

THE WATER AUTHORITY

ANNUAL REPORT

1991



**THE PORTFOLIO OF
COMMUNICATION WORKS AND AGRICULTURE**

**THE WATER AUTHORITY
Cayman Islands**

**ANNUAL REPORT
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Foreword

by

The Honourable Linford A Pierson JP
Member for Communications, Works and Agriculture.

I have always been a firm supporter and advocate of the statutory bodies and the Water Authority in particular. As such it is particularly pleasing for me to read this annual report, which represents yet another successful year of Water Authority operation. This success can obviously be measured in financial terms and as such it is a great credit to the Board of the Authority, especially as it is only the second year of independent operation. My support of the Authority is not only based on their financially successful operation, but more importantly I look at the vital services being provided to the people of this country and I see it being provided in good order and at no cost to the Government. I see all the people benefiting. And I see this vital service under the proper control of Government, creating a position where the people's rights are not put at risk from a private sector monopoly situation.

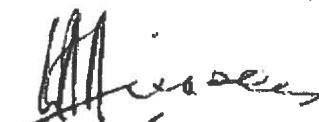
My philosophy is not anti-private sector, in fact I fully support the development of the private sector where it is appropriate. However I believe very strongly that there are certain essential services, amongst which is the country's water supply, that should be protected from the pressures created by private sector investors. I am, and the Government is grateful to the Water Authority for creating the success that gives the comfort which reduces the pressure to privatize the water utility.

The long term water supply goal of the Authority is to ensure that all the people of these islands have ready access to a pure water supply. This is being achieved with remarkable speed and success. 1991 has seen the completion of a water supply to Cayman Brac, the finalization of an agreement to supply water to West Bay and the approval and commencement of a water supply extension from Spotts Newlands to Pease Bay. The financial statements indicate that a very reasonable profit is being achieved, in this present development stage this profit is rightly being ploughed back into the business. In the not too distant future I believe that Government might comfortably expect to derive significant revenue from the Authority and this should not be forgotten when considering the future.

I would like to commend the Authority on its stand with respect to the training and employment of Caymanians. It is heartening to see its success in attracting our people into its employ and to see proper and sound training programmes in operation.

I am proud to have been the Member, with responsibility for the Authority, over the past three years and I take great satisfaction in knowing that I have been able to assist the Authority in its vital development.

May I take this opportunity to thank the Chairman, the members and the staff of the Water Authority for the invaluable work they have carried out and to wish them continued success in the years to come.



Linford A Pierson JP.

Chairman's Report

The Year 1991

I am pleased to report that the Water Authority experienced yet another good year, moving forward with additional major development in the water supply sector and commencing to deal with a number of problems experienced with the West Bay Beach sewerage system.

We were faced with increased costs but prudent management and a reduction in interests rate ensured that a reasonable profit was maintained. The net profit of \$999,703 was up on the previous year's of \$826,595. In addition the overdraft position of 1991 was replaced by a small, but gratifying cash surplus. We were fortunate to have sufficient cash to carry out the remedial works to the sewerage system and meet our debt service.

A new water supply extension to Pease Bay was approved by Government after being fully considered by the Government Economist and the Public Sector Investment Committee. The project was approved to be carried out in three phases, the funding for each phase being considered by Government for a guarantee as and when the funds were required, notwithstanding this, my Board felt that it would be prudent to ensure that funding for the whole three phases was in place prior to commencement. Associated with the new water supply extension was a refinancing of our local borrowing. It took some considerable time to obtain this funding on the right terms, as such was not available at the bank with which we already had loans. The new bank was prepared to take over our existing local loans on more favourable terms and therefore with Government's approval my Board resolved to refinance. This action will ease our cash flow over the next five years and allow the Authority time to increase its revenue base, from the additional development, before being faced with the higher capital repayment. The provision of this new financing package has allowed us to maintain our existing rates and not seek an increase for 1992.

During the year much has been said with respect to the functioning of Statutory Bodies and it is now often heard that private enterprise could do it better, more efficiently and presumably at a lesser cost to the consumer, although this latter advantage is conveniently omitted from some private sector arguments. I and my Board firmly agree that it is not in the best interest of the people of this country to allow the essential services to operate in a monopoly situation. Obviously there is economy of scale to consider, especially in a country of this size. However in the water sector a situation has evolved whereby two entities are in the business of providing a public water supply, both appear not to suffer from the reduced economy of scale as both operate in a financially sound position, providing an affordable service. A major advantage, of the existing situation, is the comparative competition keeping both operations honest. A second advantage is that the Water Authority, being fully owned by Government directly benefits all the people of this country and not just a small number of shareholders. It also means that the Government is in a better position to properly and meaningfully supervise the operation of the private water company. In fully considering the benefits of privatization of the Water Authority one must consider the many regulatory functions that it carries out in addition to the provision of a public sewerage service. At present the more lucrative water supply business tends to subsidize these costly functions which are carried out at no cost to central government. How will they be funded in the event that the profit of the water supply sector is no longer available to the Water Authority? A water royalty charge at its present level will not provide sufficient revenue, therefore the cost of the other services and regulatory functions must increase or be subsidized by Government. Finally I take great issue with the assumptions of the private sector that by definition they are more efficient, my view is that neither private nor public sector can generalize in this manner, efficiency is a sole result of the organization in control of the operation. The Water Authority operates as a commercial concern and responds to all the commercial pressures, except that it will not put profit before service, but it will ensure that the cost of its excellent service is covered by revenue. We

ensure that the works put into the ground are engineeringly sound and will survive for future generations to enjoy and profit from.

I am proud to report that the Authority continues to invest in the youth of this country and now has on staff a majority of young Caymanians who have benefited from overseas education arranged by the Authority. We presently have two young men in university studying for Bachelor degrees in Engineering and have one back in the work force, having completed his academic studies overseas, he is now employed as a Graduate Engineer. We have also been fortunate in our attempts to obtain local persons to work in the field and we now have a solid core of local expertise in all areas of our work.

It was most gratifying to myself and my Board to see the Water Authority singled out, in a United Nations report on the regions water utilities, as the most successful and professionally operated utility in the region. This is obviously a big boost to morale and all the staff of the Authority should be congratulated.

In the year Government passed a small, but significant piece of legislation, an amendment to the Water (Production and Supply) Law. Basically the amendment controls the provision of desalination equipment to any development other than a single family home. It is significant as it recognizes the large investment made in the public water supply sector and more importantly recognizes that this investment, and by association, the country benefits little if developments, within a supply area, are permitted to provide their own desalination supply.

It is disappointing to note that, despite assurances given, no work commenced on the construction of the West Bay Water Supply project that is being handled by Cayman Water Company. It is worthy of note that in the year Cayman Water Company was successful in obtaining soft loan funds from the European Development Bank and that Government provided them with a guarantee so that these funds might be secured.

The Authority continues to fight a battle with Camp Dresser and McKee, the consultants who advised on the West Bay Beach Project, seeking compensation for what it alleges to be negligence on their part. It now seems likely that the matter will be settled by arbitration sometime in 1992. This is an important point to raise as it demonstrates the determined attitude of the Board on all issues that it believes to be a matter of principle.

I trust that you will enjoy reading this comprehensive report and the 1991 accounts of our operation. I take great pleasure in the outcome of the year and I take this opportunity to thank the Members of Government, and the staff of the Authority for their efforts and assistance during the year. I also thank my fellow Board members for their invaluable contribution to the running of the Authority.



Derek B. Wight
Chairman

**THE PORTFOLIO OF
COMMUNICATION WORKS AND AGRICULTURE**

THE WATER AUTHORITY

1991 ANNUAL REPORT

1.0 GENERAL

The Water Authority completed its second year as a Statutory independent body and improved on the performance of 1990. The year ended with a profit of \$999,703 up \$173,000 on 1990, an overdraft position in 1990 was turned in to credit position at the end of 1991.

In 1991 approximately \$2.6 Million was invested in capital works, the major share being in water supply.

The Cayman Brac water supply project was completed and the works were officially opened by His Excellency the Governor in September. Whilst the project has a limited distribution to the West End of the Island a 2,000 gallon tanker truck has been purchased to supply water to the properties remote from the pipe line.

During the latter part of the year the Public Sector Investment Committee and Government approved a further large scale expansion of the water supply sector, from Spotts Newlands to Pease Bay. The design for this extension was completed in the year and the materials for the first phase were ordered and the majority were delivered by the end of the year. The expansion also included an amount of pipeline infill within the existing distribution area. The existing civil engineering contractor, Petroservicios Ltda, was given the extension and work commenced in December.

The design for the West Bay Water supply project was completed by consultants commissioned by Cayman Water Company. The design was finalized and approved by the Water Authority in the mid part of the year. At the end of the year, Cayman Water Company, awarded the contract for the works to a Florida contractor, Kimmins.

Central DeSal carried out extensive rehabilitation work to their IDE MED desalination plant which resulted in the plant being shut down from February to April. On startup the plant operated well and CDS have now instituted a modified preventative maintenance programme to avoid the serious problems that occurred in the past. By the end of the year agreement had been reached on the basis of Central DeSal's revised Licence.

The serious concrete corrosion of the West Bay Beach sewerage structures was addressed in the year and by the end of the year all the pumping stations had been protected with an integral, cast in PVC liner, and work commenced on those manholes requiring remedial work. The Authority has made a claim against the Consultant who advised on the project, the Consultant made an unacceptable offer of settlement which the Authority rejected and the matter is now likely to proceed to arbitration.

On the social side the Authority played a leading role in the organization and funding of the first international cycling event, the Hydrologic Tour, to be held in Cayman. Teams from various

regional countries and the United States took place in the competition which was won by the Cayman Team.

The Authority successfully hosted the 20th Caribbean Water Engineer's Conference and Exposition in December and this event attracted over 150 participants from all over the world.

Eight board meetings were held during the year, one of which was held in Cayman Brac.

The members of the Authority at the 31st December 1991 were:

Chairman	Mr Derek B Wight
Members:	Deputy Financial Secretary Mr Woodward Terry B.Sc. LL.B. JP Attorney-at-Law
	Principal Secretary, Communication, Works and Agriculture Mr Kearny Gomez MBE
	Chief Environmental Health Officer Mr Walling Whittaker B.Sc
	Mrs Betty Baraud
	Mr McKeeva Bush MLA
	Mr Harry Chisholm JP
	Mr Richard Flowers
	Mr Brainard Water
	Mr Otto Water
Secretary:	Director, Water Authority Mr R Beswick C Eng FICE FIWEM MASCE

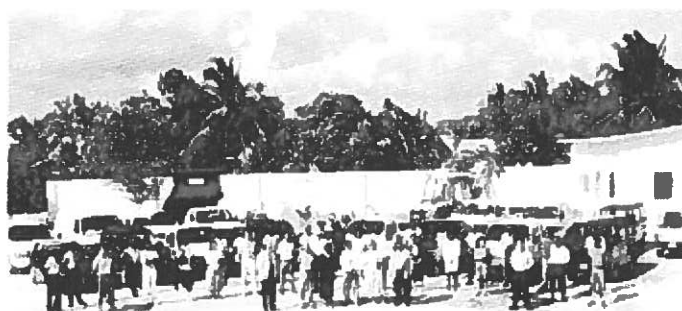
2.0 ADMINISTRATION AND FINANCE

2.1 Staffing

The Staff complement as at 31st December 1991 was as follows:-

Director	Mr R Beswick CEng FICE FIWEM MASCE
Deputy Director	Mr F McTaggart BSc
New Works Engineer	Mr T van Zanten MSc
Resident Engineer	Mr H van Genderen MSc
Graduate Engineer	Mr T Whittaker BSc
Trainee Engineer	Mr B Whittaker As
Senior Draughtsman	Ms C Seymour As
Draughtsman	Mr G Welcome
Operations Technician	Mr C Reid
Accountant	Mrs H Jackson
Assistant Accountant	Ms J Nicholas
Customer Relations Officer	Ms C Levey

Cashier	Ms E Arias	Operator	Mr W Watler
Clerical Officer	Ms G Powery	Assistant Operator	Mr A Archibold
Executive Officer, Cayman Brac	Mrs K Lazzari	Plumber	Mr D Myles
Operations Scientist	Ms G Frederick BSc	Superintendent, Cayman Brac	Mr B Banks
Laboratory Technician	Mrs B MacAree B Sc	Foreman	Mr C Morgan
Water resources Supervisor	Mr V Rankine	Meter reader	Mr J Ebanks
Water Resources Technician	Mr D Powery	Meter reader	Mr W Tamasa
Graduate Research Assistant	Mr P Roderigues BSc MSc	Asst Operator	Mr C Ramoon
Senior Superintendent	Mr T Hill Master Plumber	Labourer	Mr V Grant
Operator	Mr E Connolly	Labourer	Mr S Campbell
Operator	Mr L Tivy	Labourer	Mr W Steele
Operator	Mr B Martinez	Labourer	Mr R Cubas



Members and staff of the Authority

The following staff movements took place during the year:-

Troy Whittaker joined the Authority in July after completion of a Bachelors Degree in Civil Engineering at Widner University.

Anthony Archibold joined the Authority in September as an Assistant Operator.

Ricardo Cubas joined the Authority in April as an Labourer.

Walt Watler joined the Authority in April as an Operator.

Don Myles joined the Authority in December as a Plumber.

Gladys Powery joined the Authority in July as a Clerical Officer.

Brenda MacAree joined the Authority in February as a Laboratory Technician.

Wade Tamasa joined the Authority in November as a Meter Reader.

Emily Arias was promoted to Cashier in August.

Karen Lazzari was transferred to Cayman Brac and promoted to Executive Officer in August.

James Ebanks left the Authority in December.

Jason Arch left the Authority in May.

James Parsons left the Authority in February.

Bunyan Whittaker was promoted to Engineer in training in May.

2.2 Awards

The Chairman's Award was given to Calvin Ramoon, who is the Assistant Operator looking after the sewage treatment works.

2.3 Training

Support for the training of local staff continues to be an important activity of the Authority. As in previous years local staff are motivated to participate in local and regional seminars and workshops. Additionally, full time education overseas is encouraged.

The Authority completed its fifth year membership of the Caribbean Basin Water Management Project, a training project funded by CDB and CIDA. Each participating utility contributes a sum dependent on its size. The Authority contributed C\$4700 in 1991. The Authority participated as follows in three CBWMP workshops:

T Whittaker attended a one week course on Sewage Collection, Treatment and Disposal and Management in St. Lucia.

T Reid attended a two week workshop on Supervisory Management in Water Utilities in Grenada.

J Ebanks attended a one week course on Distribution Systems (including Mapping) in Water Utilities in Trinidad.

Other seminars and courses that the Authority participated in are as follows:

T van Zanten & G Ebanks-Petrie, of Natural Resources Unit, attended a one week CEPPOL Seminar in Jamaica on Monitoring and Control of Sanitary Quality of Bathing and Shellfish Growing Waters in the Wider Caribbean.

J Nicholas and H Jackson are now in their second and third year respectively of a part-time course which will lead to a formal accounting technicians qualification. This course is sponsored by the Government and directed by the Government Training Unit in association with the UK Association of Accounting Technicians.

G Frederick attended a Training of Trainers Workshop sponsored by Government Training Unit and UNDP. The follow-up Advanced Trainer Workshop on Supervisory Management course was organized six months later and was attended by the same staff member.

Two members of staff are being sponsored by the Government to obtain degrees. They are: C Reid and T Reid who commenced studying for Bachelor of Science Degrees with majors in Civil Engineering at Florida Institute of Technology in September. Their courses will specialise in wastewater treatment and sanitary engineering.

2.4 Finance

1990 was the second year of statutory independence; the financial statements and explanatory notes are located at the end of this report.

This year an attempt has been made to apply a number of accounting ratios to determine how well the Authority has operated. This exercise may be a somewhat misleading as at this time the Authority has very little equity, however it is worthwhile assuming that, as Government is the owner of the Authority, its investment is considered as equity and not as it actually is, a loan. The long term debt ratios to total assets have therefore been calculated in two scenarios, one with the existing position of all loan and the other assumes that the Government loans are equity.

It is worth noting from the ratios that the performance of the Authority is improving. The comparisons with 1990 show the percentage margins improving, the administration expenses have reduced relative to the revenue, the operating expenses have remained at the same level but the net income has increased as a percentage of the gross revenue. Whilst this increase is only about 1% it is significant, as it reflects a large increase in profit derived from water sales and sewerage, the revenue derived from other income, a less consistent source of revenue, has reduced significantly. A further factor improving the profit position was the reduction in loan interest paid by virtue of the re-financing of a large part of the long term debt. The working capital increased by approximately \$400,000 during 1991 a much improved position, due partly to the transfer of \$200,000 Government advance from current liabilities to long term debt, however the position was also improved by the improved cash and revenue position. The increase in the current ratio reflects this improved position and shows that the liquidity of the Authority is on an upward trend.

The return on the total assets remains below the 6% target of the Authority but it is encouraging to note that the return has increased over 1990. The same increase has been achieved with the profitability of long term funds. It might well be that the rate structure for 1993 will require revision in order to increase the return to be more in line with the Authority's goal.

The debt ratio has reduced over 1990, the 1991 ratio shows that the Authority, whilst remaining highly reliant on external funding is becoming less reliant on it. The position is not surprising as the Authority lacks any large amount of equity, it will obviously take a considerable number of years to develop a more robust position. However if the Government equity loan is considered as the Government's investment in the Authority, then the ratio is drastically reduced and puts the Authority's position in a far better condition.

2.5 Water Authority Assets

At the end of 1991 the Water Authority assets, both fixed and current were valued at CI\$22,027,687. The current liabilities were assessed at CI\$438,973 and the long term debt with borrowing institutions and Government was CI\$15,713,365. The policy of Government was that the difference between the assets and the sum of the liabilities and long term debt was their equity in the Authority which becomes an interest free loan that is payable over a period of twenty years. This debt payable to Government is therefore CI\$5,875,349 which includes the loan for the Cayman Brac Water Supply and the settlement paid to Hadsphaltic International.

Government Loan

	1990	1991
Brought Forward	3,872,349	5,122,349
Cayman Brac Loan	500,000	553,000
Hadsphaltic Settlement	750,000	
Start-up advance	0	200,000
Total	5,122,349	5,875,349

2.6 Drawing Office

The survey and drawings were completed for the first phase of the Pease Bay Water Supply Project. These drawings were completed using the CAD system.

The Cayman Brac Water Supply Project and George Town Water Supply as-built survey and drawings were completed.

The site drawings for the West Bay Beach control panels rehabilitation were completed.

Work commenced on the drawings for the Standard sewerage and sewage treatment works specifications.

3.0 WATER RESOURCES

3.1 Monitoring

Since 1984 the Water Authority has maintained a comprehensive groundwater monitoring programme of developed water resources in the Lower Valley Wellfield, and since 1986, the East End Wellfield. Monitoring over the last two years have shown that the quality of the water in Lower Valley domestic wells has improved in terms of bacteriological contamination and total dissolved solids. The results of seven years monitoring are discussed in a paper presented by the Laboratory Technician at the Engineers' Conference in December, 1991 (see Section 4.3).

Lower Valley Domestic Well Monitoring

In the Lower Valley area, thirty-three domestic wells were routinely tested for bacteriological contamination and total dissolved solids concentrations. This analysis is carried out once during the dry season and repeated during the wet season. The following are the results of this monitoring for Lower Valley:

	Percentage of Total Coliform Bacteria ≥ 10 cfu/100ml	Percentage of Faecal Coliform Bacteria > 0 cfu/100ml	Percentage of Total Dissolved Solids ≥ 1000 mg/L
Dry Season (April 1991)	16.6	16.6	0
Wet Season (September 1991)	24.2	18.2	0

East End Observation Wells Monitoring

As the East End wellfield is not in a dense residential area, the Authority monitors 5 observation wells scattered on the periphery of the lens and within the lens. There has been no indication of any general deterioration trend of the water resource in the East End lens. The following are the results of this monitoring for the East End wellfield observation wells:

	Percentage of Total Coliform Bacteria ≥ 10 cfu/100ml	Percentage of Faecal Coliform Bacteria > 0 cfu/100ml	Percentage of Total Dissolved Solids ≥ 1000 mg/L
Dry Season (April 1991)	0	0	40
Wet Season (September 1991)	20	4	40

The 40% of samples that have a TDS of > 1000mg/L are deep into the brackish water zone and are consistent with previous results.

3.2 Water Resource Licencing

In compliance with its statutory obligation the Water Authority has approved and granted the following licences and permits:-

Discharge Permits	246 No
Ground Water Abstraction Licences	3 No

Canal Permits
Quarry Permits

0 No
0 No

The collection of revenue from this licencing and permitting continues to be handled by the Building Control Section of the Planning Department, who coordinate with the Authority for the issuance of the permits.

Control continued to be exercised on the construction of deep wells and monitoring was carried out on commercial abstraction licences which had been issued for large abstractions.

3.3 Rainfall Distribution

The following summarizes the rainfall figures for 1987, 1988, 1989, 1990 and 1991 and annual averages over the indicated period.

Station	Annual Average		Annual Total				
	period	mm	1987	1988	1989	1990	1991
Driftwood Village	84-90	1066	050	1632	823	844	1054
Tortuga Club	67-90	967	938	1078	880	1004	1036
Furtherland Farms	84-90	936	827	894	1052	—	962
East End Village	85-90	1056	913	1459	1022	960	1248
Frank Sound	84-90	1055	888	1565	945	1041	1058
Bodden Town	67-90	1211	1159	1600	984	1252	1410
Lower Valley	84-90	1279	1261	1648	1186	1261	1224
Savannah	84-90	1319	1392	1668	1269	1245	1406
Prospect Park	84-90	1299	1444	1550	1265	1275	1502
South Sound	84-90	1415	698	1556	1371	1404	1425
Airport	67-90	1328	1541	1468	1301	1399	1524
West Bay	73-90	1046	1039	1536	949	1050	1261
Island Wide Average		1165	1179	1473	1087	1158	1259

The island wide average in Grand Cayman was 1259mm (49.57 inches), higher than the average for the recorded period. 1991 experienced an average increase of 101mm over the previous year. As in all previous years the rainfall was significantly less in the Eastern Districts compared to the Western districts.

4.0 QUALITY CONTROL AND RELATED MATTERS

4.1 Laboratory

The laboratory facilities continued to be upgraded as the demand for more analytical activities increase with the Authority's development. The major piece of equipment purchased in 1991 was a HACH DR2000 Spectrophotometer. This equipment has a wavelength range of 400-900nm and is precalibrated for over 120 specific analyses once the appropriate reagents and standards are available.

The major activities of the laboratory continue to be:

- Quality control of the George Town, Lower Valley, East End and Cayman Brac Water Supplies;
- Monitoring of the Lower Valley and East End water resources;
- Research and monitoring of the West Bay Beach sewerage system and sewage treatment works; and
- Development and implementation of Authority's personnel training programmes.

In February, the laboratory technician, Mr Gene Parsons left to take up his post at the Natural Resources Unit. He was replaced with Mrs Brenda MacAree in the same month.

The laboratory continues to support two research projects both of which are described in section 4.2.

Several papers have been produced by, or in conjunction with the laboratory and these are described in section 4.3.

As in previous years the laboratory accommodated several visits from the Cayman Islands High School fourth and fifth year chemistry students. These visits involved analytical demonstrations and tours of the Red Gate Water Works conducted by the operations scientist and/or the laboratory technician.

Monitoring Programme

The laboratory continues to operate its comprehensive quality monitoring programme of both sewage and water supply. Improvements in analytical procedures have been implemented such as weekly quality control graphs which serve as a measurement of the precision of testing methods over specific time periods.

The monthly breakdown of analyses performed as per Authority operation are as follows:

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
STW	28	26	32	35	90	75	75	94	84	101	69	29	
GTWS	37	44	45	56	56	37	55	53	48	50	22	36	
LVW	15	9	8	41	8	12	16	42	16	9	12	7	
EEW	10	10	10	7	9	8	6	12	14	6	6	9	
Private	7	4	3	16	10	3	7	14	14	10	11	3	
Queries	6	13	7	5	3	2	8	11	14	3	1	7	
Marine	0	34	17	34	18	34	19	34	17	17	27	17	
Gov	0	0	4	0	0	0	0	0	0	0	0	0	
CBWS	0	0	0	0	0	0	2	5	4	2	6	3	
TOTALS	103	140	126	194	194	171	188	265	211	198	154	111	2055

Over the year the following routine samples were taken and analyzed:

	Number of Samples	Percentage of Total
STW	738	36
GTWS	539	25
LVW	195	9
EEW	107	5
Private	102	5
Queries	80	4
Marine	268	13
Gov	4	0.2
CBWS	22	1
Totals	2055	100

George Town Water Supply

Monitoring of the distribution system continued and was improved with the implementation of sampling taps throughout the supply area. Regular monitoring of chlorine residual, bacteria and conductivity at these sampling points commenced in January, 1991. Additionally, regular monitoring of water supplied to the reservoirs and entering the distribution system continued on a twice daily basis.

The free chlorine residual of water entering the distribution system averaged 0.11 mg/L, while the pH averaged 7.55 units and the total dissolved solids (TDS) averaged 119.4 mg/L. Daily analyses for total and faecal coliform in the water entering the distribution system showed 0 cfu/100ml throughout the year.

The laboratory received and attended to a number of queries that resulted in eighty checks being made. Written reports were provided to customers, and where necessary, the customer was advised on what action to take regarding problems encountered on the customer's side of the meter box.

Cayman Brac Water Supply

Quality control monitoring of the Cayman Brac Water Supply began with the commissioning of the distribution system. Daily analyses for chlorine, pH, and corrosion inhibitor are carried out on the water supplied to the public. Weekly samples for bacteriological analyses are sent to the Authority's laboratory in Grand Cayman.

Sewage Treatment Works

Monitoring of the sewage treatment works continued on a weekly basis. Additionally, weekly monitoring of the electrical conductivity at eleven pumping stations on the West Bay Road commenced in May, 1991, the purpose being to ascertain the integrity of the sewerage system along these points and to observe seasonal and tidal influenced variations.

The following is a summary of the operational performance of the sewage treatment works since commissioning:

Year	Average BOD-5 day mg/L			Average FC cfu/100ml			Average EC μ S/cm
	Raw sewage	Final effluent	% reduce	Raw sewage	Final effluent	% reduce	Raw sewage
1988	213.0 (g)	13.0 (g)	94.0	4.39×10^6	1.68×10^3	99.962	3787 (g)
1989	174.0 (g)	36.0 (g)	80.0	1.62×10^8	2.87×10^3	99.998	6551 (g)
1990	103.5 (c)	25.4 (g)	75.5	3.18×10^8	7.30×10^3	99.998	11955 (c)
1991	76.4 (c)	20.8 (g)	73.0	2.77×10^6	1.55×10^4	99.440	16749 (c)

note: BOD = Biochemical Oxygen Demand; FC = Faecal Coliform Bacteria; cfu = colony forming units; EC = Electrical Conductivity; g = grab sample; c = 24hr composite sample.

The 24 hr raw composite sewage samples for 1991 had BODs which ranged from 35.6 to 166.1 mg/l and averaged 76.4 mg/L. The electrical conductivities for the same samples ranged from 11490 to 19430 μ S/cm with the average being 16749 μ S/cm. Faecal indicator bacteria analysed in raw sewage grab samples averaged 2.77×10^6 cfu/100ml and ranged from 1.30×10^5 to 8.20×10^6 cfu/100ml.

Unfiltered BODs in the final effluent samples from the last maturation treatment pond in series ranged from 9.6 to 43.6 mg/l, and an averaged of 20.8 mg/L in 1991. Faecal indicator bacteria analysed in these samples ranged from 3.00×10^2 to 2.08×10^5 cfu/100ml, with an average of 1.55×10^4 cfu/100ml.

From the monitoring data it appears that the quality of the final effluent has been negatively influenced by the increases in salinity as measured by electrical conductivity. Rehabilitation of the sewerage system is programmed for 1992, and it is expected that the quality of the final effluent will improve in terms of BOD, faecal coliform and salinity, and as a result become suitable for irrigational reuse.

Hog Sty Bay Monitoring Programme

In February, 1991, the Hog Sty Bay Monitoring Programme commenced as part of an interdepartmental agreement between Natural Resources Unit, Environmental Health Department and the Water Authority. However, after the first sampling session the Environmental Health Department declined to participate. The Water Authority and Natural Resources agreed to continue the twelve month coastal water quality monitoring programme.

There are nine sampling points in the Hog Sty Bay area and a control point off Seven Mile Beach. A surface and a bottom sample are taken at each point for analysis every three weeks. The samples are analysed for faecal indicator bacteria; faecal coliforms and enterococci, in addition to several physico-chemical parameters.

The average faecal coliforms density of the seventeen points up until December, 1991 was 1.9 cfu/100ml. The highest individual sampling point average was 10.3 cfu/100ml.

The average enterococci density of the seventeen points up until December, 1991 was 3.2 cfu/100ml. The highest individual sampling point average was 7.33 cfu/100ml.

The physico-chemical parameters were all within normal range for tropical seawater.

4.2 Research

G Frederick, the operations scientist, continued her collaborative M Phil, with the University of Surrey. Her supervisor Dr B Lloyd, visited three times during the year to monitor and advise on the progress of the research. Ms Frederick went on study leave for two months in the summer during which she completed a report to continue on for a higher degree. The written report was defended verbally and approval was granted by the University Board. Proposal for further research includes an in depth study of the functional ecology of waste stabilisation ponds with the aim to establish a biotic index that may be used in place of chemical and microbiological analyses in determining the performance of waste stabilization ponds.

Mr Paulino Rodrigues, the graduate research assistant continued with his third year, during which he expanded his data collection to include other parameters that affect the performance of waste stabilization ponds. These parameters included the weekly monitoring of dissolved oxygen and temperature of the waste stabilization ponds. Analyses of the first 9 months of these results produced the first insight of the distribution of temperature and oxygen within the ponds, which will assist in determining the efficiency of the system. This work was presented in a paper to the 20th Caribbean Water Engineer's Conference. In addition to the research aspects of this data they were also used for operational purposes.

The research also included a monthly parasitological survey which is carried out with the cooperation of Mrs Kathy Gomez in the Hospital laboratory. A joint paper on this work was produced and submitted to the Director for possible publication.

A pilot scale experiment was carried out to determine if it was evident that the depth of the sludge layer affected the performance of the treatment process. This experiment was carried out over a period of six months and is expected to be concluded in April 1992.

The GRA's supervisor, Mr Ken Ellis of Loughborough University, visited on two occasions. During these periods guidance was given on the direction of the research and a number of modifications were recommended and accepted.

Experimental work being carried out on the sludge accumulation in the sewage treatment works



Hon Linford Pierson takes an interest in the Exposition during the 1991 Caribbean Water Engineers Conference organized by the Water Authority and held at the Grand Pavilion hotel in December

Chairman, Derek Wight addresses delegates at the Caribbean Water Engineers Conference



4.3 Conferences, Papers and Reports

Conferences

In December, 1991, the 20th Caribbean Water Engineer's Conference and Exposition was hosted at the Grand Pavilion Hotel by the Water Authority-Cayman. This was the first time that the annual conference was held in these islands. This conference followed the two-day Advisory Management meeting of the CBWMP which was attended by water utility Directors and Managers within the Caribbean region. A total of twenty-seven technical and scientific papers were presented by engineers and scientists from North America, the Caribbean and Europe on topics ranging from cholera preparedness in the region to quantifying the environmental impacts of water distribution projects. The complete conference proceedings will be published by the Water Authority in early 1992. One hundred and fifty delegates representing 30 countries world-wide attended the three-day conference. The exposition drew representatives of twenty manufacturers of water/wastewater related products and services. Several exhibitors also sponsored lunches, dinners and cocktails. The objective of the conference was to provide an engineering and scientific forum for the exchange of experiences and informational technology among regional and international engineers, scientists, researchers, manufacturers and other professionals concerned with all aspects of water and wastewater management.

Papers

- Zanten T C van: Waste stabilisation ponds - Alternate or first choice? Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.
- Genderen H-J van: Data collection for the development of piped water supply in Grand Cayman. Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.
- MacAree B: Ground water quality of the Lower Valley wellfield, Grand Cayman, Cayman Islands. Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.
- Ellis K V and Rodrigues P C C: Verification of two design approaches for stabilization ponds. Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.
- Ellis K V and Rodrigues P C C: Temporal and spatial distribution of dissolved oxygen and temperature in stabilization ponds. Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.
- Jaegar C W: Cayman electrical innovation as enhanced operations and maintenance. Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.
- Shook W E : Non-disruptive reconstruction and corrosion protection of manholes and lift stations on Grand Cayman. Presented at the 20th Caribbean Water Engineer's Conference, 4-6 December, 1991.

The following Papers were prepared by the University of Alberta in cooperation with the Water Authority:

- Cerridwen S. and Jones B. 1991. Distribution of bivalves and gastropods in the Pleistocene Ironshore Formation, Grand Cayman, British West Indies. Caribbean Journal of Sciences v. 27, p 97-116

- Jones B and Hunter I G. 1991. Corals to rhodolites to microbialites - a community replacement succession indicative of regressive conditions. *Palaeos*, V. 6, P. 54-66.
- Jones B 1991. Genesis of Terrestrial Oncoids, Cayman Islands, British West Indies. *Canadian Journal of Earth Sciences*. V. 28, p. 382-397.
- Tongpenyai B. and Jones B. 1991..Application of Image Analysis for delineating Modern Carbonate facies changes through time: Grand Cayman, Western Caribbean Sea. *Marine Geology*, v. 96, p. 85-101.

A report establishing a pollution monitoring programme for the Hog Sty Bay area was completed by the Authority in cooperation with Natural Resources Unit and Environmental Health Department.

The operations scientist prepared a report entitled "Evaluation of full-scale waste stabilisation ponds treating saline wastewater." This report was submitted to and accepted by the University of Surrey as qualification for continuation of her research studies.

5.0 WATER SUPPLY - OPERATIONS

5.1 Lower Valley Wellfield Facility

The Lower Valley wellfield has completed its eighth full year of production. The wellfield has been pumping for 97% of the year, 21% more than 1990.

The following table indicates various performance criteria of the wellfield and compares them to the previous years. There has been a 2% reduction in production over the previous year at this facility, but the increased line losses resulted in a greater reduction in sales.

Year	Hours Run	Average Pumping Rate Cub m/hour	Quantity Produced Cub m	Power Kwh per Cub m	%age Loss	Month Max Cub m	Production Max Cub m	Total Sold Cub m
1986	6,810	8.68	59,146	2.03	7.94	7,033	2,386	55,716
1987	8,421	7.15	60,159	2.28	4.94	5,459	3,965	57,744
1988	7,884	6.16	48,564	2.35	5.60	4,770	2,692	45,989
1989	6,945	7.08	49,177	2.33	5.38	5,054	2,146	48,256
1990	6,635	6.70	44,480	2.33	8.79	5,380	2,086	44,944
1991	8,489	5.15	43,695	2.50	11.0	4,472	2,689	39,584

Lower Valley wellfield performance

The water quality remains within the World Health Organization's standards and the average saw a slight increase in total dissolved solids (TDS), with a TDS ranging between 748 ppm to 920ppm, depending on the time of the year and position of the tide.

The total quantity of water produced since commencement of the wellfield operation is 417,626 Cub m (110,253,264 US Gallons).

5.2 East End Wellfield Facility.

The East End wellfield has completed its sixth full year of production. The wellfield has been pumping for 14% of the year, 2% more than 1990. The production was 31% higher than 1991.

The following table indicates the various performance criteria of the wellfield and compares them to the previous year.

Year	Hours Run	Average Pumping Rate Cub m/hour	Quantity Produced Cub m	Power Kwh per Cub m	%age Loss	Month Max Cub m	Production Max Cub m	Total Sold Cub m
1986	603	14.72	8,877	0.46	1.03	1,760	339	4,191
1987	2,712	14.00	37,973	0.47	1.37	6,401	1,244	29,263
1988	3,134	14.00	43,879	0.45	1.36	7,183	529	33,815
1989	3,564	17.50	62,359	0.40	7.00	11,293	954	57,973
1990	1,086	17.87	19,408	0.43	1.00	2,624	952	19,074
1991	1,191	21.39	25,481	0.45	4.55	4,203	1,087	26,323

East End wellfield performance

The water remains within the World Health Organization's standards, with a total dissolved solids ranging between 357 ppm to 534ppm, the water being better quality than Lower Valley because of the larger lens.

The total quantity of water produced since commencement of the wellfield operation is 197,977 Cub m (52,265,928 US Gallons).

5.3 Cayman Water Company.

The water sales of Cayman Water Company for 1991 were lower than 1990, which to some extent was due to the reduction in trucked water demand and sale of water to other sources, although there was a significant drop in pipeline sales, which is difficult to understand.

The following table indicates the performance of their various operating parameters and compares them to 1990.

	1991	1990	Variance 1991 to 1990
Water Produced (US Galls)	180,189,000	186,819,220	-3.5%
Total Water Sold(US Galls)	157,998,373	172,686,551	-8.51%
Pipeline Sales(US Galls)	152,313,323	161,872,715	-5.91%
Truckers Sales(US Galls)	4,960,870	7,295,400	-32.00%
Other Sales	724,180	3,518,436	-79.42%
Fuel Adjustment Factor Av	\$0.46	\$0.71	-34.55%
Average water price pipeline (1000 US Galls)	\$17.91	\$18.16	
Average water price trucker (1000 US Galls)	\$15.46	\$15.71	
Total Royalty Payment	\$205,763.41	\$223,773.55	-8.05%
Unaccounted for water	12.80%	7.55%	+5.23%

5.4 Water Truckers

The following companies continue to provide a trucking service:-

H.A. Bodden
Eden's Water Service
C.L. Flowers and Sons
Wilford Ryan
Thompson Water Service
Brasely McLean

Five of the companies drew water from East End, five from Lower Valley, all six from the George Town reservoir and one from two private wells situated on Walkers Road. For a part of the year water was also drawn from the Treasure Island and Hyatt Hotels when other sources were insufficient to meet the need and an estimate of the quantities from these sources is included in the table below.

The total quantity of water drawn by the truckers expressed in US gallons was as follows:-

	1989	1990	1991
Water Company	3,457,214	7,295,400	4,960,870
Lower Valley	12,861,024	11,864,799	10,305,359
East End	15,304,872	5,033,169	6,670,284
George Town Reservoir	7,802,362	14,797,234	16,634,772
Walkers Road	2,790,162	103,752	102,000
Other Sources	12,000,000	0	0
Total	54,215,634	39,094,354	38,673,284

This equates to an average daily trucked demand of 105,954 US Gallons, representing a nominal reduction over 1990, which may well have been effected by the increase in rainfall. However a greater reduction in trucked demand may have been expected when considering the significant increase in rainfall over 1990.

5.5 George Town Water Supply

Although no large areas were added in 1991, the George Town water distribution system continued to grow steadily with the addition of 423 new customers from January to December 1991, an increase of 20%. This was reflected in a 23.9% increase in pipeline sales over 1990 figures.

Several small developments were connected to the public system through pipelines which were installed by their developers under Water Authority supervision. The installations costs were borne totally by the developer and the lines were turned over to the Authority for operation.

DeSal Ltd. carried out major repair work on their problem riddled plant during the early part of 1991. Their Israeli built multiple effect distillation (MED) plant was shut down from February 1 until April 1, during which time the condenser and three evaporator effects were rebuilt. They have gained back much of their production capacity and are operating more efficiently. Although no official agreement has been reached between the Authority and CDS, their plant has provided approximately 640 m³ per day after its rehabilitation. The Water Authority have proposed a new agreement whereby the Authority will purchase approximately 700 m³ per day or 33% of the average daily demand from CDS. Negotiations on the new licence are pending.

Ocean Conversions Ltd., formerly Reliable Water Cayman continued to provide a consistent supply of desalinated water throughout the year with no major plant breakdowns. A second RW-5 plant was commissioned in January to provide water during the Central DeSal plant rehabilitation. The new plant provides an additional 700 m³ per day for a total capacity of 2000 m³ per day. Ocean Conversions is currently installing an energy recovery system for the second RW-5 plant which will increase the combined plant capacity to 2,660 m³ per day. The RW-2 plant was dismantled and shipped to Cayman Brac in May.

Data on George Town Customers:

Month	Single Residential	Multi Residential	Commercial	Industrial	Public	Truck	Total
Jan	1,775	50	261	2	39	8	2,147
Feb	1,834	51	266	2	39	8	2,212
Mar	1,857	51	271	2	39	8	2,240
Apr	1,879	51	276	2	41	7	2,268
May	1,941	52	279	2	41	7	2,334
Jun	19,69	52	287	2	42	7	2,371
July	2,048	52	285	2	42	7	2,448
Aug	2,047	53	284	2	42	7	2,446
Sept	2,058	52	286	2	44	7	2,460
Oct	2,070	54	287	1	44	7	2,474
Nov	2,116	54	294	1	44	7	2,527
Dec	2,148	57	295	1	46	7	2,565

1990 Average monthly consumption per Consumer Group (cub m)

Month	Single Resident	Multi Resident	Commercial	Industrial	Public Auth	Total Pipeline Cust	Trucker
Jan	15.99	163.19	55.37	96.95	124.43	26.35	733.01
Feb	14.16	150.33	48.52	76.05	95.63	23.00	1,015.23
Mar	16.75	167.55	50.57	158.70	130.60	26.47	1,439.11
Apr	17.02	180.07	54.58	160.50	125.05	27.42	1,182.47
May	16.33	157.14	50.60	121.85	137.89	25.87	695.24
June	12.17	118.18	42.59	75.45	84.40	19.57	445.53
July	15.26	141.16	53.32	135.95	112.27	24.19	633.47
Aug	14.40	146.94	51.19	104.25	96.48	23.09	597.71
Sept	12.12	123.08	49.05	66.55	94.49	20.33	310.37
Oct	12.89	110.57	54.14	91.50	97.63	21.41	352.53
Nov	11.23	107.80	42.15	169.30	86.98	18.32	488.61
Dec	10.81	95.49	37.44	97.60	75.48	16.99	645.60

Total water sales by Consumer Group (cub m)

	1991	1990	1989
Single Residential *1	332,432	322,373	183,054
<u>Multi Residential</u>	<u>86,635</u>		
<u>Total Residential</u>	<u>419,067</u>	322,373	183,054
Commercial	165,200	140,689	109,570
Industrial	2,351		
Public Authority	52,522	45,184	33,446
<u>Truckers</u>	<u>62,963</u>	<u>62,768</u>	<u>29,553</u>
Total	702,103	571,014	355,625

In the previous table *1 1990 and 1989 figures include multi-residential consumption. In 1991 the multi-residential consumption, which includes single connections to apartment complexes, was separated out in the statistics to facilitate more accurate individual consumption data.

Unaccounted for water

The average monthly unaccounted for water was 5.08% of the gross production, a reduction of 0.21% over 1989, with a high of 21.28% in December and a low of -1.68% in October. The high loss recorded in December and the negative loss results from the timing of the sales meter readings as compared to the production meters. The high loss recorded in December was as a result of the the consumer meters being read earlier than usual, in the middle of the month, and the production meters at the end of the month.

Water Prices

The prices of water increased to the following at the 1st February 1991:

Ground Water	\$2.00 per Cub m	(\$7.58 per 1000 US Galls)
Desalinated Water		
Grand Cayman		
Residential	first 12 Cub m per month	\$3.78 per Cub m (\$14.32 per 1000 US Galls)
	over 12 Cub m per month	\$4.54 per Cub m (\$17.18 per 1000 US Galls)
Public Authority		\$4.10 per Cub m (\$15.55 per 1000 US Galls)
Commercial		\$4.54 per Cub m
Trucker		\$3.78 per Cub m
Cayman Brac		
All customer groups	\$6.60 per Cub m	(\$25.00 per 1000 US Galls)

Meter rental charges for Grand Cayman and Cayman Brac are payable monthly and vary from \$5.00 to \$58.00 depending on the size of meter.

Minimum monthly charge is payable and is made up of the meter rental charge plus the cost of 4 Cub m of water and therefore varies for the type of customer and the meter size.

5.6 Cayman Brac Water Supply

Cayman Brac became the next island in the trio to receive a piped water supply in late June of 1991. The West End Water Supply Facility began operation on the 24th of June and provides the island with 227 m³ of potable water per day. Water is stored in a 2,270 m³ reservoir and is delivered by pipeline to properties on the west end of the island. The Authority also operates a tanker truck to carry water to areas of the Brac not serviced by the pipeline.

Water is purchased exclusively from Ocean Conversions Ltd. (formerly Reliable Water Company) who operate a seawater reverse osmosis plant. Their RW-2 plant, which was relocated from Grand Cayman, has operated satisfactorily during the year. However the plant is only required to operate less than 1 week per month because of current water demands (less than 50 m³ per day).

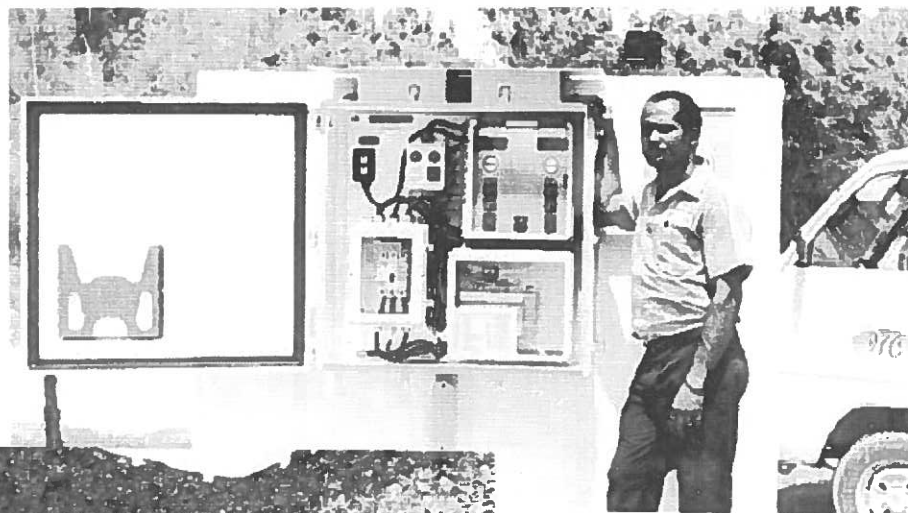
6.0 SEWERAGE - OPERATIONS

6.1 West Bay Beach Sewerage

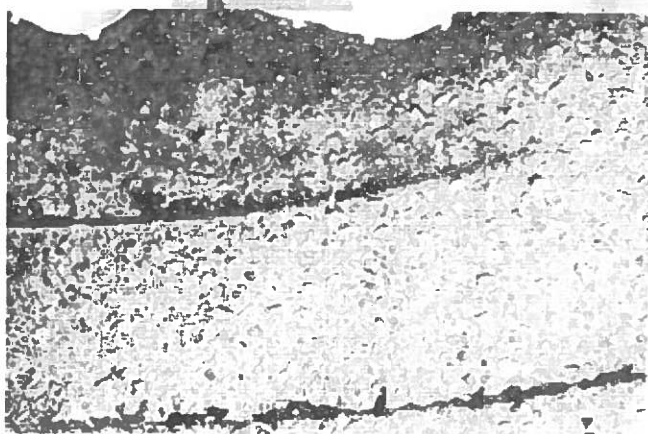
A great deal of rehabilitation work was carried out on the sewerage system during 1991, particularly on the lift stations situated along West Bay Road.

It was determined in late 1990 that the control panels for all of the ABS equipped sewage lift stations should be replaced with new, more durable electrical equipment. These new panels were custom designed and manufactured by an American electrical engineering firm and were delivered to the Authority in August. The panels were installed by a local electrical contractor and were commissioned by the design engineer in early December.

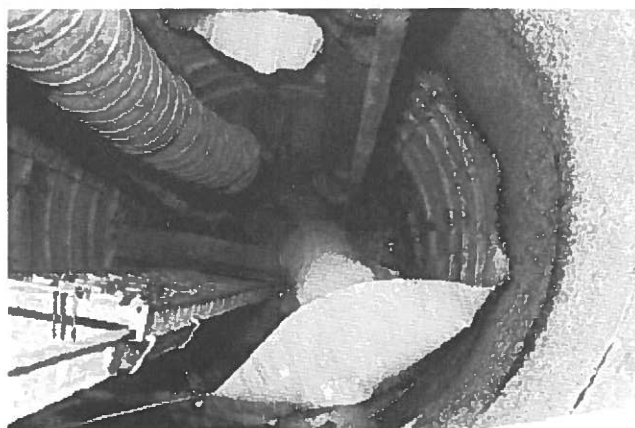
Deterioration of concrete structures in the system continued to be a problem in 1991. After extensive research into concrete protection and rehabilitation methods, it was decided to contract with an American firm, Permaform Manhole Systems, Inc. to rehabilitate 9 sewage lift stations and 29 manholes using a method whereby the old structure is completely replaced by a new poured-in-place concrete structure. Formwork is erected within the existing structure, a PVC



New computerized control panels installed on the West Bay Beach sewerage pump stations



An example of the concrete corrosion of the West Bay Beach Sewerage structures



Repair work to the concrete corrosion, PVC liner being installed

sheet liner is wrapped around the formwork, and concrete is poured between the PVC liner and the old deteriorated structure. Work commenced in mid-July and will be completed by the end of February 1992.

The salinity of the raw sewage continued to rise over the year. Visual inspections of certain gravity sewers indicated significant amounts of ground water infiltration entering the sewers through damaged pipes. It is estimated that more than 40% of the sewage entering the treatment works is actually ground water. This sharply increased electricity costs over the year. Several international companies which specialize in sewer TV inspection and insitu repair were contacted in December and it is envisaged that repair work will begin in early 1992.

Two small sewage pumping stations were commissioned in April and have operated without problems. One station, located at the entrance to Drake Quay in Governor's Sound, was paid for by the property owners in the development. It replaces an old station which had fallen into disrepair and was not functioning. The second station at the Owen Roberts Airport terminal is maintained by the Authority and pumps sewage to a small treatment works located on the airport property. This station and treatment works replaces old Chromoglass units which had caused a severe odour problem around the passenger terminal.

It was noted from electricity consumption figures for the year that pumping efficiency had dropped significantly. This is due to normal wear of the pump impellers and bottom plates. It is anticipated that these parts will be renewed in the early part of the year and that significant savings in electricity will be realized.

The stabilization ponds continued to operate under stress caused by the increased hydraulic loading and salinity from infiltration. It was necessary to run the aerators towards the end of the year in order to avoid odour problems. Design work was carried out on the effluent disposal system to reduce electricity costs at the Sewage Treatment Works by gravitating effluent into disposal wells instead of pumping.

Sewerage Statistics	1991	1990	
Total sewage treated	1,225,277	801,831	cub m
Average Daily Flow	3,357	2,197	cub m
Number of Septage loads	707	877	Loads
Pumping Stations' electricity	363,059	155,016	KwH
	0.296	0.193	KwH per Cub m
Treatment Works electricity	161,240	104,400	KwH
	0.132	0.13	KwH per Cub m
Aspirators' electricity	45,000	49,140	KwH
	0.037	0.061	KwH per Cub m
Total		0.385	KwH per Cub m
Total number of connections	231	232	
Total Sewerage Fee charged	\$1,512,387	\$1,320,964	
Average cost per connection	\$545.59	\$474.48	
Total number of septage customers	4	4	
Total Septage Fee charged	\$21,210	\$26,310	
Average cost per customer	\$441.88	\$548.13	

6.3 Sewerage Rates

The sewerage rate system was modified for commercial property and an increase per Sewerage Fixture Unit (SFU) was approved in February.

The new rate system is as follows:

Group	SFUs per Sq ft	SFUs per unit
Commercial		
Store	0.0275	
Office	0.0375	
Beauty saloon, surgery, bar, club, water sports	0.0475	
Food handling, garage, photo developing	0.0575	
Residential and hotels		
Residential Bedroom		6
Residential bathroom		14
Hotel room		18
Rate per Sewerage Fixture Unit	\$1.40 per month	

7.0 NEW WORKS

7.1 West Bay Beach Sewerage

A dispute arose between the Water Authority and the consultant Camp Dresser McKee, as the Water Authority are of the opinion that most of the problems experienced with the electrical control panels and concrete corrosion of the manholes and lift-stations on the West Bay Beach Sewerage System could have been avoided if the consultant had provided suitable advice at the time the specification and other contract documents were prepared. The Water Authority are claiming the cost of the necessary repairs from the consultant.

7.2 George Town Sewerage

Proper sewage treatment and disposal remains a serious concern of both the Water Authority and the Environmental Health Department.

Work on the pre-feasibility study on a sewerage system for North and Central George Town, which was commenced in June 1990, was abandoned in early 1991 as the Water Authority resumed its responsibility for on-site treatment and disposal of waste water at planning stage. The Environmental Health Department had assumed this responsibility for several years, but it became obvious that they did not have the resources to continue this task. More than 100 new developments were reviewed between April 1991 and December 1991.

The Natural Resources Unit and the Water Authority continued to carry out the monthly coastal water quality monitoring programme of the Hog Sty Bay area. To date no official report has been issued to government, but the results so far have not indicated that a serious pollution problem exists.

George Town Water Supply

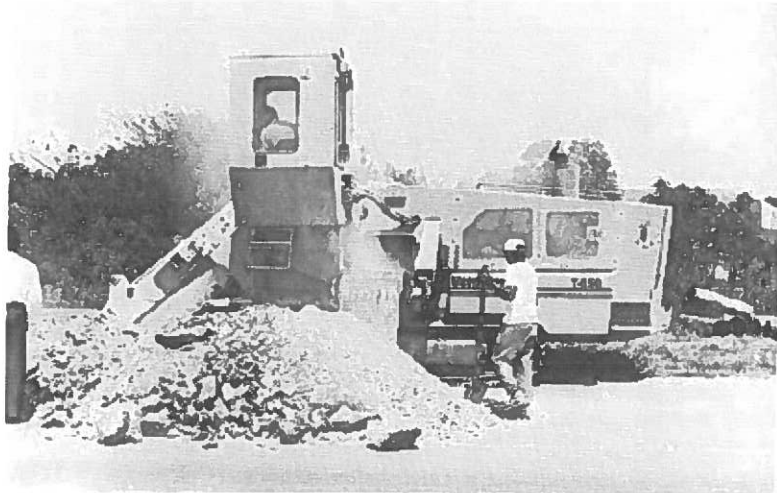
The remainder of the extension of the water supply system to Spotts Newlands was completed in two periods :

- January until early March 1991 (before the contractor left to Cayman Brac).
- Mid-June until Mid-July 1991 (after Cayman Brac project)

In addition to service connections throughout George Town, the following work was carried out and completed by the contractor in the year:

- Distribution in Savannah Estates (funded by developer)
- Distribution to Watler's sub-division in Spotts Newlands

Petroservicios's new Vermeer 850 trenching machine brought in to deal with the hard rock on the Pease Bay extension.



Official Opening of the West End Water Works in Cayman Brac September 1991

West End Water Works under construction June 1991



- Distribution in roads off Marina Drive in Prospect
- Connection Jennett Street and Shedden Road

In August, a rate increase, calculated in accordance with the conditions of contract, was given to the civil engineering contractor. This increase, which was applied retro-actively from January 1991, averaged approximately 5.0%.

It is interesting to note that the average cost per metre of pipe laid since 1987 has only increased from \$44.90 to \$46.71, an increase of \$1.81 or 4%. This increase is far below the rise in inflation over the four year period. The low increase has been achieved by prudent management and design of the system to avoid costly items such as road reinstatement. The average cost includes the construction of two one million gallon reservoirs. The small increase also reflects the very advantageous rates in the contract and the reasonableness of the contractor.

The Board having made a decision to have the existing contractor continue with the extension to Bodden Town, understood the concern of the various sectors with respect to tendering for additional work. The Board took the view that any work after the completion of the Bodden Town extension would be put out to tender.

7.4 Cayman Brac Water Supply

The contractor commenced work on the Cayman Brac Water Supply project on 19th March 1991 and completed the installation of the pipeline on 14th June 1991. During this period a total of 6,500 metres of pipeline and 72 meterboxes were installed.

The construction of the 1,600 sq.ft steel frame building, which houses the Reverse Osmosis Plant, the chlorination unit, the pumping station and the office, which commenced in October 1990 was completed by early March 1991.

The construction of the foundation ring for the 0.5 million gallon reservoir commenced on 26th March 1991 and was completed by mid-April 1991. Reservoir erectors arrived on Cayman Brac on 28th April 1991. The vitreous-enamelled circular water storage reservoir was erected by the end of May 1991. Some remedial work was carried out by mid-June 1991.

7.5 West Bay Water Supply

The design for the West Bay Water Supply was finalized in July 1991 by Consultants employed by the Cayman Water Company.

Four companies, out of ten prequalified contractors, submitted their tender for the project on 7th October 1991.

On 9th December 1991 Cayman Water Company awarded the contract to Kimmins Contracting Corporation of Tampa, Florida.

It is anticipated that the construction of the first phase will commence in early February 1992.

8.0 WATER AND SEWERAGE OPERATORS

During the year the following new Licences were approved by the Plumber's Examination Board:-

	1991 Licences issued	Total number issued to 31st Dec 91
Apprentice	10No	47No
Journeyman	1No	89No
Master	3No	26No

The Chairman of the Board continued to strengthen the series of teaching aids for plumbers and these were made available to the trade to assist with examinations and to generally upgrade the standard of plumbing on the Island.

The Plumber's Examination Board met on three occasions to assess applications and this year practical and theoretical examinations were held on three occasions to determine applicants' ability.

The Board consists of the following members:

Chairman	Senior Superintendent Water Authority (Mr Thomas Hill)
Members	Chief Environmental Health Officer (Mr Walling Whittaker) Mr Nigel Miller Plumbing Inspectors (Mr Arthur Arch, Mr George Feese)
Secretary and Member	Chief Building Control Officer Mr Roger Gough


A large, faint, stylized logo consisting of the letters 'WA' in a cursive, calligraphic font, positioned centrally on the page.

Water Authority-Cayman

**Financial Statements
and Appendix**

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CAYMAN ISLANDS

Water Authority of the Cayman

CERTIFICATE AND REPORT OF THE AUDITOR GENERAL*To the Members of the Water Authority
of the Cayman Islands*

I certify that I have examined the financial statements on pages b to i of the Water Authority of the Cayman Islands for the year ended 31 December 1991 in accordance with the provisions of Section 8 (7) of the Water Authority Law, 1982, and Section 44(1) of the Public Finance and Audit Law, 1985.

In my opinion these financial statements give a true and fair view of the state of affairs of the Water Authority of the Cayman Islands at 31 December 1991 and of its operations for the year then ended.

I have no observation to make on these financial statements.

*Nicholas Treen***NICHOLAS TREEN
AUDITOR GENERAL****27 JULY 1992**

Water Authority-Cayman

Balance Sheet

As At 31st December 1991

(Stated in Cayman Islands Dollars)

	Notes	1991 \$	1990 \$
CURRENT ASSETS			
Cash on Hand		600	200
Cash at Bank		58,943	48,760
Accounts Receivable		584,910	441,629
Office and Lab Supplies	6	8,902	8,902
		<u>653,355</u>	<u>499,491</u>
FIXED ASSETS			
Land	5	565,264	565,264
Water Supply System	5	9,345,987	8,565,088
Sewerage System	5	10,044,170	9,861,737
Tools and Equipment	5	74,839	66,540
Office Furniture and Equipment	5	93,608	88,956
Vehicles	5	114,346	59,120
Construction in Progress	4	1,136,118	437,177
		<u>21,374,332</u>	<u>19,643,882</u>
Total Assets		<u>22,027,687</u>	<u>20,143,373</u>
CURRENT LIABILITIES			
Overdrawn Bank Account		0	93,145
Accounts Payable		124,494	89,588
Customer Deposits		314,479	298,241
Government Advance		0	200,000
		<u>438,973</u>	<u>680,974</u>
LONG TERM LIABILITIES			
Loans Payable	3	19,994,617	19,092,022
Total Liabilities		<u>20,433,590</u>	<u>19,772,996</u>
Net Assets and Liabilities		<u>1,594,097</u>	<u>370,377</u>
Represented By:			
Reserve for Foreign Currency Fluctuations	7	(232,201)	(456,218)
General Reserve		1,826,298	826,595
Total Reserves		<u>\$1,594,097</u>	<u>\$370,377</u>

See accompanying notes to financial statements

On behalf of the Board

Derek B Wight
Chairman

Richard G B Beswick
Director

Water Authority-Cayman

Statement of Income and Expenses

For the Year Ended 31st December 1991

(Stated in Cayman Islands Dollars)

	Notes	1991 \$	1990 \$
INCOME			
Sales		5,544,049	4,790,925
Deposit Interest		27,406	55,781
Miscellaneous		20,004	17,050
Total Operating Income		5,591,459	4,863,756
EXPENSES			
<i>Administrative</i>			
Salaries		189,030	191,862
Wages		34	10,200
Staff Training and Benefits		56,498	25,207
Office and Lab Supplies		31,607	25,326
Licences and Dues		5,532	9,816
Telephone and Utilities		16,676	11,188
Insurance		33,381	29,388
Repairs and Maintenance		80	1,212
Bad Debt Expenses		766	6,227
Depreciation Expense	5	18,699	37,372
Miscellaneous		24,921	19,989
Total Administrative Expenses		377,224	367,787
<i>Operating</i>			
Salaries		377,355	293,364
Wages		104,769	100,216
Water Purchase		1,920,861	1,458,099
Repairs and Maintenance		43,632	37,356
Supplies		35,836	46,875
Electricity		109,297	88,077
Depreciation Expense	5	498,729	412,951
Lease Expense	11	6,250	6,250
Loan Interest		1,089,851	1,205,772
Miscellaneous		27,952	20,414
Total Operating Expenses		4,214,532	3,669,374
Total Administrative and Operating Expenses		4,591,756	4,037,161
Net Profit		\$999,703	\$826,595
General Reserve at Beginning of Year		826,595	0
General Reserve at the End of Year		1,826,298	826,595

Water Authority-Cayman

Statement of Cash Flow

For the Year Ended 31st December 1991

(Stated in Cayman Islands Dollars)

	1991	1990
	\$	\$
OPERATING ACTIVITIES		
Net Income for Year	999,703	826,595
<i>Add Items Not Affecting Working capital</i>		
Depreciation	517,428	450,323
<i>Net Change in Non-Cash Working Capital Balance Relating to Operations</i>		
Increase in Accounts Receivable	(143,281)	(324,274)
Increase in Customer Deposits	16,237	21,872
Increase in Accounts Payable	34,906	77,628
Decrease in Advance	(200,000)	
Cash Provided by Operating Activities	1,224,993	1,052,144
INVESTING ACTIVITIES		
Cost of fixed assets purchased	(1,548,937)	(2,388,334)
Construction in Progress	(698,941)	(437,177)
Cash Applied to Investing Activities	(2,247,878)	(2,825,511)
FINANCING ACTIVITIES		
Repayment of Long Term Debt	(5,648,054)	(515,000)
Proceeds of Long Term Debt	6,774,667	1,950,200
Cash Provided by Financing Activities	1,126,613	1,435,200
Increase in Cash During the Year	103,728	(338,167)
Bank Balance at the Beginning of the Year	(44,185)	293,982
Bank balance at the End of the Year	\$59,543	(\$44,185)

Water Authority-Cayman

Schedule of Income and Expenses

For The Year Ended 31st December 1991

	WATER		SEWERAGE		OTHER		TOTAL	
	1990 \$	1991 \$	1990 \$	1991 \$	1990 \$	1991 \$	1990 \$	1991 \$
Income								
Sales	2,721,742	3,590,198	1,464,894	1,544,725	604,289	409,126	4,790,925	5,544,049
Deposit Interest	---	---	---	---	55,781	27,406	55,781	27,406
Miscellaneous	---	---	---	---	17,050	20,004	17,050	20,004
Total Income	2,721,742	3,590,198	1,464,894	1,544,725	677,120	456,536	4,863,756	5,591,459
Expenses						Note 8		
Administrative								
Salaries	85,400	86,373	87,933	80,527	18,529	22,130	191,862	189,030
Wages	5,100	34	5,100				10,200	34
Staff Training and Benefits	11,724	28,249	11,724	28,249	1,759		25,207	56,498
Office and Lab Supplies	12,663	15,803	12,663	15,804	---		25,326	31,607
Licences and Dues	5,594	2,766	5,594	2,766	---		11,188	5,532
Telephone and Utilities	4,908	8,338	4,908	8,338	---		9,816	16,676
Insurance	14,694	16,691	14,694	16,690	---		29,388	33,381
Repairs and Maintenance	506		706		---	80	1,212	80
Bad Debt Expenses	554	77	5,673	689	---		6,227	766
Depreciation Expense	18,686		18,686		---	18,699	37,372	18,699
Miscellaneous	8,816		8,816		2,357	24,921	19,989	24,921
Total Admin Expense	168,645	158,331	176,497	153,063	22,645	65,830	367,787	377,224
Operating								
Salaries	208,447	273,125	84,917	104,230	---		293,364	377,355
Wages	55,048	54,744	45,168	50,025	---		100,216	104,769
Water Purchase	1,458,099	1,920,861	---	---	---		1,458,099	1,920,861
Repairs and Maintenance	7,460	10,195	29,896	33,437	---		37,356	43,632
Supplies	21,715	27,049	25,160	8,787	---		46,875	35,836
Electricity	35,433	54,023	52,644	55,274	---		88,077	109,297
Depreciation Expense	191,861	237,278	221,090	261,451	---		412,951	498,729
Lease Expense	6,250	6,250	---	---	---		6,250	6,250
Loan Interest	428,745	380,707	777,027	709,144	---		1,205,772	1,089,851
Miscellaneous	10,819	14,428	9,595	13,524	---		20,414	27,952
Total Operating Expense	2,423,877	2,978,660	1,245,497	1,235,872	---	---	3,669,374	4,214,532
Total Admin and Op Expense	2,592,522	3,136,991	1,421,994	1,388,935	22,645	65,830	4,037,161	4,591,756
Net Profit	\$129,220	\$453,207	\$42,900	\$155,790	\$654,475	\$390,706	\$826,595	\$999,703

Water Authority-Cayman Islands

Notes to Financial Statements

31st December 1991
(stated in Cayman Islands dollars)

1. Background Information

The Water Authority of the Cayman Islands ("the Water Authority") is a statutory body established on January 1st 1990 under the Water Authority Law (Law 10 of 1982), as amended.

The Water Authority is principally engaged in the management of water supply and sanitation affairs of the Cayman Islands including the provision of public water supplies, sewerage systems and the management, development and protection of water resources.

2. Significant accounting policies

The significant accounting policies adopted by the Water Authority in these financial statements are as follows:

(a) Basis of accounting

The financial statements of the Water Authority are prepared on an accruals basis, except for contributions to capital expenditure from private individuals which is treated as income in the year of collection (see note 8 below).

(b) Depreciation

Depreciation is provided on all tangible fixed assets, other than land, on a straight line basis at rates calculated to write off the cost of valuation of each asset evenly over its expected useful life as follows;

Water and Sewerage systems	50 years
Machinery and Equipment	10 years
Office Furniture	10 years
Office Equipment	5 Years
Vehicles	5 Years

(c) Foreign currency translation

Assets and liabilities denominated in currencies other than Cayman Islands dollars are translated exchange rates in effect at the balance sheets dates. Revenue and expense transactions denominated in currencies other than Cayman Islands dollars are translated at exchange rates ruling at the time of those transactions. Gains and losses on exchange are credited or charged in the Statements of Income and Expenses.

Due to the volatility of exchange rates, realized and unrealized gains and losses on the translation of foreign currency loans are transferred to a reserve for exchange fluctuations for foreign currency loans and the net gain or loss will be recognized as income when the loans are completely repaid. (see note 7)

Notes to Financial Statements (cont....)

31st December 1991
(stated in Cayman Islands dollars)

3. Loans Payable

The following is a schedule of the loans payable:

	1991	1990
Barclays Bank		
- Sewerage	0.00	3,120,000
- Water Supply	0.00	2,375,000
Canadian Imperial Bank of Commerce		
- Water Supply and Sewerage	6,021,666	0.00
Caribbean Development Bank		
- Sewerage	5,785,102	6,162,173
- Water Supply	2,312,500	2,312,500
Cayman Islands Government		
- Grand Cayman	4,822,349	4,622,349
- Cayman Brac	1,053,000	500,000
Total	<u>\$19,994,617</u>	<u>\$19,090,022</u>

The Barclays Bank sewerage and water supply loans were repaid in 1991 from the proceeds of a refinancing scheme entered into with the Canadian Imperial Bank of Commerce.

The Canadian Imperial Bank of Commerce loan is a part of a financing package of US\$16,000,000 that funded the repayment of the Barclays Bank loans and the extension of the water supply, the loan is provided at 1% over LIBOR repayable over a eight year period commencing in November 1993.

The Caribbean Development Bank sewerage and water supply loans are to be repaid over 15 years at variable interest rates (4% - 8.3%). Repayment commenced on the sewerage loan in quarterly installments in June 1991 and will commence on the water supply loan in quarterly installments in March 1992.

The Cayman Islands Government loans for Grand Cayman is interest free and is to be repaid in quarterly installments over a period of twenty five years commencing on 1st April 1993. The Cayman Islands Government loan for Cayman Brac has a moratorium on interest until repayments commence and then attract interest at a fixed rate of 8%, over a period of 15 years commencing in March 1995.

4. Construction in Progress

During the year ended 31st December 1991 the Water Authority commenced work on the water supply extension to Bodden Town, which at the year end had not been completed. An amount of \$1,132,643 had been expended on this project, at

Notes to Financial Statements (cont....)

31st December 1991
(stated in Cayman Islands dollars)

the time these assets are put into operation their value will be transferred to plant and will be depreciated on a straight line basis at normal rates of depreciation. A sum of \$3,475 was expended on the sewerage capital works which will be treated in the same manner.

5. Fixed Assets

The value of the water supply system and sewerage system includes the value of electrical and mechanical equipment and machinery.

The value of the other assets includes the value of tools and equipment, office furniture and equipment and vehicles.

Cost	Land \$	Water Supply \$	Sewerage \$	Other Assets \$	Total \$
Start of year	565,264	8,565,088	9,861,737	214,616	19,206,705
Add in Year	---	995,068	423,126	130,743	1,548,937
End of Year	<u>565,264</u>	<u>9,560,156</u>	<u>10,284,863</u>	<u>345,359</u>	<u>20,755,642</u>
Accum Depreciation					
Charge for Year	---	214,169	240,693	62,566	517,428
At end of Year	---	<u>214,169</u>	<u>240,693</u>	<u>62,566</u>	<u>517,428</u>
Net Book Value					
End of Year	<u>565,264</u>	<u>9,345,987</u>	<u>10,044,170</u>	<u>282,793</u>	<u>20,238,214</u>

6. Office and Laboratory Supplies

An amount of \$8,902 was entered in the accounts at the beginning of the 1990 to cover the value of materials held in inventory. All materials purchased for the capital projects were costed against construction in progress and not entered into inventory. All materials purchased locally for operations were costed as an operational expense as none were entered to the store. It was intended that during 1991 the computerized purchasing and inventory data base would be operational and the 1991 accounts would show a complete and up to date inventory, unfortunately with the change in the accounting system, it was not possible to finalize the inventory system. A new inventory system that interfaces with the new accounting system will be commissioned in 1992.

7. Reserve for foreign currency fluctuations

In accordance with accounting policy detailed in Note 2(c) the foreign currency loans included an unrealized net loss of \$232,201 as at the balance sheet date. The balance in the Reserve for Foreign Currency Exchange fluctuations is as follows:

1990	(456,218) Loss
1991	<u>224,017 Gain</u>
	(232,201) Net loss

Notes to Financial Statements (cont....)

31st December 1991
(stated in Cayman Islands dollars)

- 8. Other Income**
Other Income includes a sum of \$175,636 contributed from private individuals to fund capital works which were taken over by the Water Authority. The relevant expenses have been capitalized as water and sewerage works.
- 9. Other Operating Expenses**
During the year the Cayman Islands Government provided at no charge to the Authority, administrative office accommodation, legal and a limited amount of personnel services. Also during the year, the Water Authority provided at no charge to the Government availability and use of water for fire fighting, disposal of septage collected by the Environmental Health department, free sewerage service to a number of indigent persons in the Watler's Road area, supervision of ground water resources, administration of Plumbers Examination Board, consultative services for development control and water at a reduced Public Authority rate.
- 10. Pension**
The Authority employs a number of staff who are seconded civil servants of the Cayman Islands Government. In respect of these staff the Authority pays to Government the pension contribution and Government will bear all and any pension liability due to these staff members.
- 11. Leases**
Property is leased in Lower Valley on which is situated the ground water reservoir and treatment works, the annual cost (\$6,250) of this lease is treated as an operational cost.

APPENDIX - FINANCIAL PERFORMANCE RATIOS

<i>Percentage Margins</i>		1991	1990
Overall		\$	\$
Revenue		5,591,459	4,863,756
Expenses	%age of Revenue		%age of Revenue
Admin	6.75%	377,224	367,787 7.36%
Operating	75.37%	4,214,532	3,669,374 75.44%
Total	82.12%	4,591,756	4,037,161 83.01%
Net Income	17.88%	999,703	826,595 16.99%
Water Supply			
Revenue		3,590,198	2,721,742
Expenses			
Admin	4.41%	158,331	168,645 6.20%
Operating	82.97%	2,978,660	2,423,877 89.06%
Total	87.38%	3,136,991	2,592,522 95.25%
Net Income	12.62%	453,207	129,220 4.75%
Sewerage			
Revenue		1,544,725	1,464,894
Expenses			
Admin	9.91%	153,063	176,497 12.05%
Operating	80.01%	1,235,872	1,245,497 85.02%
Total	89.91%	1,388,935	1,421,994 97.07%
Net Income	10.09%	155,790	42,900 2.93%
Current Ratio			
Current Assets		653,355	499,491
Current Liabilities		438,973	680,974
Working capital		214,382	(181,483)
Current Assets to Current Liabilities		1.49	0.73
Equity Ratio			
Total Assets		22,027,687	20,143,373
Total Liabilities		20,433,590	19,772,996
Equity Ratio		1.078	1.019
Return on Assets			
Net Income to Total Assets		4.54%	4.10%
Profitability of Long Term Funds			
Total Assets		22,027,687	20,143,373
Current Liabilities		438,973	680,974
Assets provided by Long Term Funds		21,588,714	19,462,399
Return on Assets provided by Long Term Funds		4.63%	4.25%
Debt Ratio			
Total Long Term Liabilities to Total Assets		0.93	0.98
Government Equity Loan		4,822,349	4,622,349
Long Term Liability less Gov Equity		15,611,241	15,150,647
Long Term Liability (less Gov Equity) to Total Assets		0.71	0.77