
max	$1,279	$1,424	$1,553	$1,649	$1,742					
min	$4	$4	$5	$5	$5					

Table 49**: Cash flow Statement Projection 2017-2026**

Financial Categories	Audited 2015	est. 2016	1 2017	2 2018	3 2019	4 2020	5 2021	6 2022	7 2023	8 2024	9 2025	10 2026
GROSS INCOME (real p.a.)	**$5,427**	**$6,479**	**$6,947**	**$7,197**	**$7,597**	**$8,023**	**$8,519**	**$8,796**	**$9,255**	**$9,514**	**$9,813**	**$9,843**
Revenue - (est. rev. p.a)	$3,618	$3,387	$4,097	$4,547	$5,047	$5,603	$6,219	$6,336	$6,773	$7,210	$7,687	$7,895
Total Other Income	$71	$462	$250	$250	$250	$220	$200	$460	$482	$504	$526	$548
Total Non Operating Income	$1,739	$2,630	$2,600	$2,400	$2,300	$2,200	$2,100	$2,000	$2,000	$1,800	$1,600	$1,400
OPERATING COST	**-$7,570**	**-$7,918**	**-$8,094**	**-$8,237**	**-$8,491**	**-$8,610**	**-$8,825**	**-$9,023**	**-$9,223**	**-$9,427**	**-$9,633**	**-$9,199**
1. EMPLOYMENT COST	-$1,208	-$1,551	-$1,676	-$1,709	-$1,743	-$1,778	-$1,814	-$1,850	-$1,887	-$1,925	-$1,963	-$2,002
2. PREMISES COST	-$2,734	-$2,964	-$3,024	-$3,060	-$3,097	-$3,134	-$3,171	-$3,209	-$3,248	-$3,287	-$3,326	-$3,366
3. SUPPLIES & SERVICES	-$597	-$1,164	-$1,257	-$1,276	-$1,295	-$1,314	-$1,334	-$1,334	-$1,334	-$1,334	-$1,334	$1,420
4. TRANSPORT COST	-$63	-$103	-$160	-$200	-$250	-$312	-$328	-$344	-$361	-$379	-$398	-$418
5. OFFICE & ADMIN. COST	-$280	-$265	-$279	-$292	-$307	-$322	-$339	-$355	-$373	-$392	-$411	-$432
6. OTHER COST	-$2,688	-$1,870	-$1,700	-$1,700	-$1,800	-$1,750	-$1,840	-$1,930	-$2,020	-$2,110	-$2,200	-$2,200
Depreciation	-$1,740	-$1,532	-$1,500	-$1,500	-$1,700	-$1,700	-$1,800	-$1,900	-$2,000	-$2,100	-$2,200	-$2,200
Provision for bad debts	-$496	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Adjustment Previous Year	-$453	-$337	-$200	-$200	-$100	-$50	-$40	-$30	-$20	-$10	$0	$0
NOL bef. subv.	**-$3,953**	**-$4,531**	**-$3,997**	**-$3,689**	**-$3,444**	**-$3,008**	**-$2,606**	**-$2,687**	**-$2,450**	**-$2,217**	**-$1,947**	**-$1,304**
P&L bef. subv (real p.a.)	**-$3,882**	**-$4,069**	**-$3,747**	**-$3,439**	**-$3,194**	**-$2,788**	**-$2,406**	**-$2,227**	**-$1,968**	**-$1,713**	**-$1,421**	**-$756**
Net Operating Loss	**-$2,143**	**-$1,439**	**-$1,147**	**-$1,039**	**-$894**	**-$588**	**-$306**	**-$227**	**$32**	**$87**	**$179**	**$644**

Figures presented in the tables above are in blns/Gyd

Graphical illustration of GWI Proposed Capital Investment Funding by the Functional Areas for the period 2017 – 2021

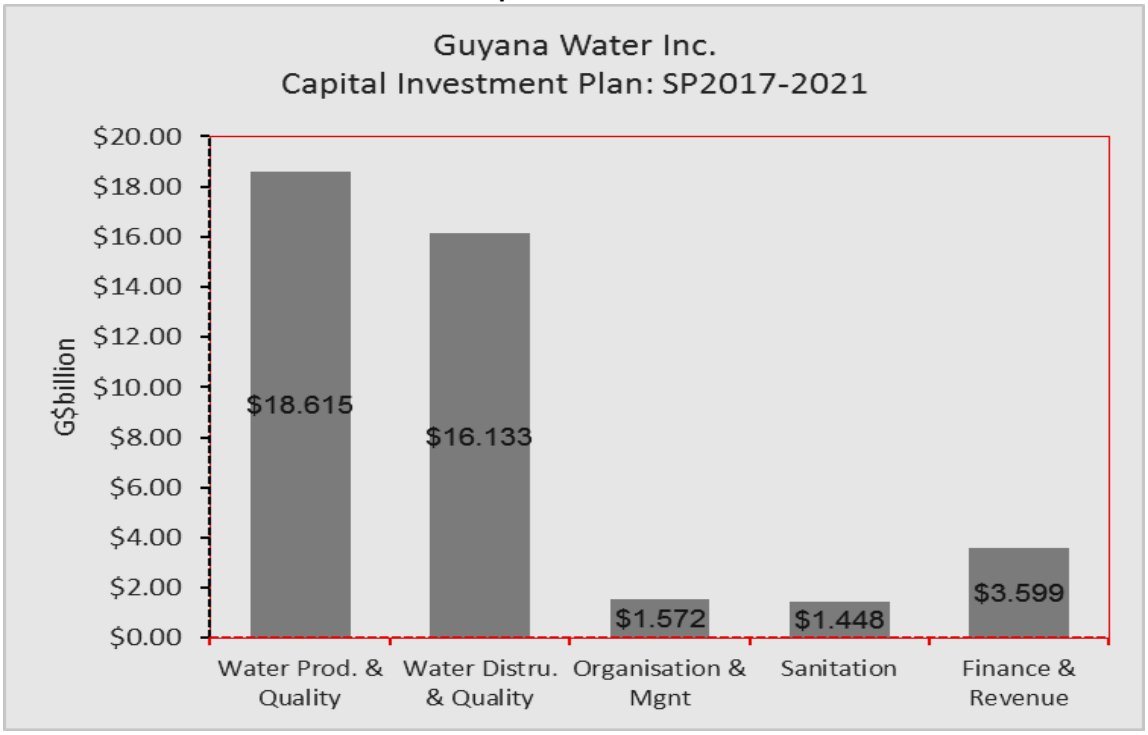


Table 50: **Proposed Capital Funding for the Strategic Plan 2017-2021**

Project/Programme Names	TC	2017	2018	2019	2020	2021
On-going Programmes						
WSSIIP	**$6.5**	$1.0	$2.0	$2.1	$1.4	$0.0
Coastal Water Supply	**$5.5**	$0.6	$0.8	$1.0	$1.3	$1.8
Urban Water Supply	**$2.8**	$0.3	$0.4	$0.5	$0.7	$0.9
Hinterland Water Supply	**$2.4**	$0.2	$0.4	$0.5	$0.5	$0.8
Linder Water Supply	**$1.5**	$0.1	$0.2	$0.3	$0.5	$0.5
Capital Expenditure (GWI)	**$6.4**	$1.0	$1.2	$1.2	$1.4	$1.6
On-going Portfolio GoG/Foreign Funds	**$18.7**	**$2.2**	**$3.8**	**$4.3**	**$4.4**	**$3.9**
CAPEX. GWI	**$6.4**	$1.0	$1.2	$1.2	$1.4	$1.6
Planned Portfolio Total	**$16.4**	$2.5	$3.3	$3.6	$3.6	$3.4
On-going Portfolio Total	**$25.0**	**$3.2**	**$4.9**	**$5.6**	**$5.8**	**$5.5**
Total Investment Program (medium-term)	**$41.4**	**$5.6**	**$8.2**	**$9.2**	**$9.4**	**$9.0**

Funding Agencies/contribution			
Funding Agns		Bln($)	%
EU/IADB	eu/iadb	$6.5	26.1%
GoG	gog	$12.1	48.5%
GoG	gwi	$6.4	25.4%
GoG	**Total**	**$25.0**	**100%**
GoG			
GWI			

Table figures are in Gyd/bln.

27.5 Summary of the Plan Costs

The total cost of implementing the Water & Sanitation Strategic Development Plan (WSSDP) over the period 2017-2021 is US$407.92 million (or G$83.62 billion). This cost entails a capital cost of US$201.79 million (49.5%) and recurrent cost of US$206.13 million (50.5%) as shown in table below. This underscores the huge investment required to improve water and sanitation service delivery to meet demand up to 2021.

Summary of Cost of 2017 – 2021

Item	US$ million	GY$ billion	% Percentage
Recurrent Cost	$206.131	$42,259.00	50.5
Capital Cost	$201.787	$41,367.52	49.5
Total Cost	**$407.919**	**$83,623.52**	**100**

Allocation of Financial Resources under the WSSP 2017-2021 (G$blns)

Functional Areas	Recurrent Cost		Capital Cost		Total Cost	
Water production & Quality	$8,873.97	21%	$18,615.0	45%	$27,488.97	32.9%
Water Distribution & Quality	$8,451.4	20%	$16,133.0	39%	$24,584.40	29.4%
Organization & Management	$15,212.52	36%	$1,572.1	3.8%	$16,784.62	20.1%
Sanitation	$5,493.41	13%	$2,482.2	6%	$7,975.61	9.5%
Finance & Revenue	$4,225.7	10%	$2,565.2	6.2%	$6,790.90	8.1%
Total Cost	**$42,257.00**	**100%**	**$41,366.52**	**100%**	**$83,623.52**	100%

Packages	Recurrent Cost		Capital Cost		Total Cost	
	Absolute (G$blns)	%	Absolute (G$blns)	%	Absolute (G$blns)	%
SERVICE DELIVERY						
Urban water service	$19,522.73	46.2	$17,580.77	42.5	$37,103.51	44.4
Hinterland and small towns water service	$11,451.65	27.1	$10,962.13	26.5	$22,413.77	26.8
Hinterland & small towns basic sanitation and hygiene service	$7,733.03	18.3	$8,273.30	20.0	$16,006.34	19.1
Sub-total	**$38,707.41**	**91.6**	**$36,816.20**	**89.0**	**$75,523.61**	**90.3**
PRODUCTION SUPPORT ISSUES						
Institutional Capacity Development and Governance	$1,352.22	3.2	$1,282.36	3.1	$2,634.59	3.2
Finance	$845.14	2.0	$2,316.52	5.6	$3,161.67	3.8
Water Resource Management	$971.91	2.3	$620.49	1.5	$1,592.41	1.9
Knowledge Management, Gender, Coordination and M&E	$380.31	0.9	$330.93	0.8	$711.23	0.9
Sub-total	**$3,549.58**	**8.4**	**$4,550.32**	**11**	**$8,099.91**	**9.7**
TOTAL	**$42,257.00**	**100**	**$41,366.52**	**100**	**$83,623.52**	**100**

The total cost of implementing the WSSDP equates to an average annual cost of US$407.92 million (or G$83.62 billion). This cost entails average recurrent and capital costs of about US$40.16 million (G$8.45 billion) and US$40.21 million (G$8.23 billion) respectively.

90.3% of the total resource budget is projected for service delivery. This amount will be used to finance new investments as well as the replacing and rehabilitating of infrastructure. 44.4% of the total envelope will go into urban water service delivery while 26.9% will go into water service delivery for hinterland and small towns and 19.1% will be allocated to basic sanitation and hygiene services in hinterland and small towns. The allocation for sanitation and hygiene services is based on the proposed budget in the SIP for implementing a nationwide sanitation

and hygiene programme. Additional allocations have also been made to implement strategies for hand-washing with soap and safe storage and treatment of water. The recurrent component of the total expenditure on service delivery is US$188.82 million which constitutes 91.6% of the total cost of service delivery.

A total of US$39.51 million (9.7%) has been earmarked for implementing activities under the Production support package. This entails institutional capacity development and governance (3.2%); finance (3.8%); water resource management (1.9%); and knowledge management, gender, coordination and M&E (0.9%).

27.6 Government and Development Partners' Financing

GoG will continue to bear the cost of investment expenses for the water sector over the plan period. GoG is projected to make an annual average contribution of US$11.827 million (or the equivalent of G$2.424 billion) to the sector and will also assist in raising an additional US$79.76 million (or the equivalent of G$16.35 billion) from Development Partners through grants and loans, NGOs, and other sectors.

27.7 Requests for Funds from International Agencies

The Project Implementation department is responsible for preparing and requesting funding from external agencies. When such funding is approved, the department will ensure that all documents related to the project are transmitted to the Project Accountant in the Finance Department. The accountant will be responsible for setting up the funds request (funding agency) schedule and to make requests for payments in accordance with the funding agreement.

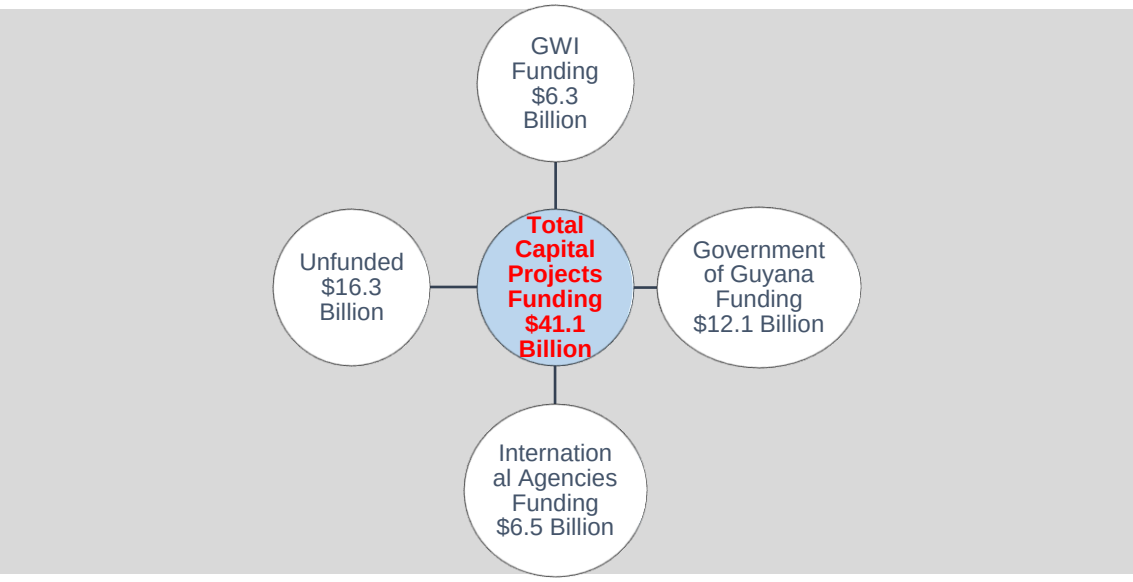
27.8 Unfunded Capital Required

GWI is projecting Guy$16.3 Billion Dollars (see above) additional funding will be needed for the 2017 – 2021 Capital Projects. It is expected that funding to fill this gap will be obtained during the program years from revenue, Government of Guyana or international agencies.

27.9 Disbursement of Funds

The Project Accountant is responsible for contractor payments. To ensure timely payments, the engineers in charge of projects will ensure that payment requests are submitted to the accountant in a timely manner. The accountant will process the payments and submit monthly reports copied to SPEM showing payment requests (funding agencies), receipt of funds and contractor payments. The Internal Audit Department will ensure that all payment requests (funding agencies), receipt of funds and contractor payments are processed in accordance with the funding requirements and GWI's financial regulations.

A Schematic: **Capital Funding ($G) for Projects – 2017 to 2021**



TECHNICAL ASSISANCE

28.0 Training

GWI personnel and persons from other entities including the University of Guyana, Ministry of communities, Mayor and City Council and Central Housing & Planning Authority completed training in Biological Wastewater Treatment, including the design of commercial septic tanks. It is expected that these persons will form the nucleus of design personnel whose skills can be utilized for wastewater treatment programs in the future. The Corporation will engage government towards the reactivation of the regulatory process for granting approval for the construction of commercial and residential septic tanks. It is expected that during the application for building process, there will be a requirement for applicants to request the assistance of GWI to prepare and attach designs for septic tanks to building permit applications for consideration by the approving entity.

Personnel who completed training in wastewater management and Certificate Presenters

28.1 Technical Cooperation

The Corporation through the sponsorship of IDB has initiated bi-lateral visits with the water utility Corporation in Surinam for personnel to compare the operations of the two (2) entities. These exchange visits allow personnel to see firsthand the operational challenges faced by each country's water utility Corporation and exchange notes on how technical challenges are resolved. Additionally, international experts have visited GWI from the Netherlands (Water is Our Life) to evaluate the treatment plants and conduct workshops for engineers and support staff.

Visiting personnel from Suriname and GWI staff

ORGANIZATION ASSESSMENT

29.0 Risk Assessment

The Corporation is fully aware of the various assumptions that are critical for the success of this plan. The following Table sets out the risk factors and their critical importance to the KPI's.

Table 51: **Assessment**

Strategic Focus	Risk	Measures for mitigation
Organization and Management	That the staffing levels and number of trained personnel do not support the organizational objectives.	The creation of Log Frame Analysis and quarterly Situation Analysis reviews to ensure adequate staffing of skilled personnel.
Water Production and Water Quality	Levels of service are adversely affected by unreliable energy supply and leaks intrusions that add contaminants to the water supply.	Create alternative energy sources such as solar, wind etc. and institute rigorous leak identification and repairs protocols.
Water Distribution	Continued usage of aged distribution lines especially in Georgetown which can generate leaks and lower service levels.	Institute a program to identify, age and replace distribution lines.
Sanitation	A continuation of inadequate services due to non-involvement of the Corporation in planning new communities.	GWI personnel will be involved in discussions with RDC's and NDC's for the creation of new and the expansion or upgrading of communities.
Revenue and Customer Relations	Less than 100%-meter coverage, especially in areas where treated water services are provided. Failure to develop customer outreach programs to ensure that customers billing issues are resolved in a timely manner to ensure billing accuracy.	The Corporation will institute policies and procedures for the timely resolution of billing issues.

ORGANIZATIONAL PERFORMANCE, EVALUATION AND MONITORING

30.0 Performance Evaluation and Monitoring

GWI's Strategic Planning, Evaluation and Monitoring Department is tasked with the responsibility for the creation, evaluation and monitoring of this plan. And, Key Performance Indicators (KPI) have been designed to collect data monthly for each department's performance which will be evaluated against the baseline and monitoring discussions will be conducted between personnel from the SPEM department and respective departments to ensure that performance is in keeping with the projected expectations. This will facilitate reporting on both qualitative and quantitative measures critical for the Corporation's viable performance. Reports on the KPI's will be prepared by the SPEM department monthly and submitted to the CMT and the Board of Directors. There will be quarterly reviews of the plan and updates as required.

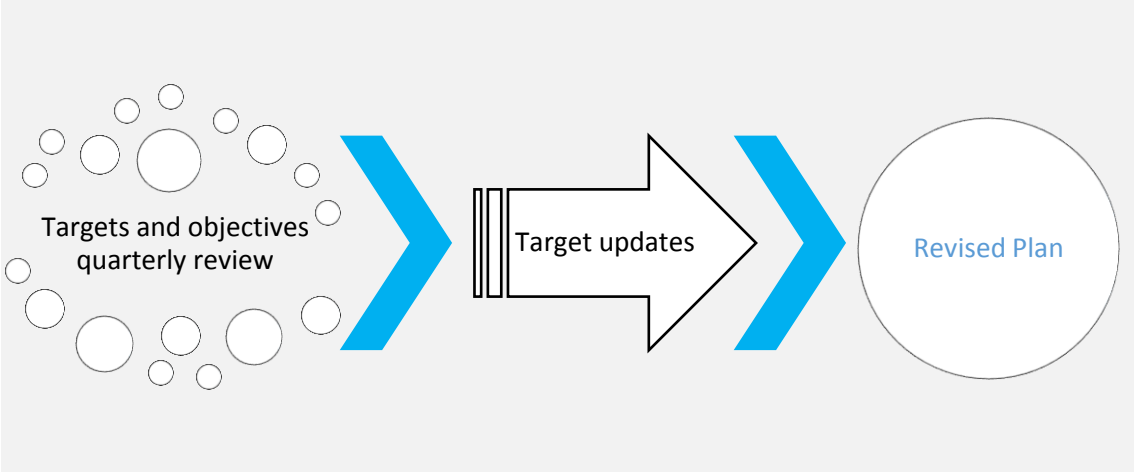
30.1 Statistical Analysis and Reporting

Data on the key performance indicators (KPI) will be collected each month using electronic data gathering programs. The data will be reviewed by SPEM staff and the statistician will perform relevant statistical analysis and the information will be sent to the officers for discussions with department heads. The information will be presented to the CMT and Board of Directors for decision-making.

Plan yearly: Operations

Program	2017	2018	2019	2020	2021
Volume of Water	>148 mn m^3 production	>148 mn m^3 production	>162 mn m^3 production	>184 mn m^3 production	>210 mn m^3 production
Level of service	24-hour availability	24-hour availability	24-hour availability	24-hour availability	24-hour Availability
Water Quality	100% WHO Standard	100% WHO Standard	100% WHO Standard	100% WHO Standard	100% WHO Standard
Sewerage services	24-hour availability	24-hour availability	24-hour availability	24-hour availability	24-hour availability

A Schematic: **Plan Evaluation and Revision**



ASSESSING THE STRATEGIC IMPORTANCE OF KEY RESOURCES

31.0 Plan Assessment

Since the 2017 – 2021 strategic plan is vital to the financial viability of GWI, it is pertinent that its key components should be assessed using an appropriate theoretical concept, Barney's (VRIN)[77] which is used to assess the competitive value of key characteristics of organizations for their financial viability.

A review of the plan allows the identification of human resources skills, production processes and research as key resources for the Corporation which can be evaluated to determine their contributions to GWI's performance in the past and its projected performance during the plan years. We can use the following factors to rate these elements.

31.1 Are the resources competitively valuable?

The Corporation's human resources, production processes and research and development (R&D) resources are competitively valuable since they are directly relevant to the Corporation's strategy. The human resources skills comprise of engineers with theoretical and practical training and skills in water production and personnel who are engaged in well drilling. Research and development provides information derived from hydrological surveys of ground water sources for the identification of suitable geographic locations based on soil formation and characteristics, depth of water sources, kind of filter media and techniques for drilling and development. Research is also valuable for the determination of suitable chemical processes necessary for the treatment of surface water that is easily contaminated and is another source of supply for the Corporation. Quality control data is also collected, analyzed and used to ensure that water production meets World Health Organization (WHO) standards for quality control. Since GWI is the sole supplier of water services in the country, it is immune from competition which would normally serve as a catalyst for innovation. Therefore, it relies on research to obtain data and information on service needs and water quality and the information that is derived from research is used to develop strategies to strengthen its business model and customer value proposition. Finally, it uses research to obtain feedback from its customers and citizens regarding service needs, especially in new communities or for existing services where customers need to raise the Corporation's awareness of service deficiencies.

31.2 Are the Resources rare? And Inimitable?

The Corporation's human resource, production processes and research and development resources are rare and unique in the industry. While it can be argued that these resources can be common to other entities in the industry, nevertheless due to the virtual monopoly of the industry (there are only a few suppliers of water from private wells and one bottled water manufacturer, and governmental approval has to be obtained for well drilling, it seems that this restricts the potential operations of other water entities, therefore, GWI operates in an industry that has no competition, thus its resources are rare and have unique applicability.

The discussion regarding GWI's virtual monopoly in the industry seems to satisfy the criteria for its resources to be inimitable. Given the complexity of water service production and distribution, it is easily assumed that in the context of Guyana, with the government's control of water

[77] Barney's (1991) "Valuable, Rare, Imperfectly Imitable and Non-substitutable (VRIN) framework.

resources and the relatively small population and monopoly of the market, it would be difficult for a competitive entity to enter the market.

31.3 Are the Resources invulnerable to the threat of substitution from different types of resources and capabilities (Non-substitutable)? And Passing the VRIN Test

There are no threats of substitution (non-substitutable) for resources and this is directly attributable to the virtual monopoly status of GWI. GWI's resources capabilities pass all four (4) VRIV tests with high (valuable) marks due to the highly technical nature of its operations and the specificity of its resources to the industry. A table of the VRIN is shown below.

Business unit	Resources	VRIN TEST				Most Superior Resources	Impact on competitative advantage
		Competitive Advantage		Sustainability of Competitive Advantage			
		Valueable	Rare	Inimitable	Non Subsitituable		
Operations	Human Resources	Yes	Yes	Yes	Yes	1	Sustainable advantage
	hydrological surveys	Yes	Yes	Yes	Yes	2	Sustainable advantage
	Selection of filter media	Yes	Yes	Yes	Yes	3	Sustainable advantage
	Selection of drilling techniques	Yes	Yes	Yes	Yes	4	Sustainable advantage
	Surface water treatment selection	Yes	Yes	Yes	Yes	5	Sustainable advantage
	Water quality	Yes	Yes	Yes	Yes	6	Sustainable advantage

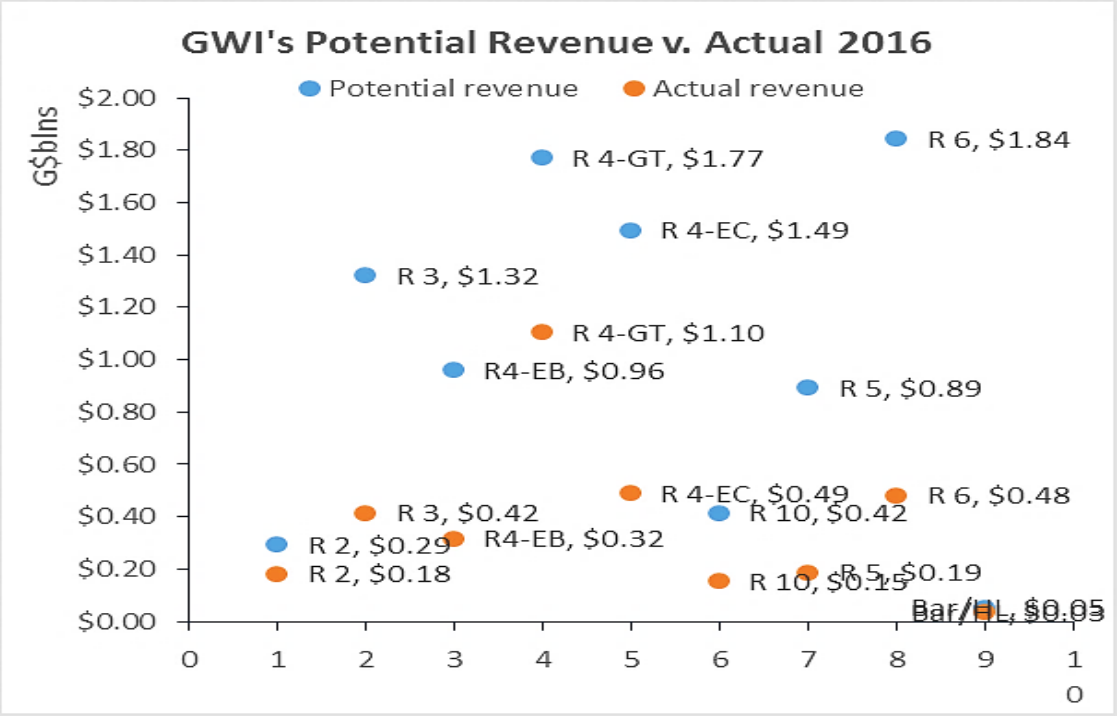
APPENDIX A: **Estimated Economic, Revenue Loss, and NRW Calculation**

Guyana Water Inc.
Revenue, Consumption, NRW est. Analysis 2016

Categories used for calc.	day	mth	annum	%	dif.	analytics
water consumption expressed in terms of the number of connections and consumption at each one						
water consumption formula						
$Q_c = Ncp$						
where:						
N = total number of connections (cus. base)	183370					
c = average water consumption, in m3/persor	0.21					
p = average number of persons per connectic	4					
			millions of m3			est/fin/econ loss ($bln)
FMO Calc using revenue	152.5	4,637	55,649	37.5%		fin. econ.
est. water consumption (establised model)	156.2	4,752	57,024	38.5%	annual consumpt	$5,568 $5,651
Total water production 2016 in mns/m3			148,302		est. UAF/NRW	
est. quantium of water UAF 2016				-61.5%	91,277 92,652	
The annual utility revenues will depend on the tariff and the quantity of revenue water						
annual utility revenue formula						
$R = T Q_r 365$			revenue in billions ($)			est. revenue loss (mns)
where:			scen0	scen1	scen2	scen0 scen1 scen2
R = annual revenues from water sales, in $/year			$3,372	$3,478	$3,395	$186.1 $106.2 $22.4
T = unit tariff (or revenue) collected, in $/m3				$61		
Qr = revenue water (annual quantium mns/m3)				57,024	55,649	

notes
1. The analysis utilised purely financial modeling to estimate consumption
2. All conclusions were establised using the strictest methodologies utilised in the international water utility industry

Source: Guyana Water Inc., SPEM Unit



The graph depicts potential versus actual revenue at the end of 2016, using a similar methodology for calculating the estimated financial and economic loss. The model only considers water production/output. However, potential revenue is calculated using a nominal price point of $61/m3 "lowest per/m3 tariff of GWI".

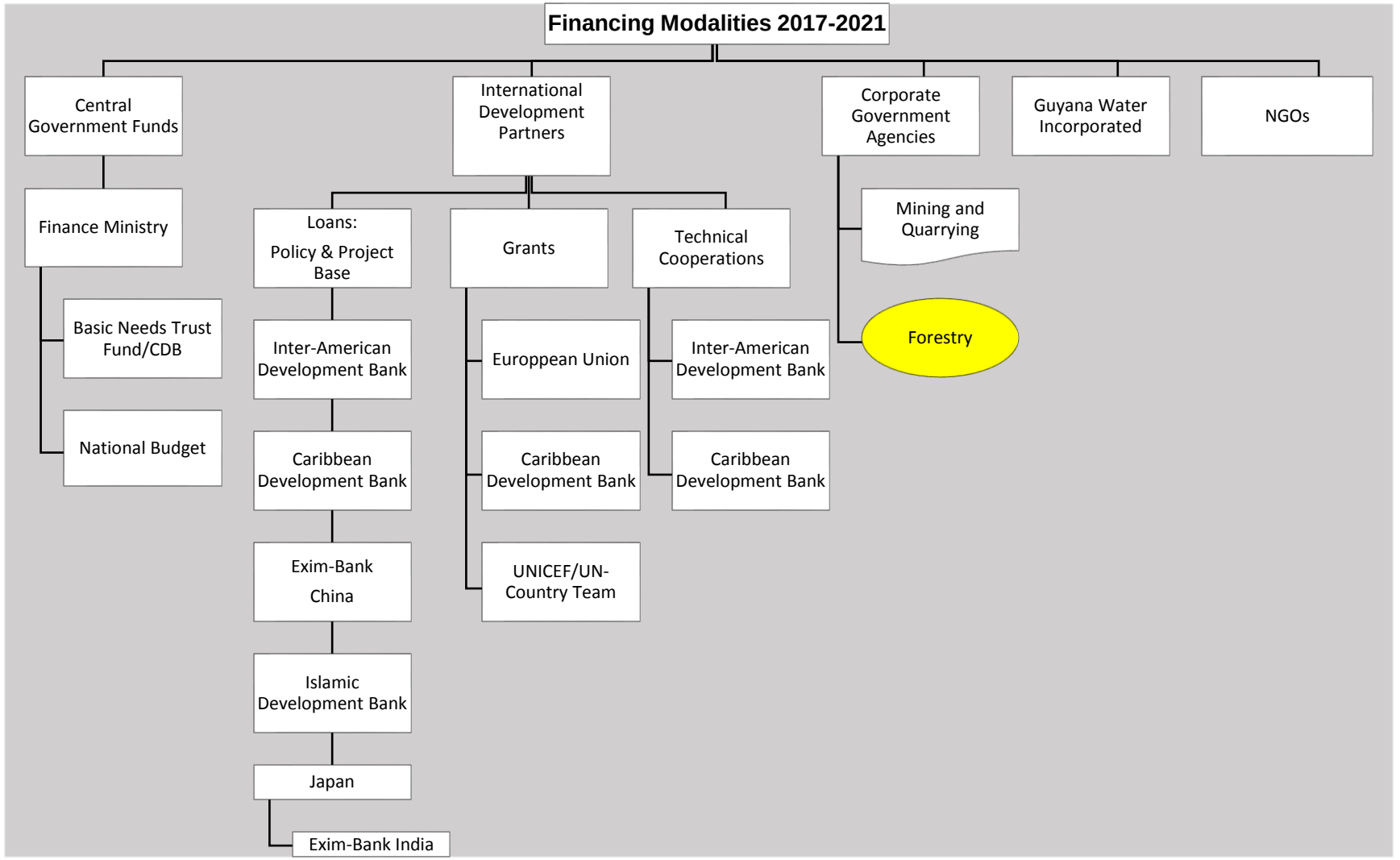
APPENDIX B: **Operations – Customer Coverage Projections**

	Total Customer	Jul-17	%coverage	Dec-17	%coverage	Jul-18	%coverage	Dec-18	%Coverage	Jul-19	% Coverage	Dec-19	% Coverage	20-Jul	% coverage	Dec-20	%coverage
Region 2	10543	5628	53%	5828	55%	6829	65%	7829	74%	8829	84%	9827	93%	10929	104%		
Region 3	29788	12103	41%	12403	42%	16403	55%	20403	68%	24403	82%	28403	95%	32403	109%		
Region 4- GT	32047	19123	60%	21123	66%	25123	78%	29123	91%	33123	103%						
Region 4-ECD	34557	16230	47%	16480	48%	20480	59%	24480	71%	28480	82%	32480	94%	36480	106%		
Region 4-EBD	18903	7679	41%	7929	42%	11929	63%	13929	74%	15929	84%	17929	95%	19929	105%		
Region 5	13622	4573	34%	4823	35%	8823	65%	12823	94%	16823	123%						
Region 6	31049	13622	44%	13872	45%	17872	58%	21872	70%	25872	83%	29872	96%	33872	109%		
Region 7	1944	1479	76%	1529	79%	2029	104%										
Region 10	7662	4514	59%	4764	62%	6764	88%	8764	114%								

APPENDIX C: **Summary of Population and Regional Census**

Regions	Number of Households	Number of Males	Number of Females	Total Population
Region 1	4,849	14,134	12,908	27,042
Region 2	12,081	23,131	22,883	46,014
Region 3	30,979	52,850	53,069	105,919
Region 4	89,360	144,013	152,396	296,409
Region 5	13,711	24,513	24,661	49,174
Region 6	31,254	53,969	53,985	107,954
Region 7	4,571	9,019	8,251	17,270
Region 8	2,371	5,939	4,953	10,892
Region 9	4,892	12,210	11,450	23,660
Region 10	10,557	19,068	19,779	38,847
Total	**204,625**	**358,846**	**364,335**	**723,181**

APPENDIX D: Financing Modalities Framework



Guyana Water Incorporated Resource Framework for New Strategic Plan 2017-2021			
DPE	**Agency Name**	**Development Partner Strategic Focus**	**Financing/comment**
1**	Canadian International Development Agency [CIDA]	CIDA supports policy reform and investment by stimulating bilateral relationships which include private sector, NGO and institutional linkages, and government-to-government co-operation.	
1**	European Union [EDF]-European Development Fund	EC supports programmes for rural and natural resources development including integrated watershed management. Thoug3h a large part of the assistance is channeled to government implemented bilateral programmes, projects undertaken by NGOs are also supported.	Grant resources may be very possible
1**	UK Department for International Development [DfID]	DFID's partners include members of the government, private sector, NGOs, civil society and the research community. One of the priority areas is promoting increased investment in clean water.	
1**	Japan Bank for International Cooperation [JBIC]	JBIC supports economic infrastructure development, poverty reduction and environmental improvement and protection. (Bilateral Partner)	Possible grant funding for water sector/projects. To be discussed with Ministry of Foreign Affairs
1**	United Nations Children's Fund [UNICEF]	UNICEF supports developing and implementing a range of replicable models for water and sanitation sector.	
1**	The World Bank	The World Bank is partnering with various organisations to reduce poverty and improve living standards. Among the focus areas is infrastructure development, which includes the water and sanitation sector.	Possible resource availability given previous operations and support in the sector.
1**	Inter-American Development Bank – [IADB]	IDB-COUNTRY Strategy focuses on sustainable energy, natural resource management, private sector development, and public sector management. Indigenous Amerindian populations' needs and particularities are being addressed in a cross-cutting manner.	Funds are currently available for the Water Sector in the Future funding cycle. Grants for technical support
2*	Islamic Development Bank-[IsDB]	Possible funding for water and sanitation infrastructure projects: These funds may be administered by IADB.	Funding are available for negotiation.
1**	Caribbean Development Bank-CDB	BNTF Program: strategic areas of the Guyana Government are (i) Education; (ii) Water and Sanitation; and (iii) Employment	9th Programme Cycle of funds are currently being negotiated by the Finance Ministry.
1**	Special Development Fund - CDB	Allocation of resources, attention shall be given to the disadvantages to development potential imposed by the limitations of the relative market sizes of the Eligible Member Countries, relevant economic and social indicators (including the level of economic and social infrastructure) and adsorptive capacity. Economic support infrastructure projects that are not necessarily self-liquidating, e.g.: water and sewerage	Possibility exist for accessing resources for water and sanitation sectors. Currently have a projection/envelope of US$165 million for this funding cycle. Funded by UKCIF & SDF.
2*	UK-CIF	Possible funding for water and sanitation infrastructure projects. Capital projects as well as projects of a Technical Assistance nature are eligible for financing from the UKCIF. Technical assistance interventions	Under review by CDB/UKCIF and the Finance Ministry

Guyana Water Incorporated Resource Framework for New Strategic Plan 2017-2021			
DPE	**Agency Name**	**Development Partner Strategic Focus**	**Financing/comment**
		from feasibility, through to preparation, implementation and evaluation will be eligible. Projects designed to provide critical infrastructure which lay the foundations for growth and prosperity, poverty reduction and increased resilience to climate change in the Caribbean.	
1**	Low Carbon Development Fund Framework – [Red+ funds]	To be discussed with the Low Carbon Management Unit, Ministry of the Presidency, and the Ministry of Finance.	Pending discussions Possible funding for the development of an energy strategy/policy and funding for hinterland projects.
1**	China	One of Guyana's bilateral development partner with substantial strategic interest in the area of water supply and distribution. Conditions may include total Chinese execution of projects, including Chinese products and materials.	Possible grant funding for projects (est. $5 mn). To be discussed with Ministry of Foreign Affairs.

Source: Ministry of Finance, UNDP, World Bank

Notes:
1**: current and/or old development partners
2*: new development partners to be engage

APPENDIX E: **Tariff Structure (Approved by the PUC)**

Water					
Metered	**Fixed Charges (Monthly)**	**Consumption Charges**			
		0-12 m^3	**up to 20 m^3**	**up to 30 m^3**	**> 30 m^3**
Untreated Area - Residential	$300	$60.90	$73.08	$100.80	
Treated Areas - Residential	$300	$76.13	$95.16	$112.00	
Untreated Area -Non Residential	$2,000	$100.80		$126.00	$170.10
Treated Areas - Non Residential	$2,000	$112.00		$140.00	$189.00
Unmetered	**Monthly**	**Monthly**			
Untreated Area - Residential 1	$300	$1,000			
Untreated Area - Residential 2		$1,425			
Treated Areas - Residential 1		$1,500			
Treated Areas - Residential 2		$2,225			
Untreated Area -Non Residential Band 1	$500	$1,890			
Untreated Area -Non Residential Band 2	$1,000	$3,150			
Untreated Area -Non Residential Band 3	$2,500	$8,505			
Untreated Area -Non Residential Band 4	$5,000	$12,758			
Untreated Area -Non Residential Band 5	$9,500	$21,263			
Treated Areas - Non Residential Band 1	$500	$2,100			
Treated Areas - Non Residential Band 2	$1,000	$3,500			
Treated Areas - Non Residential Band 3	$2,500	$9,450			
Treated Areas - Non Residential Band 4	$5,000	$14,175			
Treated Areas - Non Residential Band 5	$9,500	$23,625			
Hinterland (Small Towns) - Residential	$300	$700			
Hinterland (Small Towns) - Non-Residential Band	$300	$1,500			
Hinterland (Small Towns) - Non-Residential Band	$500	$3,000			
Hinterland (Small Towns) - Non-Residential Band	$2,000	$5,000			

APPENDIX F: **Monthly Revenue Target (G$ mns) 2017**

Guyana Water Inc.

Revenue Outloook 2017

rev.est_2017	$4,097	1	2	3	4	5	6	7	8	9	10	11	12				
% share div.	$0													Q1	Q2	Q3	Q4
total	$184	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec				
Divisions	$184	4.5%	5.0%	7.5%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.5%	11.0%	15.5%	17.0%	24.0%	24.0%	35.0%
Region 2	$228	$10	$11	$17	$18	$18	$18	$18	$18	$18	$19	$25	$35	$39	$55	$55	$80
Region 3	$500	$23	$25	$38	$40	$40	$40	$40	$40	$40	$43	$55	$78	$85	$120	$120	$175
Region 4-GT	$1,398	$63	$70	$105	$112	$112	$112	$112	$112	$112	$119	$154	$217	$238	$336	$336	$489
Region 4-EB	$378	$17	$19	$28	$30	$30	$30	$30	$30	$30	$32	$42	$59	$64	$91	$91	$132
Region 4-EC	$573	$26	$29	$43	$46	$46	$46	$46	$46	$46	$49	$63	$89	$97	$138	$138	$201
Region 5	$227	$10	$11	$17	$18	$18	$18	$18	$18	$18	$19	$25	$35	$39	$55	$55	$79
Region 6	$557	$25	$28	$42	$45	$45	$45	$45	$45	$45	$47	$61	$86	$95	$134	$134	$195
Region 7-Bartica	$51	$2	$3	$4	$4	$4	$4	$4	$4	$4	$4	$6	$8	$9	$12	$12	$18
Region 10-LIN	$177	$8	$9	$13	$14	$14	$14	$14	$14	$14	$15	$19	$27	$30	$43	$43	$62
Regions 1, 8 & 9	$6	$0	$0	$0	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$2	$2	$2
Total	$4,097	$184	$205	$307	$328	$328	$328	$328	$328	$328	$348	$451	$635	$696	$983	$983	$1,434
mean	$410	$18	$20	$31	$33	$33	$33	$33	$33	$33	$35	$45	$63	$70	$98	$98	$143
median	$303	$14	$15	$23	$24	$24	$24	$24	$24	$24	$26	$33	$47	$52	$73	$73	$106
max	$1,398	$63	$70	$105	$112	$112	$112	$112	$112	$112	$119	$154	$217	$238	$336	$336	$489
min	$6	$0	$0	$0	$1	$1	$1	$1	$1	$1	$1	$1	$1	$1	$2	$2	$2

notes**

(i) projected revenue collection distributed by months

(ii) Its expected that months 10, 11, & 12 will see the greatest collections as per seasonal trend observed over a 5 yrs period

APPENDIX G: **Regional Administrative Boundaries and Customer Database[78] - 2016**

Region 2
Region 2 ranges from Pomeroon to Supenaam along the Essequibo Coast. It produces water from ground sources through the operation of Pump Stations, and a Water Treatment Plant (WTP). The WTP located at Lima on the Essequibo Coast services twenty-six (26) communities. There are 86 other communities which receive water from the pump stations along the coast.

Region 3
Region 3 operational areas include the Essequibo Islands and range from Present Hope on the East Bank of the Essequibo River to Free and Easy on the West Bank of the Demerara River. It produces water from ground sources and water treatment plants (WTP) which supply the distribution system.

Region 4 - East Bank Demerara
Region 4 – East Bank Demerara operational areas ranges from Eccles on the East Bank of Demerara to Timehri and the Linden Highway up to Silver Hill. There are pump stations which service thirty (30) communities and four (4) State facilities at Timehri. GWI ensures that the regional health facilities and schools are provided with a reliable supply of safe potable water from pumps which operate 24 hours daily supplying water to the treatment plants which operate booster pumps for between 14 to 16 hours daily.

Region 4 – Georgetown
Region 4 - Georgetown operational areas ranges from Kingston Seawall to the North, Agricola Village to the South, Atlantic Ville to the East, and to the West which is Lombard Street. Water is provided primarily from the Lamaha Canal (surface source) and wells located at Shelter Belt.

Region 4 - East Coast Demerara
Region 4 – East Coast Demerara has an operational area ranging from Industry, Crown Dam east half, to Bygeval Mahaica on the East Bank of the Mahaica River which is the boundary separating Regions 4 and 5. Water is provided from ground sources.

Region 5 - West Coast Berbice
Region 5 – West Coast Berbice has an operational area ranging from Wilhelmina, Mahaica on the East Coast of Demerara to Gelderland on the West Bank of the Berbice. Water is provided from ground sources.

Region 6
Region 6 has an operational area ranging from Mara to Molsen Creek and includes outlying areas such as Orealla, Siparuta, Baracara and New Forest. Service is provided 24-hour through WTPs located at New Amsterdam; Number 56 Village; Port Mourant; and Queenstown and pump stations and wells stations which provide water to the WTPs at Port Mourant, Number 56, and Queenstown.

[78] Population data taken from the 2012 Census.

Region 7

GWI provides service primarily to Bartica in this region from the Mazaruni River via a WTP located in Central Bartica.

REGION 10 – Upper Demerara – Berbice

Region 10 – Upper Demerara - Berbice has an operational area ranging from Regions 3, 4 & 5 to the North, Region 6 to the East and Regions. 7 and 8 to the West. Of this number, GWI provides service through water supply facilities at Wisroc, West Watooka, # 1 Mackenzie; LPC # 2 Mackenzie; and Amelia's Ward which source water from various sources of water including surface water from Demerara River, Creeks, and manmade lakes; Natural Springs; and Aquifers.

Hinterland

The Hinterland operations cover areas within Administrative Regions 1, 8, and 9. These three regions together account for a total population of 61,594 with 12,112 households.

Guyana Water Inc.
Macro-Statistics on Water Infrastructure and Customers

Description	Regional Statistics										Grand	descriptive stats			
	2	3	4-GT	4-EC	4-EB	5	6	7	10	1,8,&9	Total	mean	medi	max	min
no. wells	8	31	19	20	16	12	28	0	3	0	**137**	14	14	31	0
no.treatment plants	1	3	3	3	3	1	4	1	5	0	**24**	2	3	5	0
cur. customer-base	8884	29872	32061	34544	19412	13593	32863	1943	7644	2910	**183726**	18373	16503	34544	1943
no. cus./Tw	2053	10079	19534	7979	12993	2841	13269	0	7644	0	**76392**	7639	7812	19534	0
no. cus./Utw1	6831	19793	12527	26565	6419	10752	19594	1943	0	2910	**107334**	10733	8792	26565	0
no. metered/cus.	5638	11984	19358	16005	7649	4217	15411	1450	4472	0	**86184**	8618	6644	19358	0
no. unmetered/cus.	3246	17888	12703	18539	11763	9376	17452	493	3172	0	**94632**	9463	10570	18539	0
no. commercial/cus.	299	585	1637	797	523	518	1000	101	241	0	**5701**	570	521	1637	0
no. domestic/cus.	7969	25827	25855	27620	15441	11226	27859	1445	5804	0	**149046**	14905	13334	27859	0
no. industrial/cus.	113	103	157	114	77	57	226	45	60	0	**952**	95	90	226	0
no. institutional/cus.	15	47	3	37	50	42	51	8	11	0	**264**	26	26	51	0
no. no-charge/cus.	488	3310	7597	5976	3321	1750	3727	344	1528	0	**28041**	2804	2530	7597	0
no. sewerage/cus.	0	0	5563	0	0	0	0	0	0	0	**5563**	556	0	5563	0
no. schools	98	140	95	80	57	78	146	12	73	214	**993**	99	88	214	12
no. health facilities	31	43	18	12	21	17	30	2	29	132	**335**	34	25	132	2
Population cen.2012	46016	105919	126180	111936	58294	49174	107954	20280	38847	78864	**743463**	74346	68579	126180	20280
no. households (R.E	12081	30979	38040	33746	17574	13711	31254	5094	10557	16683	**209719**	20972	17129	38040	5094
no. buildings	14248	35488	36827	35669	17014	15869	35787	5548	11805	14254	**222509**	22251	16442	36827	5548
no. business places	1077	2672	5862	2410	473	1138	2279	662	1089	875	**18537**	1854	1114	5862	473
ave. household size	4	3	3	3	3	4	3	4	4	5	**4**	4	4	5	3

description	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	notes**	
R.gdp forecast 17/2	4.2%	4.2%	4.2%	4.2%	5.3%	CPI	2.1% used to forecast revenue, including expenditure programming
% incr/covered ppl	10%	15%	20%	25%	30%	UCP	110288 est. uncovered population
Incr. in ppl/yr	11029	16543	22058	27572	33086	UHHs	27572 uncov/Hhs: additional cus. required to achieve opt'l break/even
uncov./Hhs/yr	2757	4136	5514	6893	8272		

Data Sources: GWI, Ministry of Public Health, Ministry of Education, BoS-Population Census 2012

APPENDIX H: **Calculating Debt and Asset to Equity Ratios**

Items	2015 (%)	2014 (%)	2015 debt /liabilities ($bln)	2015 shareholders equity ($bln)	2014 debt /liabilities ($bln)	2014 shareholders equity ($bln)
Debt/equity ratio	0.427	0.428	$3.201	$7.497	$2.659	$6.212
Asset/equity ratio	4.802	5.490	$35.998	$7.497	$34.107	$6.212

APPENDIX I: **Projected Expansion of Sanitation and Sewerage Services**

Type of Wastewater Solution	Region/ Location	Brief description/ technology	Feasibility study and estimates	Tariff arrangement
Central WWTP	Central Georgetown	Conventional WWTP e.g. Activated sludge or stabilization ponds	Necessary to determine size and appropriate technology	Adjustment to current tariff to accommodate increase capital and maintenance cost.
Central WWTP	Outside of central Georgetown – Alexander Village, Festival City, Guyhoc Park, Lodge	Simplified and Condominium Sewers- low cost sewers (smaller diameter, flatter gradient) taking sewage to Tucville or Georgetown network	Survey to determine willingness to connect and to pay	Adding of customers to database as sewerage customers
Central WWTP	Private Housing Development	Small conventional plants or package plants such as REGEN containerized plants	Cost of plants and additional cost for residential.	Who operates and maintains
Central WWTP	New housing schemes around the country	Small conventional plants or package plants such as REGEN containerized plants	Survey to determine willingness to connect and to pay	Operated by the Corporation or the NDC's. Tariff negotiated
Improved WWTP at Schools	Country-wide	Improved septic tanks and package plants (Clear Pod, etc.)	Education program and costing	Can be link to our key accounts
Central WWTP in the New Towns	Region 7, 8, 9	Activated sludge treatment, stabilization ponds	Necessary to determine size and appropriate technology	Operated by GWI- tariff to be included in water bill
Innovative Onsite sanitation facilities	Hinterland regions	Simple latrines/ VIP latrines/pour flush latrines/Septic tanks with clear.	Determine possible solutions	Contribution to NDC for maintenance services

APPENDIX I Cont'd: **Projected Expansion of Sanitation and Sewerage Services**

Sanitation	Indicators	2017	2018	2019	2020	2021
Sewerage disposal efficiency	100% - Sewer system % unplanned downtime	65%	75%	85%	95%	95%
	Ratio of volume entering to volume extracted at pump stations	100%	100%	100%	100%	100%
	Number of overflows on gravity side of system	TBD	TBD	TBD	TBD	TBD

APPENDIX J: **Regional Allocation of Customer Debt as at December 31, 2016**

Guyana Water Inc.

Debt Stock Accumulation 2016

Regions	Jan-16	Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	debt rate 2016		Share	Rank
Region 7-BAR	$54	$55	$57	$61	$44	$48	$49	$46	$46	$52	$53	$52	-$2	-3.5%	-1%	9
Region 2	$43	$35	$43	$51	$51	$59	$62	$65	$69	$80	$65	$34	-$9	-21.0%	-7%	10
Region 3	$652	$661	$651	$677	$686	$684	$697	$707	$717	$735	$731	$704	$52	8.0%	39%	2
Region 4-GT	$1,793	$1,768	$1,798	$1,819	$1,821	$1,842	$1,843	$1,843	$1,865	$1,893	$1,835	$1,793	$0	0.0%	0%	8
Region 4-EBD	$430	$422	$429	$405	$399	$405	$400	$403	$412	$420	$412	$393	-$36	-8.5%	-27%	11
Region 4-ECD	$1,364	$1,360	$1,376	$1,382	$1,385	$1,391	$1,402	$1,413	$1,413	$1,424	$1,425	$1,419	$55	4.0%	41%	1
Region 10-LIN	$296	$308	$326	$334	$328	$332	$328	$332	$336	$348	$335	$333	$37	12.4%	28%	3
Region 5	$159	$159	$169	$171	$173	$181	$187	$191	$191	$200	$187	$179	$20	12.5%	15%	4
Region 6	$866	$876	$896	$855	$850	$870	$870	$874	$881	$902	$900	$881	$15	1.7%	11%	5
Hinterland	$2	$3	$3	$3	$2	$2	$2	$2	$2	$3	$3	$3	$1	49.6%	1%	6
BLK WS	$1	$1	$0	$0	-$1	$0	$0	$0	$0	$0	$1	$1	$0	32.6%	0%	7
Total	**$5,661**	**$5,647**	**$5,747**	**$5,757**	**$5,739**	**$5,814**	**$5,840**	**$5,877**	**$5,934**	**$6,057**	**$5,948**	**$5,793**	**$132**	**2.3%**	**100%**	
mean	**$515**	**$513**	**$522**	**$523**	**$522**	**$529**	**$531**	**$534**	**$539**	**$551**	**$541**	**$527**	**$12**	**2.3%**		
median	**$296**	**$308**	**$326**	**$334**	**$328**	**$332**	**$328**	**$332**	**$336**	**$348**	**$335**	**$333**	**$1**	**12.4%**		
max	**$1,793**	**$1,768**	**$1,798**	**$1,819**	**$1,821**	**$1,842**	**$1,843**	**$1,843**	**$1,865**	**$1,893**	**$1,835**	**$1,793**	**$55**	**0.0%**		
min	**$1**	**$1**	**$0**	**$0**	**-$1**	**$0**	**$0**	**$0**	**$0**	**$0**	**$1**	**$1**	**-$36**	**32.6%**		

	Total	monthly growth rate										
Regions		Feb-16	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16
Region 7-BAR	2%	0%	5%	6%	-27%	8%	3%	-6%	-1%	12%	3%	-2%
Region 2	4%	-19%	21%	19%	0%	15%	6%	5%	5%	16%	-18%	-48%
Region 3	8%	1%	-1%	4%	1%	0%	2%	1%	1%	3%	-1%	-4%
Region 4-GT	0%	-1%	2%	1%	0%	1%	0%	0%	1%	1%	-3%	-2%
Region 4-EBD	-8%	-2%	2%	-5%	-1%	1%	-1%	1%	2%	2%	-2%	-5%
Region 4-ECD	4%	0%	1%	0%	0%	0%	1%	1%	0%	1%	0%	0%
Region 10-LIN	12%	4%	6%	3%	-2%	1%	-1%	1%	1%	4%	-4%	-1%
Region 5	13%	0%	6%	1%	2%	4%	3%	2%	0%	4%	-7%	-4%
Region 6	2%	1%	2%	-5%	-1%	2%	0%	0%	1%	2%	0%	-2%
Hinterland	51%	28%	0%	-1%	-22%	-10%	-8%	13%	15%	17%	7%	12%
BLK WS	-312%	-1%	-61%	-273%	74%	-155%	-7%	-33%	30%	30%	58%	25%
Total	**2%**	**0%**	**2%**	**0%**	**0%**	**1%**	**0%**	**1%**	**1%**	**2%**	**-2%**	**-3%**

APPENDIX K: **Comparative Cost Analysis 2015/16**

Guyana Water Inc.

comparative analytics 2015/2016

Regions	1	2	3	4	5	6	7	8	9	10	(4-3)	(6-5)	(10-9)	(8-7)	percentage change			
	NS2012	Cbase	Agg. Prod.		Prod. cost ($mns)		Tar. Billings ($mns)		Rev. Col. ($mns)		Incr.	Variance ($mns)			Pcost	blng	rev	outp
	NHS	2016	2015	2016	2015	2016	2015	2016	2015	2016	Prod.	TVC	Rev.Col	Tar.blng				
Region 2	**12081**	**10489**	4.79	4.80	$238.27	$238.88	$189.33	$166.11	$178.93	$183.30	**0.01**	$0.6	$4.4	-$23.2	0%	-12%	2%	0%
Region 3	**30979**	**31067**	18.00	21.67	$410.07	$475.24	$501.62	$475.36	$387.53	$415.06	**3.67**	$65.2	$27.5	-$26.3	16%	-5%	7%	20%
Region 4-EBD	**17574**	**19515**	15.29	15.77	$340.51	$436.98	$339.83	$305.56	$293.20	$317.60	**0.48**	$96.5	$24.4	-$34.3	28%	-10%	8%	3%
Region 4-GT	**38040**	**31859**	24.23	29.04	$679.69	$719.18	$1,023.21	$965.73	$909.33	$1,104.89	**4.81**	$39.5	$195.6	-$57.5	6%	-6%	22%	20%
Region 4-ECD	**33746**	**34473**	22.88	24.50	$480.30	$533.18	$561.24	$541.39	$392.54	$491.54	**1.62**	$52.9	$99.0	-$19.8	11%	-4%	25%	7%
Region 10-LIN	**10557**	**7552**	5.72	6.81	$26.72	$66.82	$151.32	$171.83	$121.52	$153.54	**1.08**	$40.1	$32.0	$20.5	150%	14%	26%	19%
Region 5	**13711**	**13520**	10.93	14.64	$375.07	$335.55	$195.95	$195.51	$221.59	$188.66	**3.71**	-$39.5	-$32.9	-$0.4	-11%	0%	-15%	34%
Region 6	**31254**	**31705**	22.36	30.21	$329.99	$413.01	$564.53	$528.93	$460.97	$483.43	**7.85**	$83.0	$22.5	-$35.6	25%	-6%	5%	35%
Regions 7,8,9,8	**16683**	**3192**	0.60	0.87	$94.40	$123.98	$58.05	$44.19	$49.04	$34.22	**0.27**	$29.6	-$14.8	-$13.9	31%	-24%	-30%	45%
Total	**204625**	**183372**	**124.79**	**148.30**	**$2,975.02**	**$3,342.84**	**$3,585.09**	**$3,394.61**	**$3,014.65**	**$3,372.24**	**23.51**	**$367.8**	**$357.6**	**-$190.5**	**12%**	**-5%**	**12%**	**19%**
mean	**22736**	**20375**	**13.87**	**16.48**	**$330.56**	**$371.43**	**$398.34**	**$377.18**	**$334.96**	**$374.69**	**2.61**	**$40.9**	**$39.7**	-$21.2				
median	**17574**	**19515**	**15.29**	**15.77**	**$340.51**	**$413.01**	**$339.83**	**$305.56**	**$293.20**	**$317.60**	**1.62**	**$40.1**	**$24.4**	-$23.2				
max	**38040**	**34473**	**24.23**	**30.21**	**$679.69**	**$719.18**	**$1,023.21**	**$965.73**	**$909.33**	**$1,104.89**	**7.85**	**$96.5**	**$195.6**	**$20.5**				
min	**10557**	**3192**	**0.60**	**0.87**	**$26.72**	**$66.82**	**$58.05**	**$44.19**	**$49.04**	**$34.22**	**0.01**	-$39.5	-$32.9	-$57.5				

datasource: BoS, finance div, CS&CR div., Ops. div. TVC: Total Variable Cost Tar.blng: Tariff billing

Notes**

1. All regions increased water production/2016, with Reg. 6 representing the largest increase followed by Reg. 4-GT, and Reg. 3
2. The hinterlands regions recorded the largest decrease in billings -24%, with a corresponding -30% decrease in revenue collection
3. The dif. in billings 2016 compared with 2015 resulted from: (i) Changes billing cycle; (ii) reduce estimation; & (iii) acc. corrections
4. Aggregate water production increased by 23.51 million/m3 [+18%] in 2016, compared with 2015
5. Reg. 10-LIN saw the largest growth rate (26%) in revenue collection followed by Reg. 4-ECD, Reg. 4-GT in 2016/15
6. Div5 saw a significant increase in production cost [+25%($74.9 MN)], and a [+6%($35.6 MN)] decrease in billings 2016/15
7. Increased expenditure represents: (i) electricity usage/pumping hours, (ii) chemicals, (iii) fuel, & (iv) labour
8. GWI recorded a [+10% ($328.8 MN)]/cost of water production, and a [+11.9% ($357.6 mn)]/revenue collection compared with 2015

APPENDIX L: **Regional Summary Analysis 2016**

Guyana Water Inc.
Regional Situation Summary Analysis 2016

Regions	R2	R3	R.4-GT	R10	R4-EBD	R4-ECD	R5	R6	R7	R1,8,9	Total	mean	median	max	min	
No. of employees	**36**	**86**	**135**	**55**	**65**	**62**	**41**	**92**	**11**	**14**	**597**	**60**	**59**	**135**	**11**	
Metered customer/accs	5567	11875	18933	4172	7538	15345	3941	14249	1447	156	83223	8322	6553	18933	156	thousands/accs
Unmetered customers/acc	4922	19192	12926	3380	11977	19128	9579	17456	489	1098	100147	10015	10778	19192	489	thousands/accs
Total customers/accs	**10489**	**31067**	**31859**	**7552**	**19515**	**34473**	**13520**	**31705**	**1936**	**1254**	**183370**	**18337**	**16518**	**34473**	**1254**	thousands/accs
Treated water (m3)	1.44	3.75	19.45	6.81	5.06	7.66	1.48	13.16	0.87	0.00	59.67	5.97	4.40	19.45	0.00	millions of m3
Unmtreated water (m3)	3.36	17.92	9.60	0.00	10.71	16.84	8.12	22.08	0.00	0.00	88.63	8.86	8.86	22.08	0.00	millions of m3
Total Production (m3)	**4.80**	**21.67**	**29.04**	**6.81**	**15.77**	**24.50**	**9.60**	**35.24**	**0.87**	**0.00**	**148.30**	**14.83**	**12.68**	**35.24**	**0.00**	millions of m3
Payroll Cost (PC)	$45.1	$66.5	$153.6	$66.5	$62.9	$52.3	$47.4	$84.1	$16.4	$5.2	$599.9	$60.0	$57.6	$153.6	$5.2	millions of gyd
Non-Payroll Cost (NPC)	$219.6	$537.8	$839.0	$297.9	$471.8	$716.8	$315.8	$849.1	$57.7	$62.5	$4,368.1	$436.8	$393.8	$849.1	$57.7	millions of gyd
Tot. Operating Cost	**$264.6**	**$604.3**	**$992.7**	**$364.4**	**$534.8**	**$769.1**	**$363.1**	**$933.2**	**$74.1**	**$67.6**	**$4,968.0**	**$496.8**	**$449.6**	**$992.7**	**$67.6**	millions of gyd
Metered revenue col.	$75.8	$201.2	$638.8	$44.1	$153.6	$294.0	$70.9	$234.0	$12.4	$0.0	$1,724.7	$172.5	$114.7	$638.8	$0.0	millions of gyd
Unmetered revenue col.	$39.4	$134.5	$131.0	$43.3	$92.2	$104.5	$74.0	$124.1	$2.8	$0.8	$746.6	$74.7	$83.1	$134.5	$0.8	millions of gyd
current revenue (r,I,c)	**$115.2**	**$335.7**	**$769.8**	**$87.4**	**$245.8**	**$398.4**	**$144.9**	**$358.1**	**$15.1**	**$0.8**	**$2,471.3**	**$247.1**	**$195.3**	**$769.8**	**$0.8**	millions of gyd
metered key accs	$41.0	$38.4	$224.3	$18.0	$33.2	$55.2	$5.3	$10.2	$2.2	$0.0	$427.7	$42.8	$25.6	$224.3	$0.0	millions of gyd
unmetered key accs	$27.1	$40.9	$110.8	$48.1	$38.6	$38.0	$38.5	$115.1	$13.4	$2.6	$473.3	$47.3	$38.6	$115.1	$2.6	millions of gyd
current rev key accs	**$68.1**	**$79.3**	**$335.1**	**$66.1**	**$71.8**	**$93.1**	**$43.8**	**$125.3**	**$15.7**	**$2.6**	**$901.0**	**$90.1**	**$70.0**	**$335.1**	**$2.6**	millions of gyd
current billing(r,i,c)	$111.8	$410.7	$691.1	$128.5	$255.8	$467.2	$161.3	$434.4	$27.9	$2.5	$2,691.2	**$269.1**	**$208.6**	**$691.1**	**$2.5**	millions of gyd
current billing key accs	$53.5	$67.0	$258.5	$43.6	$49.5	$66.9	$36.4	$95.6	$13.6	$0.0	$684.8	**$68.5**	**$51.5**	**$258.5**	**$0.0**	millions of gyd
Total Current Billing	**$165.4**	**$477.7**	**$949.6**	**$172.1**	**$305.4**	**$534.1**	**$197.7**	**$530.1**	**$41.6**	**$2.5**	**$3,376.0**	**$337.6**	**$251.5**	**$949.6**	**$2.5**	millions of gyd
Total Revenue Col.	**$183.3**	**$415.1**	**$1,104.9**	**$153.5**	**$317.6**	**$491.5**	**$188.7**	**$483.4**	**$30.8**	**$3.4**	**$3,372.2**	**$337.2**	**$253.1**	**$1,104.9**	**$3.4**	millions of gyd
Debt Stock by Regions	**$34.3**	**$703.8**	**$1,793.5**	**$393.5**	**$333.0**	**$1,418.7**	**$178.9**	**$881.2**	**$52.4**	**$3.4**	**$5,792.6**	**$579.3**	**$363.2**	**$1,793.5**	**$3.4**	millions of gyd
Share Categories	R.2	R.3	R.4-GT	R10	R4-EBD	R4-ECD	R5	R6	R7	R1,8,9	Total	Description				
reg. share of met/accs	6.7%	14.3%	22.7%	5.0%	9.1%	18.4%	4.7%	17.1%	1.7%	0.2%	100%					
reg. share of unmet/accs	4.9%	19.2%	12.9%	3.4%	12.0%	19.1%	9.6%	17.4%	0.5%	1.1%	100%					
reg.share customers	**5.7%**	**16.9%**	**17.4%**	**4.1%**	**10.6%**	**18.8%**	**7.4%**	**17.3%**	**1.1%**	**0.7%**	**100%**					
reg.share of tre.water	2.4%	6.3%	32.6%	11.4%	8.5%	12.8%	2.5%	22.0%	1.5%	0.0%	100%					
reg.share of untre.water	3.8%	20.2%	10.8%	0.0%	12.1%	19.0%	9.2%	24.9%	0.0%	0.0%	100%					
reg.share water produc	**3.2%**	**14.6%**	**19.6%**	**4.6%**	**10.6%**	**16.5%**	**6.5%**	**23.8%**	**0.6%**	**0.0%**	**100%**					
share of payroll by reg	7.5%	11.1%	25.6%	11.1%	10.5%	8.7%	7.9%	14.0%	2.7%	0.9%	100%					
share of non-payroll	5.0%	12.3%	19.2%	6.8%	10.8%	16.4%	7.2%	19.4%	1.3%	1.4%	100%					
share of tot.op.cost	**5.3%**	**12.2%**	**20.0%**	**7.3%**	**10.8%**	**15.5%**	**7.3%**	**18.8%**	**1.5%**	**1.4%**	**100%**					
share cur.rev (r,i,c)	4.7%	13.6%	31.1%	3.5%	9.9%	16.1%	5.9%	14.5%	0.6%	0.0%	100%	share of residential, industrial, & commercial cus.				
share of gross.rev	**5.4%**	**12.3%**	**32.8%**	**4.6%**	**9.4%**	**14.6%**	**5.6%**	**14.3%**	**0.9%**	**0.1%**	**100%**					
share billing	4.2%	15.3%	25.7%	4.8%	9.5%	17.4%	6.0%	16.1%	1.0%	0.1%	100%					
share of tot.billing	**4.9%**	**14.2%**	**28.1%**	**5.1%**	**9.0%**	**15.8%**	**5.9%**	**15.7%**	**1.2%**	**0.1%**	**100%**					
gr.rev as a share op.cos	**69%**	**69%**	**111%**	**42%**	**59%**	**64%**	**52%**	**52%**	**42%**	**5%**	**68%**	gross revenue is equal to total revenue collecton				
customer/emp. Ratio	**291**	**361**	**236**	**137**	**300**	**556**	**330**	**345**	**176**	**90**	**307**	employee to customer ratio				
production per custome	**38**	**58**	**76**	**75**	**67**	**59**	**59**	**93**	**37**	**0**	**67**	prod.per customer/month/m3				
billing per/mth/cus.	**$1,314**	**$1,281**	**$2,484**	**$1,899**	**$1,304**	**$1,291**	**$1,219**	**$1,393**	**$1,789**	**$164**	**$1,534**	average billing per/customer/account				
revenue per/cus/mth	**$1,456**	**$1,113**	**$2,890**	**$1,694**	**$1,356**	**$1,188**	**$1,163**	**$1,271**	**$1,326**	**$228**	**$1,533**	average revenue per/customer/account				

APPENDIX M: **Microeconomic and Financial Analysis 2016**

Guyana Water Inc.
Microeconomics and Financial Analysis 2016

Regions	1	2	3	4	5	7	8	9	10	11	12	13	deficit
	customer per year		customer per mth			percapita		per day		per m3			R &Cs.
	cost	revenue	cost	billing	revenue	cost	revenue	cos.	rev.	cost	billing	rev.	per m3
Reg.2	**$22,327.84**	**$17,475.01**	**$1,860.65**	$1,319.72	$1,456.25	**$5,089.46**	$3,983.30	$13.94	$10.91	**$48.80**	**$34.62**	**$38.20**	-$10.61
Reg. 3	$14,997.44	$13,360.23	$1,249.79	$1,275.10	$1,113.35	$4,398.88	$3,918.68	$12.05	$10.74	$21.50	$21.94	$19.16	-$2.35
Reg 4-EBD	$21,953.08	$16,274.60	**$1,829.42**	$1,304.81	$1,356.22	**$7,349.25**	**$5,448.26**	$20.13	$14.93	**$27.17**	$19.38	$20.14	-$7.03
Reg. 4-GT	$22,131.28	**$34,680.57**	**$1,844.27**	**$2,526.05**	**$2,890.05**	**$5,587.90**	**$8,756.46**	$15.31	$23.99	**$24.28**	**$33.25**	**$38.04**	**$13.77**
Reg. 4-ECD	$15,163.43	$14,258.74	$1,263.62	$1,308.72	$1,188.23	$4,669.91	**$4,391.29**	$12.79	$12.03	$21.33	$22.10	$20.06	-$1.27
Reg. 10-LIN	**$23,398.36**	**$20,331.00**	**$1,949.86**	**$1,896.09**	**$1,694.25**	$4,548.73	$3,952.42	$12.46	$10.83	**$25.95**	**$25.24**	$22.55	-$3.40
Reg. 5	**$24,332.07**	$13,954.18	**$2,027.67**	$1,205.04	$1,162.85	**$6,689.91**	$3,836.59	$18.33	$10.51	$22.47	$13.36	$12.89	-$9.59
Reg. 6	$12,771.28	$15,247.71	$1,064.27	$1,390.24	$1,270.64	$3,750.80	**$4,478.10**	$10.28	$12.27	$13.40	$17.51	$16.00	**$2.60**
Regs7,1,8,&9	**$42,553.02**	$10,728.54	**$3,546.09**	$1,154.36	$894.04	$1,721.24	$433.96	$4.72	$1.19	**$156.19**	**$50.84**	**$39.38**	-$116.81
Total	**$18,556.35**	**$18,390.35**	**$1,546.36**	**$1,542.70**	**$1,532.53**	**$4,705.14**	**$4,663.05**	**$12.89**	**$12.78**	**$22.94**	**$22.89**	**$22.74**	**-$0.21**
mean	**$22,180.87**	**$17,367.84**	**$1,848.41**	**$1,486.68**	**$1,447.32**	**$4,867.34**	**$4,355.45**	**$13.34**	**$11.93**	**$40.12**	**$26.47**	**$25.16**	**-$14.97**
median	**$22,131.28**	**$15,247.71**	**$1,844.27**	**$1,308.72**	**$1,270.64**	**$4,669.91**	**$3,983.30**	**$12.79**	**$10.91**	**$24.28**	**$22.10**	**$20.14**	**-$3.40**
max	**$42,553.02**	**$34,680.57**	**$3,546.09**	**$2,526.05**	**$2,890.05**	**$7,349.25**	**$8,756.46**	**$20.13**	**$23.99**	**$156.19**	**$50.84**	**$39.38**	**$13.77**
min	**$12,771.28**	**$10,728.54**	**$1,064.27**	**$1,154.36**	**$894.04**	**$1,721.24**	**$433.96**	**$4.72**	**$1.19**	**$13.40**	**$13.36**	**$12.89**	**-$116.81**

Guyana Water Inc.
Macro-Analytics of Performance 2016

Regions	Thousands						millions m3			millions ($)			Thousands ($)						
	1	2	3	4	5	6	7	8	9	10	11	12	(10/4)	(11/4)	(12/4)		PC	PC	BNG
	Popul.	Popul.	NHH	Cus.	Customers		water	Prod. m3		Prod.	Total	Rev.	COST	BILLING	REVENUE	DIF.	as %	as %	as %
	stats	covered	Census	Base	M	UNM	Prod.	T	UNT	Cost	Billing	Col.	per cus.	per cus.	per cus.	RPC-CPC	Billing	Rev	Rev
Reg.2	**46016**	**37341**	**12081**	**10489**	5567	4922	**4.80**	1.44	3.36	**$234.20**	**$166.11**	**$183.30**	**$22,328**	$15,837	**$17,475**	-$4,853	**71%**	**78%**	**110%**
Reg. 3	**105919**	**110599**	**30979**	**31067**	11875	19192	**21.67**	3.75	17.92	**$465.93**	**$475.36**	**$415.06**	$14,997	$15,301	$13,360	-$1,637	**102%**	**89%**	**87%**
Reg 4-EBD	**58294**	**69473**	**17574**	**19515**	7538	11977	**15.77**	5.06	10.7	**$428.41**	**$305.56**	**$317.60**	$21,953	$15,658	$16,275	-$5,678	**71%**	**74%**	**104%**
Reg. 4-GT	**126180**	**113418**	**38040**	**31859**	18933	12926	**29.04**	19.45	9.60	**$705.08**	**$965.73**	**$1,104.89**	$22,131	**$30,313**	**$34,681**	$12,549	**137%**	**157%**	**114%**
Reg. 4-ECD	**111936**	**122724**	**33746**	**34473**	15345	19128	**24.50**	7.66	16.84	**$522.73**	**$541.39**	**$491.54**	$15,163	$15,705	$14,259	-$905	**104%**	**94%**	**91%**
Reg. 10-LIN	**38847**	**26885**	**10557**	**7552**	4172	3380	**6.81**	6.81	0.00	**$176.70**	**$171.83**	**$153.54**	**$23,398**	**$22,753**	**$20,331**	-$3,067	**97%**	**87%**	**89%**
Reg. 5	**49174**	**48131**	**13711**	**13520**	3941	9579	**14.64**	1.48	13.16	**$328.97**	**$195.51**	**$188.66**	**$24,332**	$14,461	$13,954	-$10,378	**59%**	**57%**	**96%**
Reg. 6	**107954**	**112870**	**31254**	**31705**	14249	17456	**30.21**	8.12	22.08	**$404.91**	**$528.93**	**$483.43**	$12,771	$16,683	$15,248	$2,476	**131%**	**119%**	**91%**
Regs7,1,8,&	**78864**	**11356**	**16683**	**3190**	1603	1587	**0.87**	0.87	0.00	**$135.74**	**$44.19**	**$34.22**	**$42,553**	$13,852	$10,729	-$31,824	**33%**	**25%**	**77%**
Total	**723183**	**652797**	**204625**	**183370**	**83223**	**100147**	**148.30**	**54.64**	**93.66**	**$3,402.68**	**$3,394.61**	**$3,372.24**	**$18,556**	**$18,512**	**$18,390**	**-$166**	**100%**	**99%**	**99%**
mean	**80354**	**72533**	**22736**	**20374**	**9247**	**11127**	**16.48**	**6.07**	**10.41**	**$378.08**	**$377.18**	**$374.69**	**$22,181**	**$17,840**	**$17,368**	**-$4,813**			
median	**78864**	**69473**	**17574**	**19515**	**7538**	**11977**	**15.77**	**5.06**	**10.71**	**$404.91**	**$305.56**	**$317.60**	**$22,131**	**$15,705**	**$15,248**	**-$3,067**			
max	**126180**	**122724**	**38040**	**34473**	**18933**	**19192**	**30.21**	**19.45**	**22.08**	**$705.08**	**$965.73**	**$1,104.89**	**$42,553**	**$30,313**	**$34,681**	**$12,549**			
min	**38847**	**11356**	**10557**	**3190**	**1603**	**1587**	**0.87**	**0.87**	**0.00**	**$135.74**	**$44.19**	**$34.22**	**$12,771**	**$13,852**	**$10,729**	**-$31,824**			

NHH: National Household Stats2012 UNM: Unmetered customer UNT: Untreated water CPC: Cost per customer
Cus. Base: Customer base M: Metered customer T: Treated water RPC: Revenue per customer

APPENDIX N: **Programs Administered by IPID 2012-2016**

Item	Project Activity	Revised Budget Estimate	Expenditure to Date	% Complete	Comment
1	Supply and installation of 200mm, 150mm Transmission and 100mm Distribution Mains and Service Connection Upgrade in Lamaha Park	21,800,000	21,835,376	100%	Project Completed, in DL period
2	Supply and installation of 280mm HDPE Transmission Mains, 150mm PVC Distribution Mains and Service Connection Upgrades along Duncan Street, Campbell Avenue and Dyrey Lane - Between Vlissengen Road and Sherriff Street, Georgetown, Region #4	48,000,000	29,291,066	100%	Project Completed, in DL period
3	250mm Transmission main along Turkeyen Dam and Pattensen Dam	5,600,000	4,530,870	100%	Project Completed, in DL period
4	Project to effectively remove and dispose sludge at Shelterbelt	8,600,000	7,659,810	100%	Project Completed, in DL period
5	Completion of Drilling of Well in Sophia	35,000,000	27,728,525	70%	Works Ongiong
6	Completion of Construction of Ground Storage Tank at Sophia	36,600,000	37,432,925	50%	Foundation Completed, in DL period. Tank to be installed
7	Replacement of high voltage switch gears for frequency conversion project in GWI Shelterbelt Office	1,200,000	1,193,180	100%	Project Completed
8	Replacement of transmission and distribution mains and Service Connection Upgrade in Albouystown. Boundaries: Sussex Street - Independence Boulevard and Calendar Street - East Bank Public Road	43,300,000	15,412,375	10%	Works under this project were delayed due to the community representative requesting that the entire road be resurfaced after each road cut. Consequently, this project commenced on the 13th Oct 2016
9	Guyhoc Park distribution main rehabilitation and service connection upgrade	4,100,000	-	10%	This project was ammicably terminated since the works will be completed under the WSSIIP program
10	Replacement of Distribution Main at Meadow Bank	8,000,000	6,481,800	100%	Project Completed, in DL period
11	Installation of distribution network in North Sophia (area west of University of Guyana Compund, North of Dennis Street and East of Eastern Highway)	12,000,000	3,594,282	80%	Works Ongiong and are scheduled to be completed within the contract duration
12	Supervision	2,000,000	2,130,202	75%	ongoing
	Total	**226,200,000**	**157,290,411**	**75%**	

APPENDIX O: Energy Audit and Costs on Page 202

Outcomes	Outputs	Activities/Tasks	Timelines	Indicators	Means of Verification	Assumptions	Inputs	Responsible Parties	Cost
Outcome 1	Output 1								
Reduce Operational Energy Cost	Reduced energy index (Energy to distribute a m^3 of water) from 0.25 to 0.21 KWh/m^3	Conduct Investment Grade Energy Audit of Pump (Submersibles & Surface)	40 % of all pumps not done in 2015 by December 2016.(5% in First Qtr).	Identify submersible pumps operating below 70 % and centrifugal below 78%	To be confirmed using consultants pumping system's template provided	Aquifier Specific Capacity Remains Constant/Division requires no change in system	Measuring Equipment/Resource Personnel (Electrician)	Technical Services/Procurement /Finance & Respective Divisions	$ 35,000,000
		Monitor Energy Consumption	All Facilities By Sept 2016	Recording of GWI meter readings	Logsheet Information Capturing System (LICS)	GPL/GWI both agrees with readings provided	Energy Meters	Technical Services/Procurement /Finance & Respective Divisions	$ 10,000,000
		Manage Energy Consumption	20 facilities to have equipment installed by December 2015	Constant pressure in network	Installed Data Loggers	Network is tight so and system parameters varies with demand	Variable Speed Drive	Technical Services/Procurement /Finance & Respective Divisions	$ 40,000,000
		Tariff Adjustments	Jun-16	Tabulation of benefits/Application for tariff change	Inspection Certificates/Adjustments in GPL billing rates	Division will not seek to increase the pumping rates	Data Entry/Elect. Engineer (Available)	T/Services/GPL/Min Pub Infrastructure	$ 2,000,000
		Train Personnel (Audit & Maintenance)	Feb - Mar & July - Aug 2016	Schedule training (production engineers/electricians and fitters)	Provide list of trainees to HR/Improve systems efficiency	Personnel apply what is taught	Measuring Equipment (some available)	T/Services Dept	
		Procurement of suitable replacement & spares	Apr-16	Provide list of all pump installed and spares needed	Orders placed in Oracle	Spares and replacement is received	Pumps and pump spares	Technical Services/Procurement /Finance	$ 6,000,000
		Identify & set up test bench for pump testing	Apr-16	Energy Index is expected to average 0.21 KWh/m3 when of completed facilities	Order placed in Oracle	A redundant well is available to carry out testing	Electric Chain Hoist/Tripod	Technical Services/Procurement /Finance	$ 3,000,000
		Improve power conversion	80 % of facilities by April 2016	2% reduction in demand charges applied	KVA charges in (GPL) energy bill	Minimum charges are applied	Capacitor banks	Technical Services/Procurement /Finance	$ 3,000,000
		Model 2 existing low pressure pipe network	May-16	Improve customer Level of Service	Level of Service Maps	Software Licence Updated/ All customers in area metered	Access to Watergem Software/Boundary Valves/DMA	T/services & Respective Division	
	Customer Satisfaction	Add Redundancy to Power Supply	One by July 2016 (Approvals to be sought in 2016 fist qtr)	Provide loss operation hours in selected pilot area	Reduced system downtime (LICS)	Permission is granted by the relevant authorities	Electrical transmission line/Building to place generator (generator available)	Technical Services/GUYSUCO/Procurement/Finance & Respective Divisions	$ 20,000,000
		Improve Power Quality	6 pumping facilities to receive improved power quality by June 2016/	Reduction in GPL operating loss hours in 6 pilot	Reduced system downtime in Logsheet Information Capturing System (LICS)/Increased asset life	Equipment available to cater for variances we experience	Volltage Balancer/Regulators	Technical Services/Procurement /Finance & Respective Divisions	$ 6,000,000
			All commercial Offices by Dec 2016 on solar power	Reduction in GPL operating loss hours in all offices	Loss Hours Due To Power Outages	Sufficient space available at office location to mount solar panels	Solar Panel	Technical Services/Procurement /Finance & Respective Divisions	$ 45,000,000
		Provide real time system data of 10 remote facilities	Jun-16	Reduce Fault response time	Real time update	Device can utilize SIM used in pressure flow logger	Voltage Current Data Logger	T/Services	$ 3,000,000
		Improve Protection System of all facilities	Jul-16	Reduce Asset Failure	Improved Asset Life	Equipment available to cater for variances we experience	Electrical Protective Devices	T/Services/Procurement/Finance	$ 5,000,000
									$ 178,000,000

Appendix P: Strategic Outcomes and Goals Framework 2017-21

Guyana Water Inc. **Strategic Outcomes, and Goals Framework 2017-2021**						
Outcomes	**Key goals**	**Key Performance Indicators (KPIs)**	**Measurement**	**Baseline**	**Results**	**Accountable for Results**
The Health of Guyana's people	Reduction of the risk of waterborne diseases such as cholera, dysentery, and typhoid fever	% of coastal population having access to the drinking water system	% of coastal population having access comparing to National Census 2012	95%	100% of coastal population having access to potable water system by 2021	Operations
		% Hinterland communities with access to water	% of Hinterland communities with access comparing to figures Ministry Indigenous Affairs/GWI/Bureau of Statistics/UNICEF	45% (Guyana MICS2014, 40%/UNICEF)	75% of Hinterland communities receiving potable water by 2021	PIPB
		pH: 6.5-8.5	% of samples achieving international levels for total pH	41%	95% by 2021	Operations /WQD
		Turbidity (NTU) <5	% of samples achieving international levels for total Turbidity	73%	100% by 2021	Operations /WQD
		Iron (mg/l) <0.3	% of samples achieving international levels for total iron	42%	95% by 2021	Operations /WQD
		Aluminum <0.2	% of samples achieving international levels for total aluminum	24%	95% by 2021	Operations /WQD
		Total Coli	% of samples achieving international levels for total coli form	25%	95% by 2021	Operations /WQD
		E. coli/mg/l, 0	% of samples achieving international levels for E.coli	90%	100% by 2020	Operations /WQD
		Sewer system	% Unplanned downtime	N/A	95% by 2021	Operations
		# of new water quality labs established	# water quality labs servicing treatment plants.	1 central lab currently in operation	Creation of labs as needed.	Operations/ WQD

Guyana Water Inc. **Strategic Outcomes, and Goals Framework 2017-2021**						
Outcomes	**Key goals**	**Key Performance Indicators (KPIs)**	**Measurement**	**Baseline**	**Results**	**Accountable for Results**
Customer Satisfaction	Drinking water 24hours /7days a week	% of customers having access 24/7.	# of customers with access 24/7 of the total customer base.	55%	2021: 100% 24h/day; 7days/week	Operations
	Drinking water without Fe	Fe in produced and delivered water	% of samples achieving international levels for iron at source/midpoint/final/distribution	N/A	Meeting international standards	Operations
		# of water treatment plants	# water treatment plants constructed and operational according to Strategic Plan 2017-2021	27	27 providing treated water by 2021	Operations
Improve financial sustainability of GWI	NRW to be reduced from > 65% to 48% in by 2021	Ratio of metered customers of the total customer base.	# meters installed	45%	100% by 2021	Operations
		# of bills, correctly generated.	# billing queries processed	TBD	>95% bills generated.	CS&CR + Regions
		% of bills paid within the 28-day cycle	Customer Debt Aging Schedule showing collections efficiency.	95%	100% collections efficiency by 2021	CS&CR + Regions
		Commercial loss due to inaccuracies in the customer database (NRW)	Matching field verification of service connections with the customer database and ensuring accuracy.	N/A	100% accuracy	Regions
		Physical loss through leaks.	Data from DMA's	N/A	<48% by 2021	Regions
	Finance	Restructure/implementation of new tariff	GWI to prepare proposal and engage PUC on tariff restructuring	N/A	Approval for new tariffs	CS&SR
		Operational break-even	financial system (operational cost/revenue/tariff)	N/A	Break-even 2021?	FiMD

Guyana Water Inc. **Strategic Outcomes, and Goals Framework 2017-2021**						
Outcomes	**Key goals**	**Key Performance Indicators (KPIs)**	**Measurement**	**Baseline**	**Results**	**Accountable for Results**
Job satisfaction of GWI staff	100% performance of all staff	Target achievements	Evaluations for target performance	N/A	100% target achievement	All departments

APPENDIX Q: Strategic Investment Programme 2017-2021

Guyana Water Inc. **Strategic Investment Programme 2017-2021**			
Functional Areas	**Region**	**Project/Activity**	**Budget (G$bln)**
Water Production and Quality	1	1. Design of Water Treatment Plant for Mabaruma and Port Kaituma. Possible treatment includes: a. Slow Sand Filters b. Pre- fabricated treatment units 2. Survey riverain communities that need mini water systems and identify existing wells and hand pumps.	G$18,615 bln
	2	1. Design of a new Water Treatment Plant for the Somerset to Charity Areas. To service Walton Hall to Charity 2. Explore treatment options for the Lima Sands well station.	Currently unfunded
	3	1. Construction of Water Treatment Plant at Uitvlugt 2. Design of Expansion of the Pouderoyen and Fellowship Water Treatment Plants. Design of a new well for Vergenoegen. 3. Design of transmission network to transmit water from Farm to Vergenoegen Water Treatment Plant. 4. Design of Water Treatment Plant for the West Bank Demerara. La Parfait Harmony and Canal #1 5. Identify Water Resources and treatment options for Leguan. 6. Identify Water Resources and treatment options for Wakenaam.	Currently unfunded
	4-ECD	1. Design for Friendship Water Treatment Plant – Aerators, Rapid Gravity Filters and pumping station. 2. Design of 2nd well for Friendship Water Treatment Plant or the Design of Transmission Main to send water from Non Pariel Industrial Site and Bachelor Adventure to Friendship Water Treatment Plant for treatment or Design of a new Water Treatment Plant for Bachelor's Adventure, Non Pariel and Enmore. 3. Prepare Pre- Feasibility for a 50 MLD Water Treatment Plant inclusive of Transmission Mains, Storage Facilities and Booster System for surface Water at Hope to supply the Golden Grove to Bygeval Network, including Cane Grove.	
	4-EBD	1. Construction of Water Treatment Plant at Diamond 2. Rehabilitation of the Timehri Water Treatment Plant.	

Guyana Water Inc. **Strategic Investment Programme 2017-2021**			
Functional Areas	**Region**	**Project/Activity**	**Budget (G$bln)**
		3. Conduct feasibility study for the design of a Water Treatment Facility for Caledonia. 4. Expansion of the Covent Garden Water Treatment Plant. 5. Expansion of the Grove Water Treatment Plant. 6. Design of Transmission Main to transmit raw water from Providence to Covent Garden. 7. Design of a new well for Covent Garden. 8. Design of a new well for Grove and the design of mini water systems for Long Creek, Kairuni, Dora, Low Creek, Hairaruni, Laluni and Rivers View	
	4-GT	1. Design and construction a Water Treatment Plant in North Ruimveldt to cover Turkeyen, Sophia, Lilandaal, North and South Ruimveldt, Cummings Lodge 2. Removal and replacement of all asbestos water lines in the water distribution network	
	5	1. Design of new well for the Cotton Tree Water Distribution Network. This is intended to replace the Rosignol Well. 2. Commission the existing Cotton Tree Well and test performance 3. Expansion of the Cotton Tree Service Area to Ithaca 4. Construction of a Water Treatment Plant at Bush Lot	Currently Unfunded
	6	1. Construction of Water Treatment Plant at Sheet Archor Conduct feasibility and designs for the expansion of the following plants: 1. Expansion of the Port Moraunt Water Treatment Plant. 2. Expansion of the New Amsterdam Water Treatment Plant (Sanvoort to be included in New Amsterdam, Berbice) 4. Design of a water treatment plant at Black Bush. This activity is expected to result in the expansion of the treated water coverage and decommission at least one of the wells that serve this area (Yakusari/Mibicuri/Johanna) 5. Construction of a Water Treatment Plant to service communities from No. 50 to Tain	Currently Unfunded
	7	1. Design new filters and clarifier for the Bartica Water Treatment Plant. This includes and will result in the following: a. Increase through put from 140 cu.m/hr. to 300 cu.m/hr. b. Improve Distribution Management.	

Guyana Water Inc. **Strategic Investment Programme 2017-2021**			
Functional Areas	**Region**	**Project/Activity**	**Budget (G$bln)**
		c. Set-up water shop at Bartica.	
	8	1. Design of Water Treatment Facility for Mahdia. This includes the relocation and rehabilitation of the tank from Wisroc, Linden.	
	9	1. Review of the Water Catchment Design by the MOMR and E 2. Assessment of the impact of the hand dug wells.	
	10	1. Plan decommissioning, refurbishing and relocating of the old Amelia's Ward Water Treatment Plant. 2. Further rehabilitation of the Wisroc and Mackenzie Water Treatment Plant.	
Water Supply and Distribution	1	1. Design of Distribution Systems at: a. Mabaruma b. Port Kaituma to Jonestown.	G$16,133 bln
	2	1. Drill an additional well to provide service to Capoey, Hill Foot and Main Stay and surrounding communities.	
	4-ECD	1. Rehabilitation of DMA infrastructure for distribution systems 2. Incorporate elevated storage for Lusignan and Annandale Service Area.	
	4-GT	1. Ring Main Upgrade for Georgetown includes: a. Square of the Revolution to Mandela Avenue b. Shelterbelt to Kitty c. Shelterbelt to Avenue of the Republic via Church Street d. Avenue of the Republic to Mandela Avenue e. Extension of ring main along Aubrey barker to North Ruimveldt to "E" field Sophia and connect to Denis Street main 2. Conduct feasibility studies for Fire/ Grey Water main design for Distribution Network, inclusive of metering and installation 3. Design and build a Bottle Water Plant at Central Ruimveldt	
	6	1. Inter- link of Corentyne distribution systems	
	7	1. Design elevated storage system to service extremities of the distribution system such as the Five Miles area. 2. Design another Raw Water Intake from the Essequibo River. 3. Rehabilitation of the Instrumentation and SCADA System. 4. Identify satellite communities in the Essequibo River for water supply. Some of the communities identified include Aliki.	

Guyana Water Inc. **Strategic Investment Programme 2017-2021**			
Functional Areas	**Region**	**Project/Activity**	**Budget (G$bln)**
	8	1. Design of Distribution System and DMA at Mahdia 2. Procurement and distribution of C2 life savior filters for hinterland communities identified in studies conducted by the water quality department	
	10	1. Design of Elevated Storage and Distribution System for the following communities: a. Moblissa b. Silver Hill c. Rockstone	
Sanitation	National	1. Conduct survey of Waste water volume from cities and towns and construct a Waste Water Treatment Facility in Georgetown 2. Develop a waste water and sanitation best practices infomercial for children and city residents on the use of the Sewerage system 3. Develop a risk assessment for the Georgetown Sanitation system and future use 4. Conduct research on waste water treatment technology for new towns/communities/housing settlements/developments 5. Conduct research of biogas development for institutions and rural communities 6. Conduct survey to determine the opportunities for sewerage systems in Bartica, Linden, New Amsterdam, Anna Regina, Lethem, Rose Hall, Corriverton and Mabaruma.	G$2,482.2 bln
Finance and Revenue	3	1. Review of the DMA Infrastructure	G$2,565.2 bln
	4-ECB	2. Plan metering survey and installation for service area	
	6	3. Design of DMA and metering Programme for unmetered areas in Region #6	
	National	4. Procurement and implementation of New Customer Information & Billing System	
	National	5. Procurement and installation of 95,000 water meters. This is estimated to increase revenue by approximately 11%, $600 million annually for the period of the strategic plan	
Organization and Management	National	1. Procurement and Installation of HRMIS 2. Upgrade of ICT infrastructure, including main frames computers, procure desktop & laptop PCs, and Cyber Security software	G$1,571.1 bln

Guyana Water Inc. **Strategic Investment Programme 2017-2021**			
Functional Areas	**Region**	**Project/Activity**	**Budget (G$bln)**
		3. Design and construction of a Head Office in Georgetown 4. Construct and expansion of regional offices at Region 2, 3, 5, and 8 5. Construction of water quality mini-labs in all regions 6. Procurement of software package (IDEA) for the Audit Department 7. Procure and install of instrumentation for monitoring and securing water sources and sanitation infrastructure 8. Procurement of three (3) boats for coastal and hinterland operations	
GRAND TOTAL			**G$41,366.1 bln**

APPENDIX R: Policy Objectives and Strategies

Package Service	Policy Objectives	Strategies
Urban & Semi-urban Water Services	(1) Improve access to water services for all in urban and semi-urban areas	(1) Increase water services in low-income and semi-urban communities
		(2) Improve water production and distribution system
Hinterland & Small Towns Water Services	(1) Improve access to water services in hinterland and small towns	(1) Provide new water facilities in under-served and un-served hinterland areas and small towns
		(2) Institute appropriate mechanism for rehabilitation, operation and maintenance of existing facilities
Hinterland and Small Towns Sanitation & Hygiene Services	(1) Maximize health benefits through integration of water, sanitation and hygiene education interventions	(1) Promote safe sanitation and hygiene practices in all water beneficiary institutions and communities
Cross Cutting Issues		
Institutional Capacity Development and Governance	(1) Ensure that all institutional structures perform their roles efficiently and effectively	(1) Strengthen capacity of all institutional structures
	(2) Ensure that the water sector operates in a transparent and accountable manner	(1) Facilitate timely reporting and participatory discussion of results/issues in the water sector
		(2) Institute appropriate mechanism to track funds flow and investment in the sector
	(3) Ensure an effectively harmonised and aligned water sector	(1) development and implementation of a sector coordination framework
Finance	(1) Ensure sustainable financing of investment and operation and maintenance cost of water services	(1) Enhance the implementation of existing regulations on WRM
		(2) Develop and implement additional regulations on Dam Safety and Effluent discharges
		(3) Ensure the protection and conservation of river basins and wetlands for water security as well as enhanced resilience and adaptation to climate change
Water Resource Management	(2) Enhance public awareness and education in water resource management issues	(1) Strengthen communication campaigns and education to stimulate interest and promote support for WRM-related initiatives
		(1) Improve hydrological and meteorological data and information management

Package Service	Policy Objectives	Strategies
	(3) Improve access to water resource knowledge base to facilitate water resources planning and decision making	(2) Implement a developed Groundwater Management strategy to increase access to accurate groundwater resource information
		(3) Strengthen water quality monitoring and data assessment
	(4) Improve trans-boundary and international cooperation in the management of shared water resources	(1) Facilitate the development of bilateral and multilateral agreements/protocols to strengthen cooperation with countries in shared basins
Knowledge Management, Gender and M&E	(1) Promote generation, sharing and utilization of knowledge relevant to the water sector	(1) Support research, dissemination and discussion of research results on key issues affecting water and sanitation service delivery
		(2) Promote scientific investigations and research in water resources assessment, management and development
	(2) Provide evidence-based data and knowledge to improve decision making in the water sector	(1) Development and operationalization of a national M&E system to track sector progress
	(3) Ensure gender equity in participation in water and sanitation management at all levels	(1) Empowering both sexes to appreciate their complementary roles in water and sanitation service delivery

APPENDIX S: Estimated Water Output for the period of the Strategic Plan 2017-2021

183370 customers/accs/connections
148.30 water production/million/m3/water output
$61 pricing/tariff/lowest/m3
$5,247 billion/gyd/revenue forecast

Yrs	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
$5,247	127.30	124.74	115.95	124.19	148.30	179.65	187.73	195.82	203.90	211.99	220.07	228.16	236.24	244.32	252.41
$45	$3,323	$3,256	$3,026	$3,241	$3,871	$4,689	$4,900	$5,111	$5,322	$5,533	$5,744	$5,955	$6,166	$6,377	$6,588
$47	$3,470	$3,401	$3,161	$3,385	$4,043	$4,897	$5,118	$5,338	$5,558	$5,779	$5,999	$6,220	$6,440	$6,660	$6,881
$49	$3,618	$3,545	$3,295	$3,530	$4,215	$5,106	$5,335	$5,565	$5,795	$6,025	$6,254	$6,484	$6,714	$6,944	$7,173
$51	$3,766	$3,690	$3,430	$3,674	$4,387	$5,314	$5,553	$5,792	$6,031	$6,271	$6,510	$6,749	$6,988	$7,227	$7,466
$53	$3,913	$3,835	$3,564	$3,818	$4,559	$5,522	$5,771	$6,019	$6,268	$6,516	$6,765	$7,014	$7,262	$7,511	$7,759
$55	$4,061	$3,979	$3,699	$3,962	$4,731	$5,731	$5,989	$6,247	$6,504	$6,762	$7,020	$7,278	$7,536	$7,794	$8,052
$57	$4,209	$4,124	$3,833	$4,106	$4,903	$5,939	$6,206	$6,474	$6,741	$7,008	$7,276	$7,543	$7,810	$8,077	$8,345
$59	$4,356	$4,269	$3,968	$4,250	$5,075	$6,148	$6,424	$6,701	$6,978	$7,254	$7,531	$7,807	$8,084	$8,361	$8,637
$61	$4,504	$4,413	$4,102	$4,394	$5,247	$6,356	$6,642	$6,928	$7,214	$7,500	$7,786	$8,072	$8,358	$8,644	$8,930
$63	$4,652	$4,558	$4,237	$4,538	$5,419	$6,564	$6,860	$7,155	$7,451	$7,746	$8,041	$8,337	$8,632	$8,928	$9,223
$65	$4,799	$4,703	$4,371	$4,682	$5,591	$6,773	$7,078	$7,382	$7,687	$7,992	$8,297	$8,601	$8,906	$9,211	$9,516
$67	$4,947	$4,848	$4,506	$4,826	$5,763	$6,981	$7,295	$7,610	$7,924	$8,238	$8,552	$8,866	$9,180	$9,494	$9,809
$69	$5,095	$4,992	$4,640	$4,970	$5,935	$7,190	$7,513	$7,837	$8,160	$8,484	$8,807	$9,131	$9,454	$9,778	$10,101
$71	$5,242	$5,137	$4,775	$5,114	$6,107	$7,398	$7,731	$8,064	$8,397	$8,730	$9,063	$9,395	$9,728	$10,061	$10,394
$73	$5,390	$5,282	$4,909	$5,258	$6,279	$7,606	$7,949	$8,291	$8,633	$8,976	$9,318	$9,660	$10,002	$10,345	$10,687
$75	$5,538	$5,426	$5,044	$5,402	$6,451	$7,815	$8,166	$8,518	$8,870	$9,221	$9,573	$9,925	$10,276	$10,628	$10,980
$77	$5,685	$5,571	$5,178	$5,546	$6,623	$8,023	$8,384	$8,745	$9,106	$9,467	$9,828	$10,189	$10,550	$10,912	$11,273
$79	$5,833	$5,716	$5,313	$5,690	$6,795	$8,232	$8,602	$8,972	$9,343	$9,713	$10,084	$10,454	$10,825	$11,195	$11,565
$81	$5,981	$5,861	$5,447	$5,834	$6,967	$8,440	$8,820	$9,200	$9,579	$9,959	$10,339	$10,719	$11,099	$11,478	$11,858
$83	$6,128	$6,005	$5,582	$5,979	$7,139	$8,648	$9,038	$9,427	$9,816	$10,205	$10,594	$10,983	$11,373	$11,762	$12,151
$85	$6,276	$6,150	$5,716	$6,123	$7,311	$8,857	$9,255	$9,654	$10,052	$10,451	$10,850	$11,248	$11,647	$12,045	$12,444
$87	$6,424	$6,295	$5,851	$6,267	$7,483	$9,065	$9,473	$9,881	$10,289	$10,697	$11,105	$11,513	$11,921	$12,329	$12,737
$89	$6,571	$6,439	$5,985	$6,411	$7,655	$9,274	$9,691	$10,108	$10,525	$10,943	$11,360	$11,777	$12,195	$12,612	$13,029
$91	$6,719	$6,584	$6,120	$6,555	$7,827	$9,482	$9,909	$10,335	$10,762	$11,189	$11,615	$12,042	$12,469	$12,895	$13,322
$93	$6,867	$6,729	$6,254	$6,699	$7,999	$9,690	$10,126	$10,562	$10,999	$11,435	$11,871	$12,307	$12,743	$13,179	$13,615
$95	$7,014	$6,873	$6,389	$6,843	$8,171	$9,899	$10,344	$10,790	$11,235	$11,680	$12,126	$12,571	$13,017	$13,462	$13,908
growth rate		-2.0%	-7.1%	7.1%	19.4%	21.1%	4.5%	4.3%	4.1%	4.0%	3.8%	3.7%	3.5%	3.4%	3.3%
NRW		62.0%	62.0%	62.0%	60.0%	58.0%	54.0%	50.0%	46.0%	42.0%	38.0%	34.0%	30.0%	26.0%	22.0%

Source: GWI, SPEM
Modeling Revenue with estimated NRW 10 yrs outlook

APPENDIX T: Strategic Investment Programme 2017-2021 (G$bln)

Regions	2017	2018	2019	2020	2021	Total
Reg2	$0.338	$0.493	$0.549	$0.563	$0.539	$2.482
Reg3	$0.450	$0.657	$0.733	$0.751	$0.718	$3.309
Reg4-EB	$0.563	$0.822	$0.916	$0.939	$0.898	$4.137
Reg4-EC	$0.732	$1.068	$1.191	$1.220	$1.167	$5.378
Reg4-GT	$1.576	$2.300	$2.564	$2.628	$2.514	$11.583
Reg5	$0.394	$0.575	$0.641	$0.657	$0.628	$2.896
Reg6	$0.619	$0.904	$1.007	$1.033	$0.988	$4.550
Reg10	$0.506	$0.739	$0.824	$0.845	$0.808	$3.723
HL	$0.450	$0.657	$0.733	$0.751	$0.718	$3.309
Total	**$5.628**	**$8.216**	**$9.158**	**$9.387**	**$8.978**	**$41.367**
mean	$0.625	$0.913	$1.018	$1.043	$0.998	$4.596
median	$0.506	$0.739	$0.824	$0.845	$0.808	$3.723
max	$1.576	$2.300	$2.564	$2.628	$2.514	$11.583
min	$0.338	$0.493	$0.549	$0.563	$0.539	$2.482

Functional Areas	2017	2018	2019	2020	2021	Total
Water Prod. & Quality	$2.53	$3.697	$4.121	$4.224	$4.040	$18.615
Water Distru. & Qualit	$2.195	$3.204	$3.572	$3.661	$3.501	$16.133
Organisation & Mgnt	$0.214	$0.312	$0.348	$0.357	$0.341	$1.572
Sanitation	$0.197	$0.288	$0.321	$0.329	$0.314	$1.448
Finance & Revenue	$0.490	$0.715	$0.797	$0.817	$0.781	$3.599
Total	**$5.628**	**$8.216**	**$9.158**	**$9.387**	**$8.978**	**$41.367**
mean	$1.126	$1.643	$1.832	$1.877	$1.796	$8.273
median	$0.490	$0.715	$0.797	$0.817	$0.781	$3.599
max	$2.532	$3.697	$4.121	$4.224	$4.040	$18.615
min	$0.197	$0.288	$0.321	$0.329	$0.314	$1.448

$3.6	$0.9	$1.0	$1.0	$0.8	debt/distı	$3.6
debt/inv.	15%	12%	11%	8%	9%	
debt dis./	24%	28%	28%	21%		
Items	2017	2018	2019	2020	2021	**Total**
$CAPEX_1$	$2.453	$3.270	$3.597	$3.597	$3.434	**$16.352**
$CAPEX_2$	$3.175	$4.945	$5.561	$5.790	$5.544	**$25.015**
T.CAPE)	**$5.628**	**$8.216**	**$9.158**	**$9.387**	**$8.978**	**$41.367**
Rec.EXP	$8.094	$8.237	$8.491	$8.610	$8.825	**$42.257**
Rev.Tari.	$4.097	$4.547	$5.047	$5.603	$6.219	**$25.513**
INCOME	$6.947	$7.197	$7.597	$8.023	$8.519	**$38.283**
TOTALE)	**$13.722**	**$16.453**	**$17.649**	**$17.997**	**$17.803**	**$83.624**
deficit	**$6.775**	**$9.256**	**$10.052**	**$9.974**	**$9.284**	**$45.341**
Subv	$2.850	$2.650	$2.550	$2.420	$2.300	**$12.770**
real def.	$3.925	$6.606	$7.502	$7.554	$6.984	**$32.571**
% chng		-7%	-4%	-5%	-5%	

Unfunded
Funded
electricity subv. Incl in gross Inc.
deficit after subvention
subvention

description	2017	2018	2019	2020	2021	
Est. CAPEx./cus	$32,546	$45,248	$48,037	$46,896	$43,969	thousand
Est. Rev./cus	$23,693	$25,043	$26,473	$27,990	$30,458	thousand
deficit	**$8,853**	**$20,205**	**$21,563**	**$18,905**	**$13,512**	thousand
	$752	$1,099	$1,225	$1,255	$1,200	

APPENDIX T Cont'd: Financing the Strategic Investment Programme 2017-2021

	financial ratios						
percent	2017	2018	2019	2020	2021	Total	
percent	34.65%	30.58%	27.80%	20.85%	0.00%	22.02%	Debt/CAPEx
percent	20.75%	21.99%	19.81%	13.39%	0.00%	14.11%	Debt/Rev
percent	59.87%	71.92%	71.28%	64.20%	55.22%	64.09%	CAPEx/Rev
percent	35.31%	45.44%	47.35%	44.84%	40.31%	42.71%	CAPEx/Income
percent	29.86%	27.64%	28.60%	31.13%	34.93%	30.51%	Rev/TotExp
percent	13.60%	19.86%	22.14%	22.69%	21.70%	100.00%	% distribution CAPEX over the medium term (5yrs plan)
percent	56.50%	91.78%	98.75%	94.16%	81.98%	85.08%	deficit as a percentage of t.income

items/yrs	2012	2013	2014	2015	2016	Total	Items
G$bln	$192.8	$208.8	$220.0	$221.1	$230.0	$1,072.8	National Budget
G$bln	$1.16	$1.37	$1.84	$0.63	$1.16	$6.15	Guyana Government
G$bln	$1.08	$1.18	$1.22	$0.61	$0.70	$4.80	Development Partners
G$bln	$0.53	$0.58	$0.77	$0.55	$0.93	$3.37	GWI Capital Expenditure
%	1.16%	1.22%	1.39%	0.56%	0.81%	1.02%	% of CG to national budget
%	0.28%	0.28%	0.35%	0.25%	0.40%	0.31%	% of GWI as a percent of national budget

per capita investment 2012-2021					
yrs	**2012**	**2013**	**2014**	**2015**	**2016**
gyd	$371	$418	$514	$240	$273
% chng		12.8%	22.8%	-53.2%	13.5%
yrs	**2017**	**2018**	**2019**	**2020**	**2021**
gyd	$752	$1,099	$1,225	$1,255	$1,200
% chng	175.7%	46.0%	11.5%	2.5%	-4.4%

Source: GWI's, SPEM

Pre capita investment declined by >50% in 2015 as a result of the closing phase of the GSWP, delays in the implementation of WSSIP, including a decrease in central government expenditure in the water sector owing to a general decline in the implementation rate of the Public Investment Programme (PIP)

Mel Williams, Economist/Sr. Financial Management Specialist

APPENDIX U: **Income Statement Projection 2017-2026**

Financial	**Audited**	**est.**	1	2	3	4	5	6	7	8	9	10
Categories	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**
GROSS INCOME (real p.a.)	**$5,427**	**$6,479**	**$6,947**	**$7,197**	**$7,597**	**$8,023**	**$8,519**	**$8,796**	**$9,255**	**$9,514**	**$9,813**	**$9,843**
Revenue - (est. rev. p.a)	$3,618	$3,387	$4,097	$4,547	$5,047	$5,603	$6,219	$6,336	$6,773	$7,210	$7,687	$7,895
Total Other Income	$71	$462	$250	$250	$250	$220	$200	$460	$482	$504	$526	$548
Total Non Operating Income	$1,739	$2,630	$2,600	$2,400	$2,300	$2,200	$2,100	$2,000	$2,000	$1,800	$1,600	$1,400
OPERATING COST	**-$7,570**	**-$7,918**	**-$8,094**	**-$8,237**	**-$8,491**	**-$8,610**	**-$8,825**	**-$9,023**	**-$9,223**	**-$9,427**	**-$9,633**	**-$9,199**
NOL bef. subv.	**-$3,953**	**-$4,531**	**-$3,997**	**-$3,689**	**-$3,444**	**-$3,008**	**-$2,606**	**-$2,687**	**-$2,450**	**-$2,217**	**-$1,947**	**-$1,304**
P&L bef. subv (real p.a.)	**-$3,882**	**-$4,069**	**-$3,747**	**-$3,439**	**-$3,194**	**-$2,788**	**-$2,406**	**-$2,227**	**-$1,968**	**-$1,713**	**-$1,421**	**-$756**
Net Operating Loss	**-$2,143**	**-$1,439**	**-$1,147**	**-$1,039**	**-$894**	**-$588**	**-$306**	**-$227**	**$32**	**$87**	**$179**	**$644**
description		value	Dec-17	Dec-18	Dec-19	Dec-20	Dec-21	Dec-22	Dec-23	Dec-24	Dec-25	Dec-26
estimated billings		billions	$4,301	$4,547	$5,047	$5,603	$6,219	$6,336	$6,773	$7,210	$7,687	$7,895
est'd collection effi.		percent	95%	100%	100%	100%	100%	100%	100%	100%	100%	100%
estimated cus. base		thousanc	172919	181565	190644	200176	204185	205185	206185	207185	208185	209265
new customers		thousanc	8234	8646	9078	9532	4009	1000	1000	1000	1000	1080
est. billing/cus./yr		thousanc	$23,745	$25,045	$26,476	$27,989	$30,457	$30,879	$32,848	$34,799	$36,922	$37,729
est. billing/cus./mth		thousanc	$1,979	$2,087	$2,206	$2,332	$2,538	$2,573	$2,737	$2,900	$3,077	$3,144
est. revenue/cus./yr		thousanc	$22,614	$23,906	$25,272	$26,716	$29,871	$30,729	$32,690	$34,631	$36,745	$37,535
est. revenue/cus./mth		thousanc	$1,885	$1,992	$2,106	$2,226	$2,489	$2,561	$2,724	$2,886	$3,062	$3,128
customer base chane/yr				5%	5%	5%	2%	0%	0%	0%	0%	1%
billings change/yr				6%	11%	11%	11%	2%	7%	6%	7%	3%
revenue change/yr				11%	11%	11%	11%	2%	7%	6%	7%	3%
expenditure change/yr		5%	2%	2%	3%	1%	2%	2%	2%	2%	2%	-5%

APPENDIX V: Guyana Water Inc. Income Statement Indicators 2017-2021

Fin. Categories	percentage change (%)												comments
	2016	2017	2018	2019	2020	2021	16'	17'	18'	19'	20'	21'	
GROSS INCOME (real p.a.	19.4	7.2	3.6	5.6	5.6	6.2							Gross income is projected to increase by 5.6% average/yr
Revenue - (est. rev. p.a)	-6.4	20.9	11.0	11.0	11.0	11.0							Revenue projected to increase by 13% on average/yr
Total Other Income	551.8	-45.9	0.0	0.0	-12.0	-9.1							
Total Non Operating Income	51.3	-1.2	-7.7	-4.2	-4.3	-4.5							
OPERATING COST	4.6	2.2	1.8	3.1	1.4	2.5							Operating cost is projected to increase over the SBP2017/21
1. EMPLOYMENT COST	28.5	8.0	2.0	2.0	2.0	2.0							Empl. cost is projected to increase steadily of the period
2. PREMISES COST	8.4	2.0	1.2	1.2	1.2	1.2							
3. SUPPLIES & SERVICES	94.9	8.0	1.5	1.5	1.5	1.5							
4. TRANSPORT COST	63.6	55.0	25.0	25.0	25.0	5.0							
5. OFFICE & ADMIN. COS'	-5.4	5.0	5.0	5.0	5.0	5.0							
6. OTHER COST	-30.4	-9.1	0.0	5.9	-2.8	5.1							
Depreciation	-12.0	-2.1	0.0	13.3	0.0	5.9							
Adjustment Previous Year	-25.6	-40.6	0.0	-50.0	-50.0	-20.0							
NOL bef. subv.	14.6	-11.8	-7.7	-6.7	-12.7	-13.4							NOL bef. subv. is est. to decrease owing to incr revenue
P&L bef. subv (real p.a.)	4.8	-7.9	-8.2	-7.1	-12.7	-13.7							
Net Operating Loss	-32.9	-20.2	-9.4	-14.0	-34.2	-47.9							Overall NOL is estimated to decrease below 50% by 2021
	Financial ratios (%)												
Operational cost/Gross incom	117.0	113.6	111.7	110.4	106.7	103.1							All financial ratios indicates a declining trend, as a result of projected improve financial (revenue) performance of the corporation
Employment cost/revenue	45.8	40.9	37.6	34.5	31.7	29.2							
Premises cost (elec.)/revenue	87.5	73.8	67.3	61.3	55.9	51.0							
Depreciation/revenue	45.2	36.6	33.0	33.7	30.3	28.9							

Notes**

1. NOL: Net Operating Loss before subvention
2. P&L: Profit and loss before subvention

APPENDIX W: Key Performance Indicators (KPI's)

			Yearly Targets				
	Programmatic Area	**Key Performance Indicator (KPI)**	**2017**	**2018**	**2019**	**2020**	**2021**
1	**Water Production**	**Total Water Produced (m3)**	179.65	187.73	195.82	203.9	211.99
2	**Water Quality**	**% of schedules samples taken**	100%	100%	100%	100%	100%
3	**Water Quality**	**% of samples taken meeting guidelines (water leaving facility)**	100%	100%	100%	100%	100%
4	**Water Quality**	**% of samples taken meeting guidelines (in distribution line)**	100%	100%	100%	100%	100%
5	**Water Supply and Distribution**	**% of special institutions with adequate supply of potable water**	100%	100%	100%	100%	100%
6	**Water Supply and Distribution**	**% of villages in regions (2,3,4,5,6, Bartica,10) with access to water**	63%	70%	76%	81%	85%
7	**Water Supply and Distribution**	**% of population in regions (2,3,4,5,6, Bartica,10) with access to water**	97%	97%	98%	99%	99%
8	**Water Supply and Distribution**	**% of coastal population receiving treated water**	57%	70%	74%	85%	86%
9	**Water Supply and Distribution**	**% of hinterland population receiving treated water**	16%	26%	38%	49%	60%
10	**Water Supply and Distribution**	**% of customers having access to 24hrs hours of distribution (hrs.)**	74%	84%	92%	100%	100%
11	**Water Supply and Distribution**	**average level of service (metres)**	5	5	5	5	5
12	**Water Supply and Distribution**	**% leakages fixed within required time frame**	95%	95%	95%	95%	95%

13	NRW	% of NRW	64%	60%	56%	52%	48%
14	Revenue & Customer Relations	Return on investment (ROI)	TBD	TBD	TBD	TBD	TBD
15	Revenue & Customer Relations	Return on equity (ROE)	TBD	TBD	TBD	TBD	TBD
16	Revenue & Customer Relations	Working Ratio	TBD	TBD	TBD	TBD	TBD
17	Revenue & Customer Relations	Operating Ratio	80%	80%	80%	80%	80%
18	Revenue & Customer Relations	Metering ratio	67%	78%	89%	97%	100%
19	Revenue & Customer Relations	% of reports resolved	100%	100%	100%	100%	100%
20	Revenue & Customer Relations	commercial queries per 1000 customers	TBD	TBD	TBD	TBD	TBD
21	Revenue & Customer Relations	% of customer database billed	98%	100%	100%	100%	100%
22	Revenue & Customer Relations	% revenue collection efficiency	95%	100%	100%	100%	100%
23	Organisation & Management	% of staff reduction recorded annually	< 5%	< 5%	< 5%	< 5%	< 5%

Performance Indicators (PI's)
Below and on the following pages

Yearly Targets

	Programmatic area	Indicators	2017	2018	2019	2020	2021
1	Water Quality (Treated)	% of samples achieving international levels for iron (water leaving facility)	100%	100%	100%	100%	100%
2	Water Quality (Treated)	% of samples achieving international levels for total coli form (water leaving facility)	100%	100%	100%	100%	100%
3	Water Quality (Treated)	% of samples achieving international levels for e coli (water leaving facility)	100%	100%	100%	100%	100%

4	Water Quality (Treated)	% of samples achieving international levels for pH (water leaving facility)	100%	100%	100%	100%	100%
5	Water Quality (Treated)	% of samples achieving international levels for residual chlorine (water leaving facility)	100%	100%	100%	100%	100%
6	Water Quality (Treated)	% of samples achieving international levels for colour (water leaving facility)	100%	100%	100%	100%	100%
7	Water Quality (Treated)	% of samples achieving international levels for aluminium (water leaving facility)	100%	100%	100%	100%	100%
8	Water Quality (Treated)	% of samples achieving international levels for turbidity (water leaving facility)	100%	100%	100%	100%	100%
9	Water Quality (Treated)	% of samples achieving international levels for iron (in distribution line)	100%	100%	100%	100%	100%
10	Water Quality (Treated)	% of samples achieving international levels for total coli form (in distribution line)	100%	100%	100%	100%	100%
11	Water Quality (Treated)	% of samples achieving international levels for e coli (in distribution line)	100%	100%	100%	100%	100%
12	Water Quality (Treated)	% of samples achieving international levels for p H (in distribution line)	100%	100%	100%	100%	100%
13	Water Quality (Treated)	% of samples achieving international levels for residual chlorine(in distribution line)	100%	100%	100%	100%	100%
14	Water Quality (Treated)	% of samples achieving international levels for colour (in distribution line)	100%	100%	100%	100%	100%
15	Water Quality (Treated)	% of samples achieving international levels for aluminium(in distribution line)	100%	100%	100%	100%	100%
16	Water Quality (Treated)	% of samples achieving international levels for turbidity (in distribution line)	100%	100%	100%	100%	100%
17	Water Quality (Untreated)	% of samples achieving international levels for total coli form (water leaving facility)	100%	100%	100%	100%	100%
18	Water Quality (Untreated)	% of samples achieving international levels for e coli (water leaving facility)	100%	100%	100%	100%	100%
19	Water Quality (Untreated)	% of samples achieving international levels for total coli form (in distribution line)	100%	100%	100%	100%	100%
20	Water Quality (Untreated)	% of samples achieving international levels for e coli (in distribution line)	100%	100%	100%	100%	100%

21	Sanitation	sewerage station availability	TBD	TBD	TBD	TBD	TBD
22	Sanitation	Proportion of housing plans decisions made within 21 days	95%	95%	95%	95%	95%
23	Sanitation	Proportion of planned sewerage maintenance done	100%	100%	100%	100%	100%
24	Revenue & Customer Relations	number of promotions	4	4	4	4	4
25	Revenue & Customer Relations	number of new residential accounts created	TBD	TBD	TBD	TBD	TBD
26	Revenue & Customer Relations	number of new non-residential accounts created	TBD	TBD	TBD	TBD	TBD
27	Revenue & Customer Relations	% of meters read	100%	100%	100%	100%	100%
28	Revenue & Customer Relations	% of bills delivered	98%	98%	98%	98%	98%
29	Revenue & Customer Relations	% of accounts adjusted	5%	5%	5%	5%	5%
30	Revenue & Customer Relations	% disconnected accounts	5%	5%	5%	5%	5%
31	Revenue & Customer Relations	% of accounts reconnected	95%	95%	95%	95%	95%
32	Revenue & Customer Relations	% of payment contracts with increasing balance	< 2%	< 2%	< 2%	< 2%	< 2%
33	Revenue & Customer Relations	number of referrals to litigation	as needed	as needed	as needed	as needed	as needed
34	Revenue & Customer Relations	% of referrals that have been pursued	100%	100%	100%	100%	100%
35	Revenue & Customer Relations	number of judgements	as needed	as needed	as needed	as needed	as needed
36	Revenue & Customer Relations	value of judgements ($ m)	as needed	as needed	as needed	as needed	as needed

37	Revenue & Customer Relations	% of water related reports resolved each month	100%	100%	100%	100%	100%
38	Revenue & Customer Relations	water related reports per 1000 customers	TBD	TBD	TBD	TBD	TBD
39	Revenue & Customer Relations	sewerage reports per 1000 customers	100%	100%	100%	100%	100%
40	Revenue & Customer Relations	% of sewerage reports resolved	100%	100%	100%	100%	100%
41	Organisation & Management	number of hours/days involved in community engagement programs	96	96	96	96	96
42	Organisation & Management	number of community engagement programs	12	12	12	12	12
43	Organisation & Management	staff per 1000 connections	5%	5%	5%	5%	5%
44	Organisation & Management	number of internal training programs	as needed	as needed	as needed	as needed	as needed
45	Organisation & Management	number of external training programs	as needed	as needed	as needed	as needed	as needed
46	Organisation & Management	job evaluation exercises each year	as needed	as needed	as needed	as needed	as needed
47	Organisation & Management	% absenteeism of staff	<10%	<10%	<10%	<10%	<10%
48	Organisation & Management	% of replacements done within 15 days	90%	90%	90%	90%	90%
49	Organisation & Management	Energy efficiency	TBD	TBD	TBD	TBD	TBD
50	Organisation & Management	number of new meters purchased	40,000	40,000	20,000	TBD	TBD
51	Organisation & Management	number of new meters correctly installed	40,000	40,000	20,000	TBD	TBD
52	Organisation & Management	number of new meters updated in database	40,000	40,000	20,000	TBD	TBD
53	Organisation & Management	% of projects on schedule	100%	100%	100%	100%	100%

54	Organisation & Management	proportion of project budget disbursed	TBD	TBD	TBD	TBD	TBD
55	Organisation & Management	% program unscheduled downtime duration in excess of 2 days	5%	4%	3%	2%	1%
56	Organisation & Management	% of users inability in excess of 1 day to access to business apps or ICT servcies e.g email services	5%	4%	3%	2%	1%
57	Organisation & Management	% threats actioned measured from various level i.e. IDS,Spam filtering, EPPS	100%	100%	100%	100%	100%
58	Organisation & Management	% compliance with preventative maintenance schedule	100%	100%	100%	100%	100%
59	Organisation & Management	% compliance with ICT support response time	90%	90%	95%	95%	98%
60	Organisation & Management	% of purchasing items processed within 5 days	90%	90%	90%	90%	90%
61	Organisation & Management	% of items valued under 10M procured within 15 days	90%	90%	90%	90%	90%
62	Organisation & Management	% of items valued between 10M and 20M procured within 25 days	90%	90%	90%	90%	90%
63	Organisation & Management	% of items valued in excess of 20M procured within 66 days	90%	90%	90%	90%	90%

APPENDIX Y: **Comparison of Key Features of CIS Infinity and HiAffinity on the following pages**

A Quick Comparison of key features and functionalities of CIS Infinity and HiAffinity

Module	Sub-Area		Attributes/Features	Feature exists in Hiaffinity (Yes=Y, No=N, limited)	Feature exists in CIS Infinity? (Yes=Y, No=N, Need further demo/ Info Needed = NMI)
Billing	Adjustments to Charges Raised	Functionality	The system should have the ability to reverse a charge raised and rebill based on user defined parameters.	y	y
Billing	Adjustments to Charges Raised	Functionality	The system should provide for electronic approval of adjustment to charges and the process flow should be electronically monitored and managed.	n	y
Billing	Bill Processing	Functionality	The system should make provision for strict cycle control, providing for the management of groups of customer accounts so that the utility billing cycle can be staggered to accommodate logistical and resource considerations	limited	y
Billing	Bill Processing	Functionality	The system should be able to bill a single customer or account.	y	y
Billing	Bill Processing	Functionality	The system should make provision for the optional production of estimates based on utility policy guidelines. (Fixed, calculated based on historical reading or manually imputed)	limited, requires input from the provider to make changes to codes	y
Billing	Bill Processing	Functionality	The system should calculate consumption and regular charges based on the utility tariff structure.	y	y
Billing	Bill Processing	Functionality	The system should calculate user definable service and ancilliary charges. (eg. Connection, Reconnection fees etc.)	y	y
Billing	Bill Processing	Functionality	The system should provide a pre bill run report with calculated charges and the option to flag accounts not to be billed from the cycle.	n	y
Billing	Bill Processing	Functionality	The system should allow the user to define the Pay- by Period. (Due Date).	y	y
Billing	Bill Processing	Functionality	The system should be able to consolidate all other transactions (brought forward balances) and generate accurate bills.Reflect amounts and dates on bills.	y	y
Billing	Bill Processing	Functionality	Provide for mailing to a third-party address for each customer if needed.	y	y
Billing	Bill Processing	Functionality	The system should provide for consolidated billing (e. for Govt accounts etc.)	n	y
Billing	Bill Processing	Functionality	Option to print a masterbill for the account and its subordinate accounts.	n	y
Billing	Bill Processing	Functionality	Print a blanket message or a message specific to a customer type, geographic location, status, rate code, etc.	n	y
Billing	Bill Processing	Functionality	Provide the option to re-design the bill format by an authorized user without software customization by the Vendor.	limited	y
Billing	Bill Processing	Functionality	Provide the ability to email the bill to the customer.	n	y
Billing	Bill Processing	Functionality	Update information and reprint a bill with corrected “address” or billing information and keep the history.	n	y
Billing	Bill Processing	Functionality	Mark/Flag the accounts to be read but not billed	n	y
Billing	Bill Processing	Functionality	Flag an account or a group of accounts not to be billed	n	y
Billing	Bill Processing	Functionality	Assign an Invoice number to each bill as well as a bill number for each customer	n	y

Billing	Bill Processing	Functionality	Allow the user to do a re-print of the original bill and print to remote printer	y	y
Billing	Bill Processing	Functionality	Allow the user to re-start printing from an identified invoice number or page number	n	y
Billing	Bill Processing	Functionality	The system should make provision for printing options based on user criteria such as a billing cycle, village and street, district and walk route.	n	y
Billing	Bill Processing	Functionality	The System should provide for billing of Bulk Water Sales.	limited	y
Billing	Bill Processing	Functionality	The System should provide for billing of Bottled Water.	n	y
Billing	Bill Processing	Functionality	The ability to segregate the bill file (charges/bills raised) into separate files for inspection by user prior to printing (eg. Debit balances greater than user define value, credit balances less than user define value, by category and type etc).	limited	y
Billing	Bill Processing	Report	Revenue Target - by user defined criteria	very limited....done by deduction	y
Billing	Bill Processing	Report	Various discrepancy reports should be prepared in order to ensure accurate and transparent billing. (format to be determined)	limited	y
Billing	Delivery Management	Activity	The system should provide for tracking and management of delivery of bills via the work flow system.	n	y
Billing	Delivery Management	Functionality	The system should provide for the registering of returned and undelivered bills.	n	y
Billing	Delivery Management	Functionality	The system should provide for the registering of the action taken and this should be integrated with the work flow system.	n	y
Billing	Delivery Management	Functionality	The system should provide for a process of automatic rebates	limited	y
Billing	Delivery Management	Report	Bill Production/Billing Analysis Report (Number of Bills Generated, Number of bills to be Queried, Bills to be delivered, Bills Returned, Bills Delivered, etc).	n	y
Billing	Delivery Management	Report	No Bills Generated List	n	y
Billing	Delivery Management	Report	Report to show number of Undelivered/Returned bills by user defined category, area etc.	n	y
Billing	Delivery Management	Report	Report to show action taken for Undelivered/Returned bills by user defined category	n	y
Billing	Delivery Management	Report	Report to show user defined trend analysis for Undelivered/Returned Bills.	n	y
Billing	Printing	Functionality	The printing of the bills must be in the walk route and address order. (Sequence/Street/Village/District) and user define criteria, customer name, invoice # etc.	very limited	y
Billing	**Rate Structure**	Everything	One of the roles of the Application is to act as the sales ledger of an accounting system – effectively dealing with all the accounting entries relating to the debtors of the services provider – whether for water, sewerage or any other billable item.	y	y
Billing	**Rate Structure**	Functionality	The user should be able to define the allocation of charges to the different consumption categories.	n	y
Billing	**Rate Structure**	Functionality	Maintain a control record that has surcharges, taxes and other rates that are common calculations for all customers.	n	y
Billing	**Rate Structure**	Functionality	Allow rates to be based on effective dates and/or effective months to accommodate rate changes.	y	y

Billing	**Rate Structure**	Functionality	Allow for pro-rated tariffs and charges.	limited	y
Billing	**Rate Structure**	Functionality	The tariff structure should be able to be changed by an authorized user, without requiring software customization.	n	y
Billing	**Rate Structure**	Functionality	The system should have provision for fixed and variable tariff.	limited.....coding intervention needed by the product	y
Billing	**Rate Structure**	Report & Analysis	Tariff Analysis & Projection (A tariff analysis functionality to enable the user to project revenues under different scenarios as well as enforcing policy).	n	y
Billing	Reports and Analysis	Report	The system should produce a detailed and summary daily breakdown of billed revenues, the consumption charged and the number of accounts billed. (format to be determined)	limited	y
Billing	Scheduling	Functionality	The system should make provision for the automated planning and management of the billing and meter reading processing cycle and generation of bills. (Billing Schedule)	very limited	y
Collections	Collections	Report	Comparative Analysis Revenue Collection (for a given period, for a given Geographical Area, for a given Supply Source/A Collection of Supply Sources, Service type, Customer Type, Uncollectible/Bad Debt)	n	y
Customer	Customer Contact	Activity	Recording and Actioning of Customer Complaints, Suggestions, etc	very limited	y
Customer Service	Customer Management	Activity	Creation of New Customer, Inactivation of Customer	very limited	y
Customer Service	Customer Management	Entity	Customer Number, Name, Telephone #, ID, TIN, Email, In Care Of, Classification, Billing Address, Date of Birth, Owner/Tenant, Copy of Tenancy Agreement, Date of Expiration of Tenancy Agreement	limited	y
Customer Service	Customer Management	Report	Customer Listing (New Accounts Created, Active Accounts (All services connected and billable, Inactive Accounts (Services not connected and not billable), Disconnected Accounts on Database, Customers "Awaiting Connection"., Metered and Unmetered Accounts, etc).	limited	y
Customer Service	Customer Management	Report	The system should allow for printing of delivery statements, compliance, etc.	limited	y
Customer Service	Data Validation	Report & Analysis	Identifying and reporting on Inactive Customers, Properties, Services, Meters, etc	limited	y
Customer Service	Meter Management	Entity	Meter Make, Model, Size, Life, Unit of Measurement, Number of Dials, Serial Number	limited	y
Customer Service	Meter Reading	Functionality	The system should provide for scheduling of readings for user defined criteria (Cycle, Book, Route, any given geographical area, customer type, etc).	y	y
Customer Service	Meter Reading	Functionality	The system should make provision for the management of the meter reading activity cycle and other meter related non-cycle activities. These functions will be used for the capturing of meter reading, the identification and rectification of discrepancies.	n	y
Customer Service	Meter Reading	Functionality	Should make provision for the set-up of system and hand-held unit (HHU) and mobile device parameters to facilitate transmission of information from system to hand-held unit and mobile devices software.	n	y
Customer	Meter Reading	Functionality	The system must make provision for manual meter reading.	y	y
Customer Service	Meter Reading	Functionality	Should enable the authorised user to set-up meter Books/cycle, discrepancy/validation controls upload/download file formats to facilitate automatic meter readings.	n	y
Customer Service	Meter Reading	Functionality	The user should be able to edit readings and messages downloaded from HHU or record manual readings per Walk Route.	n	y

Customer Service	Meter Reading	Functionality	The system should evaluate consumption based on discrepancy/validation controls defined and initiate user definable relevant actions when needed and should be integrated with the work flow system.	n	y
Customer	Meter Reading	Functionality	Should allow viewing of a selected walk route in GIS.	n	y
Customer	Meter Reading	Functionality	Should allow editing the selected walk route in GIS.	n	y
Customer	Meter Reading	Functionality	Should allow for the re-sequencing in a meter book or walk route.	limited	y
Customer	Meter Reading	Functionality	Should allow for the unscheduled request for a meter reading. (Ad-hoc)	limited	y
Customer Service	Meter Reading	Functionality	Should enable the user to generate a request to check a read on specified meters for verification via the work flow system.	n	y
Customer Service	Meter Reading	Functionality	Display a history of meter readings flagged as suspect for information/ re-investigation – Generation of work orders.	n	y
Customer Service	Meter Reading	Functionality	The system should be able to flag an anomaly on a reading and integrate with the work flow system to trigger a user defined action.	n	y
Customer Service	Meter Reading	Functionality	Entry/Population of Reading Table (Manual Entry and Upload of readings collected with Meter Reading Devices).	n	y
Customer Service	Meter Reading	Functionality	Provision for a validation process (Too high/Low reads) which is fully integrated with the work flow system to enable automatic triggering of relevant actions.	limited	y
Customer	Meter Reading	Report	Meter Reading Analysis (Meters to be Read, Meters Read, Meters Not Read).	limited	y
Customer Service	Meter Reading	Report	The system should produce statistical and discrepancy reports which will enable the user to determine whether the level of meter reading accuracy is acceptable for billing.	n	y
Customer Service	Meter Reading	Report	The System should produce Reader Activity reports which includes but not limited to Reader id, date, number of reads with relevant date and time, anomalies raised from the cycle and other user definable information which will be used to established Reader trends and Anomalies.	n	y
Customer Service	Meter Reading	Report	Consumption (Per Individual Meter, Geographic Area, Supply Source/Collection of Supply Sources, District Metering Area, Type of Meters, Type of Customers, Size of Service Connection, etc). Provide Consumption analysis, allowing for analysis of readings history, high consumer and consumption trends and consumption analysis for category types.	n	y
Customer Service	Meter Reading	Report & Analysis	The system should be able to create exception reports for meters that are not regularly read, or have irregular reading patterns.	n	y
Customer Service	Meter Reading	Report & Analysis	Provide for the identification of suspect or wrong consumer categories through analyzing the relationship between water usage and consumer types on properties to find exceptions and discrepancies.	n	y

Customer Service	Metering	Functionality	The system should make provision for registration of meter information (Meter Inventory) to be used for assignment to service.	limited	y
Customer Service	Metering	Functionality	The system should make provision for the management of maintenance tasks relating to connections and meters generated by the various Divisions and through bulk and ad hoc requests automatically triggering the relevant work flow actions (Request for Servicing of Meter, Replacement of meter, etc).	n	y
Customer Service	Metering	Report	The system should provide for generation of Meter Inventory reports by user defined criteria (Meters by expiration of life date, type, model, size, etc).	limited	y
Customer Service	Property Management	Analysis			
Customer Service	Property Management	Entity	The system should provide for storing the following attributes for the Property; Property Number,Physical Address, GIS Coordinates, Property Type, Classification	limited	y
Customer Service	Property Management	Functionality	Creation of New Property, changes to property information, associating properties with services (s),	y	y
Customer Service	Property Management	Report	Data Activity (change of service- Metered to Unmetered and vice versa, Not treated to Treated and vice versa, change of Supply Source, etc .....)	limited	y
Customer	Service Management	Activity	Provide for Installation/Removal of service	y	y
Customer Service	Service Management	Entity	The system should provide for storing the following attributes for the Service; Service Type (Water/Sewerage, Metered/Unmetered), Size, Supply Source, Treated/Not Treated, Effective Date of Start and End of Service, etc	y	y
Database	Data Analysis, Verification and Rectification	Functionality	Provide for importing survey data into a survey database	n	y
Database	Data Analysis, Verification and Rectification	Functionality	Provide for mapping of the log file reference files to the survey database and the CIMS data structures	n	y
Database	Data Analysis, Verification and Rectification	Functionality	Provide for an automated wizard that builds a comparison of the survey data to the commercial data and production of lists of potential matches. Matches should be based on a series of intelligent filters	n	y
Database	Data Analysis, Verification and Rectification	Functionality	Provide for importing the survey log books into the survey database for further processing	n	y
Database	Data Analysis, Verification and Rectification	Functionality	The user, based on the results of the matching wizard, should be able to automatically accept a group of matches or further query the results on a one to one basis for easier identification of potential problems	n	y
Database	Data Analysis, Verification and Rectification	Functionality	Allow for Posting of matched data to the main database	n	y

Database	Data Analysis, Verification and Rectification	Functionality	Evaluate the success of the survey exercise	n	y
Database	Data Analysis, Verification and Rectification	Report	Analysis of customers not identified as part of the matching process. Further processing of this category must result in list of customers that have to be re-surveyed or flagged for notification or further processing	n	y
Database	Data Analysis, Verification and Rectification	Report	List of provisionally approved matches for further analysis of the quality of connection and property data	n	y
Database	Data Analysis, Verification and Rectification	Report	Analysis of customers/ properties found that are not in the system	n	y
Database	Data Analysis, Verification and Rectification	report	Provide summary report and cross-tabulation of results via screen, hard copy and digital file format.	n	y
Database	Data API	Functionality	Should include mechanism that allows audit trails on any table in the database.	limited	y
Database	Data API	Functionality	Database architecture should be based on the implementation of Metadata mechanism. Structure should allow for the generation of reports from Meta Data descriptions.	n	y
Database	Data API	Functionality	Application API should support MS SQL Server, Oracle platforms, other databases	n	y
Database	Data API	Functionality	Application should include automated upgrading mechanism allowing upgrades through the internet (preferably XML based) or Updated by the supplier remotely.	y	y
Database	Data API	Functionality	The System must provide a technique to be used for database recovery facility: menu/parameter driven & procedural.	n	y
Database	Data API	Functionality	Provision of a Backup facility: online and batch	n	y
Database	Data API	Functionality	Must have the ability to do backup without halting the system	limited	y
Database	Data API	Functionality	Have the ability to roll back and forward	n	y
Database	Data API	Functionality	Have the ability to automatically archive transaction data to media based (machine-readable) archives based on system administrator defined retention period for transaction types	n	y
Database	Data API	Functionality	Provide a facility to roll back the status of the database if errors are encountered during processing and produce exception triggers and reports for same.	n	y
Debt Management	Debt Recovery	Functionality	The system should provide for the scheduling and management of payment arrangements/contracts. The parameters to be used for scheduling should be designated user definable.	limited	y

Debt Management	Debt Recovery	Functionality	The system should provide a functionality for the automatic flagging/triggering of events/user definable actions for management and monitoring of payment arrangements. These events/user definable actions should be automatically raised by the work flow system.	n	y
Debt Management	Debt Recovery	Report	The system should provide for reports for Debt Analysis by user defined criteria. These reports would be used to determine the distribution of debt (by geographic area, customer type, service type, etc).	n	y
Debt Management	Debt Recovery	Report	The system should provide for generation (manually and automatically via scheduling) of Age Analysis reports with user definable criteria (bucket periods, etc).	limited	y
Debt Manageme	Debt Recovery	Report	The system should provide a Payment Due report which is driven by user definable run parameters.	n	y
Debt Manageme	Debt Recovery	Report	The system should provide for the generation of Arrears Report (past due by user defined date, by user defined value).	n	y
Debt Management	Debt Recovery	Report	The system should provide for the generation of Disconnection Lists and flagging of accounts to be disconnected via a automatically configured work flow system.	n	y
Debt Management	Debt Recovery	Report	The system should provide for management of reconnection of services utilizing the work flow system and generation of the Reconnection Lists for user defined run parameters.	n	y
Debt Manageme	Debt Recovery	Report	The system should provide for authorised users to flag and automatically manage accounts for Litigation/Legal Action.	n	y
Debt Management	Debt Recovery	Report	The system should provide for flagging of bad debt accounts and triggering automated predefined actions/events which should be managed by the work flow system.	n	y
Integration	E-Billing	Functionality	The system should provide for automatic dissemination of bills via predetermined parameters.	n	y
Integration	FTP/Web File Transfer	Functionality	The system should provide for interfacing with vendors/agencies that would require a file transfer or upload via FTP or web (e.g. Collection Agencies).	limited	y
Integration	General Ledger	Functionality	The system should be able to Interface with Oracle or industry standard General Ledger Applications.	n	y

Integration	General Ledger	Functionality	The system should be able to post summaries to general ledger of: cash sales (billing), customer deposits, (payments) and adjustments (debit or credit) on a daily basis.	n	y
Integration	General Ledger	Report	Generate a report that is used for reconciling the accounts receivable and deposits to the financial system (The specific transactions are to be defined by the user.)	n	y
Integration	GIS	Functionality	Application must be integrated to a commercial GIS platform, for example ESRI ArcMap, MapInfo, Autodesk Map etc	n	y
Integration	GIS	Functionality	To Display of Vector datasets (points, lines and areas) including ESRI Shape files and SDE database	n	y
Integration	GIS	Functionality	To Display raster images selected from files as backdrops to vector data.	n	y
Integration	GIS	Functionality	Print the map view as displayed at any point in time on GIS with labeling, legend, scale, and North Arrow	n	y
Integration	Hand Held/mobileDevices for Meter Reading	Functionality	The system should provide for itegration with industry standard applications used with mobile and meter reading devices to upload and download meter reading and survey data.	n	y
Integration	Human Resources	Functionality	The system should interface with the Utility's human resources system to populate the User table with the requisite HR Personnel Approval for level of access.	n	y
Integration	Interactive Voice Recording Systems	Functionality	Interface with and automated phone answering system for outage calls (could be part of IVR features) to pull information from the CIS database such as current customer, phone number and address as well as customers querying their basic account information via the telephone system.	n	y
Integration	Inventory Ledger (meters, installation equipment, etc)	Functionality	The system must have the ability to integrate with GWI's Oracle EBS - Inventory module to populate service orders with materials for jobs to be done in the field.	n	y
Integration	Third Party Reporting Applications	Functionality	The application should interface to standard reporting engines (eg Crystal Reports/SAP BI, etc.	y	y
Integration	Web Self Service	Functionality	The system should allow for integration with the Company's Website where a customer portal would be provided for customers to access services (querying of account details, balances,etc, pay bills, submit meter readings, request new service, register a change of service request, change of address, etc).	n	y

Querying, Reporting and Printing	**All Areas**	**Functionality**	**The Application should provide for comprehensive reporting tools which can be used to help manage customer service, revenue stream and business processes. Within the application, there should be an embedded, easy-to-use report builder which requires no third-party software. Pre-packaged/pre-configured reports should be modifiable via the application by GWIs' personnel. The application should provide for exportation of any data gathered by queries and reports into industry standard formats such as xls, doc, pdf, txt, etc A Comprehensive Entity Relationship Diagrams and Data Dictionary should be provided to aid creation of custom queries and reports. The Application should include a query builder enabling the creation of user defined SQL queries.**	**n - this is one of the most deficient areas of HiAffinity**	**y**
Querying, Reporting	All Areas	Functionality			
Reporting and Analysis	Bill Processing	Report	The system should provide summaries of reflecting analysis of billing (Number of accounts selected for billing, number of rejects for bad readings, other anomalies, number of bills produces, etc.).	n	y
Reporting and	Bill Processing	Report	The system should provide for generation of detailed and summary estimation report.	limited	y
Reporting and Analysis	Reports and Analysis		The User should be able to project future billed revenues using the available historical data and the defined scenarios. Forecasting should be performed based on the consolidation of the proposed tariff structures, consumption patterns and number of accounts. Analysis should be done per consumption category.	n	y
Revenue Manageme	Cash Register	Functionality	The system should make provision for the management of the revenue collection or receipting activity cycle	n	y
Revenue Manageme	Cash Register	Functionality	The system should offer a mechanism for user and session and float control. Assigning unique cashier number and names to each user.	y	y
Revenue	Cash Register	Functionality	The system should provide information on cashier session status.	limited	y
Revenue Manageme	Cash Register	Functionality	The system should be able to capture and report on any disruption as it relates to cashier sessions.	n	y
Revenue Manageme nt	Cash Register	Functionality	The system should make provision for user error in issuing a receipt and printer misfeeds. The system should allow an authorized user to do a reprint of the receipts when there is a system error.	n	y
Revenue Manageme	Cash Register	Functionality	The system should provide real time payment processing. Posting payments immediately to accounts.	limited	y
Revenue Manageme	Cash Register	Functionality	Allow the user to void payments in real time with the requisite security approval measure.	n	y
Revenue Manageme	Cash Register	Functionality	Allow the user to modify the information entered on a transaction to correct account numbers or amounts, before saving/printing.	limited	y
Revenue Manageme	Cash Register	Functionality	Allow the authorized user to void/transfer payments from one account to another after payment was posted.	y	y
Revenue Manageme nt	Cash Register	Functionality	Use a variety of payment method for Cash, Cheque, Credit Card, Debit Card, and Money Order, (the cashiers should to choose the payment type at the cashier screen	limited	y

Revenue Management	Cash Register	Functionality	Allows for acceptance of manual receipts and the possibility that the receipts numbers can be system generated and assigned to each divisions. (The pre assigned receipt numbers will be given to the supplier of receipt books).	limited	y
Revenue Manageme	Cash Register	Functionality	Allows the user to see the remaining balance on the account after payment received and it should be able to be printed on the receipt.	limited	y
Revenue Manageme	Cash Register	Functionality	A message should be displayed for a customer with a large balance and no Payment Arrangement Plan to check with the CSR/Supervisor.	n	y
Revenue Manageme	Cash Register	Functionality	The system should provide a means of locking sessions that do not balance during end-of-day reconciliation.	n	y
Revenue	Cash Register	Functionality	Allows acceptance and allocation of security deposit.	n	y
Revenue Management	Cash Register	Functionality	Allow for end of day balancing by user defined criteria. (Cashier/payment locations.) Generate reports on the batches for balancing broken down by payment type and method.(Metered, unmetered, reconnection, connectionetc. and debit card, cheques etc.), including the number and value of All voided transactions.	limited	y
Revenue Manageme	Cash Register	Report	Generates report for any period on void transactions by cashier and payment location.	n	y
Revenue Management	Collections	Functionality	The system should manage the registration of receipt batches to ensure synchronisation of pre-printed form numbers with system generated receipt numbers.	n	y
Revenue Management	Collections	Functionality	Allocates payment to the oldest debt, (but when the payment is based on payment type (reconnection/connection fee, tamper fee the user must be allow to allocate these when the payment is being entered).	limited	y
Revenue Manageme	Collections	Functionality	Allows for allocation of payments from a consolidated account to individuals accounts. (Government accounts).	n	y
Revenue	Collections	Functionality	Should review method of payment by customers and blacklist if needs be.	n	y
Revenue Manageme	Collections	Functionality	Automatically generate a reconnection slip if account is turned off for field personnel to reconnect the service once payment is received?	n	y
Revenue	Collections	Functionality	Create a file for transfer to billing system for posting?	y	y
Revenue Manageme	Collections	Functionality	Allows for payment transferred from external payment agencies into customers' accounts.	y	y

Revenue	Collections	Functionality	Allow real time updating of all agencies payment	n	y
Revenue	Collections	Functionality	Allows user to search for receipt by date/receipt number.	limited	y
Revenue Manageme	Collections	Report	Capture and generates daily reports on suspense cash (payments that were not posted due to some error).	limited	y
Revenue Manageme	Collections	Report	Generate warnings on the report (Balancing Error) if there is a problem with transaction.	n	y
Revenue Manageme nt	Collections	Report	Generates report for any period for all payments received by cashiers/locations/agents broken down by region, district, ward, street, supply source, payment type.	n	y
Revenue Manageme	Collections	Report	Generated report on cheque payments received by customer reference number,Date, Bank, Cheque number, amount.	n	y
Revenue Manageme	Collections	Report	Generates a list of all receipts used for any period for real time and manual receipts	n	y
Revenue Manageme	Collections	Report	Generates payment allocations for any period by bill date /month/year/payment type (detailed and Summary)	n	y
Revenue Manageme	Collections	Report	Generates a list of accounts with overdue balance based on any given due dates.	n	y
Revenue Manageme nt	Collections	Report	Allows for disconnection list to be generated after a specific date as determined by user, highlighting any outstanding service order, that may require action before disconnection.	n	y
Revenue Manageme	Collections	Report	Generates a list of Last payment received from customers for any defined period.	n	y
Search Facilities	All Modules	Activity	This system should provide search capabilities by any object or field on the database. For Customer Service Representative, a user should be able to query the database by customer id, any of the name fields, National identification number, TIN, Customer address, Billing address, property number, property address, property type, meter number, etc.	n	y
System and					
User Security and Audit	Audit Trail & Monitoring	Functionality	The Application should consist of a User monitor to enable authorized users to view, print or export to standard file formats (e.g. excel, word) user activity information at any chosen time.	n	y
User Security	Audit Trail & Monitoring	Report	User Activity	limited	y
User Security	Audit Trail & Monitoring	Report	User Listing with the designated Menu Access	limited	y
User Security and Audit	User Access	Functionality	The access control system should be customizable per user. The application should include mechanism to limit access by user on any object or specified functionality.	limited	y

Work Flow & Task Management	**All Areas**	**Activity**	**A Work Flow and Task Management system which provides the ability to automate repetitive tasks in a way that reduces work effort while improving customer service. This system should respond to specific events with a set of automated actions that includes any combination of: e-mails or letters to customers; service orders; financial transactions; messages on bills; tasks assigned to other users or departments; notes on customers' accounts, and more. The system should be able to track and manage these actions providing alerts to users.**	**not at all**	**y**
Work Flow & Task	Billing	Activity	Reversal of Charges with requisite approval process done via an automatic work flow process.	limited	y
Work Flow & Task	Billing	Activity	Provide for recording, management and reporting of Returned Bills - Bills not Delivered.	n	y
Work Flow & Task	Billing	Activity	Provide for management and reporting of "No Read received".	n	y
Work Flow & Task	Customer Contact	Activity	Provide for recording, reporting and management of Bill Queries via a work flow system complete with flags and indicators.	n	y
Work Flow & Task	Customer Service	Activity	Provide for recording, reporting and management of New Applicants via a work flow system complete with flags and indicators.	n	y
Work Flow & Task Manageme	Meter Management	Activity	Provide for recording, reporting and management of Installation of New Meters via an automated work flow system complete with flags and indicators.	n	y
Work Flow & Task Manageme	Meter Management	Activity	Provide for recording, reporting and management of Installation of Replacement of Meter via an automated work flow system complete with flags and indicators.	n	y
Work Flow & Task Manageme	Meter Management	Activity	Provide for recording, reporting and management of Installation of Servicing of Meter via an automated work flow system complete with flags and indicators.	n	y
Work Flow & Task Manageme	Service Management	Activity	Provide for recording, reporting and management of Installation of Replacement of Leaking Service Connections via an automated work flow system complete with flags and indicators.	n	y

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GUYANA WATER INCORPORATION

Water and Sanitation Strategic Plan 2017 - 2021

Guyana Water Incorporated			
Monthly Tariff			
Categories	**Tariff**	**Rate**	**Frequency**
NON-DOMESTIC (METERED)			
Georgetown	GT Wtr Mon Mtr N-Dom	$100.80	MTH
Non-Georgetown	NG Mnth Mtr Non Dom	$96.60	MTH
DOMESTIC			
Georgetown			
GT Dom Band 1	GT Wtr MTH Mtr Dom	$112	MTH
GT Dom Band 2			
GT Dom Band 3			
GT Dom Band 4			
GT Dom Band 5			
Non-Georgetown			
NG Q Mtr Dom Low RV	NG Wtr MTH Mtr Dom	$60.90	MTH
NG Q Mtr Dom Med RV			
NG Q Mtr Dom High RV	NG Wtr MTH Mtr Dom HRV	$94.50	MTH
NON-DOMESTIC (UNMETERED)			
Georgetown	GT Wtr MTH UnM Non Dom	$2,750	MTH
Non-Georgetown			
Commercial Small	NG MTH Unm Comm Small	$1,366	MTH
Commercial Medium	NG MTH Unm Comm Medium	$3,291	MTH
Commercial Large	NG MTH UNM LARG COMM	$10,966	MTH
Institutional Small	NG MTH Unm Inst Small	$1,366	MTH
Institutional Medium	NG MTH Unm Inst Medium	$5,483	MTH
Institutional Large	NG MTH UNM LARG INST	$10,966	MTH
Industrial Small	NG MTH Unm Indus Small	$2,741	MTH
Industrial Medium	NG MTH UNM MED INDUS	$3,291	MTH
Industrial Large	NG MTH UNM LRG INDUS	$18,283	MTH
DOMESTIC			
Georgetown			
GT Dom Band 1	GT W MTH UNM B1	$983	MTH
GT Dom Band 2	GT W MTH UNM B2	$983	MTH
GT Dom Band 3	GT W MTH UNM B3	$1,533	MTH
GT Dom Band 4	GT W MTH UNM B4	$1,533	MTH
GT Dom Band 5	GT W MTH UNM B5	$1,758	MTH
Non-Georgetown			
NG Dom Low RV	NG W MTH UNM DOM LRV	$742	MTH
NG Dom Med RV	NG W MTH UNM DOM LMV	$1,150	MTH
NG Dom High RV	NG W MTH UNM DOM LHV	$1,333	MTH
NG DOM COMBINED	NG W MTH UNM DOM COM	$900	MTH
SEWERAGE			
Metered			
GT Sew Non-Dom	GT Sew Mon Mtr N-Dom	$2,100 & $3,150	MTH
GT Sew Dom	GT Sew MTH Mtr Dom	$416	MTH
Unmetered			
GT Sew Non-Dom	GT Sew Mth Umet Non-Dom	$2,200	MTH
GT Sew Dom	GT SEW MTH UNM DOM	$416	MTH

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