# PARKS AS FUNCTIONAL OPEN SPACE
# A STRATEGY TO SUSTAINABLE URBAN DRAINAGE

By

Johan Barnard

*Assisted by Hercules Strydom*

NEWTOWN LANDSCAPE ARCHITECTS

NLA

IERM CONFERENCE

President Hotel, Cape Town

26 September 2016

**Context…**

The presentation reflects on the way we can make parks work hard – be better and do more for our urban environment.

As a Landscape Architect I have been involved in more than 70 park developments over the past 25 years. And things we were trying out in Gilooly's Farm and Moroka Dam (20 and 16 years ago) are only now becoming more common place.

City of Johannesburg promulgated their "new" Storm Water By-laws in 2010, but they have not yet been implemented or enforced. NLA, together with Chris Brooker Associates and Fourth Element Engineers, have been tasked with developing the Storm Water Design Guidelines for the City . This project again focussed my attention on what we can do with our parks.

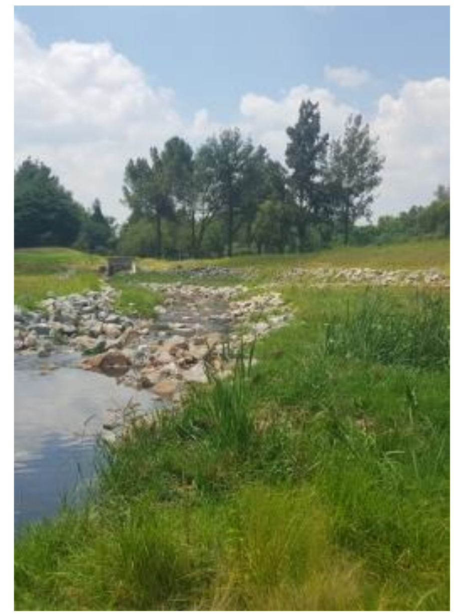
The term 'green infrastructure' is most widely used in reference to the networks of open space and natural areas that surround and penetrate cities and towns. Such references inherently recognize that these greenways provide ecological services, such as flood control, air purification recreation and wildlife habitat. More recently, the concept has grown to describe low-impact and multifunctional infrastructure networks that support an environmentally sound approach to design and planning in urban and urbanizing areas. The recognition that green infrastructure, such as parks, urban forests and stream corridors provide essential ecological services elevates their perceived value in a community, Further more, when these elements are recognized as parts of larger systems they can be designed and managed to achieve higher ecological and infrastructural performance. (Rottle & Yocom, n.d.)

Parks can work much harder than just play and recreation areas. They are significant storm water management opportunities. There is not enough time and effort spend on considering regional issues when designing parks today. In 1997 NLA drafted the Soweto Open Space Frame Work, which guided park development in Soweto until the Klipriver/Klipspruit Master Plans were developed in 2007. This gave rise the a series of parks along the Klipspruit in Soweto which now all work together as a park korridor.

THE OUTLINE

## Key Projects for Discussion

- CoJ Stormwater Design Guidelines
- International examples
- **F**irst attempts:
    - Moroka Dam Precinct 2000 – ecological design (2002);
- **Current projects** :
    - Paterson Park Bio swale (2015-17);
    - Westbury SUDS(2015-16);
    - Caledonian Park(2015-18);



# CoJ Storm Water Guide Outline

Ch 0. INTRODUCTION

- PRINCIPLES
- DEFINITIONS

Ch1. INTERPRETATION

Ch 2. SITE DEVELOPMENT ACTIVITY PERMITS

- STORM WATER MANAGEMENT REPORT

Ch 3. EROSION & SEDIMENT CONTROL

- SETTING LIMITS
- BMPS

Ch 4. GRADING

Ch 5. STORM WATER MANAGEMENT

- DESIGN METHODS
- MAJOR & MINOR DEVELOPMENTS

Ch 6. OPERATION & MAINTENANCE

Ch 7. CRITICAL DRAINAGE AREAS

Ch 8. STORM WATER POLLUTION

Ch 9. MISCELLANEOUS

APX A. GEOGRAPHICAL INFORMATION

APX B. RIVERS & RIPARIAN CORRIDOR

APX C. GREEN STORM WATER INFRASTRUCTURE

APX D. CALCULATION METHODS & MODELLING

APX E. DESIGN RAINFALL

Joburg
a world class African city

NLA

cba
SPECIALIST ENGINEERS

# Drainage Principles

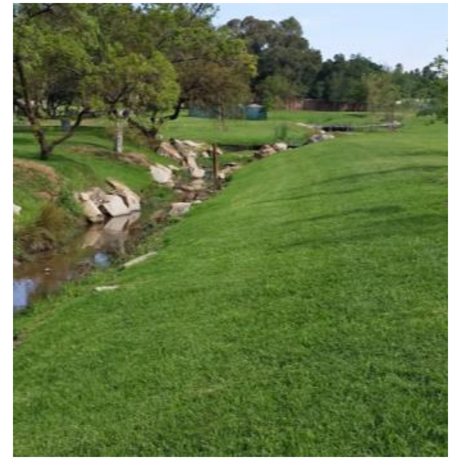
1. Storm water is a resource
2. Catchment Master Planning (CMP)
3. Catchment recovery ("Catchment Repair")
4. Run off harvesting (more then rainwater harvesting)
5. Water quality (a municipal issue)
6. Flood aspects (hazard, floodplain management)
7. Ecological services
8. Amenity services
9. Informal settlements
10. Densification
11. Climate change & adaptation
12. Asset register

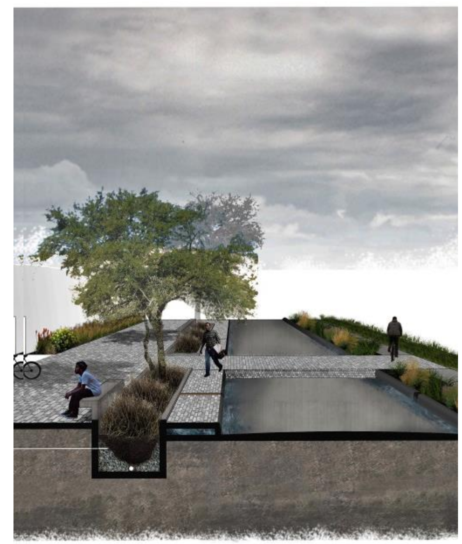
Joburg
a world class African city

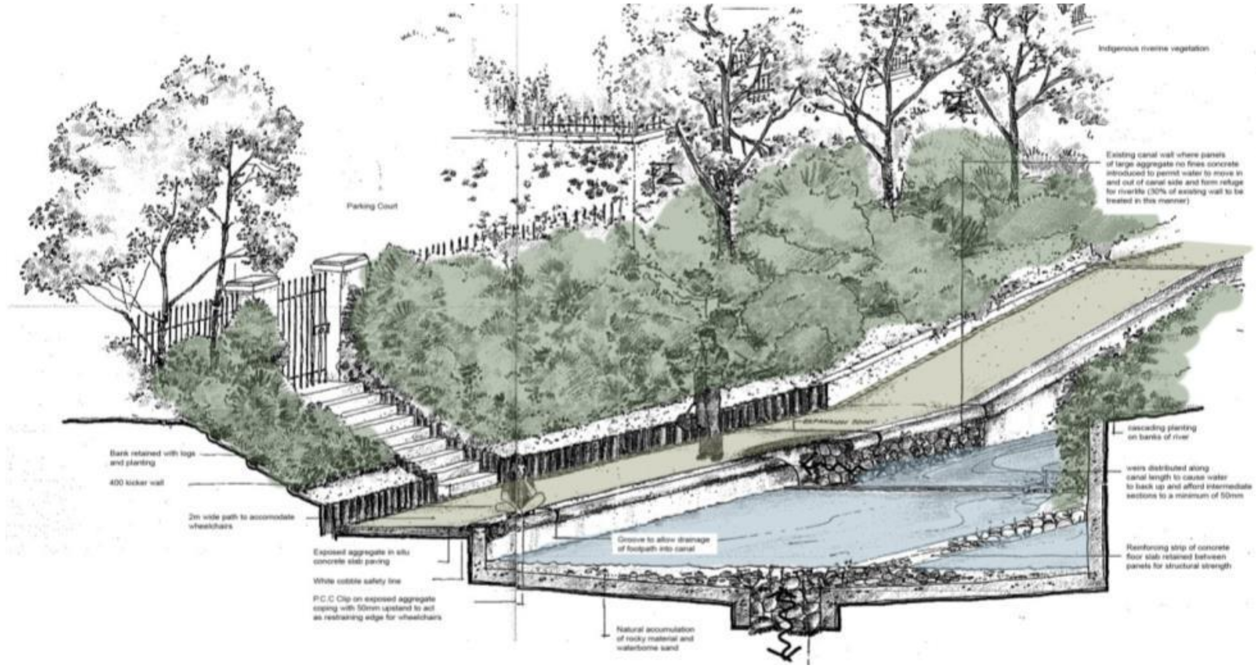
NLA

cba
SPECIALIST ENGINEERS

| | |
|---|---|
| GSI | Green Storm water Infrastructure |
| SUDS | Sustainable Urban Drainage Systems |
| BMPs | Best Management Practices |
| WSUDS | Water Sensitive Urban Designs |
| LIDS | Low Impact Drainage Systems |
| SQIDs | Storm water Quality Improvement Devices |
| RG | Rain Gardens |

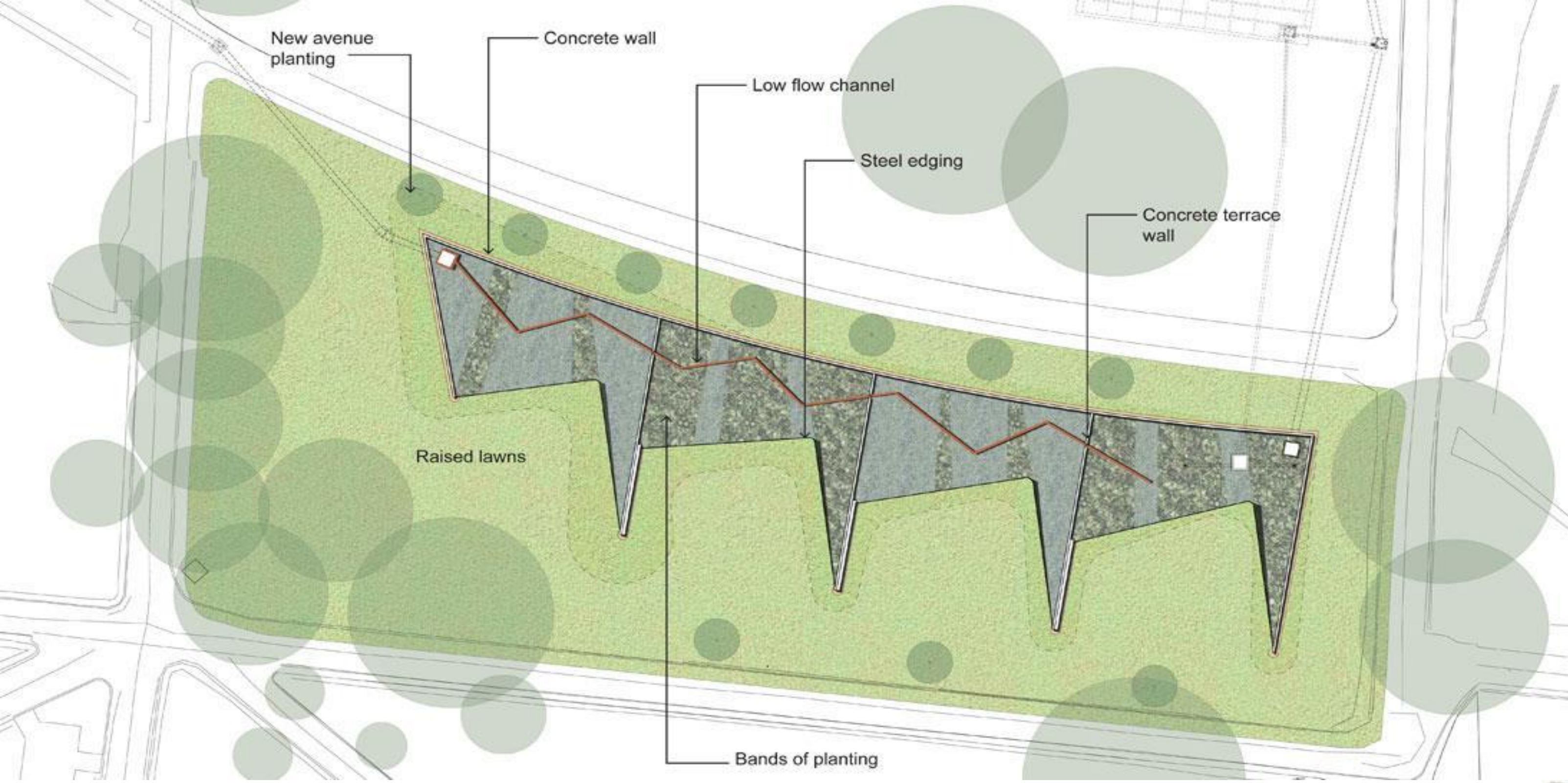




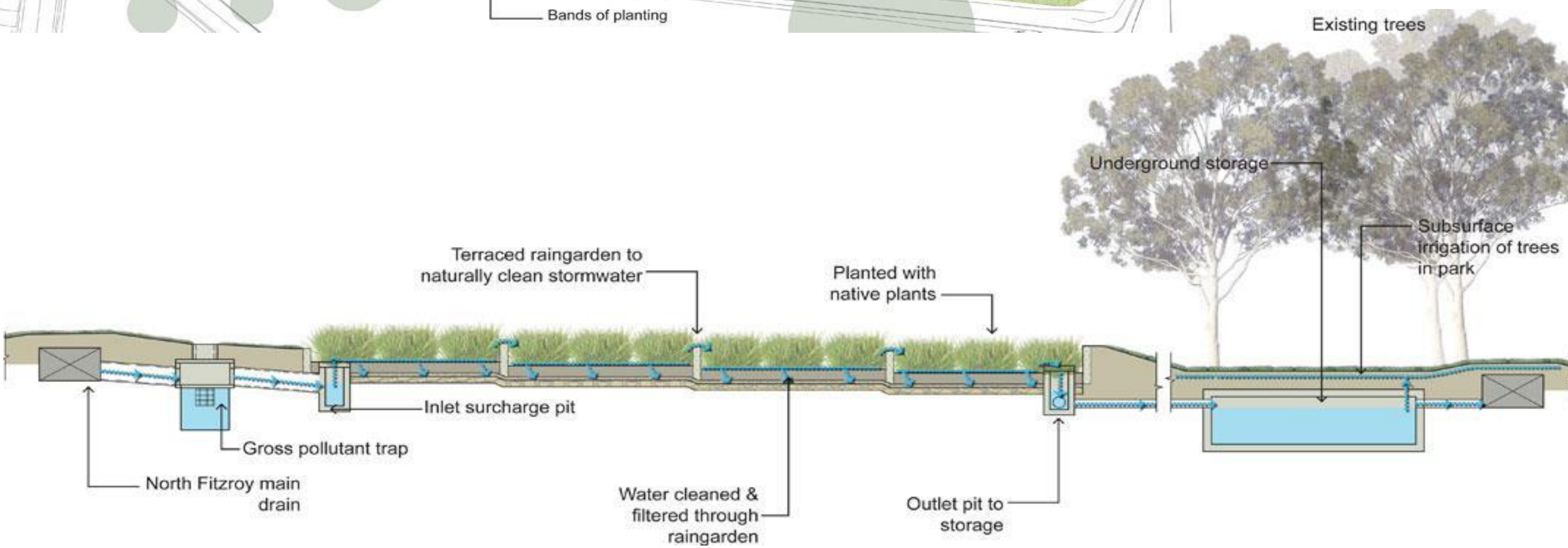



EPM Magazine, Landscaping and Ecological Rehabilitation of Urban River way - Liesbeek River, May 1995

Andrea Munoz, Chenggyoenchen Stream, accessed 24 July 2015
< http://www.munozandrea.com/chenggyoencheon-1/>




GHD Pty Ltd, Edinburgh Gardens Raingarden, accessed 24 July 2015 < http://www.landezine.com/index.php/2012/10/edinburgh-gardens-raingarden-by-ghd-pty-ltd>



GHD Pty Ltd, Edinburgh Gardens Raingarden, accessed 24 July 2015
< http://www.landezine.com/index.php/2012/10/edinburgh-gardens-raingarden-by-ghd-pty-ltd>

The **Sustainable Sites Initiative™ (SITES™)** is a program based on the understanding that **land is a crucial component of the built environment** and can be planned, **designed**, developed, and maintained to **avoid, mitigate, and even reverse detrimental impacts**.

## Economic Benefits

- Annually, **250 people are expected to be employed in green jobs.**
- Increase of up to **$390 million in property values near parks and green areas over the next 45 years.**

## Social Benefits

- Increase of up to **10% more visits to Parks & Recreation sites.**
- Reduction of up to **140 fatalities caused by excessive heat over the next 45 years.**
- Up to **1-2 avoided premature deaths, 20 avoided deaths from asthma and up to 250 fewer missed school or work days.**

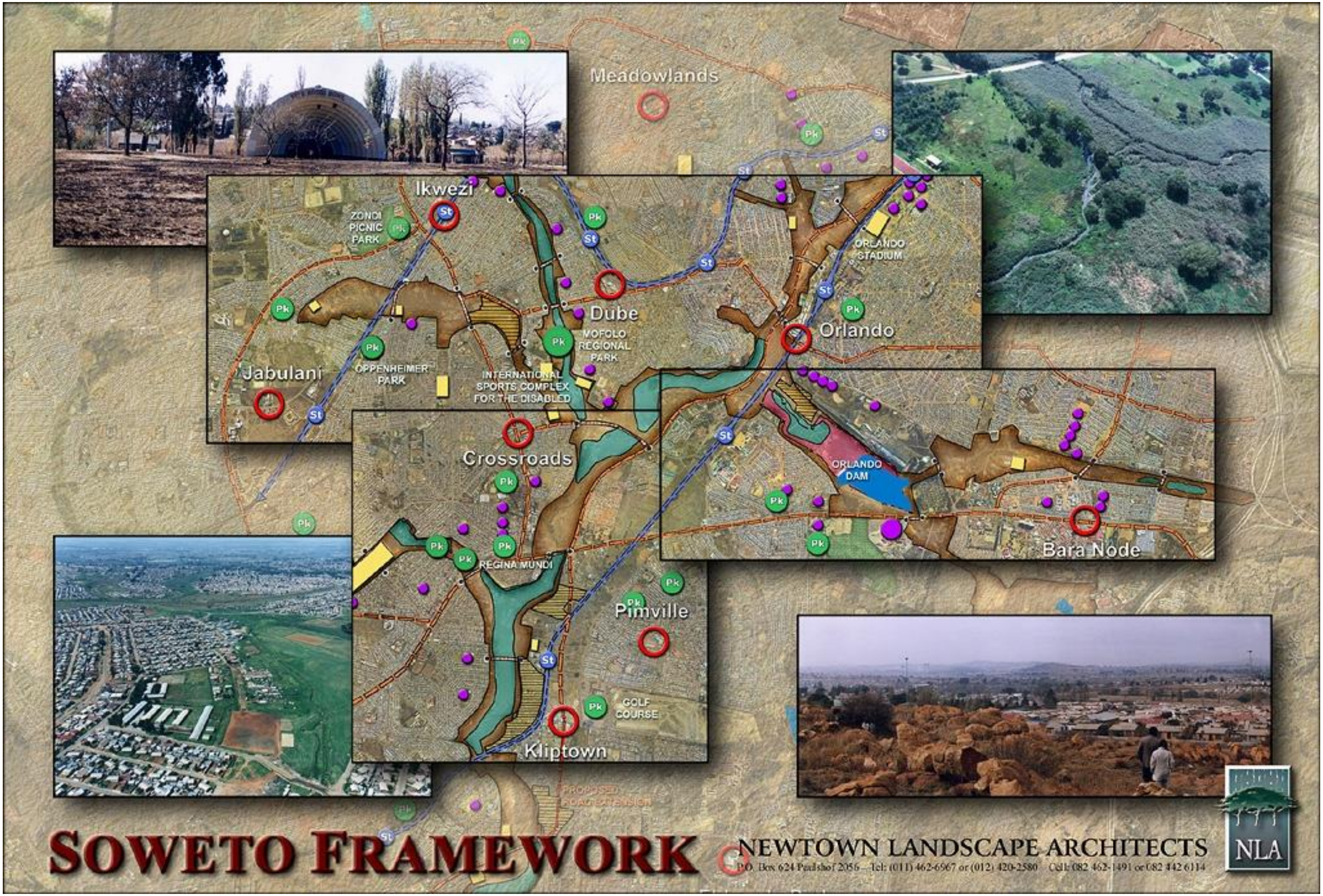
## Environmental Benefits

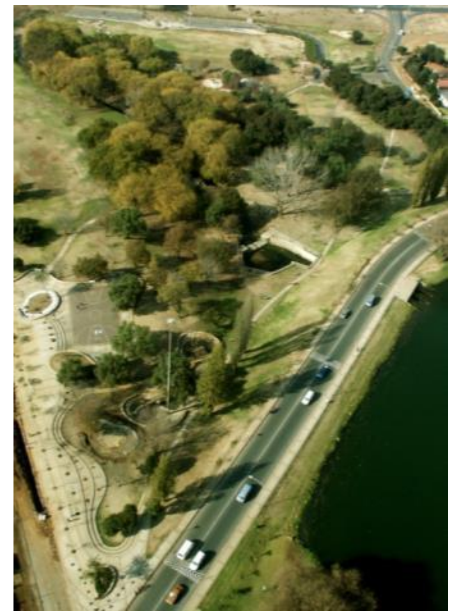
- Up to **1.5 billion lbs. of carbon dioxide emission avoided or absorbed, equivalent to removing close to 3400 vehicles from roadways each year.**
- Up to **$8.5 million in water quality and habitat improvements SAVED over 40 years.**

**THE COST OF GREEN INFRASTRUCTURE: CHEAPER THAN WE THOUGHT**

ater management, native grasses (Portland, OR)

asses used in park (Seattle)


Meadowlands
Ikwezi
ZONDI PICNIC PARK
Dube
MOFOLO REGIONAL PARK
ORLANDO STADIUM
Orlando
Jabulani
OPPENHEIMER PARK
INTERNATIONAL SPORTS COMPLEX FOR THE DISABLED
Crossroads
ORLANDO DAM
Bara Node
REGINA MUNDI
Pimville
GOLF COURSE
Kliptown
Pk
St
SOWETO FRAMEWORK
NEWTOWN LANDSCAPE ARCHITECTS
P.O. Box 624 Paulshof 2056 – Tel: (011) 462-6967 or (012) 420-2580 Cell: 082 462-1491 or 082 442 6114
NLA

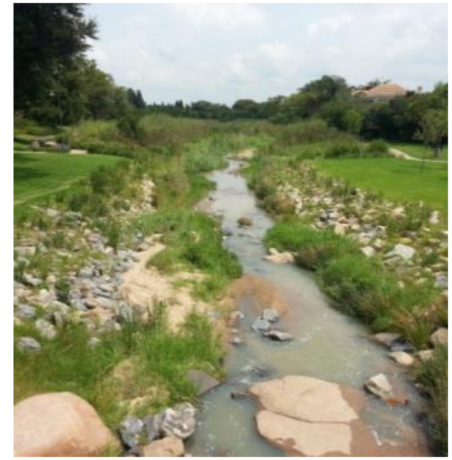
MOROKA DAM PARK


Dam rehabilitation
and silt trap
Wetland and stream
rehabilitation

Flood attenuation
Storm water runoff
Silt trap dam
Rehabilitated stream and new flood plain/wetlands


Dam
Silt trap
Stream rehabilitation

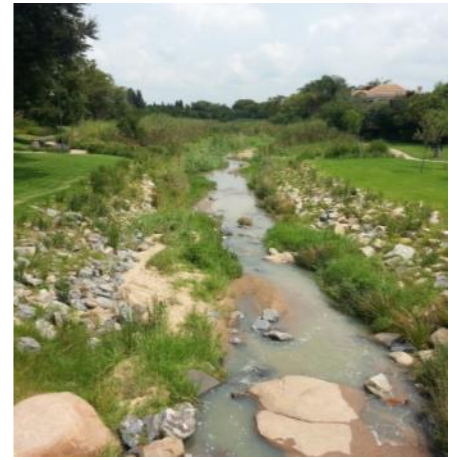
MOROKA DAM PARK



PATERSON PARK VISION

UNDER CONSTRICTION

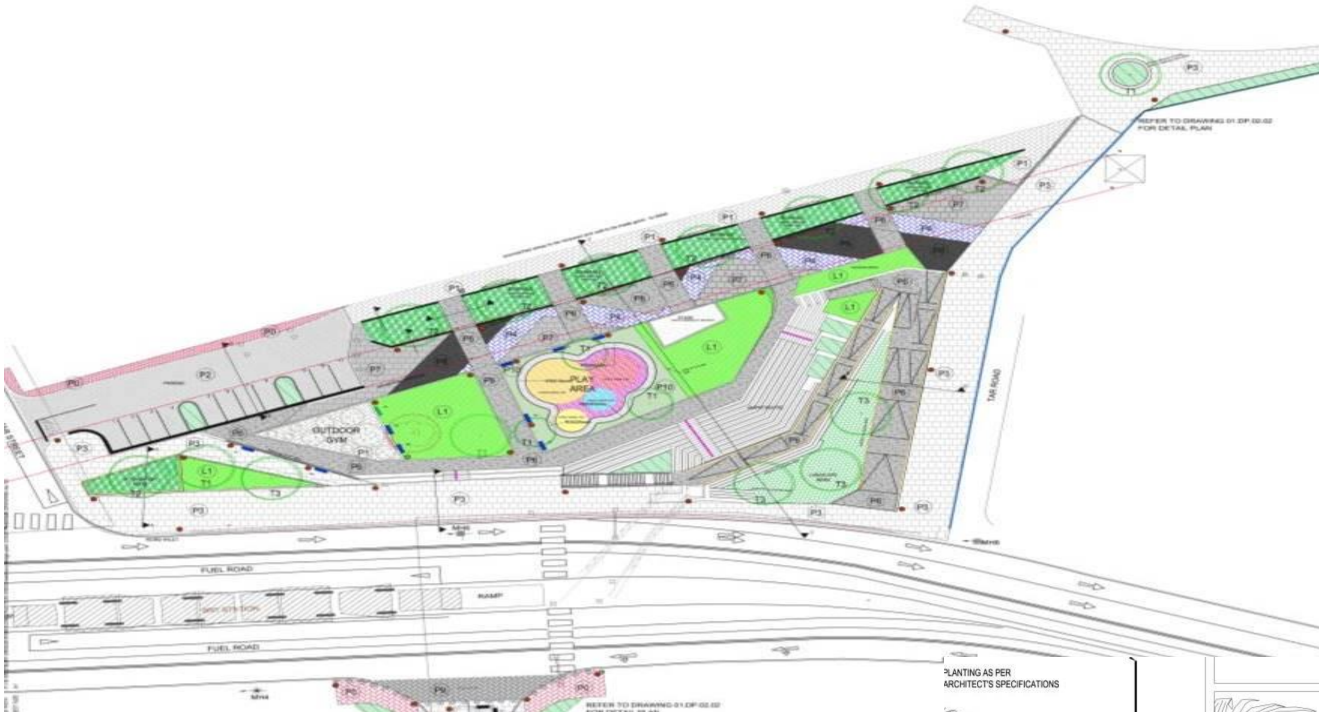
NLA/CBA for JDA



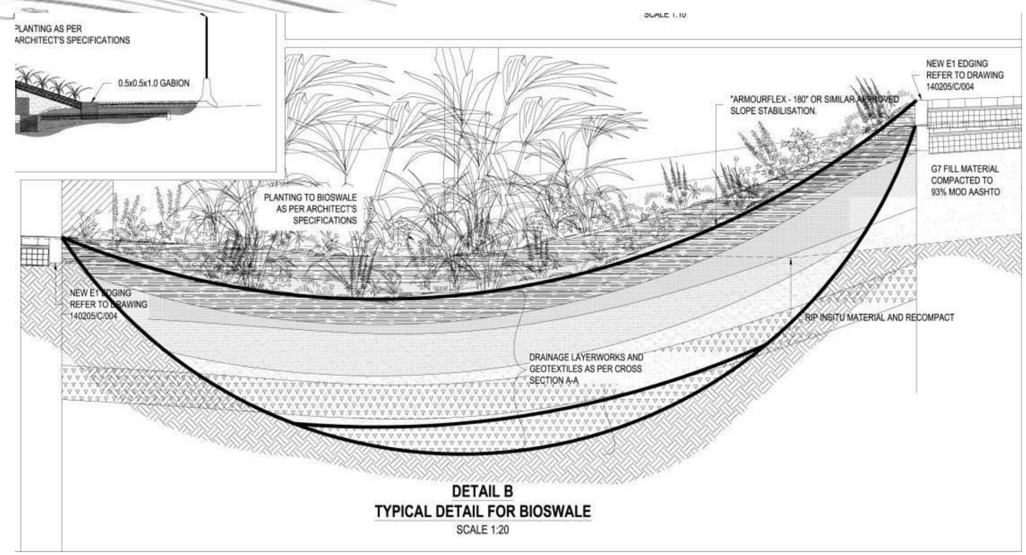
PATERSON PARK VISION

ARTIS IMPRESSIONS

NLA/CBA for JDA



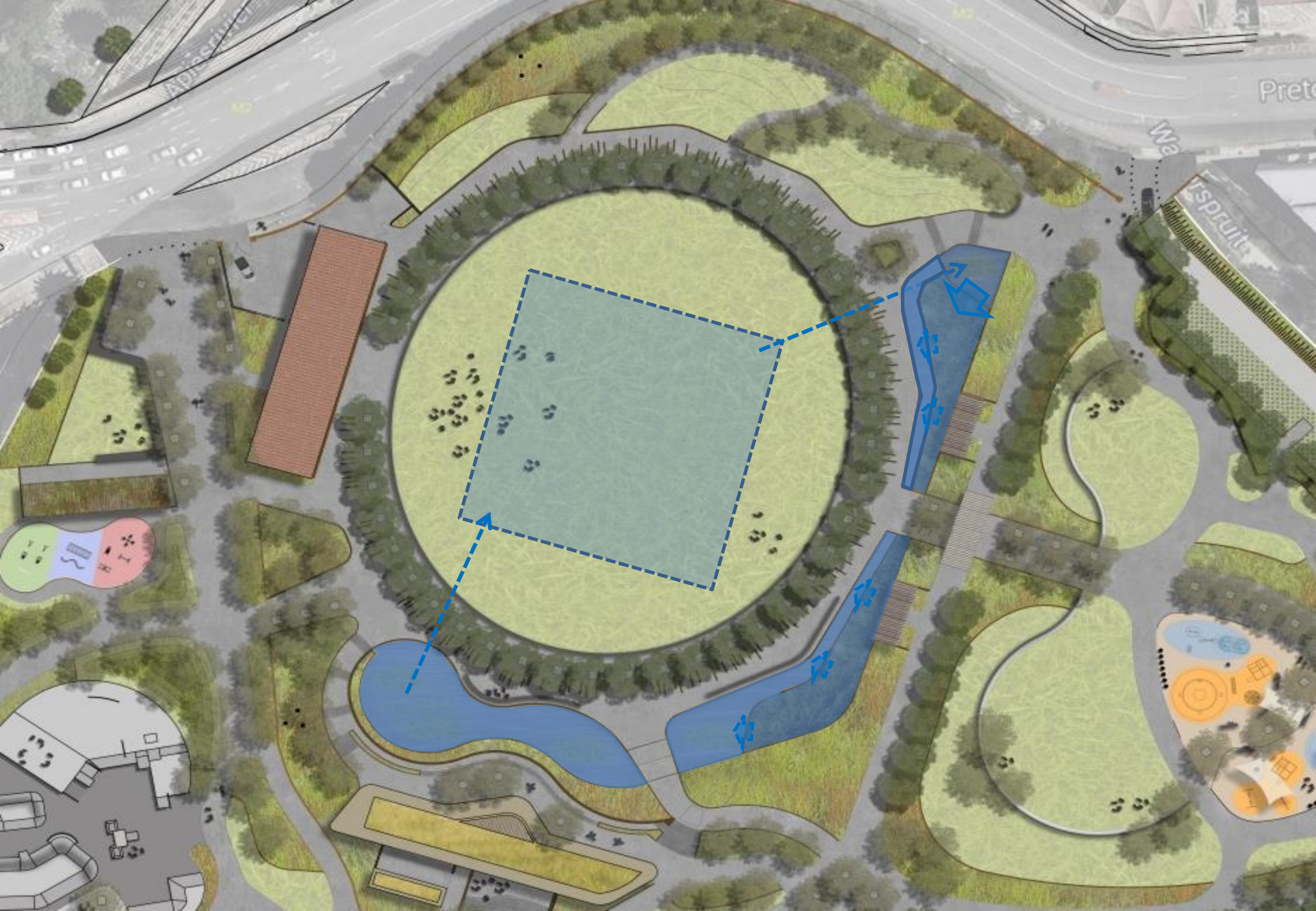
REFER TO DRAWING 01.DP.02.02 FOR DETAIL PLAN
PLAY AREA
OUTDOOR GYM
TAR ROAD
FUEL ROAD
RAMP
FUEL ROAD
REFER TO DRAWING 01.DP.02.02 FOR DETAIL PLAN

PLANTING AS PER ARCHITECT'S SPECIFICATIONS
0.5x0.5x1.0 GABION
NEW E1 EDGING REFER TO DRAWING 140205/C/004
"ARMOURFLEX - 180" OR SIMILAR APPROVED SLOPE STABILISATION.
G7 FILL MATERIAL COMPACTED TO 93% MOD AASHTO
PLANTING TO BIOSWALE AS PER ARCHITECT'S SPECIFICATIONS
NEW E1 EDGING REFER TO DRAWING 140205/C/004
RIP INSITU MATERIAL AND RECOMPACT
DRAINAGE LAYERWORKS AND GEOTEXTILES AS PER CROSS SECTION A-A
DETAIL B
TYPICAL DETAIL FOR BIOSWALE
SCALE 1:20


CALEDONIAN PARK

1. Surface Drainage
2. Infiltration
3. Underground Reservoir
4. Skate Park
5. Play Area
Pump for Irrigation System
Flo-Cell® 30mm drainage cell
STORMWATER HARVESTING TANK
Liner
Geotextile
Flo-Tank® modules
Pretorius St
Nelson Mandela Dr
Apiesrivier
Francis Baard Street
Park St
Walkerspruit


Apiesrivier

| IRRIGATION DEMAND | | | | | | | |
|---|---|---|---|---|---|---|---|
| Month | Lawn area ($m^2$) | Irr. depth / week (m) | Irr. depth / month (m) | Beds area ($m^2$) | Irr. depth / week (m) | Irr. depth / month (m) | Irrigation demand ($m^3$/month) |
| January | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| February | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| March | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| April | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| May | 10635 | 0.01 | 0.04 | 7680 | 0.02 | 0.08 | 1039.8 |
| June | 10635 | 0.01 | 0.04 | 7680 | 0.02 | 0.08 | 1039.8 |
| July | 10635 | 0.01 | 0.04 | 7680 | 0.02 | 0.08 | 1039.8 |
| August | 10635 | 0.01 | 0.04 | 7680 | 0.02 | 0.08 | 1039.8 |
| September | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| October | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| November | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| December | 10635 | 0.02 | 0.08 | 7680 | 0.025 | 0.1 | 1618.8 |
| | | | | | | | 17109.6 |

| | |
|---|---|
| **Paving** | **11075** |
| **Lawn (H)** | **10635** |
| **Lawn (I)** | **10635** |
| **Beds** | **7680** |
| **C (Paving)** | **0.8** |
| **C (Lawn)** | **0.1** |

| Single 24 hr rain event | | | |
|---|---|---|---|
| Event size | Paving Yield / event ($m^3$) | Lawn Yield / event ($m^3$) | Total Yield / event ($m^3$) |
| 25 | 221.5 | 26.6 | 248.1 |
| 50 | 443.0 | 53.2 | 496.2 |
| 75 | 664.5 | 79.8 | 744.3 |
| 100 | 886.0 | 106.4 | 992.4 |
| 125 | 1107.5 | 132.9 | 1240.4 |
| 150 | 1329.0 | 159.5 | 1488.5 |

## DEMAND
## 17,109$m^3$/annum

| RAINWATER YIELD | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Month | Ave P (m) | Paving Area ($m^2$) | Paving C | Paving Yield ($m^3$) (Yield = PxAxC) | Lawn Area (H) ($m^2$) | Lawn C | Lawn Yield ($m^3$) (Yield = PxAxC) | Total Yield ($m^3$) |
| January | 0.133 | 11075 | 0.8 | 1178.4 | 10635 | 0.1 | 141.4 | 1319.8 |
| February | 0.085 | 11075 | 0.8 | 753.1 | 10635 | 0.1 | 90.4 | 843.5 |
| March | 0.088 | 11075 | 0.8 | 779.7 | 10635 | 0.1 | 93.6 | 873.3 |
| April | 0.052 | 11075 | 0.8 | 460.7 | 10635 | 0.1 | 55.3 | 516.0 |
| May | 0.012 | 11075 | 0.8 | 106.3 | 10635 | 0.1 | 12.8 | 119.1 |
| June | 0.008 | 11075 | 0.8 | 70.9 | 10635 | 0.1 | 8.5 | 79.4 |
| July | 0.004 | 11075 | 0.8 | 35.4 | 10635 | 0.1 | 4.3 | 39.7 |
| August | 0.006 | 11075 | 0.8 | 53.2 | 10635 | 0.1 | 6.4 | 59.5 |
| September | 0.025 | 11075 | 0.8 | 221.5 | 10635 | 0.1 | 26.6 | 248.1 |
| October | 0.073 | 11075 | 0.8 | 646.8 | 10635 | 0.1 | 77.6 | 724.4 |
| November | 0.104 | 11075 | 0.8 | 921.4 | 10635 | 0.1 | 110.6 | 1032.0 |
| December | 0.108 | 11075 | 0.8 | 956.9 | 10635 | 0.1 | 114.9 | 1071.7 |
| ANNUAL AVE. | 0.698 | | | 6184.3 | | | 742.3 | 6926.6 |

| | WATER BUDGET | Year: 1 | | | |
|---|---|---|---|---|---|
| | Month | Yield ($m^3$) | Demand ($m^3$) | Monthly balance | Vol. water in tank ($m^3$) |
| | January | 1319.8 | 1618.8 | -298.97 | -1432.79 |
| | February | 843.5 | 1618.8 | -775.30 | -2208.10 |
| | March | 873.3 | 1618.8 | -745.53 | -2953.63 |
| | April | 516.0 | 1618.8 | -1102.78 | -4056.41 |
| | May | 119.1 | 1039.8 | -920.72 | -4977.12 |
| | June | 79.4 | 1039.8 | -960.41 | -5937.54 |
| | July | 39.7 | 1039.8 | -1000.11 | -6937.64 |
| | August | 59.5 | 1039.8 | -980.26 | -7917.90 |
| | September | 248.1 | 1618.8 | -1370.71 | -9288.61 |
| START: | October | 724.4 | 1618.8 | -894.38 | 0.00 |
| | November | 1032.0 | 1618.8 | -586.76 | -586.76 |
| | December | 1071.7 | 1618.8 | -547.06 | -1133.82 |
| | ANNUAL AVE. | 6926.6 | 17109.6 | -10182.997 | |

## RAINWATER YIELD
## 6,926$m^3$/annum

CALIDONIAN PARK: AERIAL LOOKING SOUTH WEST

CALIDONIAN PARK: COMMONS

CALIDONIAN PARK: WETLAND

CALIDONIAN PARK: WETLAND

In contrast to buildings, **landscapes** have the capacity to protect and even **regenerate natural systems**, thereby increasing **ecosystem services.**

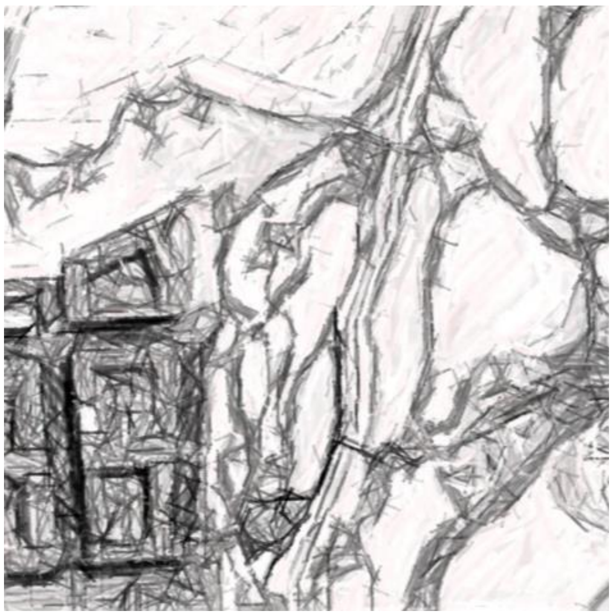
Addressing **water issues**, through **intelligent landscape architectural design** provides an opportunity to **improve urban resilience** to water related risks.


**_“Without great parks, there are no great cities”_**

Dr. John Crompton

CALEDONIAN PARK

# NEWTOWN LANDSCAPE ARCHITCTECTS



LANDSCAPE ARCHITECTURE ENVIRONMENTAL PLANNING URBAN DESIGN