Summary of reports and plans for Baviaans River, Hout Bay Rehabilitation (July 2022)

Participants: SEBCID, FORHB, restoration experts, City (departments of Invasive Species, Parks, and Stormwater), and the National Department of Water and Sanitation.

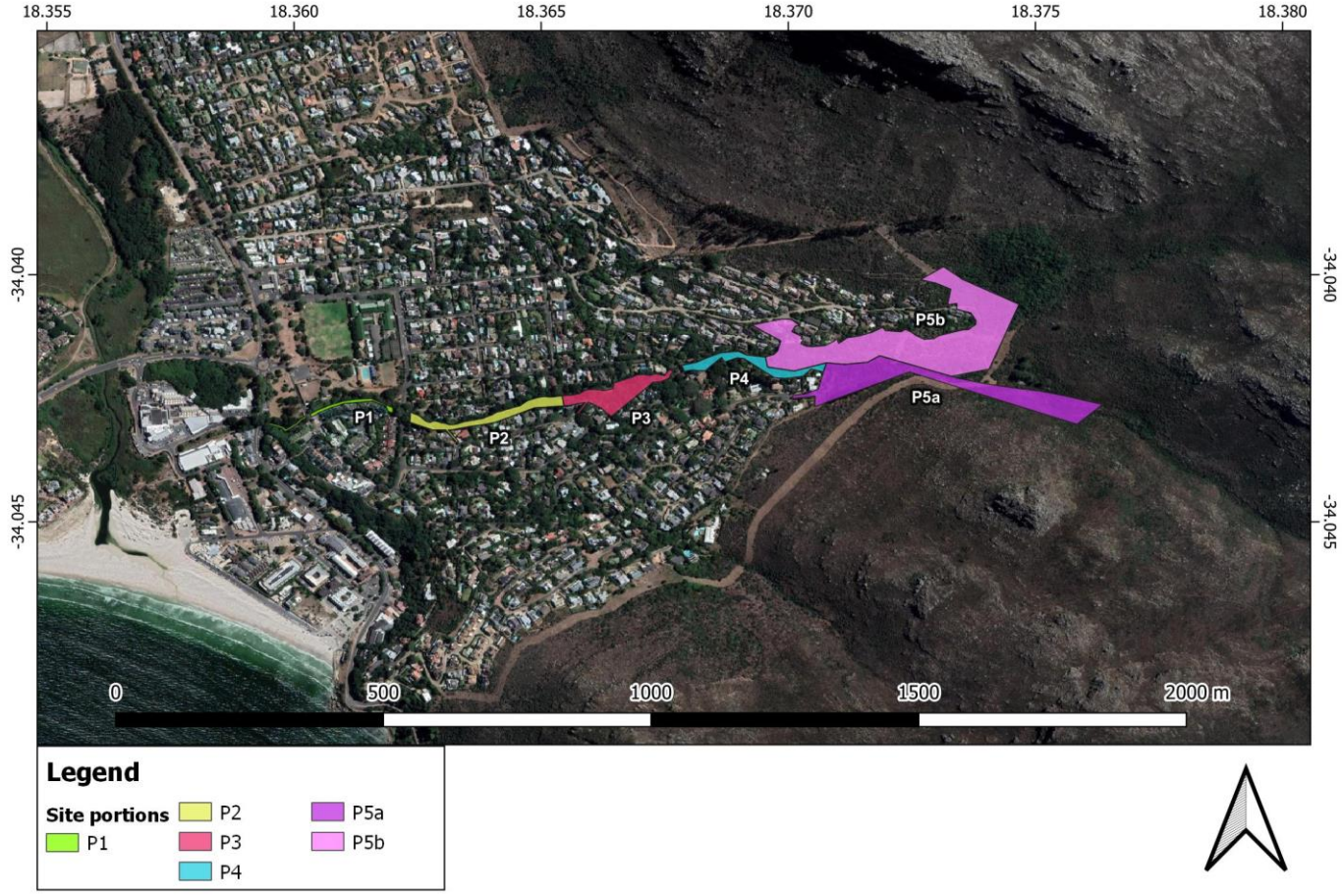
Contributors

Department of Invasive Species
Department of Biosecurity
Prof Patricia Holmes (plan attached)
Dr Julia Glenday (report attached)
Dr Guy Preston
Dr Penny Brown

The area

The Baviaans River corridor and adjacent Public Open Space (POS - property of City of Cape Town, managed by Rec and Parks) forms part of the Scott Estate Baviaanskloof City Improvement District (SEBCID) in Hout Bay, City of Cape Town. At the upstream end of the SEBCID area, the river corridor dovetails with the Tierboskloof private open space (PrOS) and then the Table Mountain National Park (TMNP) where two watercourses join to form the Baviaans River (Map 1). Below Hout Bay Main Road the river enters the landscaped corridor through the shopping centre before joining the Disa River estuary to flow out at Hout Bay beach.

Baviaans River rehabilitation project portions shown in context of the broader landscape and urban area (Map 1.)



Why restoration?

- Fire risk management.
- Flood mitigation and stormwater management
- Infrastructure protection
- Property protection
- Increased bio diversity and ecosystem services
- Groundwater replenishment
- Increase in the length of time surface water flows down the river during the year

Fire risk management

The Baviaans River and its tributaries arise in the fynbos catchment of the local mountain nature reserve and pass through the SEBCID residential area (and commercial area lower down), before entering the bay via the Disa river estuary.

The reserve burns from time to time, as a natural and necessary part of the fynbos regenerative process. Regular fires also act as a way to reduce the risk of excessively damaging mega wildfires.

It must be noted that the river corridor can act as a natural passage along which fire can spread into the residential area and thus place properties at risk.

From wildfire and invasive alien plants (IAPs) perspectives, it follows that high risk trees and plants (eg gums, wattles, pines, palms) should be removed from the riparian area, as well as, from the urban edge and within the residential fabric itself, as such species tend to burn hotter than the natural vegetation, exacerbating the impact of wildfires. They also outcompete and prevent the natural less fire prone riverine vegetation from thriving and providing the necessary ecosystem services.

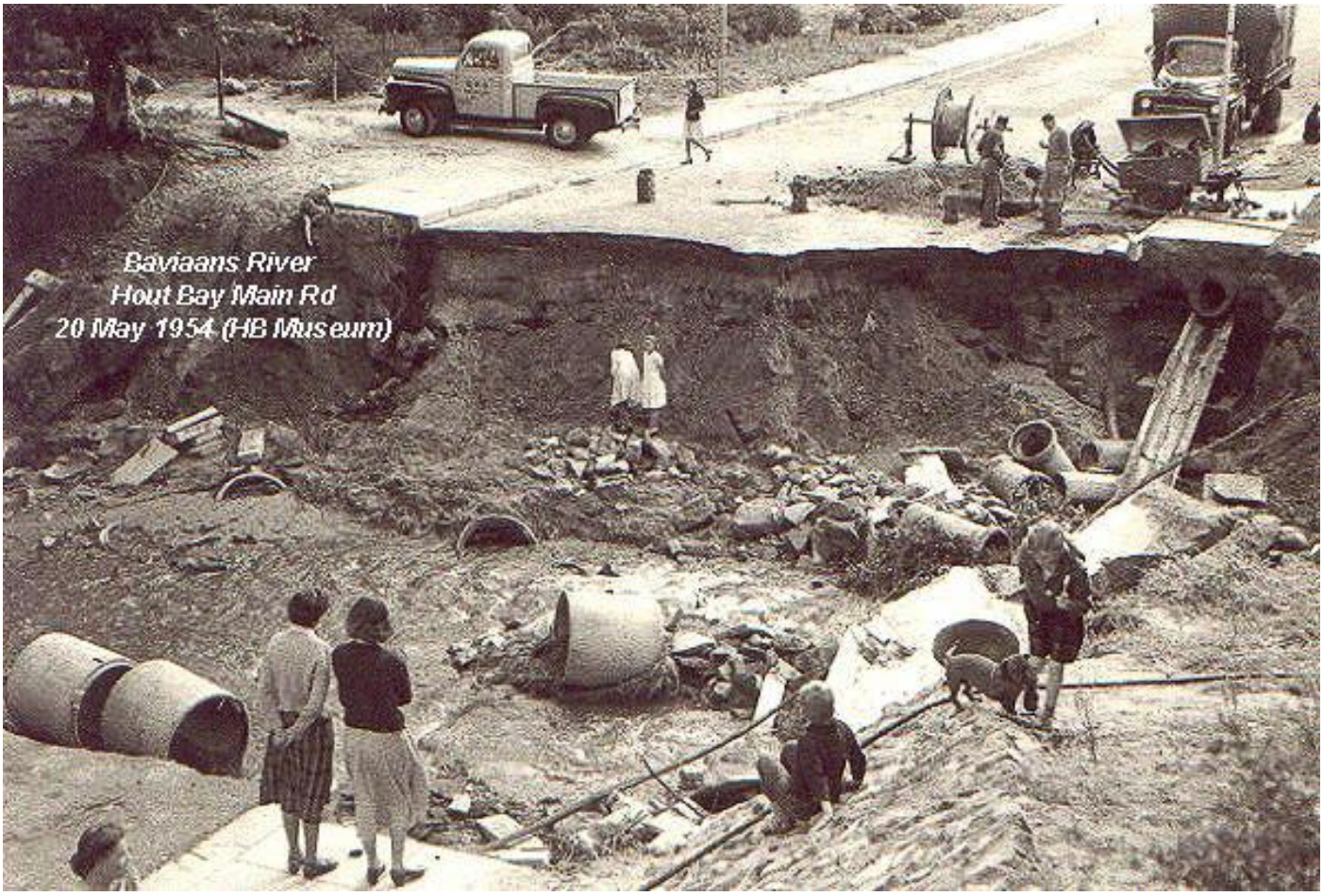
With the strong East winds that dominate from September to April (our fire season), gum, pine and palm trees are particularly problematic – some exploding when on fire, sending fireballs long distances under windy conditions – as has happened on various occasions (eg 1992, 2000, 2015) and as more recently exemplified in the devastating Knyskna fires (June 2017) and the Devils Peak/UCT fire (April 2021) - that resulted in irreplaceable loss of artifacts and buildings at UCT and Mostert's Mill. By far the majority of houses that were burnt were due to nearby invasive trees.

In the restoration catchment area problematic trees have been identified by DEFF and notices handed to landowners to remove to ameliorate fire risk.

Flood mitigation

With residential development on the banks (sometimes too close to the banks of the river), and inappropriate management of the river corridor (the previous policy used the river purely as a stormwater drain, rather than a valued natural entity and, allowing transformative invasive species to replace the naturally flood attenuating riverine vegetation) the river course has become deeper and narrower. Due to canalization and erosion river movement has been restricted, preventing natural overflow into adjacent wetlands/palmiet beds – which would act very efficiently to reduce the intensity of floods by absorbing floodwaters and releasing the water slowly, thereby extending stream flow into the drier seasons and also preventing accumulated flows to damage downstream infrastructure unnecessarily.

Although flooding does not generally pose a problem, the Baviaans River has burst its banks on occasion and in May 1954 flooding resulted in the Hout Bay Main Road bridge being washed away (see photo below) This could recur with far worse repercussions.



Homes built close to steep banks may thus be at risk during flooding – large alien trees in the riparian area can be uprooted during high rains and washed away, causing further damage and scouring as they move down their course.

It follows that managing the river corridor to minimize impacts on property during a flood is therefore important.

Hydrology researcher, Dr Julia Glenday, has inspected the river to identify areas where the river may safely overflow it's banks in a flood situation - so as to slow the force of water rushing down stream.

Dr Glenday has identified a number of areas between Coral Close and Campbell St (within the zone labelled P3 in the Holmes 2022 Baviaans River Restoration Plan indicated on map 1 above) that are broad enough to receive excess water - and slow flood waters before re-entering the main stream.

She indicates that restoring beds of palmiet (*Prionium serratum*), the indigenous fynbos wetland plant, along the middle reaches of the Baviaans River, Hout Bay, would not only serve as ecological restoration, but would also provide a flood attenuation and erosion prevention services of benefit to those downstream. Dr Glenday sites the need for engagement of a civil engineering hydrologist to ensure work performed is adequate.

Prof Holmes identifies these areas as areas that could be more open and managed as Riparian Scrub by regular cutting back. She also indicates that these open zones will allow for greater biodiversity, provide flood banks and that the low stature vegetation will use less water than forested/treed areas.

Steep banks need to be supported with cross beams and pegs and planted with a variety of species to form a mat-like root system that will help prevent erosion.

Invasive alien vegetation (especially trees that transform the environment) should be removed as soon as possible, to enable restoration. Both passive (natural regeneration from nearby plants, seedbanks, wind and bird action, etc) and active (planting and seed scattering of locally indigenous vegetation) restoration efforts must be promoted; and

immediate action taken to prevent unnecessary erosion (possibly using biomass, from trimming and felling invasives, to secure banks and plantings).

Trees, creating thick shade, should be trimmed to let light through and local vegetation compatible with the riverine ecosystem introduced.

Infrastructure and property protection

The proposed fire and flood mitigation action taken above will help protect infrastructure and property.

There has been an increase in the number of Indian Banyan Ficus trees in the area - generally and specifically along the river corridor. The ecosystem around these trees is changed – ie the crowding out indigenous species. Moreover, these trees seek water and their roots enter plumbing and sewer pipes which may damage related infrastructure in the SEBCID area that is already fragile, having failed frequently in recent times. This results in costly consequences not just for the owner of the erf on which they occur, but also neighbours and surrounding environments.

Once the Indian Banyan trees reach a certain size it become very expensive to remove them. Furthermore, removing a parent tree encourages the proliferation of saplings that sucker from the remaining root system. This means that once felled ongoing maintenance will be required. Younger trees should be removed on site and a plan may need to be put in place to systematically remove larger trees. Although impressive, these trees never stop growing and they completely transform the surrounding area leaving a difficult legacy that others including future generations will need to deal with at great expense.

Increase in biodiversity, the length of time water flows down the river during the year and replenishment of groundwater.

At this time, the Disa River, the other major freshwater source in Hout Bay, is highly polluted, and the Baviaans River provides fresh water for a number of riverine fauna species at the confluence of the two rivers. The Baviaans River historically ran all year round, but over time has stopped running during the summer months for various reasons. It is an objective of this restoration plan to provide longer periods of time in the year in which the water flows down the Baviaans (i.e. to enhance low flows) enabling the riverine ecosystem to function more optimally.

One of the factors contributing to the diminished flow in the Baviaans River is that many residents, with properties adjacent to the river, unlawfully pump water out of the river for personal use – without usage permissions from the Dep of Water and Sanitation (DWS). This is done to the extent that, during hot summer months, water often does not flow past points where pumps have been installed. The DWS will need to assist the City in dealing with this unlawful abstraction of water.

Over the years the Baviaans River has become increasingly degraded with invasive species proliferating. These plants, mostly, do not provide food or habitat for our natural fauna. Invasive species also consume too much water, cause erosion, displace more useful vegetation and often pose an additional fire risk. Managing the flora in the river corridor - by removing inappropriate plant species - will increase biodiversity and low flows in the Baviaans River and thereby help restore the natural riverine environment and its valuable ecosystems services for the benefit of all.

Dr Pat Holmes has been engaged by the SEBCID to draw up a planting and invasive species removal plan that will both increase biodiversity and the amount of water running down the river annually (full plan attached) *as well as reduce the risk of fire and restore the natural riverine ecosystem.*

Summary of Baviaans River Rehabilitation Plan, May 2022 (Prof. P. M. Holmes (PhD)

Historically the riparian vegetation in the CEBCID area comprised mainly Fynbos Riparian Scrub - which is fire-adapted and would have burnt periodically as fires swept across the slopes and valley. As fire is now excluded from the urban area, the plan proposes alternative target plant communities for revegetating various portions of the river corridor, ranging from low-stature open vegetation to Afrotemperate Forest patches. Locally indigenous trees could be introduced along some parts of the Baviaans River now that fires do not prevent their establishment.

Rehabilitation is a long-term process and should be tackled in stages. Generally it is best to work from the top of the catchment downstream towards the estuary to facilitate the removal of alien species and their propagules while promoting the natural dispersal of indigenous riparian species downstream, particularly the herbaceous, wet bank species.

Terms of Reference

The Baviaans River Rehabilitation plan addresses the following:

1. Describes the current ecological condition of riparian vegetation in the study area and potential for rehabilitation in relation to ecological restoration principles in Fynbos riparian zones.
2. Lists the invasive alien plant species present, their clearing methods and suggested timing thereof.
3. List any extra-limital South African species and non-listed alien, weedy species that should be controlled.
4. Indicates the rehabilitation work required following control of alien species, including revegetation and erosion-control work.
5. Presents alternative revegetation target plant communities (scenarios) that may be implemented in different sections of the river, depending on degradation state and other factors, such as buy-in from neighbouring property owners.
6. Together with the client, indicate on a map of the SEBCID areas examples of where the various rehabilitation scenarios could be applied.

1. Current Ecological Condition

During the winter flows, water quality is high as the river receives clean water from two TMNP streams and there is no sewage inflow or major pollution sources (Map 1). However, the riparian vegetation is degraded and there is a range of ecological conditions throughout the SEBCID area, relating to past physical modifications, planting of non-local tree species and invasions by alien species, garden escapees and other weedy species, including extra-limital South African species.

The plan divides the Baviaans River SEBCID area into 5 portions (see map 1 and 2):
(P1-5) from Hout Bay Main Road to the upstream POS

<u>P1. Hout Bay Main Road to Darling Street</u>

Portion 1 riparian vegetation is highly modified and dominated by alien species when compared to a natural ecological state. It has been planted with parkland and alien trees. In addition to the modified riparian vegetation, road and bridge construction and development of the adjacent Commonage as a high intensity use area, have resulted in this portion being the most physically modified from its natural ecological state. This portion has the lowest restoration potential of the five and rehabilitation actions in the short term should be limited to the control of invasive alien species (as required by law)

<u>P2. Darling Street to level with Campbell Street</u>

Portion 2 riparian vegetation is highly degraded and dominated by alien species. . It is a low priority for rehabilitation action and to be managed as per P1 above.

P3. Campbell Street to Coral Close

As one moves upstream through P3, the density of local indigenous plants increases, yet the riparian vegetation still remains dominated by invasive alien and non-local species. The presence of some indigenous wet bank species), indicates some restoration potential. However, there are many large trees shading this understorey, that are invasive along streams, and cast a deep shade and are required to be removed, where it is desirable, to re-introduce indigenous riparian species. Sections of Portion 3 (and Portion 4) have some areas with potential for revegetation with local indigenous species. However, both also have sections of very steep banks (some currently stabilized with logs) where erosion following alien removal could be a problem.

P4. Coral Close to Baviaanskloof Road end

The lower end of Portion 4 is similar to Portion 3 and dominated by alien species. However, as one moves upstream the vegetation becomes a mix of alien and local indigenous species. Portion 4 has higher restoration potential than Portion 3, as some indigenous seed banks remain in the soil and indigenous propagules more readily disperse into the area from the natural vegetation areas upstream.

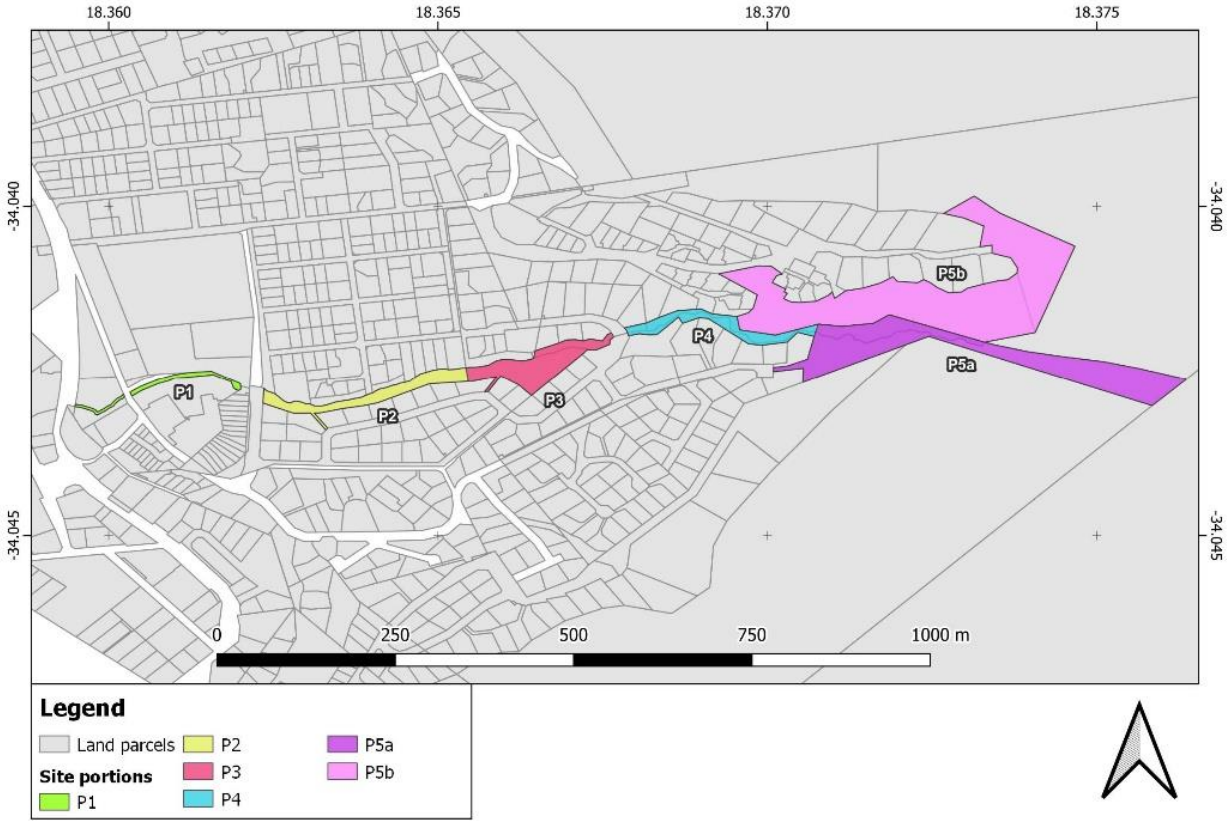
The lower sections of Portion 4 have some steep banks and here the same approach is recommended as for Portion 3 of integrating alien vegetation control, bank stabilization and revegetation actions.

The upper section has potential to self-restore following careful removal of the invasive alien species. Although still within the urban area, closer proximity to the natural vegetation upstream increases the fire risk here and during alien clearing operations large fuel (logs), not used for stabilization, should be removed from site if possible and smaller slash stacked outside of the river bed to minimize blockages and scouring during high flow events.

P5. Baviaanskloof Road end and above

Portion 5 of the Baviaans River lies above the urban area and on Map 2 is divided into 5a (open POS) and 5b (Tierbos POS) to the North (behind fence in photograph below). P5 is dominated by indigenous species, with a mix of Riparian Scrub dry bank and Fynbos species present at the edge. The most important intervention for Portion 5 is ongoing invasive alien vegetation control. In the absence of alien vegetation, riparian species will re-colonize over time, especially if a fire sweeps through this section.

Map 2. Baviaans River rehabilitation project portions shown in the context of the land parcels



2. Invasive plants

Any areas with very dense alien stands will likely require re-introduction of local species after alien clearance to prevent immediate reinvasion by undesirable weedy species and soil erosion.

Many alien and invasive species have become established along the Baviaans watercourse Those species that are listed as invasive by law require either eradication or control.

3. Extra-limital and Other Alien Plant Species Requiring Control

There are some other naturalized alien species, besides the listed invasive species (Table 1), that require removal from the watercourse if the goals of the project are to be met. These include extra-limital South African species that have been popular garden subjects, but have jumped the garden fence to become invasive or are slowly spreading, and unsuited aliens such as large trees that cast very deep shade and use profligate amounts of water, such that local indigenous species struggle to establish or thrive next to them.

Invasive alien control and removal of other inappropriate non-local species on erodible banks must be planned in tandem with bank and soil stabilization using a combination of hard (physical structures) and soft (planting of vegetation) approaches.

4. Rehabilitation Requirements

In order to meet the goals of the project, i.e., improve stream functioning and faunal habitat, a phased approach with identified subprojects is recommended. Where revegetation with indigenous species is planned, the short, open vegetation community scenario (see section 5) would best support this goal of improved stream functioning as well as increase local biodiversity in the watercourse.

Phase 1.
Control invasive alien species in P5, including removal of a large wood (>10cm diameter) and stacking of smaller felled material outside of the riparian zone. It is also recommended to remove any invasive extra-limital and unsuitable species.

Phase 2.
Control invasive alien species in P3 and P4, including removal of a large wood (>10cm diameter) and stacking of smaller felled material outside of the riparian zone. Identify areas of dense alien species and steep bank areas that would become bare or prone to soil erosion, to implement revegetation with local species. Here unsuitable alien and extra-limital species should be cleared prior to planting and steep slopes physically stabilized using logs pegged across the slopes or alternative suitable method. Clearing should be integrated with rootstock production to avoid long periods of bare soil for weeds to colonize. It is envisaged that several subprojects will be required in to accommodate the various different areas and formalize the footpath. The photo below shows the use of logs to build vertical walls to stabilize a steep slope. In some areas single logs pegged across the slope at 1 m intervals combined with indigenous plants to stabilize the soil surface will suffice.

A footpath route should be clarified (as in photo below) to avoid several paths emerging and causing trampling of the vegetation.
A subproject to restore the Palmiet wetland area would require the removal of alien trees that currently cause intense shading and high water-use. If this can be agreed upon then the Palmiet bed is likely to recover and could be expanded by physically reshaping the depression (see photo below of a Palmiet wetland in the watercourse above SEBCID).

Phase 3.
Control listed invasive alien species in P1 and P2, including removal of large wood (>10cm diameter) and stacking of smaller felled material outside of the riparian zone. Rehabilitating certain sections with local indigenous species should only be considered here at a later stage once the upstream sections have successfully established and resources are available for further work. Any dense areas of invaders may therefore need to be retained until sufficient budget is available to do simultaneous rehabilitation plantings.

Following are a list of species (table 1 and 2) which need to be systematically removed from the riparian area followed by lists indicating plants suitable for 3 different types of rehabilitation areass

Table 1. List of invasive alien species observed in the SEBCID area and recommended control methods. Please refer to the latest approved herbicide list for the best one to use in each circumstance[#] (i.e., alien species, life-cycle phase - seedling versus resprout - and clearing method (e.g., stump treatment, frilling).

Invasive Alien Species	Common Name	Category^	Clearing Methods
Acacia longifolia	Longleaf Wattle	1b	A weak resprouter – hand-pull seedlings; sapling – popper; cut below root crown; or cut low & stump treat; tree – cut low & stump treat; resprouts – cut lower & stump treat; or foliar spray.
Acacia saligna	Port Jackson Wattle	1b	A strong resprouter – hand-pull seedlings; sapling – popper; cut below root crown; or cut low & stump treat; tree – cut low & stump treat; resprouts – cut lower & stump treat; or foliar spray.
Agave sisalana	Sisal	2	Suckering species that also produces plantlets – important to control before it seeds; pull small plants; herbicide large plants after breaking the 'heart' from the main plant.
Ageratina adenophora	Crofton Weed	1b	Resprouting perennial – rip out or apply herbicide in summer/autumn; active sowing of competitive indigenous species recommended afterwards.
Anredera cordifolia	Madeira Vine	1b	Tuberous species & difficult to control – mechanical control and herbicide have been used; regular follow-up is essential; Take especial care not to drop or spread aerial bulblets.
Arundo donax	Giant reed	1b	Control by burning or cutting followed by herbicide application to resprouting shoots.
Buddleja madagascariensis	Madagascar Buddleia	3	Small plants – hand-pull; larger plants fell & stump-treat with herbicide.
Cenchrus clandestinus	Kikuyu Grass	1b^	Apply foliar herbicide when actively growing in summer.
Cenchrus setaceus	Fountain Grass	1b	Produces many long-lived seeds which hinders control; remove seed heads and hand-pull small plants regularly; larger plants need to be dug out; bag and remove all seed heads (can be burnt); or spot spray with herbicide before flowering.
Cotoneaster cf. pannosus	Silver leaf Cotoneaster	1b	Hand-pull small plants; cut larger plants and stump-treat with herbicide.
Eriobotrya japonica	Loquat	1b	Remove small plants by hand; ringbark large trees or fell and stump-treat with herbicide.
Hedera canariensis	Canary Islands Ivy	3	Cut down and remove all runners, mow regularly and/or spray with glyphosate when new season's leaves first emerge.
Hedera helix	Common ivy	3	Cut down and remove all runners, mow regularly and/or spray with glyphosate when new season's leaves first emerge.
Hedychium flavescens	Yellow ginger	1b	Spreads by rhizomes and seed; plants need to be dug out or foliar sprayed with herbicide.
Homalanthus populifolius	Queensland Poplar	1b	Hand-pull seedlings; cut and stump-treat with herbicide.

Ipomoea indica	Purple Morning Glory	1b	Roots from cut stems, so material must be carefully disposed of; hand-pull and dig out plants to remove roots; cut down plants and apply herbicide to stumps; regular follow-up required.
Lantana camara	Lantana	1b	A strong resprouter - Seedling – hand pull; larger plants – use panga to hack away prickly branches to access the stump – cut stump close to ground & treat stump and remaining bark with herbicide immediately.
Melia azedarach	Syringa	1b*	Hand-pull seedlings when soil moist; ringbark large trees.
Nephrolepis cordifolia	Fishbone Fern	1b	Spreads from rhizomes and tubers; 1.5% solution of glyphosate herbicide controls them; but regular follow-up needed for sprouting tubers.
Nerium oleander	Oleander	1b	Cut and stump-treat with herbicide or basal bark treatment.
Opuntia monacantha	Thin-leaved Prickly Pear	1b	Inject systemic herbicide.
Pittosporum undulatum	Australian Cheesewood	1b	A strong resprouter. Seedling – hand pull; Sapling – popper, or cut low & stump treat; Tree – cut low & stump treat; Resprouts – cut lower & stump treat; or foliar spray.
Pontederia cordata	Pickerelweed	1b	Cut and dig out rhizomes or treat with herbicide.
Robinia pseudoacacia	Black locust	1b	Strongly suckering species – ring bark or frill; triclopyr more effective than glyphosate.
Schinus terebinthifolia	Brazilian pepper	3	Hand-pull young plants, removing all roots; for larger plants use cut and stump treat or foliar application of herbicide.
Sphagneticola trilobata	Trailing daisy	3	Spreads from soil seed banks – hand pull and remove flowering material to prevent seed set.
Syzygium jambos	Rose-apple	3	Hand-pull seedlings; cut and stump-treat with herbicide.

** = in urban areas; ^ = in wetlands*

^ Invasive listing category: 1a – must be removed; 1b – must be controlled; 2 – must be controlled & permit required to grow the species; category 3 – may not multiply & no longer may be traded or planted.

 # Working for Water list of invader species & treatments: WfW Species & Herbicide List v13; Working for Water website www.wfw.org.za.

Table 2. Non-listed alien species growing in the SEBCID area. Here alien means from outside South Africa, whereas I have used 'extra-limital' to mean a South African plant from outside the Cape Peninsula. Status of species in a riparian habitat given as 'invasive' (strong spreader - should be cleared), 'slightly invasive' (slowly spreading - requires control), 'unsuited' (to water course - should be removed) or no status (remove prior to active planting of indigenous species).

Species	Common Name	Category	Status
Acanthus mollis	Bears Breeches	Extra-limital	
Afrocarpus falcatus	Outeniqua Yellowwood	extra-limital	Invasive
Agapanthus praecox	Bluelily	extra-limital	(hybridizes *A. africanus*)
Agave angustifolia	Caribbean Agave	alien	
Aloe arborescens	Krantz Aloe	extra-limital	
Aspidistra elatior	Cast-iron Plant	alien	
Asystasia gangetica	African Coromandel	extra-limital	Invasive
Bambusa sp.	Bamboo	alien	Slightly invasive
Brachylaena discolor	Coast Silver-oak	extra-limital	Unsuited
Briza maxima	Greater Quaking Grass	alien	
Buddleja salviifolia	Sagewood	extra-limital	
Carissa macrocarpa	Num-num	extra-limital	
Centella asiatica	Asian Pennywort	extra-limital	
Chlorophytum comosum	Hen-and-Chicks	extra-limital	
Coleus barbatus	Grand Woolly Plectranthus	alien	Invasive
Coleus madagascariensis	Thicket Spurflower	alien	Invasive
Coleus neochilus	Lobster Flower	alien	Invasive
Commelina benghalensis	Wandering Jew	alien	invasive
Coprosma repens	Taupata	alien	Invasive
Corymbia ficifolia	Red-flowering Gum	alien	Invasive
Cyathea cooperi	Australian Tree Fern	alien	Invasive
Cynosurus echinatus	Bristly Dogtail Grass	alien	
Cyrtomium falcatum	House Holly-fern	alien	Invasive
Dais cotinifolia	Pompom Tree	extra-limital	Unsuited
Dianella tasmanica	Tasmanian Flax-lily	alien	
Ekebergia capensis	Cape Ash	extra-limital	Unsuited
Erigeron karvinskianus	Santa Barbara daisy	alien	Slightly invasive
Felicia amelloides	Coastal Blue Felicia	extra-limital	
Ficus benghalensis	Indian Banyan	Alien	Unsuited
Ficus carica	Common Fig	alien	Unsuited
Ficus sur	Cape Fig	extra-limital	Unsuited
Harpephyllum caffrum	African Plum	extra-limital	Invasive
Hypericum canariensis	Canary Isle St John's Wort	alien	invasive
Hypochaeris radicata	Hairy Wild Lettuce	alien	
Hypoestes aristata	Ribbon bush	extra-limital	Slightly invasive
Ipomoea cairica	Mile-a-minute Vine	extra-limital	
Justicia protracta	-	Extra-limital	
Leonotis ocymifolia	Rock Lionspaw	extra-limital	
Liquidambar styraciflua	American Sweetgum	alien	Unsuited
Melianthus major	Giant Honeyflower	extra-limital	
Ochna serrulata	Small-leaved Plane	extra-limital	
Papaver rhoeas	Common poppy	alien	

Parthenocissus quinquefolia	Virginia Creeper	alien	Slightly invasive
Paspalum urvillei	Vasey Grass	alien	
Phoenix canariensis	Canary Island Palm	alien	Invasive
Phoenix reclinata	Reclining Date Palm	extra-limital	Unsuited
Pinus pinea	Stone Pine	alien	Unsuited, invasive
Plumbago auriculata	Blue Plumbago	extra-limital	Invasive
Polygala virgata	Broom Falsepea	extra-limital	
Prunus persica	Peach	alien	
Quercus robur	English Oak	alien	Invasive
Quercus suber	Cork Oak	alien	Unsuited
Rumex cf. acetosella	Sheep's Sorrel	alien	
Salix babylonica	weeping Willow	alien	Unsuited
Senecio angulatus	Creeping Groundsel	extra-limital	
Syzygium australe	Scrub Cherry	alien	Invasive
Syzygium cordatum	Water Berry	extra-limital	Invasive
Syzygium guineense	Bushveld Waterberry	extra-limital	Invasive
Tecomaria capensis	Cape Honeysuckle	extra-limital	Invasive
Thamnochortus insignis	True Thatchreed	extra-limital	Invasive
Tropaeolum majus	Nasturtium	alien	
Yucca cf. filimentosa	Common Yucca	Alien	Slightly invasive
Zingiber officinale	Ginger	alien	

a) Low stature revegetation scenario

Planting a variety of low growing shrubs (<1m), herbaceous perennials and ephemerals (annuals and geophytes) in sunny areas will provide seasonal floral displays and support local faunal diversity as well as reducing water usage (Table 3). Note that over time natural processes will result in thicket and forest species invading the open areas. To keep the areas open and sunny, large shrub and tree species should be removed. If these are local indigenous species they could be transplanted in designated Scrub or Forest areas. Without fire, open, low stature areas may need to be re-established after 15-20 years using the desired species mix.

Table 3. Low stature (<1 m) vegetation species for a sunny area (SSB = soil seed bank; none = no seed bank). Alternative local species may be substituted. Annuals may be added (e.g. *Senecio elegans*) and directly sown onto bare ground in autumn.

Species	Growth form	Regeneration mode	Propagation method
Wet Bank			
Isolepis prolifer	Herb–sedge	Reseeder SSB	Split
Juncus capensis	Herb–rush	Reseeder SSB	Split
Juncus effusus	Herb-rush	Reseeder SSB	Seed, split
Juncus lomatophyllus	Herb–rush	Reseeder SSB	Split
Orphium frutescens	Herb	Reseeder SSB	Seed
Dry Bank			
Agapanthus africanus	Geophyte	Resprouter none	Seed
Amaryllis belladonna	Geophyte	Resprouter none	Seed
Chasmanthe aethiopica	Geophyte	Resprouter none	Seed, corm
Chironia baccifera	Shrub	Reseeder SSB	Seed
Chrysocoma coma-aurea	Shrub	Reseeder SSB	Seed
Coleonema album	Shrub	Reseeder SSB	Seed, cutting
Dimorphotheca nudicaulis	Shrub	Reseeder SSB	Seed, cutting
Diosma hirsuta	Shrub	Reseeder? SSB	Seed, cutting
Elegia filacea	Herb-restio	Reseeder SSB	Seed
Eriocephalus africanus	Shrub	Reseeder SSB	Seed, cutting
Felicia fruticosa	Shrub	Reseeder SSB	Seed, cutting
Hermannia pinnata	Herb-shrub	Reseeder? SSB	Seed, cutting
Hermannia multiflora	Shrub	Reseeder? SSB	Seed, cutting
Lessertia frutescens	Herb-shrub	Reseeder SSB	Seed
Otholobium virgatum	Herb-shrub	Reseeder SSB	Seed, cutting
Pelargonium betulinum	Shrub	Reseeder SSB	Seed, cutting
Pelargonium capitatum	Herb-Shrub	Reseeder SSB	Seed, cutting
Pelargonium cucullatum	Shrub	Resprouter SSB	Seed, cutting
Pentameris pallida	Herb–grass	Reseeder SSB	Seed
Plecostachys serpyllifolia	Shrub	Reseeder SSB	Seed
Psoralea repens	Herb-shrub	Reseeder SSB	Seed, cutting
Senecio burchellii	Herb	Reseeder SSB	Seed
Thamnochortus punctatus	Herb-restio	Reseeder SSB	Seed
Tribolium uniolae	Herb–grass	Reseeder SSB	Seed
Watsonia meriana	Geophyte	Resprouter none	Seed, corm
Zantedeschia aethiopica	Geophyte	Resprouter none	Seed
Zygophyllum flexuosum	Shrub	Reseeder	Seed, cutting

b) Riparian Scrub scenario

Fynbos riparian scrub would have been the original plant community along most of the Baviaans River. Like Fynbos it is fire-adapted and its woody scrub elements mostly resprout post-fire. Without fire it will eventually be colonized by Afrotemperate Forest species (many are dispersed by vertebrates) as forest seedlings can establish in shade and trees can grow in most places where fire is excluded. Riparian scrub species require a sunny area to establish in and will provide fauna with good cover, but will grow to a dense thicket 2-3m tall, so it may only be a suitable scenario where the SEBCID corridor is wider and allows for both a path and a lower stature vegetation zone close to the stream. Local riparian scrub species may be selected from Table 4. However, for lower stature wet and dry bank species use those in Table 3. Shrubs and small trees from Table 5 may also be used here.

Table 4. Riparian scrub species require at least partial sun. (SSB = soil seed bank; CSB = canopy seed bank; none = no seed bank)

Species	Growth form	Regeneration mode	Propagation method
Wet Bank			
Cyperus textilis	Herb–sedge	Resprouter? SSB	Seed, split
Elegia capensis	Herb–restio	Resprouter SSB	Seed, split
Erica caffra	Shrub	Reseeder SSB	Seed
Isolepis prolifer	Herb–sedge	Reseeder SSB	Split
Juncus capensis	Herb–rush	Reseeder SSB	Split
Juncus lomatophyllus	Herb–rush	Reseeder SSB	Split
Prionium serratum (Palmiet)	Woody-herb	Resprouter SSB	Seed
Restio paniculatus	Herb-restio	Reseeder SSB	Seed
Salix mucronata ssp. hirsuta	Shrub	Resprouter	Cutting
Todea barbara	Fern	Resprouter?	?
Dry Bank			
Anthospermum aethiopicum	Shrub	Reseeder SSB	Seed
Berzelia lanuginosa	Shrub	Reseeder CSB	Seed, cutting
Brabejum stellatifolium	Shrub–tree	Resprouter none	Seed, cutting
Diospyros glabra	Shrub	Resprouter none	Seed, cutting
Erica triste	Shrub	Resprouter? SSB	Seed, cuttings
Gymnosporia buxifolia	Shrub	Resprouter none	Seed, cutting
Helichrysum pandurifolium	Shrub	Reseeder SSB	Seed, cutting
Leonotis leonurus	Shrub	Reseeder SSB	Seed, cutting
Morella serrata	Shrub	Resprouter none	Seed, cutting
Olea europaea cuspidata	Small tree	Resprouter none	Seed, cutting
Pentameris pallida	Herb–grass	Reseeder SSB	Seed
Phylica buxifolia	Shrub	Reseeder? SSB	Seed, cutting
Podalyria calyptrata	Shrub	Reseeder SSB	Seed, cutting
Psoralea pinnata	Shrub	Reseeder SSB	Seed
Searsia angustifolia	Shrub	Resprouter none	Seed, cutting
Searsia laevigata	Shrub	Resprouter none	Seed, cutting
Tarchonanthus littoralis	Small tree	Resprouter?	Seed, cutting

c) Forest Scenario

The forest scenario is suggested for areas where taller trees are required to replace alien and undesirable tree species. The tree species listed in Table 5 are mostly those present higher in the Baviaanskloof catchment in steep fire-protected kloofs or boulder screes and comprise Afrotemperate Forest species as well as some thicket and rocky outcrop tree species that should establish well in riparian habitat. Some forest understorey species are listed too, but for the wet bank zone use the species from Tables 3 & 4. If the area to be planted is quite open, then some other species from Tables 3 & 4 can be selected as companion or 'filler' species. Note that to grow tall, forest saplings need some sunlight.

Table 5. Forest species are mostly able to establish in the shade but require sun to grow tall. (SSB = soil seed bank; none = no seed bank)

Species	Growth form	Regeneration mode	Propagation method
Anemone vesicatoria	Geophyte	Resprouter none	Seed?
Asparagus scandens	Geophyte	Resprouter none	Seed, rhizome
Carex uhligii ^	Herb-sedge	Reseeder? SSB	Seed
Cassine peragua	Tree	Resprouter none	Seed, cutting
Celtis africana	Tree	Resprouter none	Seed, cutting
Chasmanthe aethiopica	Geophyte	Resprouter none	Seed, corm
Chionanthus foveolatus	Tree	Resprouter none	Seed, cutting
Cunonia capensis	Tree	Resprouter none	Seed, cutting
Cyperus albostriatus^	Sedge	Resprouter? SSB	Seed, splits
Gymnosporia buxifolia	Shrub	Resprouter none	Seed, cutting
Halleria lucida	Tree	Resprouter none	Seed, cutting
Kiggelaria africana	Tree	Resprouter none	Seed, cutting
Maytenus acuminata	Tree	Resprouter none	Seed, cutting
Maytenus oleoides	Small tree	Resprouter none	Seed, cutting
Olea capensis	Tree	Resprouter none	Seed, cutting
Olea europaea cuspidata	Small tree	Resprouter none	Seed, cutting
Phylica buxifolia	Shrub	Reseeder? SSB	Seed, cutting
Podalyria calyptrata	Shrub	Reseeder SSB	Seed, cutting
Podocarpus latifolius	Tree	Reseeder none	Seed, cutting
Rapanea melanophloeos	Tree	Resprouter none	Seed, cutting
Sideroxylon inerme	Tree	Resprouter none	Seed, cutting
Tarchonanthus littoralis	Small tree	Resprouter?	Seed, cutting
**Diospyros glabra*			
**Myrsine Africana*			

^ Forest sedges – will grow in shade

* *added by Pat verbally during follow up walk*

Table 6. Potential locations in Portion 3 for revegetating with one of three proposed scenarios.

GPS coordinates	Revegetation scenario	Description
-34.042034S 18.367716E	Low stature	At entry point from Coral Close; already partly revegetated with some appropriate species. Large Loquat could be removed to extend this open area downstream.
-34.042334S 18.366469E	Low stature	Open area where trees recently felled.
-34.042361S 18.365951E	Low stature	Open area where trees recently felled.
-34.042450S 18.365545E	Low stature	Partially open area: remove *Virgilia* and trim limbs on stream side of *Ekebergia*. Australian tree ferns cast deep shade over stream banks.
-34.042193S 18.366816E	Riparian scrub	Below 3-7 Guinevere Ave; central bank area currently with dense scrub could be replaced with indigenous Fynbos Riparian Scrub. Large Gum and Palm need to be removed to increase sunlight.
-34.042047S 18.367100E	Forest	Area close to Brazilian Pepper tree with stabilized steep bank that is eroding at base. One of the forest sedges could be planted here to help stabilization and alien trees replaced with forest trees over time. Forest ground covers could replace some of Crassula monoculture