[redacted]:

Services Report

ISLAND VIBE

ISLAND VIBE COLCHESTER TOURIST RESORT

BULK & INTERNAL SERVICES REPORT

Report Ref: P6995

Date: 17 May 2022

Revision: 15

Prepared for:

Island Vibe
4 Jenvy Road,
Summerstrand,
Port Elizabeth

Contact Details:
Loren Sampson
Tel: +27 41 583 1256
Cell: +27 83 463 5922
Fax: -
Email: loren@islandvibe.co.za

Prepared by:

AfriCoast Consulting Engineers (Pty) Ltd
PO Box 5104, Walmer, 6065
South Africa
AfriCoast Building, Cnr Rose/Havelock Street,
Central, Port Elizabeth

Contact Details:
Thomas Jachens
Tel: +27 41 505 8000
Fax: +27 41 585 3437
Email: info@AfriCoast.com

AFRICOAST CONSULTING ENGINEERS	QUALITY DOCUMENTATION DOCUMENT VERIFICATION FORM	8QSF20	

The purpose of this form is to ensure that documents are reviewed and approved prior to issue. The form is to be bound into the front of all documents to be released by the Client.

PROJECT NUMBER: P6995

CLIENT: Loren Sampson (Island Vibe)

PROJECT NAME: Island Vibe Colchester Tourist Resort

DOCUMENT TITLE: FINAL BULK & INTERNAL SERVICES REPORT

Revision Record

Revision	Date	Description / File name	Prepared	Checked	Approved
0	16/10/2018	Original Report	JP	TJ	TJ
1	11/12/2018	Bulk & Internal Services Updated	JP	TJ	TJ
2	18/03/2019	Report updated to include additional 7 units.	JP	TJ	TJ
3	15/04/2019	Revised to include comments from NMBM& revised cost estimates	JP	TJ	TJ
4	03/05/2019	Revised to include comments from NMBM & revised cost estimates	AD	TJ	TJ
5	03/06/2019	Additional Waste Water Alternatives	AD	TJ	TJ
6	13/09/2019	Additional Waste Water Alternatives: Reedbed	EdT	TJ	TJ
8	21/02/2020	Phased development considerations + revised infrastructure proposals	JP	TJ	TJ
9	01/12/2021	Updated Waste Water Alternatives	TP	TJ	TJ
10	22/03/2022	Updated Recommendations Vetiver System	TP	TJ	TJ
11	05/05/2022	Update minor errors in report as per comments	TP	TJ	TJ
12	16/05/2022	Update pond information section	TP	TJ	TJ
13	31/01/2023	Update Service Report – wastewater	TP	TJ	TJ
14	11/07/2023	Revised Wastewater & Stormwater sections	TP	TJ	TJ
15	17/08/2023	Revised Wastewater & Stormwater sections	TP	TJ	TJ

Prepared by: _____

Name: Terray Pothier Date:

Designation: Technologist

Checked & Approved by: _____

Name: T. Jachens Date:

Designation: Technical Director

Contents:

1. BACKGROUND

Island Vibe Developers is proposing the development of Erf 1618 Colchester, into a Tourist Resort. The resort will comprise of two Phases. Phase1 will comprise of 12 Single Units (24 persons), 5 Double Units (20 persons) and 2 Group Units (12 persons). Phase 2 will comprise of 4 Single Units (8 persons), 3 Double Unit (12 persons) and 2 Group Units (12 persons). Phase 1 will also include, a reception and stores building and a restaurant building. Please refer to Annexure A for the layout plan of the planned development.

As per proposal dated 4 October 2018, AfriCoast Consulting Engineers were instructed to determine the availability and location of bulk civil infrastructure services in close proximity of the site, for the purpose of supplying and connecting the proposed development with water, roads (access), stormwater and sewerage infrastructure. On site the services layout plan was checked and altered taking cognisance of the environmental constraints and an investigation of the jetty options to gain access to the Sundays River was also done.

2. EXISTING STATUS OF INFRASTRUCTURE

2.1 Water

Bulk Water supply consists of a 250mm ND feeder main to the 1.5ML reservoir in Colchester, from where water gravitates and is supplied via distribution mains to the town of Colchester.

A 90mm ND distribution main runs along the N2 and terminates approximately 900m South East of the Tourist Resort. Based on a meeting held with NMBM Water Directorate, there are 3 metered offtakes supply pipes from the NMBM 90mm dia. These water pipes, supply to different existing developments in close proximity of the Tourist Resort, with two of the offtakes running through the Resort to two separate developments West of the Resort. NMBM has originally confirmed that a 4th offtake will not be permitted directly from the 90mm or from any of the current 2 offtakes crossing the Island Vibe Resort property.

A 250mm ND distribution main traverses the centre of Colchester residential area, as indicated on the existing reticulation drawing (See Annexure B). NMBM completed the extension of the existing 250mm ND main to provide water supply for the proposed Island Vibe Development.

2.2 Waste Water

Waste water for the existing Colchester housing consists of septic tanks. No water borne waste water reticulation system or treatment system is currently in operation in the Colchester area.

2.3 Stormwater

Existing Stormwater infrastructure in close proximity of the development, consist only of gravel side drains next to the existing paved (MR462) and gravel (DR1937) roads. The development site drains naturally with overland stormwater flowing into the Sundays River.

2.4 Roads

Currently the development is being accessed via the gavel district road (DR1937) to the North of the development site. A municipal paved road (MR462) also runs parallel down the South Eastern Boundary of the development site. Currently no access is gained via the paved municipal road.

3. DEMAND OF PROPOSED DEVELOPMENT

3.1 Water

Water will be required for wash water/cleaning water purposes only. No water will be required for Toilet Flushing, as Dry Sanitation Enviro-loo is considered.

The NMBM has confirmed that the Colchester Reservoir has sufficient capacity to supply the development's water needs at full capacity, under worst case scenario conditions (i.e not considering all the water saving options that are planned).

The water demand is based on the Neighbourhood Planning and Design Guide.

Phase 1 Demand:

- Accommodation Units (Moderate – Table J.2)
  - 12 single units @ 2 people/unit @ 35l/p/d = 840l/d
  - 5 double units @ 4 people/unit @ 35l/p/d = 700l/d
  - 2 group units @ 6 people/unit @ 35l/p/d = 420l/d
- Restaurant (J.4): 30 seats @ 10l/s/d = 300l/d
- Reception: 10 people 35l/p/d = 350l/d
- Total: 2610l/d

Annual Average Daily Demand = 2610l/d

Peak Factor = 2.5

Peak Dry Weather Demand = 6525l/d

Or 0.15l/s (over 12 hr period)

Phase 2 Demand:

- Accommodation Units (Moderate – Table J.2)
  - 4 single units @ 2 people/unit @ 35l/p/d = 280l/d
  - 3 double units @ 4 people/unit @35l/p/d = 420l/d
  - 2 group units @ 6 people/unit @ 35l/p/d = 420l/d

- Total: 1120l/d

Annual Average Daily Demand = 1120l/d

Peak Factor = 2.5

Peak Daily Demand = 2800l/d

Or 0.065l/s (over 12-hour period)

Total Water Demand (Phase 1 + 2):

Annual Average Daily Demand: 3730l/d

Peak Factor = 2.5

Peak Daily Demand: 9325l/d

Or 0.22l/s (over 12 hr period)

Fire Flow & Pressure Requirement:

Based on the flow requirements and design guidelines of the Neighbourhood Planning and Design Guide, the area is considered a low risk area therefore assume that one hydrant would be in use at a time with a design flow of 15l/s and a minimum residual head of 7m.

3.2 Waste Water

The proposed wastewater management system as follows:

- Wash/Shower Water (Grey Water) – discharged to Vetiver system
- Enviro-Loo Dry Sanitation System

The following waste water discharge volumes:

Phase 1:

- Accommodation Units (Moderate – Table J.2)
  - 12 single units @ 2 people/unit @ 35l/p/d = 840l/d
  - 5 double units @ 4 people/unit @ 35l/p/d = 700l/d
  - 2 group units @ 6 people/unit @ 35l/p/d = 420l/d
- Restaurant (J.4): 30 seats @ 10l/s/d = 300l/d
- Reception: 10 people 35l/p/d = 350l/d
- Total: 2610l/d

Wastewater:

The following waste water discharge system split:

- 95% of 2610l/d i.e 2480l/d grey water to Vetiver system
- 5% of 2610l/d i.e 130.5l/d to Enviro-Loo System

Phase 2:

- Accommodation Units (Moderate – Table J.2)
  - 4 single units @ 2 people/unit @ 35l/p/d = 280l/d
  - 3 double units @ 4 people/unit @35l/p/d = 420l/d
  - 2 group units @ 6 people/unit @ =35l/p/d = 420l/d
- Total: 1120l/d

Wastewater:
The following waste water discharge system split:

- 95% of 1120l/d i.e 1064l/d grey water to Vetiver system
- 5% of 1120l/d i.e 56l/d to Enviro-Loo System

Total Waste Water:

Grey Water Vetiver System: 3544l/d

Enviro-Loo System: 186.5l/d

3.3 Stormwater

The proposed Tourist Resort development impacts minimally on the existing natural environment. The housing consists of accommodation units with minimal roof drainage and roads consist of cleared grass paths and parking consist of grassed or permeable grass block areas. The restaurant, admin buildings and communal accommodation facilities will be constructed with roof drainage and water tanks, generating minimal stormwater runoff from the development. The pre and post development run-off calculation were checked and come to approximately the same value of 19.5 l/s.

3.4 Roads

The development will generate minimal traffic with an estimated maximum 88 vehicles accommodated a day.

4. PROPOSED INFRASTRUCTURE

4.1 Bulk Water Supply

There is an existing 250mm dia. Water supply pipeline installed by the Municipality.

Propose for the provision of an offtake from the existing 250mm dia. water pipeline for the water supply to Island Vibe. Refer to Annexure A for plan layout of proposed offtake and existing 250mm dia Municipal water supply line.

4.1.1 Internal Distribution Network

A distribution network consisting of approximately 32mm to 50mm dia. HDPE pipe network will be required to distribute water from the existing 250mm dia. Municipal offtake, together with connections

to the individual accommodation units and other facilities. No internal metering will be required, but some isolating valves may be required, to isolate parts of the reticulation, from O & M perspective.

The distribution network will also be designed for firefighting requirements, a fire hydrant or suitable fire equipment in line with NMBM Fire Fighting Regulations for the accommodation unit's fire risk category will need to be confirmed.

4.2 Waste Water Collection, Storage, Treatment and Disposal

The following waste water treatment/disposal is proposed:

- Toilets: Enviro-Loo Dry Sanitation System
- Grey Water: Vetiver Wetland System

Details of the proposed wastewater systems as follows:

4.2.1 Enviro-Loo Dry Sanitation System

The Enviro-loo dry sanitation system would provide an environmentally safe and waterless system. The system is a sealed containerized system that does not leak or cause ground water pollution and is odourless. The system will not require any water for flushing but will require maintenance in cleaning out the substructure.

The Enviro-loo system has a container in which the waste would enter from the toilet bowel. The liquid waste would drain to the bottom of the container while the solid waste remains on the drying plate. The waste is exposed to a continuous flow of air. Air is extracted from the extraction unit from the top via the air vent pipes and toilet bowl. As the air moves through the system, it dehydrates the solids waste on the drying plate and the liquid waste in the container would evaporate. The sunlight would increase the ambient temperature in the container and dehydrate and decompose the waste. The negative pressure that is created in the container prevents the escape of odour through the toilet bowl and air inlet pipes.

Operation and Maintenance:

Enviro Loo has an operation and maintenance procedure manual with steps on how to maintain the Enviro Loo system. The Enviro Loo would be registered on a cloud-based management database which utilizes GPS coordinates and geographical information to provide accurate and up-to-date information on the functionality of the units. The Enviro-Loo service provider also provides an option to enter into a contract where they manage the dry waste or alternatively, they can provide training for on-site staff. The units would be serviced every 3 months and should only be conducted by a trained service technician. The units should be monitored regularly to ensure they function

effectively. The Facility Management should appoint reliable personnel to whom the maintenance staff can report their findings and who would process the inspection forms to ensure timely maintenance is performed.

4.2.2 Vetiver Treatment System

The Vetiver System (VS), also known as the Vetiver Grass Technology (VGT), provides a low cost, simple wastewater treatment system that employs live vetiver plant for soil and water conservation and environmental protection. The system is practical, inexpensive and requires low maintenance and have effective means of soil erosion and sediment control, water conservation and land stabilization and rehabilitation. The system is also environmentally friendly.

The vetiver plants are usually planted in rows close to each other to form a hedge or rows that would act as a barrier to slow down the inflow of the greywater and trap sediment and extract the nutrients or as floating pontoons that would float on the water in a pond or constructed wetland. The hedges reduce soil erosion, conserve moisture and trap the sediment.

The resort would implement a system similar to a reed bed / retention pond to manage the discharge of treated greywater. The development will control the cleaning materials used at Island Vibes and promote environmentally friendly products only. Guests will be alerted to this at the time of booking so they know what to expect. This will reduce the risk of chemicals and phosphates in the greywater. The ponds are to be sealed to prevent any leaching of partially treated greywater, as well as to prevent ingress of stormwater runoff. Prior to entering the ponds, a small inlet structure will facilitate settling of sediments. These ponds will have a minimum depth of 1m and a retention time of four (4) days. In the event of overflow from the ponds during periods of high rainfall conditions with risk of untreated greywater leaving the ponds or pond retention time exceeding 4 days, is to be discharged to a planted zone adjacent to the ponds which is lined with a PVC liner, backfilled with gravel and soil, with vetiver plants planted in the soil, with 12-plants per m². All overflow will be absorbed by the plants, which will render the vetiver greywater process a zero-discharge system and so will comply with General Limit Standards.

The retention time of 4 days has been worked out on a trial and error basis over many years. There is no empirical formula. It is a combination of daily flow rate, quantity of plants and speed of water flow through the root bio-zone. The retention in the ponds has been worked out on full occupancy, when we know that the occupancy levels will be variable, which in turn will increase the retention time in the ponds. Refer to Annexures A for examples of where vetiver systems have been used and certificates of the water analysis.

The site would comprise of six (6) cluster drainage zones consisting of the Vetiver systems. Each zone would receive the following flow:

- Zone 1: 350l/d
- Zone 2: 910l/d
- Zone 3: 1080l/d
- Zone 4: 560l/d
- Zone 5: 630l/d
- Zone 6: 300l/d

Refer to Annexure A for the layout of the planned development and a typical section through the pond.

The pond walls to be sloped at about a 2:1 slope. The amount of vetiver plants per pond would be estimated at about nine (9) vetiver plants per m².

The size of the ponds would be as follows:

(The depth of the pond is the depth of water and excludes the freeboard)

Zone 1 Pond – Flow 350l/d:

Volume : 0.35 x 4 days retention = 1.5m³ Say 2m³
Depth = 1m
Area : 2 / 1 = 2m²
Pond Dimensions: 2m(l) x 1.25m(w) x 1m(d)
Estimated No. of plants: 2 x 9 = 18 say 22 plants

Zone 2 Pond – Flow 910l/d:

Volume : 0.9 x 4 days retention = 3.6m³ Say 4m³
Depth = 1m
Area : 4 / 1 = 4m²
Pond Dimensions: 3.5m(l) x 1.25m(w) x 1m(d)
Estimated No. of plants: 4 x 9 = 36 say 39 plants

Zone 3 Pond – Flow 1080l/d:

Volume : 1.08 x 4 days retention = 4.32m³ Say 5m³
Depth = 1.0m
Area : 5 / 1 = 5m²
Pond Dimensions: 5m(l) x 1.25m(w) x 1m(d)
Estimated No. of plants: 5 x 9 = 45 plants

Zone 4 Pond – Flow 560l/d:

Volume : 0.56 x 4 days retention = 2.24m³ Say 3m³
Depth = 1m
Area : 3 / 1 = 3m²
Pond Dimensions: 3m(l) x 1.25m(w) x 1m(d)
Estimated No. of plants: 3 x 9 = 27 say 34 plants

Zone 5 Pond – Flow 630l/d:

Volume : 0.63 x 4 days retention = 2.52m³ Say 3m³
Depth = 1m
Area : 3 / 1 = 3m²
Pond Dimensions: 3m(l) x 1.25m(w) x 1m(d)
Estimated No. of plants: 3 x 9 = 27 say 34 plants

Zone 6 Pond – Flow 300l/d:

Volume : 0.3 x 4 days retention = 1.2m³ Say 1.5m³
Depth = 1m
Area : 1.5 / 1 = 1.5m²
Pond Dimensions: 1.25m(l) x 1.25m(w) x 1m(d)
Estimated No. of plants: 1.5 x 9 = 13.5 say 15 plants

Total quantity of vetiver plants for the ponds, excluding the pond edges would be approximately 190 plants.

The inlet structure can be constructed with standard clay type bricks and plastered with a 110mm diameter uPVC inlet pipe. The ponds would be excavated and shaped with 2:1 slope sides and lined with HDPE lining or similar.

The system comprises of the following steps:

Sewerage system shall consist of grease traps with header pipes and rodding eyes with access header pipes in order to flush enzymes down pipes for degreasing. Greywater shall be gravitated via the 110mm PVC Class 34 pipeline into a wastewater collection tank where the sediments is settled and then discharged into the Vetiver Grass Nutrient Absorption Bed. The vetiver plants would slow the water flow reducing any erosive power, trap any sediment, extract the nutrients and allow more time for water to infiltrate into the soil.

The overflow from the ponds will be piped into a lined constructed wetland that will be sized and planted with adequate quantity of Vetiver plants to absorb all overflow liquid.

Operation and Maintenance:

The system is simple and easy to maintain as it does not require highly qualified staff. The system has no downtime or breakdowns and allows for expansion. The operation and maintenance requirements for the Vetiver system should be as follows:

On a weekly basis, the pontoons should be inspected, the anchor cables and flotation of pontoons should be checked and the plant growth should be monitored. The vetiver foliage should be trimmed bi-annually.

4.2.3 Waste Water Disposal Recommendation:

Based on the above, it is recommended that both the Enviro-Loo Dry Sanitation and the Vetiver Wetland System are considered to be effective wastewater treatment systems that are cost effective, operated, maintained and managed by specialist service providers. Both treatment solutions meet the DWA General Limits Standards.

4.3 Stormwater

Stormwater discharge will be overland, and all roads will be at in situ ground level, with no specific drainage channelling created or required.

At the reception area, a grass block system is proposed, so that all stormwater will either flow overland or infiltrate in the grass block.

The 1:100 flood line was previously computed by SRK, and not revisited for the purpose of this report. The flood line traverses along the banks of the Sundays River and does not impact on the site for the proposed development.

4.4 Roads

Access road consisting of gravel transition is proposed for the access from DR 1037 District Road to the development.

The reception area will be area where all vehicles will be parked, hence grass block type surfacing is proposed. The grass blocks will create a stable surface for the road parking area, suitable for delivery medium duty load vehicles as well as normal light motor vehicles. Parking bays for 20 vehicles will be created.

No vehicles will be permitted to traverse beyond the parking area at reception, and visitors/staff will traverse by electric type vehicles (golf carts) from reception to the individual accommodation units or other facilities in the development. From the reception area, roads will consist of bush cleared surfaces (no stripping of in situ soil or placement of gravel), for access to accommodations units and other amenities.

4.5 Jetty

Two possible positions for the proposed jetty were investigated. Both positions were not favourable for the construction of a permanent walkway structure and therefore it was decided to position the Jetty in the position closest to the restaurant. The access approach to jetty i.e., by rope ladder and platform has to be carried out in an environmental sensitive manner. The jetty can be constructed using a wooden platform floated with empty plastic drums and anchored with concrete block weights to form a floating jetty platform. The jetty platform will move upward/downward with the tides of the river. The access approach will consist of cleared paths and a wooden platform securing the ladder which will provide access down to the floating jetty. See Annexure E for details of access ladder and jetty.

Note that this is the most practical proposal complying with the environmental requirements of not constructing any permanent structure on the bank of the river. However, the vertical drop from the top of the bank to the Jetty is in excess of 5m, this poses a safety risk for the people that will make use of the rope ladder. Appropriate safety measures will have to be implemented by the Developer.

5. REFERENCES

Bishop, Roland. 2019. *Enviro Loo Services Operation, Maintenance and User Education Manual.* January.

Ltd, WSE (Pty). n.d. “Phytoremediation vetiver polishing.” *Phyto-vet polishing (PVP) vetiver Overview*, 1-14.

Vanoh, Robinson. 2020. *Training Manual - Vetiver System.* Fiji, February/March.

ANNEXURE A – EXAMPLES OF VETIVER SYSTEMS AND CERTIFICATES