



Green Bonds Investor Report

Prepared by ERM on behalf of the City of Johannesburg Metropolitan Municipality

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This document aims to provide a harmonised framework for impact reporting on projects in Johannesburg, South Africa, to which Green Bond proceeds have been allocated. Performance data has been provided for selected Green Bond projects for the reporting period 2013/14 pointing to the environmental benefit associated with each project. The City of Johannesburg has committed to reporting on the progress of projects benefitting from the Green Bond towards their environmental objectives on an annual basis to the Green Bond investors. This report is the first report per City's commitment to report to investors, and subsequent reports will be published on an annual basis.

2.1 PURPOSE OF THIS REPORT

Following the successful issuance of bonds for general city financing, the City of Johannesburg (COJ) issued the first Green Bond on the JSE in June 2014 (to the value of R1.46 billion), which was a first instrument of its nature in the local government sector and South Africa as a whole. This initiative by COJ was undertaken with the objective of strengthening climate change action within Johannesburg, as well as rolling out projects with additional environmental benefits.

This report, compiled by ERM on behalf of the COJ, serves to provide investors with information related to a selection of projects supported by the COJ's Green Bond.

The Green Bond Principles (GBP; discussed further in the sections to follow) recommend the use of quantitative and/ or qualitative performance indicators which measure, where feasible, the impact of the specific investments (e.g. reductions in greenhouse gas (GHG) emissions, number of people provided with access to clean power or water, or improvements in air quality etc.). Data related to these areas for the projects reported on was collected to the extent that it was available. The COJ is committed to improving on the reporting process year-on-year.

This report provides data captured from the initial reporting period 2013/14, in line with the financial year commencing July.

2.2 DEFINITION: GREEN BONDS

Green Bonds are any type of bond instruments where the proceeds will be exclusively applied to finance or re-finance in part or in full new and/or existing projects that are determined to satisfy the Green Bond criteria. Green Bonds follow four Green Bond Principles (GBP), namely⁽¹⁾:

1. Use of Proceeds;
2. Process for Project Evaluation;
3. Management of Proceeds; and
4. Reporting.

Principles 1 and 2 are elaborated on further below with specific reference to the COJ's Green Bond. This report fulfils the requirements of Principle 4.

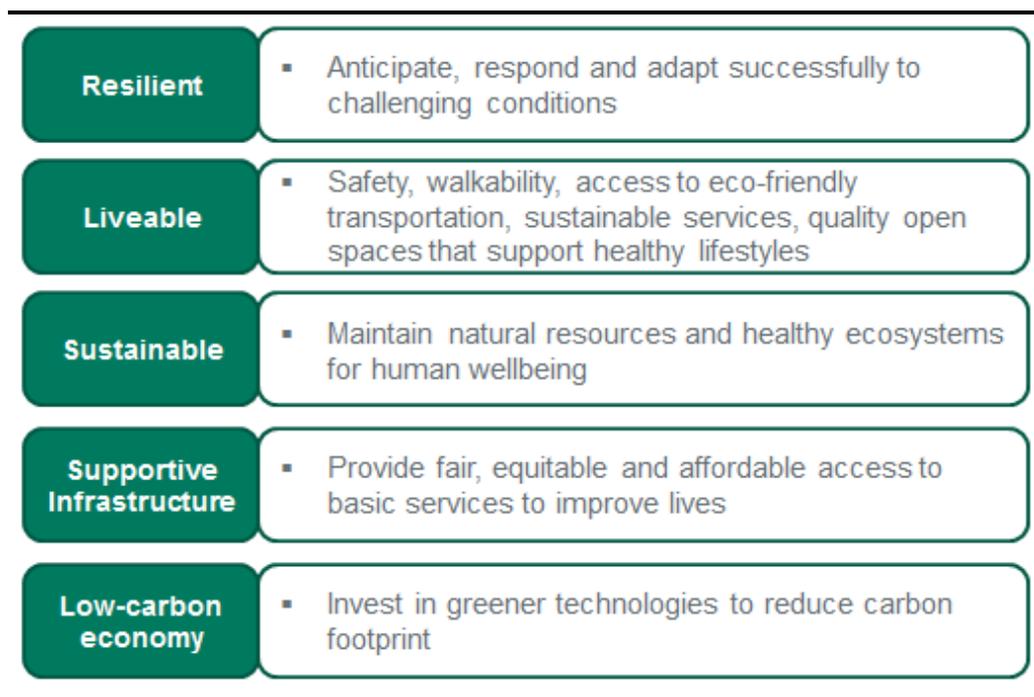
¹ Green Bond Principles, 2015- Voluntary Process Guidelines for Issuing Green Bonds *International Capital Market Association* (27 March 2015)

The GBP are voluntary process guidelines that recommend transparency and disclosure and promote integrity in the development of the Green Bond market by clarifying the approach for issuance of a Green Bond. This approach allows investors to assess the progress and impact of the project against that of the proceeds allocated towards its development. Unlike that of a standard bond agreement, the investor has a dual interest in the performance of the selected project, being the financial return as well as the environmental benefits achieved.

2.3 COJ'S GREEN BOND

The COJ's Green Bond was borne out of the City's Growth and Development Strategy (GDS, 2040), where the goal under the 'sustainable services' pillar of the strategy is 'to provide a resilient, liveable, sustainable urban environment that is underpinned by infrastructure supportive of a low-carbon economy'. This goal is unbundled in *Figure 2.1* below.

Figure 2.1 COJ's Sustainable Services Goals (GDS, 2040)¹



2.3.1 Use of the Proceeds

Green Projects are defined as projects and activities that contribute to the broader green economy and promote environmentally sustainable activities as

¹ Adapted from the COJ's Green Bond Roadshow Presentation, 2014.

defined by the issuer⁽¹⁾ (in this case, COJ) and in line with the issuer's project process for evaluation and selection⁽²⁾.

The GBP explicitly recognise several broad categories of potentially eligible 'green' projects aiming to address key areas of concern such as climate change, natural resources depletion, biodiversity conservation and/or pollution. These broad categories are including, but not limited to:

- Renewable energy (e.g. solar, wind, geothermal and ocean power);
- Energy efficiency (e.g. energy efficiency improvements in lighting and equipment; and retrofit of transmission lines, substations or distribution systems to reduce technical losses);
- Sustainable waste management (e.g. incineration of waste, landfill gas capture and landfill gas combustion);
- Sustainable land use (e.g. sustainable forestry and agriculture);
- Biodiversity conservation (e.g. reduce emissions from deforestation and degradation of ecosystems);
- Clean transportation;
- Sustainable water management (including clean and/or drinking water); and
- Climate change adaptation.

The COJ identified projects with elements related to renewable energy, water conservation, energy efficiency, climate change and waste and wastewater management in the sectors of power, transport, water and waste. Further details on the criteria employed to select the projects are provided in *Section 2.3.2*.

2.3.2 *Process for Project Evaluation*

In accordance with the GBP, the Green Bond issuer (in this case, the COJ) must outline the eligibility criteria that a candidate project is required to satisfy in order to be issued with Green Bond proceeds. This should include the issuer providing details on the following aspects:

- the process followed to determine how the projects align with the eligible green projects' categories;
- the criteria making the projects eligible for benefitting from the Green Bond proceeds; and
- the environmental sustainability objectives of the projects.

In terms of the process followed by the COJ to ensure that the projects selected were eligible, the COJ defined criteria based on the International Finance Corporation's (IFC) Performance Standards on Environmental and Social

¹ See GBP 1.

² See GBP 2.

Sustainability (2012) and World Bank criteria related to climate change mitigation and adaptation projects (see *Table 2.1*), and the environmental objectives for each of the projects reported on are discussed in this report alongside information related to progress towards those objectives. The final list of projects selected by COJ to receive funding from the Green Bond is included in *Table 2.2*.

Table 2.1 *COJ's selection criteria*¹

Sector	Criteria
Energy	<ul style="list-style-type: none"> • Grid electricity efficiency • Grid-connected electricity generation from renewable sources • Installation of power efficient transformers in power distribution grid • Installation of high voltage direct power transmission line • Supply side energy efficiency improvements (transmission and distribution) • Off-grid electricity generation • Electrification of communities through grid extension • Renewable thermal energy • Solar water heating systems • Fuel Switch - Coal/oil to gas • Switching fossil fuels • Waste energy recovery projects
Transport/ climate change	<ul style="list-style-type: none"> • Energy Efficiency • Transportation energy efficiency activities using retrofit technologies • Fossil fuel switch • Fuel Switch • Introduction of low emission vehicles/ technologies to commercial vehicle fleet
Household and building energy efficiency	<ul style="list-style-type: none"> • Water Saving • Demand side energy efficiency activities for installation of low-flow hot water savings devices • Lighting • Distribution of efficient light bulbs to households • Demand side activities for efficient lighting technologies • Demand side activities for efficient outdoor and street lighting technologies • Demand side energy efficiency activities for installation of energy efficient and/or controls in buildings • Energy efficiency and fuel switching measures for buildings • Energy efficiency and renewable energy measures in new residential buildings • Substituting fossil fuels based lighting with LED/CFL lighting systems • Demand side energy efficiency activities

¹ Adapted from COJ's Green Bond Roadshow presentation (2014).

- Waste management and wastewater
- Recovery and recycling of materials from solid waste
 - Alternative waste treatment processes
 - Avoidance of methane emissions through composting
 - Avoidance of methane emission through excavating and composting of partially decayed municipal solid waste
 - Landfill Gas
 - Flaring use of landfill gas
 - Landfill methane recovery
 - Manure and comparable waste
 - GHG emission reductions through multi-site manure collection and treatment in a central plant
 - Reforestation and Afforestation
 - Small scale project activities implemented on wetlands
 - Small scale project activities implemented on lands other than wetlands

It is against this broader set of criteria that the performance of the Green Bond project will be monitored and annually reported to the investment stakeholders. *Table 2.2* below sets out all the COJ projects benefitting from the Green Bond according to department managing the project as well as the main environmental benefit category associated with the project. It should be noted, however, that certain projects can have multiple environmental (and socio-economic) benefits that cross-cut categories. Those projects explored in more detail in this report are highlighted in light green.

Table 2.2 *List of projects benefitting from the Green Bond*

Climate Change	
Transport Department	ReaVaya New Bus Rapid Transit Joburg F City Wide
	Cycling lanes: Ivory Park
	Cycling lanes: Orange Farm
	Cycling Lanes: Orlando
Energy (including renewables and efficiency)	
City Power	Electrification of Lehae phase 2
	Lehae 88/11kv substation
	Revenue Generation Efficiency Project: Smart Meters
	Roll out of smart grid to all substations
	Capital program to replace aged and critical switch gear
	Transformer capital program to eliminate high risk
	Add 11 kV ring to relieve load on existing distributors New Medium Voltage Network STRIJDOMPARK EXT.1 B
	Install public lights in formal areas New Public Lighting REUVEN F City Wide
	New public lights Midrand New Public Lighting IVORY PARK EXT.2 A Regional
	New public lights New Public Lighting ORANGE FARM EXT.1 G Regional
New public lights New Public Lighting ORLANDO EKHAYA D Regional	
Water Conservation	

Development Planning Environment and Infrastructure	<p>Jukskei River Environmental Upgrading and Rehabilitation Renewal Bulk Infrastructure ALEXANDRA EXT.1 E</p> <p>Rehabilitation of Bruma Lake Renewal Park BRUMA</p> <p>Rehab of Princess Mine Dump</p> <p>Biogas to Electricity</p> <p>Operation Gcina amanzi- water conservation</p> <p>Replacement of water pipes (143 km) - Water conservation & security of water supply</p> <p>Pressure management - water conservation & security of water supply</p> <p>Smart Prepaid Meters</p>
Johannesburg Water	<p>Replacement of sewer pipes - to reduce the level of sewer blockages and improve both public health and environmental impact</p> <p>LA: Module 1 New Bulk Waste Water LANSERIA EXT.17 C Regional</p> <p>Northern Works: desludge Dam 01 and 02 Renewal Bulk Waste Water DIEPSLOOT WES EXT.5 A Regional</p> <p>Olifantsvlei Works: Mod 3 Unit 3 New Bulk Waste Water KLIPRIVIERSOOG ESTATE G Regional</p> <p>Roodepoort/ Diepsloot: Planned replacement sewer mains ROODEPOORT C</p> <p>Soweto: Bramfisherville sewer upgrade Renewal BRAM FISCHERVILLE E</p> <p>Soweto: Diepkloof Corridor sewer upgrade DIEPKLOOF E</p> <p>Soweto: Planned replacement sewer mains THETA E</p> <p>Soweto: Thulani sewer upgrade THULANI E</p> <p>WWTW: Ferric dosing x14 New Bulk Waste Water BERTRAMS F City Wide</p> <p>Biogas to electricity at NW, GK ,BK New Bulk Waste Water DIEPSLOOT WES EXT.5 C Regional</p> <p>Johannesburg Central: planned replacement water mains Renewal Water Mains MAYFAIR F Regional</p> <p>Midrand: Planned replacement: water mains Renewal Water Mains BLUE HILLS A.H. A Regional</p> <p>Operations and Maintenance Renewal Operate and Maintenance Assets JOHANNESBURG F City Wide</p> <p>Provision for Emergency Work Renewal Operate and Maintenance Assets MARSHALLS TOWN F City Wide</p> <p>Roodepoort/Diepsloot: Planned replacement of water mains Renewal Water Mains NORTH RIDING A.H. C Regional</p> <p>Ivory Park sewer upgrade Renewal IVORY PARK EXT.2 G</p> <p>Waste Water Treatment Works : Scada and PLC Replacements for infrastructure investigations Renewal Bulk Waste Water JOHANNESBURG F City Wide</p> <p>Basic Water Service New Basic Water and Sewer Services ORANGE FARM EXT.8 G Regional</p>
Joburg Market	<p>Midrand: Erand: Upgrade water infrastructure Renewal Water Mains SUMMERSET EXT.13 A Regional</p> <p>Sandton/Alexandra: Bryanston District Upgrade Water Infrastructure New Water Mains DOUGLASDALE EXT.96 E Regional</p> <p>Sandton/Alexandra: Planned replacement of water mains Renewal Water Mains WOODMEAD EXT.5 E Regional</p> <p>Potable water to halls and washbasins New Building Alterations CITY DEEP EXT.8 F Regional</p> <p>Revamp sewer and drainage system New Drainage System CITY DEEP EXT.22 F Regional</p>
Johannesburg City Parks and Zoo	<p>Diepsloot river- wetland rehabilitation</p> <p>Klipspruit Klipriver wetland studies</p>

Waste and wastewater management	
	Garden Sites, Buy back Centres and Sorting facilities - Renewal waste collection
	Glass Banks, Recycling Banks
Pikitup	Facilities to facilitate separation at source city wide New waste collection
	JOHANNESBURG F City Wide
	Waste Treatment - Waste to Energy New Plant and Equipment
	DIEPSLOOT A.H. A City Wide

2.3.3

Alignment with Other Initiatives

The Green Bond-funded projects that have climate change mitigation and/ or adaptation benefits will also contribute to the COJ's commitment to address climate change. In 2012, the COJ adopted an Energy and Climate Change Strategy and Action Plan that sets out an aggressive agenda to tackle climate change through the implementation of greenhouse gas (GHG) mitigation projects as well as projects that will facilitate adaptation to changing climatic conditions. Certain of the Green Bond-funded projects will help contribute to the targets set by the City per sector. This strategy and action plan falls within the City's Climate Change Strategic Framework which sets out the City's commitment to contributing to national and global climate change efforts. An aspirational GHG mitigation target of 65% reduction by 2040 against the 2007 baseline has been set for Johannesburg, and is expected that this will be refined in the first quarter of 2016 based on recent carbon footprint calculations and mitigation efforts.

PROJECT PORTFOLIO

The following section sets out the portfolio of selected projects to which Green Bond proceeds have been allocated by the COJ (i.e. those in light green in *Table 2.2*). The table is divided into project categories indicating the project particulars and the amount of Green Bond proceeds allocated during the 2013/14 reporting period. The purpose of this table is to provide an executive summary of the selected projects, presenting data against key indicators to monitor the development or operational progress to date.

The selected portfolio of projects described in *Table 3.1* has been confined to 10 beneficiaries of the Green Bond. The projects were selected with the objective of reporting on a representative sample of the total group of projects issued with Green Bond proceeds. It is expected that this representative sample will be increased year-on-year.

Table 3.1. Description of the selection of Green Bond-funded projects reported on

No.	Project	Brief Project Description & Environmental Benefits	Signed Amount of Green Bond Proceeds	Project Status
<i>Environment and Infrastructure</i>				
1.	<p>Rehabilitation of Bruma Lake</p> <p>Bruma, Johannesburg</p> <p>(Four year contract)</p> <p>Applicable criteria: GBP: Biodiversity conservation COJ: Waste management & wastewater</p>	<p>The project is centred on rehabilitating the Bruma Lake by filling the lake basin to reform the natural channel and floodplain, with the objective of improving the hydraulic characteristics and create a more diverse and sustainable aquatic environment. A natural channel will allow for a constant flow of water which will prevent sedimentation and siltation in future.</p> <p>Environmental benefits:</p> <ul style="list-style-type: none"> • Improved water quality (pH levels) (i.e. provision of good quality water)/ aquatic environment • Healthier wetland ecosystem • Promotion of natural fauna and flora • Carbon sequestration through the promotion of an intact wetland ecosystem (climate change mitigation) <p>In addition, the project will look to address the odour and aesthetics issues associated with the lake. In doing so, the project will have a positive impact on public health. In the long-term, the project is looking to restore the continuity of the riparian corridor to create a viable ecosystem and simultaneously reduce the operational cost associated with desilting in the future.</p>	R 71.5 million	<ul style="list-style-type: none"> ✓ Phase 1 of this project (the civil construction) is 100% complete as is the wetland repair phase. ✓ Phase 2 of this project (landscaping) commenced at the end of January 2015 and is currently standing at 98% completion. <p>Activities completed include:</p> <ul style="list-style-type: none"> - Draining and drying of the lake; - Channel construction; - Filling of the basin; - Shaping and trimming to final landscaping level; - Installing irrigation systems and electrical reticulations; - Planting 43 000 m² of grass; - Repairing and repainting of spillway and bridge; and - Wetland repair.
2.	<p>Rehabilitation of Princess Dump</p> <p>Roodepoort, Johannesburg</p> <p>(Three year contract)</p> <p>Applicable criteria:</p>	<p>The tailings complex referred to as the Princess Dump is located in Roodepoort directly adjacent to the Davidsonville suburb. There is a long history of contaminated run-off, slime spillage and dust emanating from the Princess Dump, affecting the occupants of houses adjacent to the dump.</p> <p>In October 2006, the COJ was cited as the Third Respondent in an application to the High Court of South Africa for a court order requiring that urgent remedial action be taken to address the</p>	R 17.5 million.	<ul style="list-style-type: none"> ✓ Construction of surface and subsurface systems underway. ✓ Upgrades to current infrastructure presently underway. ✓ The excavated area has been shaped to accommodate surface and sub-surface drainage. ✓ Seepage cut-off drain has been constructed.

	<p>GBP: Sustainable waste management COJ: Waste management & wastewater</p>	<p>nuisance and pollution problems, and environmental damage relating to the dump, specifically:</p> <ul style="list-style-type: none"> • Toe seepage or shallow sub-surface seepage emanating from the toe of the slimes dam which leads to wetness and a shallow water table in the stands on the eastern side of Cupido Street. • During high rainfall periods, some storm water run-off from the northern part and the western side used to enter the stands, causing wetness and occasionally ponding of water. At times, when the storm water system becomes blocked, heavy rains have also led to eroded slimes being deposited in some of the stands. • During windy periods, dust from the tailings complex has been a nuisance to the Davidsonville community <p>In FY2013/2014, COJ appointed Johannesburg City Parks and the Johannesburg Zoo to address the abovementioned issues, and the dump is presently being rehabilitated</p> <p>Environmental benefits:</p> <ul style="list-style-type: none"> • Improved air quality (specifically related to dust) • No seepage or runoff of contaminated storm water • Improved groundwater quality (through reduced infiltration of contaminated water and slimes) • Promotion of natural fauna and flora <p>In addition, the project is looking to improve the living conditions of the local community, including health, through the reduction of dust, improvement in aesthetics and elimination of contaminated run-off.</p>		<ul style="list-style-type: none"> ✓ The earth berm on top of embankment has been constructed. ✓ Evaporation paddocks have been upgraded. ✓ Gabions have been installed. ✓ Areas for vegetation in zone 2 have been ploughed. ✓ The security fence has been constructed. ✓ Dust-generating areas have been vegetated.
Transport development				
3.	Orlando Non-Motorised Transport Facilities	This project involves the construction of 5.5 km of sidewalks and cycling lanes, and improvements to stormwater drainage.	R 16.7 million	<ul style="list-style-type: none"> ✓ Community Liaison Officer appointed. ✓ Site establishment is complete.

	<p>Orlando, Johannesburg</p> <p>(Two year contract)</p> <p>Applicable criteria: GBP: Clean transportation COJ: Transport</p>	<p>The primary objective of the route is to connect the following local amenities:</p> <ul style="list-style-type: none"> - Noordgesig Clinic; - Orlando and Mlamlankunzi Train Stations; - Approximately 19 educational institutions; - Orlando Children Home; - Orlando Stadium; - Orlando Magistrate Court; - Orlando Police Station; and - Five Rea Vaya Bus Stations. <p>Environmental benefits:</p> <ul style="list-style-type: none"> • Reduction in GHG emissions (climate change mitigation) by encouraging non-motorised transport <p>In addition, the objective of the project was to:</p> <ul style="list-style-type: none"> - create a safe cycling route; - reduce travel times; - reduce accident rates and severity; and - promote healthy living. 		<ul style="list-style-type: none"> ✓ The contractor has commenced construction. ✓ Construction of 5.5 km sidewalks, cycle lanes and associated bicycle racks, hawker stalls and bollards completed.
Water management				
4.	<p>Biogas to Electricity at Northern Works, Goudkoppies and Bushkoppies Wastewater Treatment Works</p> <p>Diepsloot West Ext.5 C Regional, Johannesburg</p> <p>(Ten year contract)</p> <p>Applicable criteria:</p>	<p>This project is centred on the generation of renewable electricity (from biogas) at Northern Works, Goudkoppies and Bushkoppies Wastewater Treatment Works.</p> <p>Environmental benefits:</p> <ul style="list-style-type: none"> • Reduction in GHG emissions (climate change mitigation) through the provision of renewable energy and reduced dependence on grid electricity • Improved air quality (reduction in particulate matter through the reduced pressure on the national grid) (although this would be national and not applicable at a site level) 	R 99.9 million	<ul style="list-style-type: none"> ✓ Northern works installation completed. ✓ Driefontein works currently under construction (86% complete).

	GBP: Renewable energy COJ: Renewable electricity/ power			
5.	Operation Gcina Amanzi Johannesburg (One year contract) Applicable criteria: GBP: Sustainable water management	This project involves the upgrading and replacement of secondary water mains to prevent leaking and unnecessary loss of water (to ensure security of supply) across Johannesburg. Environmental benefits: <ul style="list-style-type: none"> • Water conservation 	R239 million	✓ A total of 131,110 m of piping has been laid against the annual target of 163,945 m for FY 2014/15.
6.	Replacement of water pipes Johannesburg (One year contract) Applicable criteria: GBP: Sustainable water management	The aim of this project is to replace and/or upgrade 900 km of water infrastructure that have a remaining useful life of less than two years across the Johannesburg municipal area to prevent leaking and unnecessary loss of water. Environmental benefits: <ul style="list-style-type: none"> • Water conservation 	R198 million	✓ A total of 321 km of piping has been replaced to date. ✓ The project has managed to reduce the number of pipe burst from 35,521 in 2012/13 to 32,131 by June 2015.
7.	Replacement of sewer pipes Johannesburg (One year contract)	Johannesburg Water has planned to replace a total of 800 km of old sewer infrastructure by FY 2016/17 to reduce the level of blockages, improving public health and reducing adverse environmental impact by reducing sewage spills. Environmental benefit: <ul style="list-style-type: none"> • Reduced environmental impact 	R 80 million	✓ In FY2013/14, a total of 33 km of sewer pipelines was replaced against the target of 60 km. ✓ Replaced 39 km of sewer pipelines against a target of 130 km for FY 2014/2015.

	<p>Applicable criteria: GBP: Sustainable waste management COJ: Waste management and wastewater</p>	<ul style="list-style-type: none"> Improved water quality 		
8.	<p>LA: Module 1 New Bulk Wastewater</p> <p>Lanseria EXT.17 C Regional, Johannesburg</p> <p>(Four year contract)</p> <p>Applicable criteria: GBP: Sustainable waste management COJ: Waste management & wastewater</p>	<p>This project aims to increase the COJ's wastewater treatment capacity by 150 mega litres (ML)/day, thereby reducing the risk of environmental pollution via spillages.</p> <p>Environmental benefits:</p> <ul style="list-style-type: none"> Decreased environmental pollution Improved groundwater quality 	R20 million	<ul style="list-style-type: none"> ✓ Appointment of professional services provider (consulting engineers). ✓ Project Inception Report completed. ✓ Feasibility study completed. ✓ Preliminary design and geotechnical investigation completed. ✓ The Environmental Impact Assessment is presently underway, as is the detailed design phase.
9.	<p>Northern Works: De-sludge Dam 01 and 02 Renewal Bulk Waste Water</p> <p>Diepsloot West EXT.5 A Regional, Johannesburg</p> <p>(Four year contract)</p> <p>Applicable criteria: GBP: Sustainable waste management COJ: Waste management & wastewater</p>	<p>This project involved construction to reduce the rate of future sludge ingress/ sewage spills, including introduction of the following:</p> <ul style="list-style-type: none"> - High Rate Settling tanks; - Pumping mains; - Dam liner; and - M&E and C&I equipment for pumping installations. <p>Environmental benefits:</p> <ul style="list-style-type: none"> Decreased environmental pollution Improved water quality 	R 87 million	<ul style="list-style-type: none"> ✓ Currently in the construction phase (45% completed).

10.	<p>Operations and Maintenance Renewal Operate and Maintenance Assets</p> <p>Johannesburg: City-wide</p> <p>(One year contract)</p> <p>Applicable criteria: GBP: Sustainable waste management and sustainable water management COJ: Waste management & wastewater</p>	<p>This project aims to replace or renew all water infrastructure assets city-wide to reduce number of (sewer) spillages and water leakages.</p> <p>Environmental benefits:</p> <ul style="list-style-type: none"> • Decreased environmental pollution • Improved water quality • Water conservation <p>The funds were utilised to refurbish Hector Norris water pump station that feed the City Centre. The programme is still in progress with plans to refurbish Florida North water pump station and Jakskei sewer pump station. Planning is at advance stage to commence with the work on the two pump stations.</p>	R23.2 billion	<p>✓ Project consultants are in the process of undertaking a feasibility study for refurbishment of the current sewer and water pump stations as well as standby power during load shedding periods.</p>
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This section reports on *ex ante* estimates of progress towards each project's environmental objectives. Note, however, that not all projects are complete (some remain in the construction or implementation phase) and as a result the environmental objectives may not have been fully realised. In addition, some of the projects are in the process of taking baseline measurements against which to measure the change in conditions.

4.1

ENVIRONMENTAL INDICATORS

Table 4.2 provides details regarding the progress of projects against environmental-related metrics, based on information provided by project personnel. The environmental indicators listed in the table are monitoring indicators recommended by ERM based on international reporting practice. Essentially, data on these indicators should be collected prior to the commencement of the project ('baseline data') and regularly (timing would be dependent on the project) thereafter. Recommendations have been made by ERM to the COJ to ensure that data related to these environmental metrics is collected on a regular basis going forward. More information related to these recommended environmental indicators and how they should be measured is included in Table 4.1 below. It should be noted that some indicators will not be able to be measured directly for certain projects (e.g. reduction in GHG emissions from transport projects) but these numbers can be estimated.

Table 4.1 *Environmental indicators*

<i>Indicator</i>	<i>Sub-indicator</i>	<i>Unit</i>	<i>Additional details</i>
Water quality improvements	pH	pH	pH measurements reflect the acidity (0 - 7) or alkalinity (7 - 14) of a water body, with 7 being neutral (pure water). A pH of between 6.5 - 8.5 typically reflects good water quality. Anything outside of that is unhealthy (either too acidic or too alkaline). pH can be tested using water samples and litmus paper or a spectrophotometer.
	Total dissolved solids (TDS)	mg/l	TDS is an indication of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionised or micro-granular suspended form. TDS has an impact on electricity conductivity of a water body (another measurement of water quality). TDS differs from area to area depending on the substrate on which the water body is situated (i.e. type of rock). The Department of Environmental Affairs

(DEA) defined water quality guidelines for aquatic systems (1996) which states that TDS should fall within the range of 5.5 – 7.5.

Total suspended solids (TSS) mg/l

TSS is the measurement of the concentration of suspended solids (i.e. larger than two microns) within a water body/ sample. TSS will affect the turbidity and ecosystem functioning of a water body. TSS can be measured using a portable turbidimeter. The DEA defined water quality guidelines for aquatic systems (1996) which states that TSS should not exceed 100.

Dissolved oxygen (DO) mg/l or %

Dissolved oxygen in a water body is critical to the survival and functioning of fauna and flora in the water body. In unpolluted waters, DO levels are close to saturation. DO levels vary during the day and should be measured at different times, either by taking samples during the day and sending to a laboratory for measurements or *in situ* using an oxygen-sensitive electrode. Concentrations of less than 100% reflect an impact on water quality.

Temperature °C

Temperature measurements should be taken in the water body itself to understand if water pollution has impacted the water body. Measurements should be taken at around 10 cm below the surface in various points within or along the water body. An increase in foreign material into the water body can result in an increase in temperature which will disrupt ecosystem functioning. Temperature will be specific to the water body (e.g. dependent on whether the water body is shaded or not, size of the water body, flow rate etc) and an appropriate temperature should be determined by an ecologist/ water expert on site.

Air quality improvements Particulate matter (PM₁₀) µg/m³

Particulate matter denotes small particles in the air (including but not limited to dust) that could have a harmful effect on people (by lodging themselves in the bronchial walls during inhalation). Particulate matter measurements provide a good indication of air quality.

Acceptable PM levels as per the National Environmental Management: Air Quality Act 39 of 2004 (National Ambient Air Quality Standards, 2009) are as follows (over a 24-hour and 1-year period):

- 24-hour: 75
- 1-year: 40

Exceedances of the 24-hour limitation are limited to four times per year. Air quality monitoring stations can take these measurements.

Dustfall (D)	mg/m ² /day	<p>Dustfall refers to particulate matter that has settled or has been deposited. Acceptable dustfall rates as per the National Environmental Management: Air Quality Act 39 of 2004 (National Dust Control Regulations, 2013) are as follows (measured over a 30-day period):</p> <ul style="list-style-type: none"> • Residential area: < 600 • Non-residential area: 1200 > D > 600
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These figures cannot be exceeded more than twice in a year period, and never in sequential months. Air quality monitoring stations can take these measurements.

Reduction in GHG emissions	t CO ₂ e	<p>GHG emissions can be avoided through the generation and use of renewable energy, avoidance of motorised transport, reduction of fuel or energy use etc. This data is not directly measurable. Rather, the figures should be calculated based on the litres of fuel saved, kWh of grid electricity saved etc by applying an emissions factor to those figures. Details on the emission factors can be found in the GHG Protocol (A Corporate Accounting and Reporting Standard), Defra's Voluntary Reporting Guidelines or the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for Greenhouse Gas Reporting. One would need to measure the difference in baseline conditions to understand the GHG emissions saved/ avoided.</p>
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Renewable energy generated	kWh	<p>Renewable energy used in place of grid electricity will have positive environmental benefits through the reduction of coal-fired electricity</p>
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generation, and related improvements in air quality as well as a reduction in GHG emissions. These benefits are not directly measurable on site but the amount of grid electricity saved (and corresponding GHG emission saved) can be calculated by measuring the kWh and applying the grid emission factor.

Water conserved

ML

Water saved can be reported on using mega litres (ML). Water losses through leaks/ spills should have been quantified or estimated at the beginning of the project (baseline figures) and thereafter the spills avoided as a result of the project will provide an indication of the quantity of water conserved.

Table 4.2. Key Indicator Table for Impact Reporting (Use of Proceeds and Results)

No.	Project	Environmental Indicator(s)	Environmental Benefit in Reporting Period	Other Benefits Achieved
1.	Rehabilitation of Bruma Lake	<ul style="list-style-type: none"> Water quality improvements: pH, DO, TSS, TDS, temperature 	<p>The rehabilitation of the Bruma Lake has improved the aesthetics of the area, as well as previous odour problems.</p> <p>This project has also assisted with the improvement of Present Ecological State (PES) of the Jukskei Bruma Water Management Unit (Baseline: 2010 PES: F). The results obtained during the dry season indicate an improvement of PES to E. A second assessment, the wet assessment, will be done during wet season, and the overall PES will be determined based on both the dry and wet assessment.</p> <p>Water quality monitoring is undertaken along the stretch of this water management unit on a monthly basis.</p>	<p><i>Local employment:</i></p> <ul style="list-style-type: none"> - 68 permanent staff; - nine contractors; - two subcontractors; and four small, medium and micro-sized enterprises (SMMEs).
2.	Rehabilitation of Princess Dump, Roodepoort	<ul style="list-style-type: none"> Air quality improvements: PM₁₀ and dustfall Water quality improvements: pH, DO, TSS, TDS, temperature 	<p>The baseline in terms of the water quality results shows that the pH of the Klip River close to the Princess Mine dump is acidic (< 7). The project is currently in the last phase which entails the installation of a passive treatment plant that will assist with the improvement of the acidity of the Klip River.</p>	<p><i>Local employment:</i></p> <ul style="list-style-type: none"> - 54 contracted staff; and - four sub-contractors

			<p>A mobile air quality station has been procured to measure the effectiveness of the rehabilitation works. The daily PM₁₀ levels measured at the site between July and August 2015 are below the National Ambient Air quality Standards of 75ug/m³. The results indicate that, in general, the level of particulate matter (PM) is low and there is minimal contribution from dust from the mine dump and domestic fuel burning by households in the area. This will continue to be monitored.</p>	
3.	Orlando Non-Motorised Transport Facilities	<ul style="list-style-type: none"> • Reduction in GHG emissions • Air quality improvements: PM₁₀ 	<p>Not currently reportable: the impact on carbon emissions is currently not quantifiable or measured but is understood to be positive.</p>	<p><i>Local employment:</i></p> <ul style="list-style-type: none"> - A total of 81 job opportunities were created during the construction period; and - Five local subcontracting companies were appointed during the construction period. <p><i>Local outreach:</i></p> <ul style="list-style-type: none"> - 300 bicycles have been distributed to learners (through a partnership with Qhubeka and the Department of Education) and community police forum members in Orlando.
4.	Biogas to Electricity at Northern Works, Goudkoppies and	<ul style="list-style-type: none"> • Renewable energy generated (kWh) • Reduction in GHG emissions 	<p>The Northern Works project has been completed. The installation included an upgrade of four existing anaerobic</p>	.

	<p>Bushkoppies Wastewater Treatment Works</p>		<p>digesters, installation of digester gas conditioning and compression system, upgrade of the gas storage tank and installation of three CHP units of 376 kW electrical power (kWe) each. The impact of the installation is the production of 1.2 MW of renewable electricity and a reduction in emission of 10,000 tCO₂e. Since inception in 2012, the project has generated 4,385 mWh of electricity, which has resulted in the offset of 4,516 tCO₂e.</p> <p>The Northern WWTP biogas to energy project could be expanded to around 4.5 MW supplying 50-60% of the total plant energy requirement. This expansion can be realised as soon as additional anaerobic digester capacity available which is currently underway</p> <p>Driefontein Works were upgraded to a 55Ml/d facility with the installation of digestion as part of the upgrade. Commissioning of the wastewater treatment facility is in testing phase. The second biogas to energy installation is part of this upgrade and is nearing completion and included two CHP units of 376kW electrical power (kWe) each. Commissioning of this CHP plant is planned for early 2016.</p>	
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5.	Operation Gcina Amanzi	<ul style="list-style-type: none"> Water conserved (ML) 	The project has saved 225,149 ML (June 2014) through the laying of new piping, which is equivalent to R880 million.	The programme has created 2008 jobs since its inception. A total of 157 local contractors has benefited as sub-contractors.
6.	Replacement of water pipes	<ul style="list-style-type: none"> Water conserved (ML) 	By fixing leaks and replacing pipes, the project has led to a total water savings of 3,255 ML over a total network of 11,901 km.	<i>Local employment:</i> - Over three year period (2012/13 to 2014/15) a total of 12 636 job opportunities have been created.
7.	Replacement of Sewer Pipes	<ul style="list-style-type: none"> Sewer spillages avoided (ML) Water quality improvements: pH, DO, TSS, TDS, temperature 	<p>The environmental benefit has not been quantified, but is expected to have been positive through a reduction of sewage spills as a result of the pipe replacements undertaken to date.</p> <p>Sewer pipe replacement has not been undertaken as quickly as possible over the reporting period, resulting in more blockages per 100 km of pipe network (from 418 in 2012/13 to 446 by June 2015). In order to fast-track the programme, Johannesburg Water is looking to improve the appointment of contractors and engagement with the Environmental Authorities in order to quickly advance authorisations and records of decisions (RODs) permits.</p>	<i>Local employment:</i> - Covered in no. 6 above
8.	LA: Module 1 New Bulk Wastewater	<ul style="list-style-type: none"> Wastewater pollution incidents avoided 	Not currently reportable – project is still in the early stages.	<i>Local employment:</i>

		<ul style="list-style-type: none"> Water quality improvements: pH, DO, TSS, TDS, temperature 		- Project construction has not yet commenced therefore jobs to be created is not yet confirmed.
9.	Northern Works: De-sludge Dam 01 and 02 Renewal Bulk Waste Water	<ul style="list-style-type: none"> Wastewater pollution incidents avoided Water quality improvements: pH, DO, TSS, TDS, temperature 	The project is still in the construction phase (65% complete) and the environmental benefits will be realised upon completion in April 2016.	<i>Local employment:</i> - A total of 55 jobs have been created.
10.	Operations and Maintenance Renewal Operate and Maintenance Assets	<ul style="list-style-type: none"> Sewer spillages avoided (ML) Water conserved (ML) 	Not currently reportable – project is still in the early phases, but it is expected to have positive impacts in terms of water conservation.	

It is evident from those projects reported on in within this report that the projects funded by the Green Bond are characterised by having positive environmental benefits (in line with the GBP), with many of the projects reporting on tangible benefits. Some of the projects reported on within this report are in the early stages of the bigger capital programme that they form part of with limited environmental benefits being currently realised. However, it is expected that the tangible environmental benefits associated with the projects benefitting from the Green Bond will improve year-on-year across the portfolio of Green Bond-funded projects. In addition, the projects reported on in this report have had positive socio-economic impacts. Overall, it can be concluded that the selection of projects focused on in this report are progressing in line with initial objectives and timelines, and are starting to demonstrate environmental benefits and, as such, are determined to be good beneficiaries of the Green Bond.

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