4.5 Summary Data

The table below details the range of TFRs, sizings, and holding capacities for each of the ten basic **RSF 4000** product sizes. This data can only be used as a guide as the actual TFR for each unit can vary depending upon the size and gradient of the outlet pipe or box culvert. It is important that you confirm your unit sizing, TFR, and headloss with an Ecosol representative.

Ecosol Unit Code	Inlet/Outlet Pipe Diameter[1]	Range of Treatable Flow Rates (TFRs)[2] (m^3/s)	Approximate External Dimensions (LxWxD from invert)[3] (mm)	HOLDING CAPACITIES		
				Solid Pollutants	Free Oil and Grease	Water
				m^3	Litres	Litres
RSF 4300	150 to 600mm	**0.03 - 0.12**	2700 x 1350 x 750	0.27	405	927
RSF 4450	225 to 900mm	**0.04 - 0.26**	3600 x 1650 x 1050	0.91	1,215	2,916
RSF 4600	300 to 1200mm	**0.13 - 0.47**	4580 x 1950 x 1350	2.16	2,700	6,480
RSF 4750	450 to 1350mm	**0.24 - 0.73**	5500 x 2250 x 1650	4.22	5,063	12,150
RSF 4900	600 to 1650mm	**0.42 - 1.05**	6570 x 2600 x 1950	8.38	9,781	22,965
RSF 41050	750 to 1800mm	**0.66 - 1.43**	7550 x 2900 x 2250	13.23	15,118	35,529
RSF 41200	900 to 2100mm	**0.96 - 1.87**	8250 x 3200 x 2550	19.65	22,107	51,991
RSF 41350	1050 to 2400mm	**1.26 - 2.37**	9500 x 3500 x 2850	27.87	30,971	72,877
RSF 41500	1200 to 2400mm	**1.68 - 2.93**	10470 x 3800 x 3150	38.12	41,932	98,713
RSF 41800	1350 to 2400mm	**2.50 - 4.21**	12420 x 4400 x 3950	65.57	71,034	167,340

Notes
[1] The unit can be sized to suit almost any type of pipe or box culvert
[2] The TFR varies dependent on the size and slope of the outlet pipe
[3] Unit dimensions can vary depending on vehicle load requirements

The performance data contained in this section has been verified by independent testing bodies, as detailed in the table below and confirmed by several field studies; [4,5]

SECTION	REPORT TITLE AND DATE	TESTING BODY
4.1 Capture Efficiencies	Hydraulic Headloss and Capture Efficiency Testing of the Ecosol RSF 4000 - 20 October 1998	University of Adelaide
	RSF 4000 Capture Efficiency Performance Testing - 2 April 2001	Avocet Consulting
	RSF 4000 Performance Testing - 18 April 2001	Avocet Consulting
	RSF 4000 Stormwater Filter Performance Testing - 4 May 2001	University of Adelaide
	Sediment Capture Efficiency RSF 4000 - 19 March 2002	Avocet Consulting
4.2 Holding Capacities	RSF 4000 Unit Sizing Revision A - 14 December 2000	Avocet Consulting
4.3 Treatable Flows	Hydraulic Headloss and Capture Efficiency Testing of the Ecosol RSF 4000 - 20 October 1998	University of Adelaide
	RSF 4000 Stormwater Filter Performance Testing - 4 May 2001	University of Adelaide
	RSF 4000 Hydraulic Modelling - 29 May 2001	Avocet Consulting
	RSF 4000 Development and Measurement of Treatable Flow Rates - 15 December 2000	Avocet Consulting
4.4 Headlosses	Testing of the Ecosol RSF 4000 for Hydraulic Headlosses - 23 Jan 1998	University of SA
	Hydraulic Headloss and Capture Efficiency Testing of the Ecosol RSF 4000 - 20 October 1998	University of Adelaide
	Report Ecosol RSF 4000 Fluid Mechanics – 21 November 2000	Avocet Consulting
	Report RSF 4000 Preliminary Headloss 15 December 2000	Avocet Consulting
	RSF 4000 Stormwater Filter Performance Testing – 4 May 2001	University of Adelaide
	RSF 4000 Hydraulic Modelling - 3 June 2001	Avocet Consulting

Hume*ceptor*™ ***Summary***

Hume*ceptor*™ is manufactured under licence to Stormceptor Canada Inc. **Hume***ceptor*™ is a patented water quality inlet that takes the place of a conventional access chamber in a stormwater drainage system. **Hume***ceptor*™ removes free oil and suspended solids from stormwater preventing spills and non-point source pollution from entering downstream lakes and rivers. A summary of the key benefits related to the implementation of a **Hume***ceptor*™ is as follows :

- Capable of removing up to 80% of the total sediment load when properly applied as a source control for small areas
- Removes up to 97.8% of free oil from stormwater
- Will not scour or re-suspend trapped pollutants even during peak flows
- Can be implemented as part of a treatment train (e.g. prevents groundwater contamination in recharge measures, extends the maintenance period for other stormwater quality measures)
- Excellent spills control device for commercial and industrial developments
- Simple to design and specify
- Cost Effective compared to other stormwater quality measures
- Easy to install in new or retrofit situations
- Easy to maintain (vacuum truck)
- Can be used as a bend structure
- Pre-engineered for traffic loading
- Does not require a large drop in storm drain elevation for implementation (25 mm)
- **Hume***ceptor*™ clearly marked on the cover (Excluding the STC2 Inlet model)

Although the* Hume*ceptor*™ *is extremely versatile, users of this document should keep in mind several key constraints :

- The STC2 "Inlet" **Hume***ceptor*™ is the only model which can be used as a storm drain inlet
- Treatment is dependent on head differential between the Inlet and Outlet of the treatment chamber, therefore, care should be taken when designing in tidal zones
- The difference between the inlet pipe invert elevation and the outlet pipe elevation must be 25 mm
- The largest standard inlet/outlet size that can be accommodated without customization is 1050 mm RCP (In-Line models) and 450 mm RCP (Inlet model)
- **Hume***ceptor*™ currently can only accommodate one inlet pipe. Junction structures should be installed prior to **Hume***ceptor*™ to accommodate multiple stormwater drainage lines.

2.2 **Hume*ceptor*™ *Technical Specifications***

Hume*ceptor*™ dimensions vary with the size of unit that is specified. Dimensions of the **Hume*ceptor*™** units that are being manufactured are provided in Table 2.

Table 2. Hume*ceptor*™ Dimensions *

Model STC	Treatment Bowl Diameter (m)	Pipe Invert to Bottom of **Hume*ceptor*™**(m)**
2	1.219	1.70
3	1.828	1.68
5	1.828	2.13
7	1.828	3.03
9	2.438	2.69
14	2.438	3.69
18	3.060	3.44
23	3.060	4.04
27	3.600	3.84

*** Depths are approximate**
**** inlet invert to underside of base slab**

Hume*ceptor*™ units provide total holding capacities ranging from 1.7 m^3 to 27 m^3 (Table 3). Table 3 also indicates the maximum treatment flow rate of the various **Hume*ceptor*™** units. These flow rates indicate the threshold when bypassing begins to occur. At flowrates greater than the maximum treatment flowrate, treatment is still provided in the unit at 80% to 90% of the maximum treatment flowrate (NWRI, 1993). The treatment rate decreases once the unit begins to bypass since the overflow regulates the head differential between the inlet and outlet from the lower chamber (Figure 2).

Table 3. Hume*ceptor*™ Capacities

Model STC	Maximum Treatment* Flowrate (l/s)	Down Pipe/Orifice Diameter (mm)	Sediment Capacity (l)	Oil Capacity (l)	Total Holding Capacity (l)
2	5	300**	1250	350	1740
3	18	150	1930	1020	3410
5	18	150	3070	1020	4550
7	18	150	5340	1020	6820
9	30	200	6470	1900	9090
14	30	200	9530	2980	13640
18	50	250	14090	2980	18180
23	50	250	18000	2980	22730
27	70	300	19500	4290	27270

* approximate flowrate without by-passing
** outlet decant pipe restricted to 100 mm

P1512 CDS Stormwater GPT

Further Technical Information

b>General Technical detail

- 95% sediments capture > 200 microns
- also captures organics, oils and attached pollutants
- Suitable for pipes up to 1200 mm diameter
- flow ranges up to 1500 L/s for standard configuration
- sump storage volume of 3.3 cubic metres
- bypass weir incorporated into the unit
- small underground footprint
- visually unobtrusive
- easy installation

Typical Installation

1. Excavate to required dimensions
2. Position base and upper precast and connect to pipes
3. Place coverslab and cover and backfill to local requirements.

Cleaning options

Primarily designed for suction cleaning with a standard council pit cleaning sucker truck. A separate removable basket is also availble if desired.

General P1512 drawing

www.cdstech.com.au

CDS Off-Line Units

Utilising the patented CDS indirect screening technology, CDS Off-Line units have been designed to capture and retain gross pollutants, litter, grit, sediments and associated oils.

Characteristics

- 95% capture of gross pollutants >1mm
- 95% sediment capture >200µm
- captures organics and oils
- captures absorbed toxics and nutrients
- can treat any pipe or multiple pipes
- various sump sizes available
- bypass requirements customised
- small underground footprint
- visually unobtrusive
- easy installation
- non-blocking functionality

Applications for CDS Off-Line units

- subdivisions and roads
- residential, commercial and industrial areas
- carparks and shopping centres
- pre-treatment for wetlands
- pre-treatment for re-use applications
- pipes, channels, culverts and creeks.

Cleaning CDS Off-Line units

CDS unit size and site requirements will determine which cleaning option will have the lowest life cycle costs. There are 3 methods of emptying CDS units:

- Removable Basket
- Material Grab
- Suction method.

CDS TECHNOLOGIES contacts

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Seaford, VIC 3198
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Virginia, QLD 4014
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Facsimile [07] 3325 0688

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West Perth, WA 6005
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Leederville, WA 6901
Telephone [08] 9422 1999
Facsimile [08] 9422 1989

CDS Pty Ltd ABN 27 066 909 591
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Web www.cdstech.com.au

www.cdstech.com.au

CDS Off-Line Units

STORMWATER POLLUTANT TRAPS

www.cdstech.com.au

Innovative Environmental Technologies

CDS Off-Line Units

STORMWATER POLLUTANT TRAPS

CDS Pre-cast Units

+ DIVERSION CHAMBERS

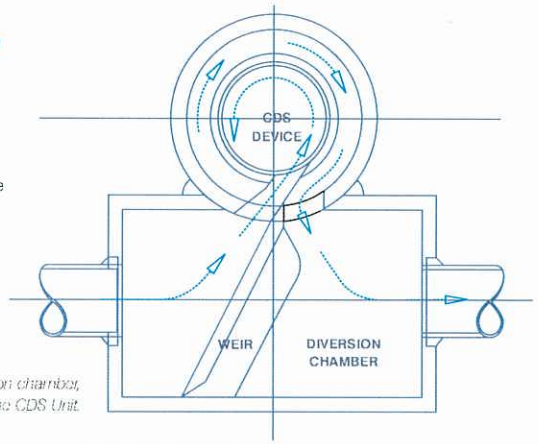
www.cdstech.com.au

Continuous Deflective Separation Device

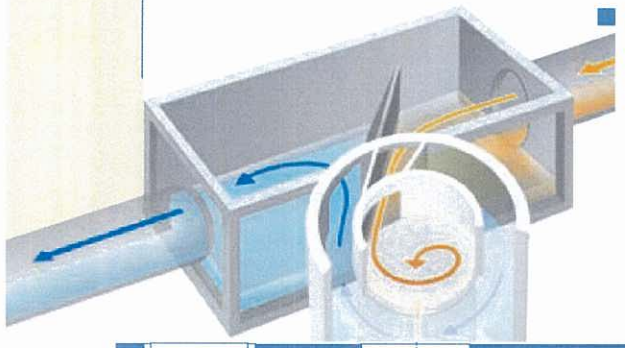
It has long been acknowledged that the best management practice for location of stormwater traps involves locating the devices off-line.

GPT's located on-line suffer badly from turbulence and eddies, often resulting in the resuspension and loss of previously captured pollution.

Also, in many systems, low flows (or a 3 month ARI storm flow) are diverted into the GPT, while infrequent high flows and all the pollution they carry are allowed to bypass.



The CDS device is located next to the diversion chamber, and combined they form the CDS Unit.

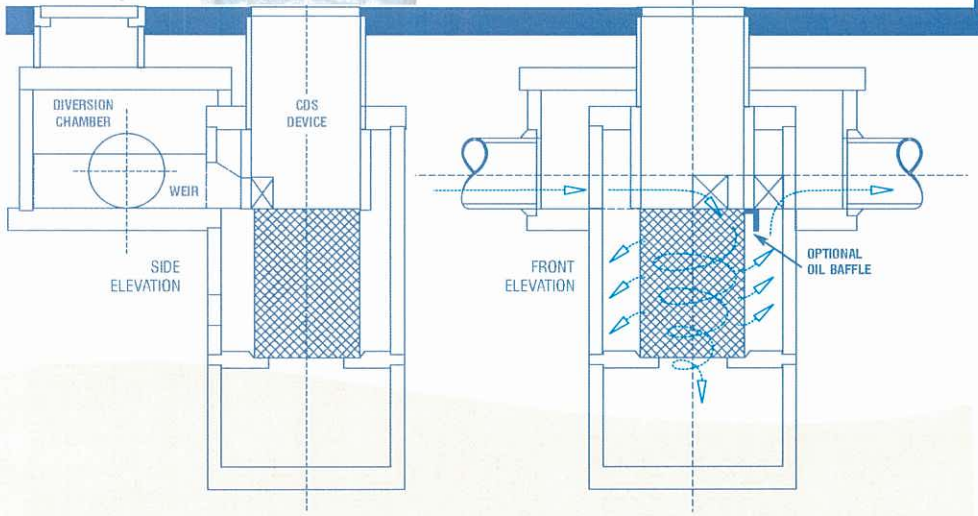


The Diversion Chamber

CDS has precast diversion chambers sized to suit most typical installations, alternatively CDS can tailor customised chambers to meet the site's hydraulic limitations.

The CDS diversion chamber has the capacity to cater for the fullest possible flow in the stormwater system. CDS units are configured to assume they have not been maintained and no flow is entering the device.

A weir is located within the diversion chamber to create a driving head and direct the majority of flows into the CDS device.



How Stormwater Pollutant Traps Rate

Not only are CDS units rated the most effective stormwater pollution trap in every independent comparison, they also have three cleaning options for the lowest cleaning costs (and therefore lowest total life-cycle costs) of any proprietary GPT.

ON-LINE DEVICES	POOR
OFF-LINE DEVICES	GOOD
OFF-LINE NON-BLOCKING DEVICES	BETTER
CDS OFF-LINE NON-BLOCKING DEVICES WITH DOUBLE OFF-LINE POLLUTION STORAGE	BEST*

*Independent studies show that no GPT does better than a CDS unit on performance and pollution retention.

CDS Unit Size options

The size and type of CDS unit you'll need to meet regulatory obligations can depend on catchment area, flows, pollution loads, maintenance choice and site hydraulics.

Simply visit the CDS website (cdstech.com.au) to download a worksheet, complete and forward to us at CDS – it contains all the information we need to expertly calculate the size of device for your particular site.
At CDS we take all responsibility for the correct operation of our units...and correct selection is the first step.

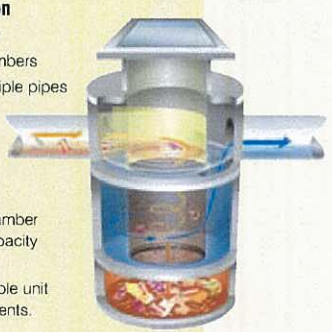
CDS Unit No	Construction Material	Catchment Area (ha)
PL0506	in-line polymer	< 1 ha
P0708	in-line concrete	< 2 ha
F0908	fibreglass	1-4 ha
F0912	fibreglass	2-6 ha
P1009	pre-cast concrete	2-8 ha
P1012	pre-cast concrete	4-12 ha
P1015	pre-cast concrete	6-15 ha
P1512	pre-cast concrete	8-20 ha
P2018	pre-cast concrete	15-45 ha
P2028	pre-cast concrete	30-75 ha
P3018	pre-cast concrete	40-100 ha
P3024	pre-cast concrete	60-150 ha
P3030	pre-cast concrete	80-200 ha

Diversion Chamber Selection

- Pre-cast Diversion chambers
- Semi-pre-cast diversion chambers
- Customised designs for multiple pipes
- In-situ channel designs
- Fixed or collapsible weirs
- Any flow capacity
- No flooding

CDS Device and Diversion Chamber design depends on system capacity and site constraints

CDS will design the most suitable unit configuration for your requirements.



CDS P0708 unit

Innovative Environmental Technologies

NSW Government
DEPARTMENT OF NATURAL RESOURCES

Contact: Mohammed Ismail
Phone: 02 9895 7978
Fax: 02 9895 7501
Email: mohammed.ismaill@dipnr.nsw.gov.au

ROBERT BIRD GROUP PTY LTD
SYDNEY
27 JUN 2006

File: 9013376
Ref: ERM06/6650

Att: Con Vink, Justin Hill, Geoff Greenaway
Robert Bird Group Pty ltd
PO Box H38 Australian Square
Sydney NSW 1215

Action	Info	Initials	Date
CV			
OH		JT	17/6

RBG Ref No 06220

22 June 2006

Dear Sir

Subject: Coca-Cola Amatil Site, NORTHMEAD

I refer to the subject site and the letter and its attached documents sent by Robert Bird Group on 2nd May 2006. I also refer to the 'flora and fauna assessment' draft report by Cumberland Ecology dated May 2006.

Following a site visit and an inspection of the plans, the Department of Natural Resources considers that the drainage line on the eastern side of the subject site which run into Toongabbie creek appears not to be a "*river*" as defined within the *Rivers and Foreshores Improvement Act 1948.*

If there are any proposal for works that are within 40 metres zone measured from the top of the bank of Toongabbie creek, then the DA will be considered as integrated development and required approval from the department. The department most likely will include conditions that protect the creek and its environment. This may be in the form of an adequate buffer be retained from the boundary of the site that adjacent to the creek to act as a soft barrier protecting the creek and its riparian vegetation.

The provision of an adequate riparian zone width along the stream is important for conserving and improving stream health, fauna habitat, connectivity and biological diversity, bank stability and water quality.

I also would like you to investigate whether having one stormwater outlet to Toongabbie creek is environmentally better than having two outlet as proposed. This to reduce disturbance to creek vegetation and for bank stability issues. I have attached the department quidlines for stormwater outlet design for your consideration.

If you have any further enquires, please don't hesitate to contact me on telephone: 02 9895 7978.

Yours sincerely

Mohammed Ismail
Natural Resource Project Officer
Sydney South Coast Region

Stormwater Outlet Structures to Streams
(For pipes, culverts, drains and spillways - Version 1)

1. **Assess the site and determine constraints:** hydrology/hydraulics (channel and floodplain flood levels and velocities, water table, etc.); geomorphology (erosion, deposition, etc.); soils; geology; debris loads; contaminants; acid sulphate soils; salinity; roads/ pathways; archaeological/heritage; service infrastructure (water, sewerage, gas, electricity, communications); flora/fauna; public safety; etc..

2. **Define the route and specific point of discharge:** Address the identified constraints. Select a route that avoids trees (preferably beyond their drip line), service infrastructure etc.. Choose a stable section of stream bank for the discharge point (preferably mid-way between bends).

3. **Address water quality and quantity issues:** Ensure that the quality of water discharging to the stream is good, and that discharge rates mimic "natural" flows (magnitude, seasonality, frequency, variability). Locate water quality improvement structures (oil/grease interceptors, sediment traps, litter traps, constructed wetlands, etc.) and detention basins outside the riparian zone.

4. **Define project tasks:** For each task necessary to complete the structure and to rehabilitate the site, identify how it will be done, its duration, its sequence and who will do it.

5. **Prepare an Erosion and Sediment Control Plan (ESCP):** The ESCP must be prepared by a person with qualifications, knowledge and experience in the preparation of such plans, and must be in accordance with the Landcom publication *Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition* (2004). The ESCP must address staging, maintenance and contingencies and must ensure that during construction, storm events and storm flows down the drainage line and/or the stream will not cause erosion or sediment loss. Prior to commencing instream works, all materials, equipment and operators must be ready and works must be planned for a forecast dry weather period. Once commenced, works must be completed without delay. The ESCP must be implemented prior to the commencement of works. Disturbance to the stream channel must be kept to an absolute minimum.

6. **Describe site rehabilitation:** Prepare a Vegetation Management Plan (VMP) in accordance with the guideline *How to Prepare a Vegetation Management Plan.* Site rehabilitation is to cover all disturbed areas and, together with weed control and bush-regeneration, is to extend at least 10 metres from disturbed areas. Any bare areas remaining after construction are to have previously stored topsoil re-spread and the litter layer restored. Any imported topsoil must be weed free. Grass seed or turf used in riparian areas must consist of non-invasive species and not species such as Kikuyu or Rhodes Grass.

7. **Prepare a time frame (eg Gannt chart):** List all tasks, their sequence, duration and ownership.

8. **Design guidelines:**

- outlet structure not to protrude beyond the stream bank and to align evenly with the bank
- outlet structure outlet to be located at invert level of stream and to point downstream
- avoid use of concrete headwalls - pipes/culverts to rest on, and be packed in by, rip-rap
- scour apron to be rip-rap and a cut-off provided; flanks to be rip-rap and keyed in
- scour protect the bed of the stream near the outlet if not bedrock and if scour is likely
- scour protect the opposite bank as required (consider bank material and "jet" effect)
- calculate tractive stresses generated from outlet discharges and from **bank full** stream discharges to determine rock size requirements for the structure
- rip-rap to consist of angular run-of-quarry durable rock placed over a bedding layer of angular cobbles over geotextile - all rock and cobbles to be packed with topsoil - gaps in rip-rap to be planted with local native sedges and rushes (cross-reference in VMP)
- if salinity is an issue, ensure pipe/culvert specifications conform with Australian standards
- stockpile excavated litter layer, topsoil and subsoil separately for site rehabilitation

9. **Prepare drawings:** Prepare concept sketches for the Department's review. Final drawings to consist of Plan, Long Section, Cross-Section and detail drawings as required. Include a scale bar on all drawings.

10. **Address other issues:** signage, relevant legislation, planning instruments/guidelines, OH&S, liaison with DNR and others (Council, NSW Fisheries, etc.).

11. **Prepare a costing:** cost out the implementation of all stages and all components of the work - show details on the cost of materials and labour. Site rehabilitation costs can be addressed in the VMP.

12. **Prepare a brief and concise report:** report on all of the above.

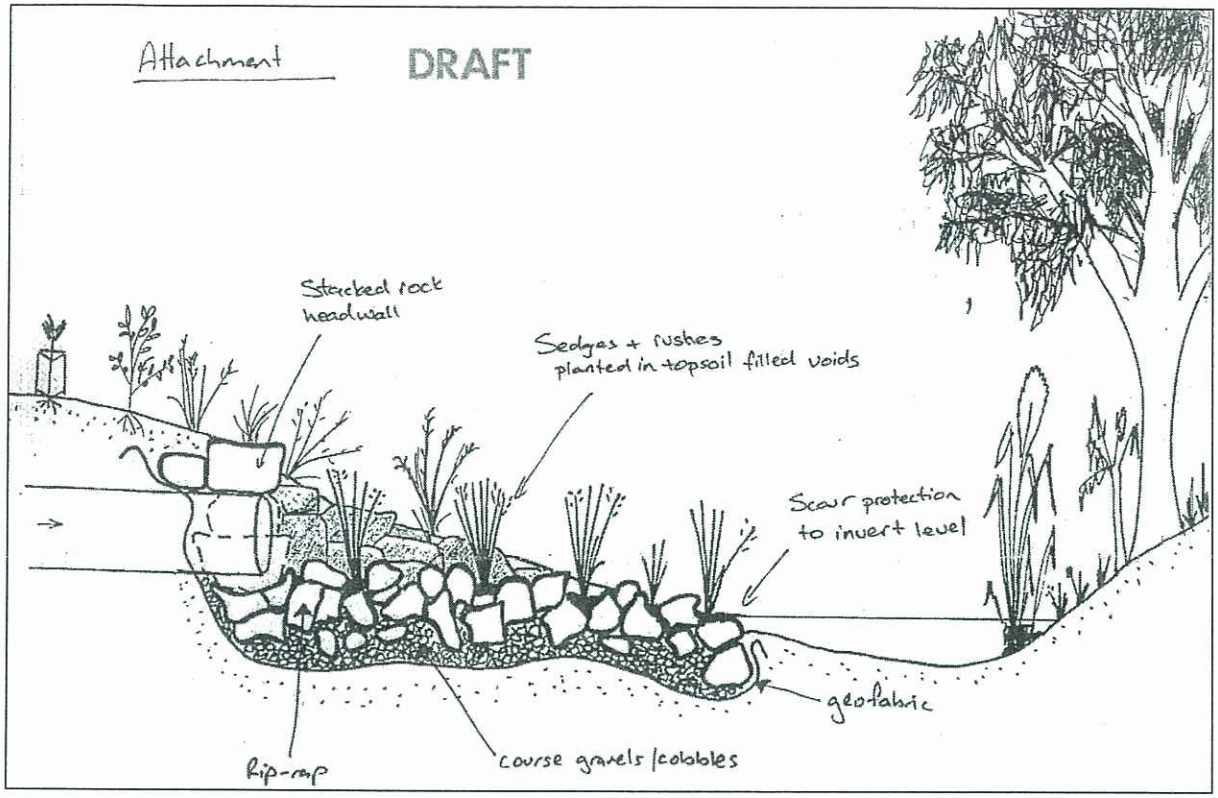


Figure 1. Rough sketch of long section through a pipe outlet structure. Spillways can be constructed in a similar fashion, but without the pipe, and should be almost unnoticeable, appearing as fully vegetated gentle undulations through the riparian zone.

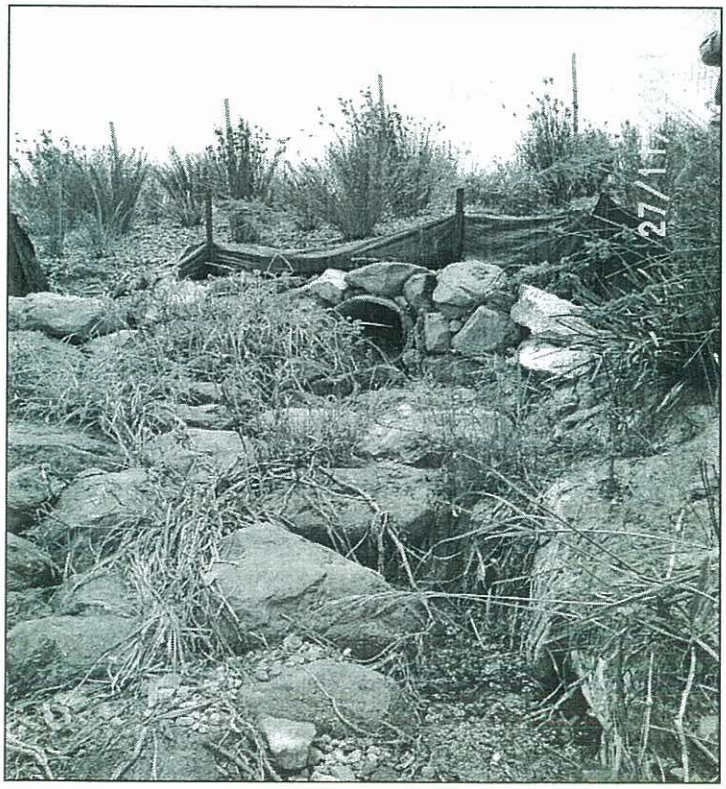
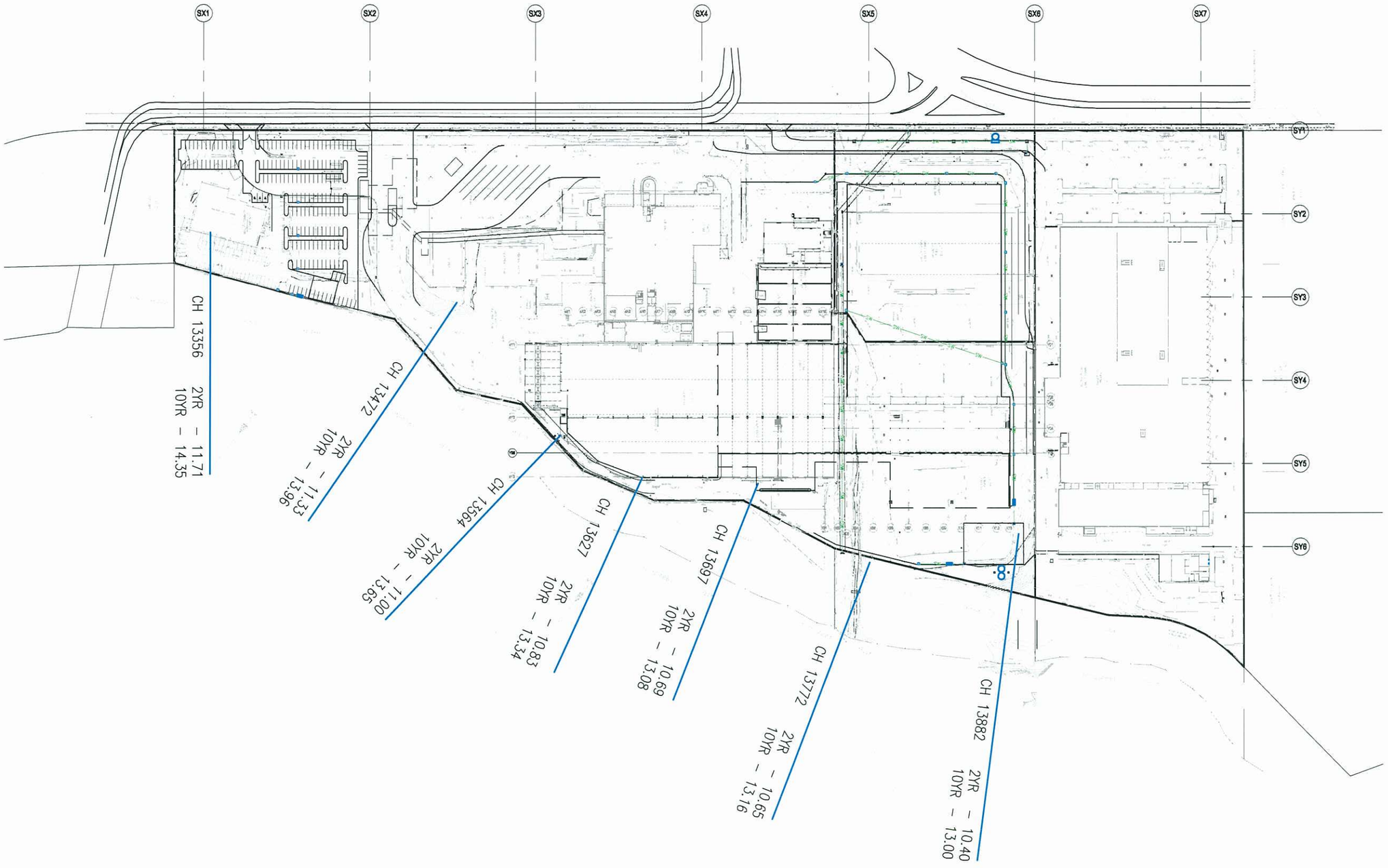


Plate 1. Photo of a rip-rap outlet structure with vegetation growing in the cracks between the rocks.



ON ORIGINAL

KEY PLAN

DIMENSIONS MUST NOT BE SCALED FROM DRAWINGS.

ALL DIMENSIONS TO BE CONFIRMED ON SITE PRIOR TO THE COMMENCEMENT OF ANY WORK.

REFER BELOW FOR MORE AMENDMENTS

REV.	REVISION DESCRIPTION	BY	APP.	DATE
1	PRELIMINARY	CM	JH	17.07.06

CLIENT

Coca-Cola Amatil (Aust) Pty Ltd
Level 15, 71 Macquarie Street Sydney NSW 2000

PROJECT
CCA
BRIENS ROAD
NORTHMEAD NSW

STRUCTURAL & CIVIL ENGINEERS
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Fax. (02) 9221 4633
Robert Bird Group

ARCHITECT
MBBA ARCHITECTS
Level 4, 8 Help Street, PO Box 1212 Chatswood NSW 2067
Tel: (02) 9495 9400 Fax: (02) 9495 9444

PROJECT MANAGER
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Level 8, 5-10 Loftus Street Sydney NSW 2000
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ELECTRICAL & MECHANICAL ENGINEERS
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FIRE ENGINEERS
BASSETT
Level 11, 44 Market St Sydney
Tel: (02) 8295 7555 Fax: (02) 8295 7500

HYDRAULIC ENGINEERS
NIVEN DONNELLY & PARTNERS
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Tel: (02) 9954 5911 Fax: (02) 9954 5977

COST MANAGER
RIDER HUNT
Level 5, 41 McLaren Street North Sydney NSW 2060
Tel: (02) 9922 2277 Fax: (02) 9957 4197

TITLE
SITE PLAN

DATE	07.07.2006	PROJECT No. 06220	STATUS CV/PR
SCALE	AS SHOWN (B1)		
DRAWN	C.MANTE		
CHECKED		DWG No. SKC10	REV No. 1
APPROVED			