

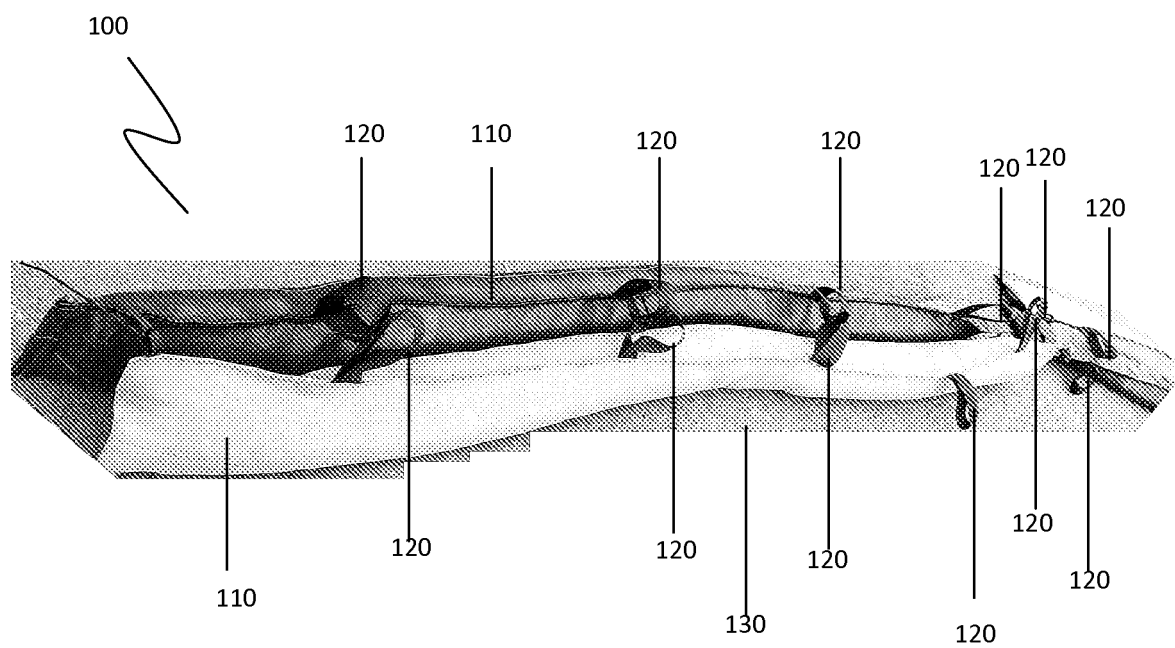


FIG. 1

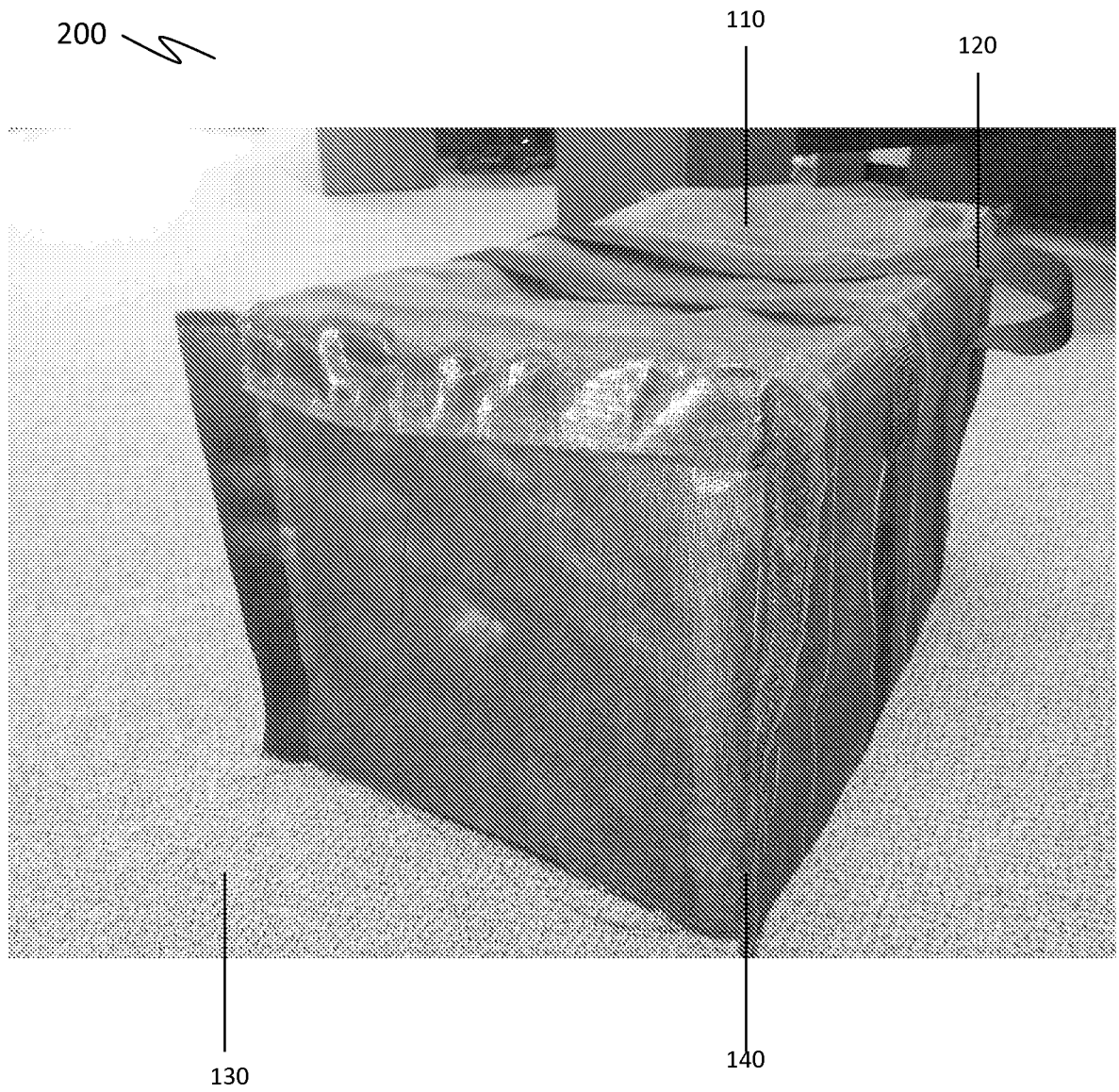


FIG. 2

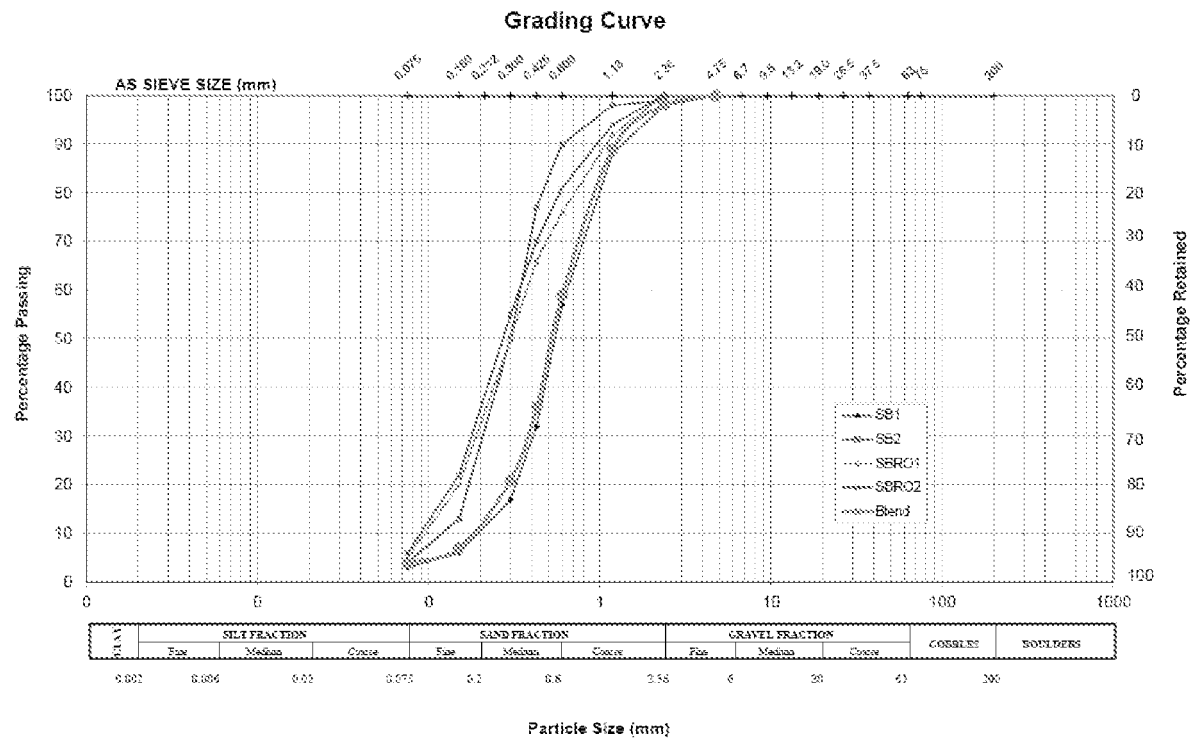


FIG. 3

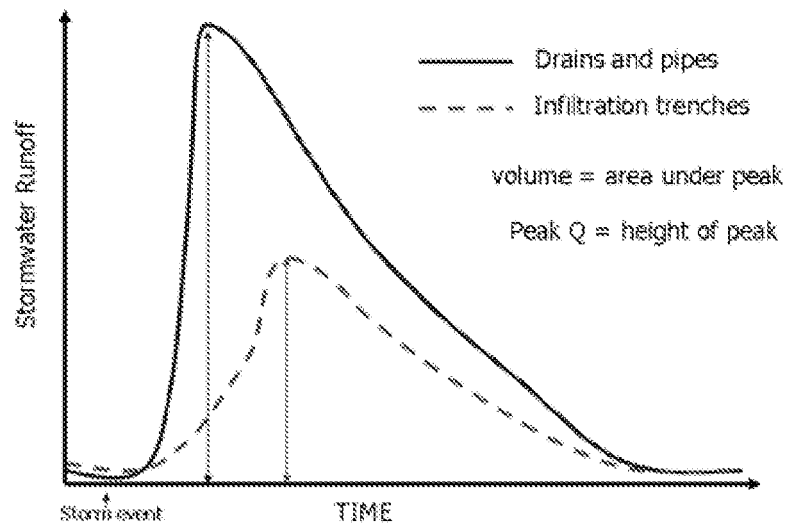


FIG. 4A

	Reduction (%)	
Flow (ML/yr)	2.1	0.2
Peak Flow (m ³ /s)	72	56.2
Total Suspended Solids (kg/yr)	34.4	79.5
Total Phosphorus (kg/yr)	26.5	60.9
Total Nitrogen (kg/yr)	8.1	30.8
Gross Pollutants (kg/yr)	100	100

FIG. 4B

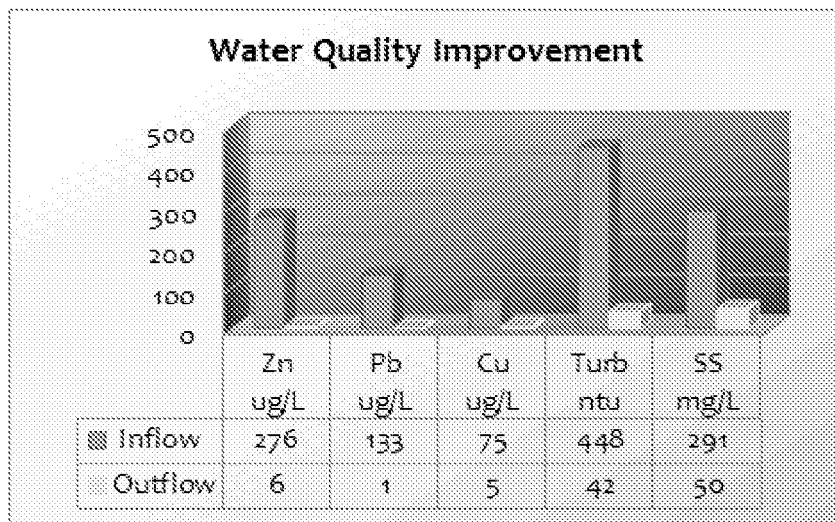


FIG 5A

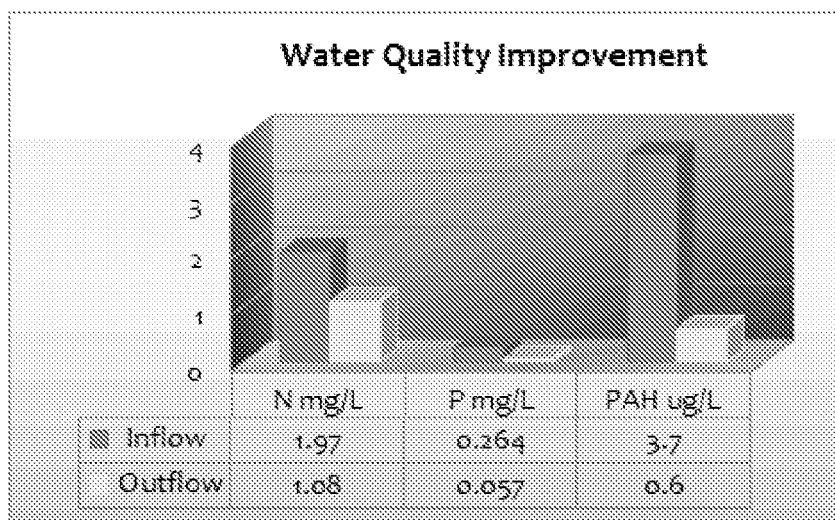


FIG 5B

Properties of Media Filtration

Location: SCAC Design [Products >>](#)

Inlet Properties

Low Flow By-pass (cubic metres per sec)	0.000
High Flow By-pass (cubic metres per sec)	100.000

Storage Properties

Extended Detention Depth (metres)	2.00
Surface Area (square metres)	1500.0
Exfiltration Rate (mm/hr)	0.00

Filtration Properties

Filter Area (square metres)	300.0
Filter Depth (metres)	1.0
Filter Median Particle Diameter (mm)	1.00
Saturated Hydraulic Conductivity (mm/hr)	500.00
Depth below underdrain pipe (% of Filter Depth)	0.0

Outlet Properties

Overflow Weir Width (metres)	2.0
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FIG 6

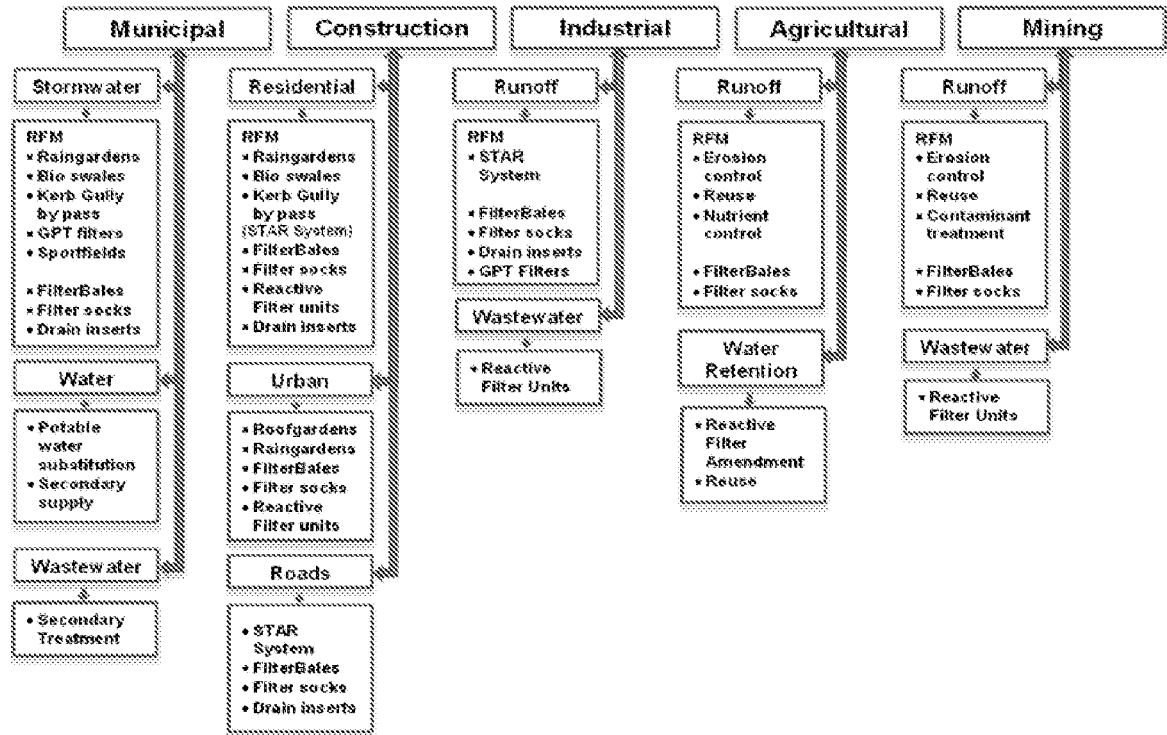


FIG. 7

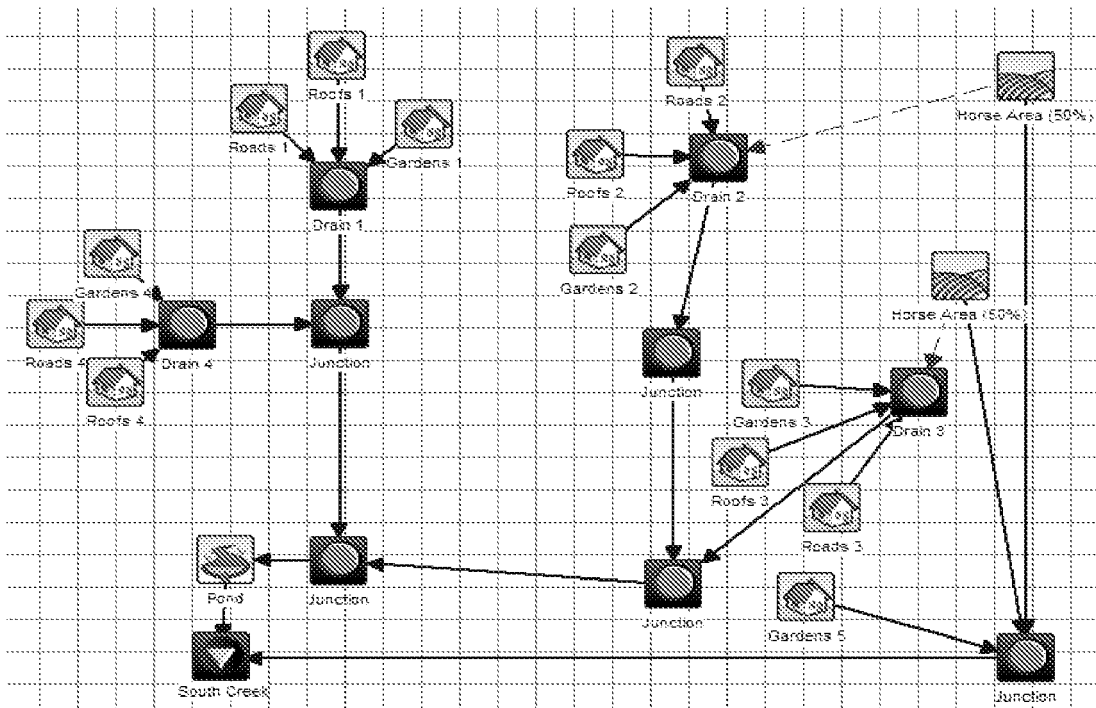


FIG. 8A

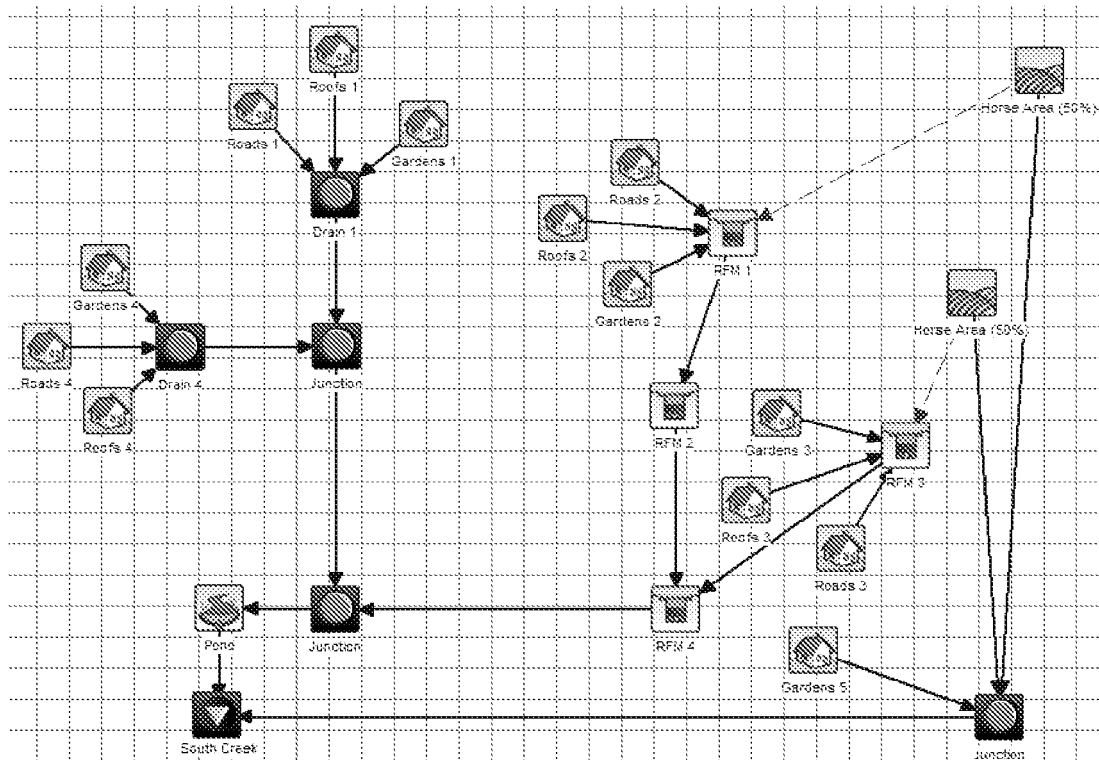


FIG. 8B

<i>Contaminant removal mechanism</i>	<i>Contaminants Targeted</i>	<i>RACS design characteristics</i>
Filtration	Particulate contaminants	Appropriate pore size of the SCAS and grainsize of media inserted
Inoculation	Hydrocarbon , Nutrient, Bacteria	Aerobic de-nitrification, microbial utilization & degradation for which the SCAS has to comply
Sorption, Ion exchange	Hydrocarbon	High organic matter, high surface area
Sorption, Ion exchange	Dissolved metals, Ammonium, Phosphorous	high organic matter, Al/Fe oxides, high surface area
Electrostatic effect	Nitrate	Charge density, surface area
Biodegradation	Dissolved nutrient	Anaerobic, high organic matter
Biodegradation	Hydrocarbon	Aerobic
Volatilisation	Hydrocarbon	Intermittent flow in device
Precipitation	Dissolved metals	High pH of media
Phytoremediation	Dissolved nutrient, metals	High plant activity and root density
Kinetic control	Dissolved organic carbon	High C:N ration
Sedimentation	Particulate contaminants	Mechanism not ideal for filtration devices

Table 1

COMPONENT	pH	EC	TON	TP	mg/L	mg/L	mg/L	Mg	Ca	K	Al	Cu	Zn	Cr	Pb	Fe	mg/L
Material 1	8.29	2510	14.1	8.1	200	7.9	7.7	> 200	0.103	0.110	0.611	<0.001	<0.001	<0.001	0.167	0.093	mm
Material 2	4.91	765	6.5	6.4	2400	9.6	11.7	75.9	0.470	0.379	3.340	0.007	0.007	0.080	0.944	0.271	
Material 3	6.71	1015	8.7	8.4	64	1.1	7.7	> 200	0.119	0.013	1.226	0.001	0.001	0.001	0.113	0.010	
Material 4	7.37	865	9	8.1	90	3.3	10.6	24.9	0.018	0.326	0.649	0.006	0.006	0.007	0.421	0.055	
Material 5	7.19	905	6.9	8.3	140	8.6	12.5	> 200	0.339	0.041	1.903	<0.001	<0.001	0.006	0.004	0.279	
Material 6	7.33	910	9.5	8.7	214	9.6	11.9	45.9	0.044	0.009	0.631	0.001	0.001	0.001	0.009	0.460	
Material 7	7.60	845	4.6	9.3	112	9.6	11.1	20.9	0.040	0.104	0.907	<0.001	<0.001	0.002	0.001	0.006	
Material 8	7.76	920	6.3	7.1	45	3.1	7.9	27.7	0.181	0.043	0.993	<0.001	<0.001	0.007	0.119	0.061	
Material 9	4.24	1635	9.6	5.5	163	7.7	3.1	4.6	0.695	0.009	0.173	<0.001	<0.001	<0.001	1.188	0.155	
Material 10	7.86	845	9.5	6.2	26	3.4	12.8	16.6	0.156	0.009	0.501	<0.001	<0.001	<0.001	0.005	0.005	
Material 11	7.99	820	9.1	5.5	20	9.4	10.9	13.3	0.039	0.026	0.294	<0.001	<0.001	<0.001	0.026	0.025	
Material 12	8.63	930	9.7	5.7	26	2.8	1.1	14.1	0.736	0.041	0.503	<0.001	<0.001	<0.001	1.157	0.024	
Material 13	8.34	905	6.1	5.5	20	3.4	12.8	18.1	0.092	0.014	0.267	<0.001	<0.001	<0.001	0.007	0.003	
Material 14	6.60	2160	7.9	58.9	1800	16.1	25.4	> 200	0.056	0.154	0.281	<0.001	<0.001	<0.001	0.071	0.041	
Secondary Treated Effluent (STE)	7.28	845	9.8	6.2	18.5	91.9	122.3	192.3	0.096	0.104	0.496	0.009	0.009	0.005	0.641	0.037	

Table 2

	kg/m ³	mm/hr	%	μS/cm	mg/L	mg/L	cfu/100 mL
Mix	BD	Ksat	MHC	EC	TN	TP	<i>E.Coli</i>
FAWB Spec	1.18	1052	22.2	720	9.1	3.7	3000
DMC1	0.92	1052	20.2	860	8.7	0.74	2200
DMC2	0.96	361	24.1	830	9.4	3.3	2200
DMC3	0.77	561	20.1	710	7.7	3.7	ND
DMC4	0.81	202	35.5	840	13.8	6.3	ND
DMC4A	1.13	842	19.5	780	8.9	4.5	ND
DMC5	0.95	421	19.9	810	10.7	4.5	ND
STE	elution solution			750	14.4	4.9	3000

Table 3

Characteristic	Method	Organic RFM	Mineral RFM	DMC
Particle size distributions (PSD)	sieve	x	x	x
Total surface area	EGME Method	x	x	x
Bulk density	Calc	x	x	x
Organic matter	Loss on Ignition	x	x	x
CHN analysis	Leco analyser	x		x
C:N ratio	Calc	x		x
Moisture content (as received)	OD	x	x	x
Moisture Holding Capacity (%)	Saturate & OD	x	x	x
Infiltration rate	mm/hr	x	x	x
pH	meter	x	x	x
Nitrogen drawdown	NDI	x		x
Toxicity	mm	x	x	x
Dispersion	Emerson class		x	x
K _{sat} (mm/hr)	Column/lab	x	x	x
CEC	Aus. Soil Lab handbook	x	x	x
Maturity	Solventa	x		x
Microbial status – bacterial &/or fungal	observation	x		x

Table 4A

Removal efficacy	STE
a. TPH	x
b. NH ₄	x
c. TKN	x
d. TON	x
e. Total Nitrogen (calc, TKN + TON)	
f. Phosphorous	x
g. Zn, Pb, Cu, Mg, Ca, K, Al, Cr, Fe, Mn, Se, B, U, As	x
h. Pathogens	x
i. DOC (reduction in DOC to stabilisation)	x
j. Total Suspended solids	x
k. Total Dissolved Solids	x
l. Lifespan (mg pollutant/ gram RFM).	
m. Leaching (reduction in EC to stabilisation)	
n. Residence time (column analysis) mm/hr	
o. Plant growth and species choice	

Table 4B

DMC	Mat 1	Mat 2	Mat 3	Mat 4	Mat 5	Mat 6	Mat 7	Mat 8	Mat 9
1	30		10			50			10
2	50		10			20	20		
3	15	15		15	15	40			
4						80		20	
5	30					70			

Table 4C

Mixture	pH	EC	TKN	TON	TN	TP	Na	Mg	Ca	K	Cu	Zn	Cd	Pb
	%	%	%	%	%	%	%	%	%	%	%	%	%	%
Sandy Loam	3	-4	-65	0	-37	-24	16	4	-3	8	135	-1	-50	-46
DMC*1	15	15	-73	3	-40	-85	-10	-73	-78	496	0.1	-7	-50	40
DMC*2	17	11	-62	0	-35	-33	28	-82	-82	201	0.4	-12	-25	49
DMC*3	5	-5	-73	-13	-47	-24	2	16	1	27	0.1	2	-25	6
DMC*4	14	4	-79	14	-38	-8	81	-76	-91	94	0.3	18	-25	69
DMC*5	10	8	-31	-19	-26	-8	17	4	-16	245	0.1	22	-50	0

Minus Value = Percentage removal. Positive Value = Percentage Increase

*DMC refers to Design Mix Configuration of the Reactive Filter Media (RFM)

Table 5A

	Pond Only			RFM + Pond	
	Inflow	Outflow	% Reduction	Outflow	% Reduction
Flow (ML/yr)	13.3	12.8	3.6	13.2	3.5
Peak Flow (m³/s)	1.3	0.232	82.2	0.264	79.7
Total Suspended Solids (kg/yr)	2680	1580	41	1020	61.9
Total Phosphorus (kg/yr)	6.75	4.48	33.6	2.57	61.9
Total Nitrogen (kg/yr)	17.1	12.2	28.6	8.7	49.1
Gross Pollutants (kg/yr)	334	0	100	0	100.0

Table 5B

Pharmaceuticals	Non categorised priority substances and specific pollutants	Metals
diclofenac	Diethylhexyl-phthalate	nickel (dissolved)
ibuprofen	BDEs ("penta" congeners 28, 47, 99, 100, 153 and 154.)	nickel (total)
atorvastatin	BDE28	lead (dissolved)
ortho-hydroxy-atorvastatin	BDE 47	lead (total)
para-hydroxy-atorvastatin	BDE 99	copper (dissolved)
propanolol	BDE 100	copper (total)
atenolol	BDE 153	zinc (dissolved)
erythromycin	BDE 154	zinc (total)
norerythromycin	perfluorooctane sulfonic acid	cadmium (dissolved)
azithromycin	perfluorooctanoic acid	cadmium (total)
clarithromycin	hexabromocyclododecane	mercury (dissolved)
ciprofloxacin	nonylphenol 4-nonylphenol and ethoxylates	mercury (total)
metformin	octylphenols ((4-(1,1',3,3'-tetramethylbutyl)-phenol))	iron (dissolved)
ranitidine	tributyltin compounds	iron (total)
carbamazepine	fluoranthene	aluminium (dissolved)
10,11- epoxy-carbamazepine	benzo(a)pyrene	aluminium (total)
sertraline	triclosan	aluminium (reactive)
norsertraline	cypermethrin	chromium (dissolved)
fluoxetine		chromium (total)
tamoxifen	Steroids	
Trixylenyl phosphate	oestrone	
Benzotriazole	17 β oestradiol	
Tolyltriazole	17 α ethinyloestradiol	

Table 6