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A STUDY ON EFFECTIVENESS AND PERFORMANCE OF GROSS POLLUTANT TRAPS FOR STORMWATER QUALITY CONTROL FOR RIVER OF LIFE (ROL) PROJECT

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INTRODUCTION

- Rapid urbanization in Malaysia with the construction of new urban conglomeration tends to change the hydrologic, hydraulic, and environment characteristics of previous rural catchments drastically.
- Apart from the physical impacts of flooding, urbanization also resulted in problems of pollution of urban rivers and other receiving waters.
- In Malaysia, gross pollutants such as litter, debris and sediments are one of the main causes of river pollution and flooding problem and, as a result, there is a widespread degradation of the river, which is often the source of the flooding problems.

Most polluted rivers in Peninsular Malaysia

Lowest water quality

- Sungai Ayer Merah (Johor)
- Sungai Tukang Batu (Johor)
- Sungai Sengkuang (Johor)
- Sungai Jelutong (Penang)

Highest amount of rubbish

- Sungai Klang (Selangor)
- Sungai Tebrau (Johor)
- Sungai Skudai (Johor)
- Sungai Pinang (Penang)

Dead rivers

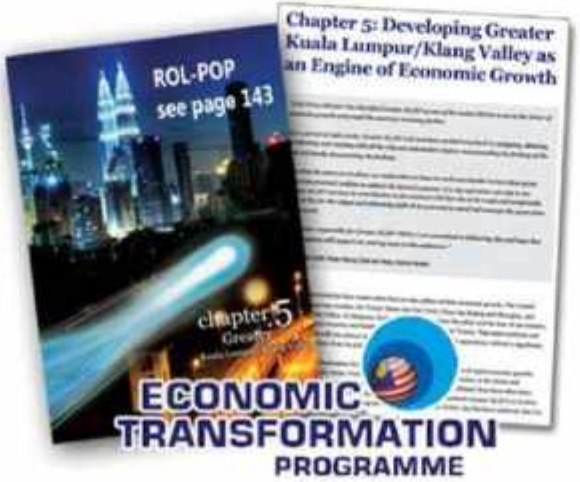
- Sungai Segget (Johor)
- Sungai Ayer Merah (Johor)
- Sungai Jelutong (Penang)
- Sungai Juru (Penang)
- Sungai Prai (Penang)

Source: Dept. of Environment & Drainage and Irrigation Dept. ©The Star Graphics

NEWSPAPER CLIP ON IMPACTS OF GROSS POLLUTANTS

OUR INITIATIVE TO REDUCE GROSS POLLUTANTS IN URBAN WATERWAYS

- DID (2012) has introduced new Urban Storm Water Management Manual (MSMA) and addressed the treatment methods to control gross pollutants in Chapter 10 by installing GPT's at the downstream end of drains or engineered waterways.
- Installation of Gross Pollutant Traps also has been identified as one of key initiatives in River of Life Project in order to trap rubbish from entering river system.



RIVER OF LIFE PROJECT

EPP 5 : River of Life

Transforming Klang River into a vibrant and liveable waterfront with high economic value

12 key initiatives are identified to effectively address pollution and flooding of Klang river

Key Initiative	Description
1	Upgrading existing sewerage facilities is the most impactful and important initiative to reduce Klang river pollution
2	Existing regional sewage treatment plants must be expanded to cater
7	Implement the Drainage and Stormwater Management Master Plan to upgrade drainage systems
8	Systematic hydrological study and rehabilitation of the river are needed for flow control
9	Promote, enforce, and manage river cleanliness and health – erosion from urban development
10	Promote, enforce, and manage river cleanliness and health – restaurants, workshops, and other commercial outlets
11	Promote, enforce, and manage river cleanliness and health – industries that generate wastewater/ effluent
12	Promote, enforce, and manage river cleanliness – general rubbish disposal

KEY INITIATIVES 4 :
INSTALL ADDITIONAL GPTS WILL IMPROVE THE RIVER AESTHETICS AND WATER QUALITY

Key Initiatives Project

1 Urban Stormwater Management Manual or Manual Baru Saliran Mesra Alan for Malaysia
SOURCE: Lab analysis

PURPOSE OF THIS PAPER...

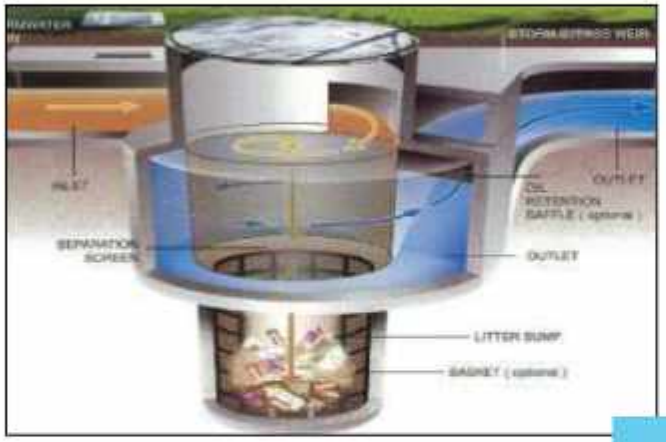
- To share findings from 4 types of GPTs monitoring for ROL project.
- The monitoring was done for a period of 3 months only (3 maintenance data was obtained)

OVERVIEW OF STUDY AREA

- There are 8 types of gross pollutant trap devices installed in commercial and residential areas in River of Life (ROL), Klang river, with total number of 370 units.
- The installations of the GPTs are located along Sungai Klang, Sungai Kemensah, Sungai Sering, Sungai Gisir, Sg. Jinjang and before Nanyang, Wahyu & Delima Pond

TYPE OF GPTs MONITORED

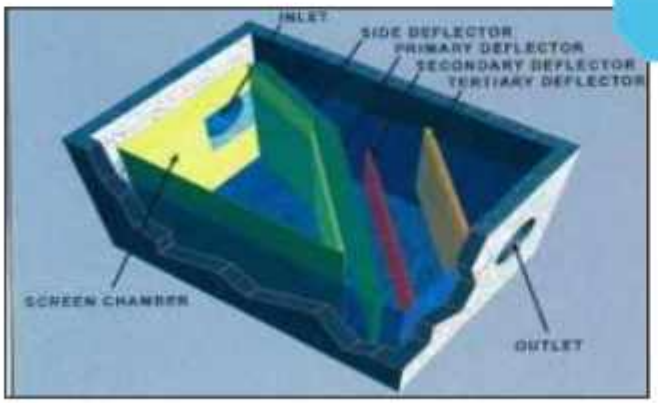
1) CONTINUOUS DEFLECTIVE SEPARATION(CDS)



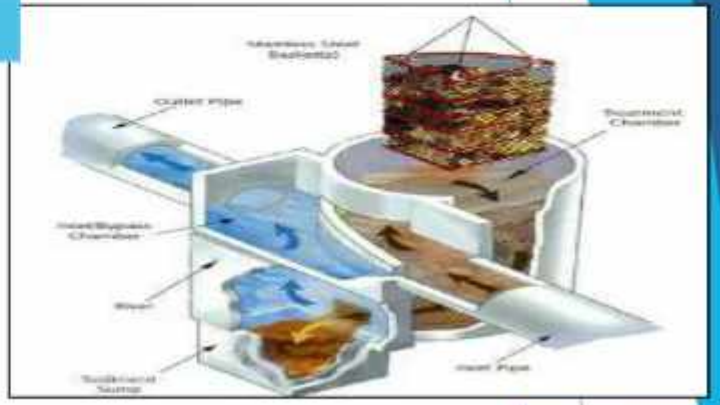
2) DOWNSTREAM DEFENDER (DD)

MONITORING
PHASE 1

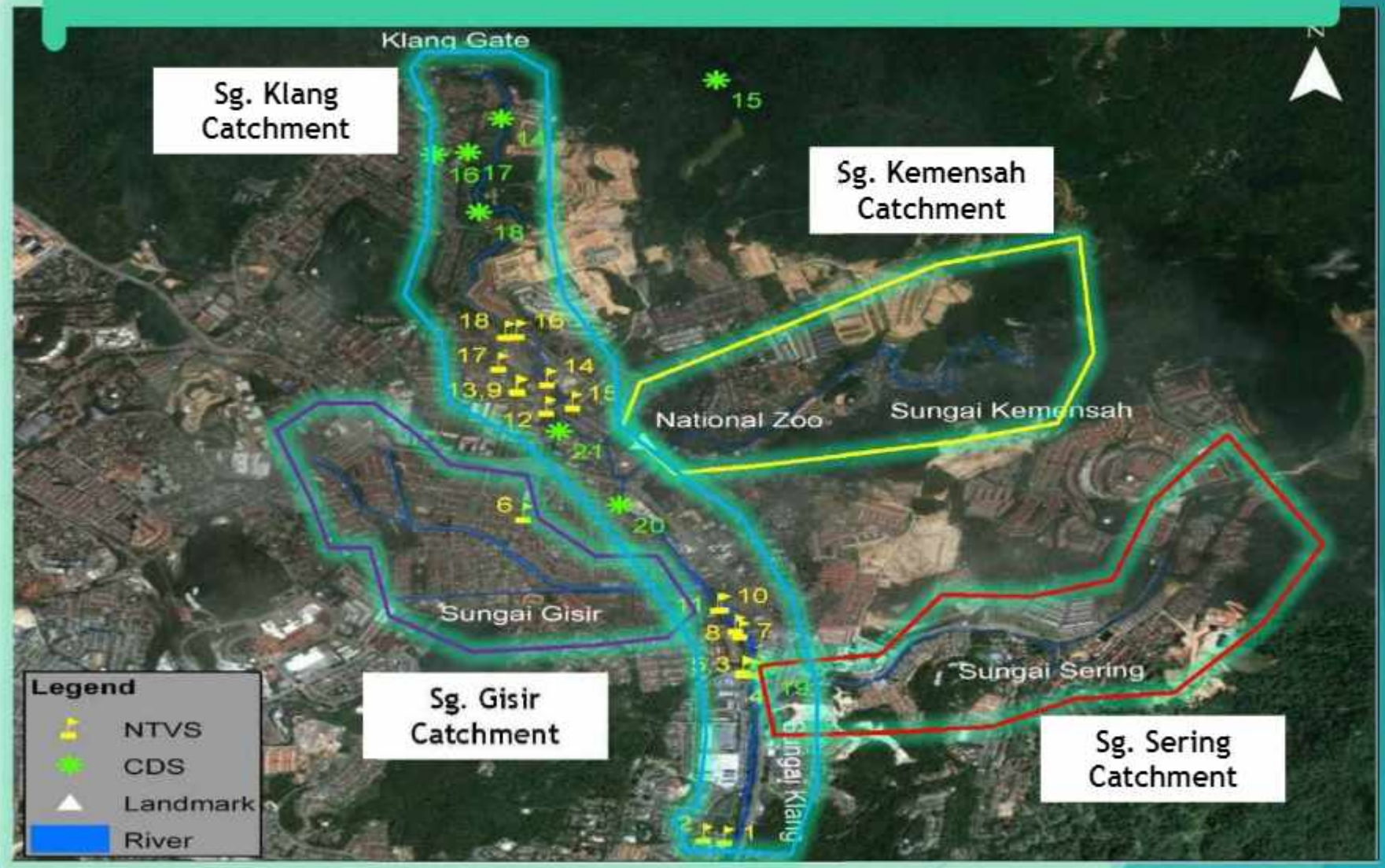
3) NTVS



4) CLEANSALL

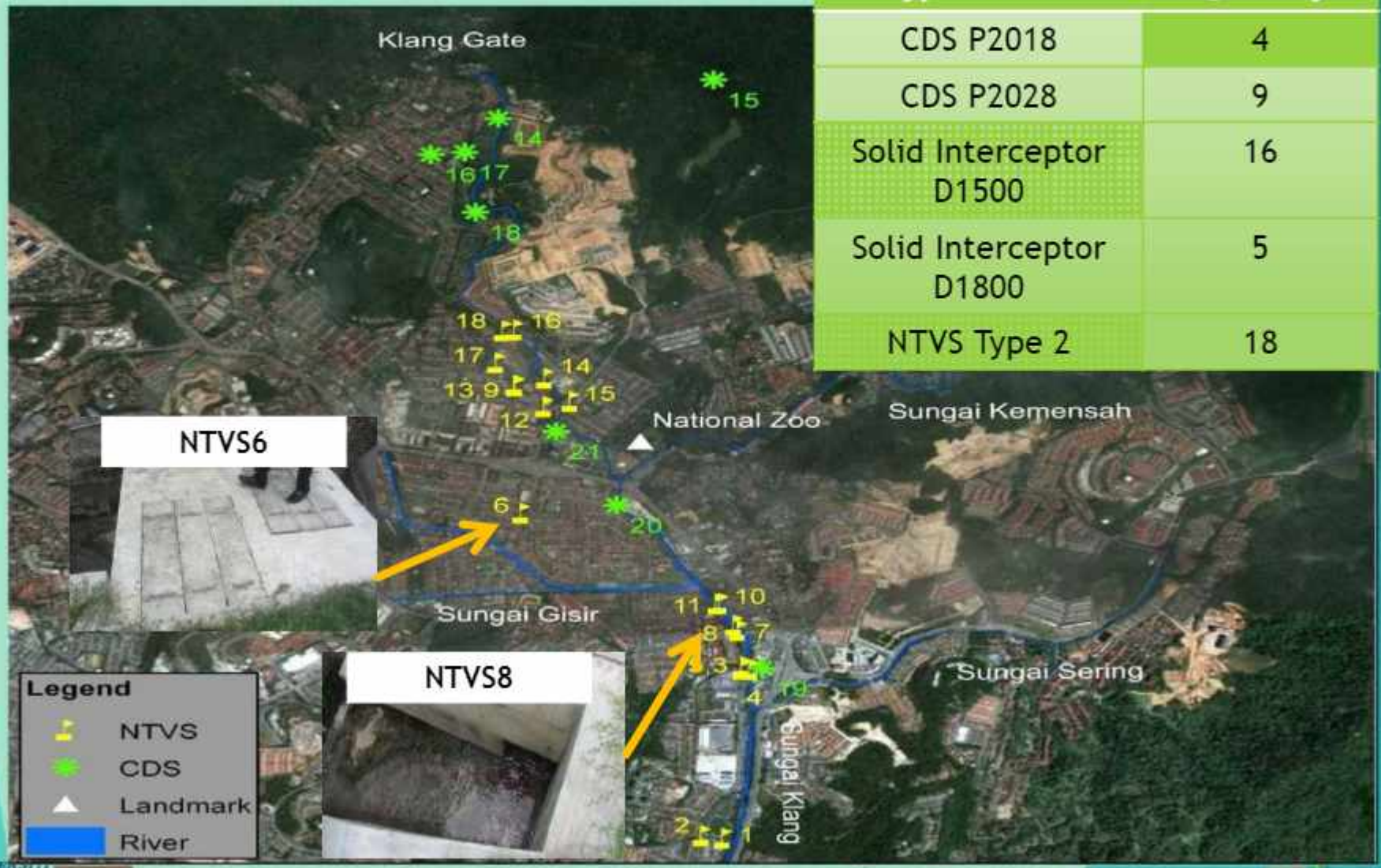


CATCHMENT BOUNDARY



LOCATION & QUANTITY OF GPTS AT SUNGAI KLANG

Type of GPT	Quantity
CDS P2018	4
CDS P2028	9
Solid Interceptor D1500	16
Solid Interceptor D1800	5
NTVS Type 2	18



LOCATION AND QUANTITY OF GPTS AT SUNGAI KEMENSAH

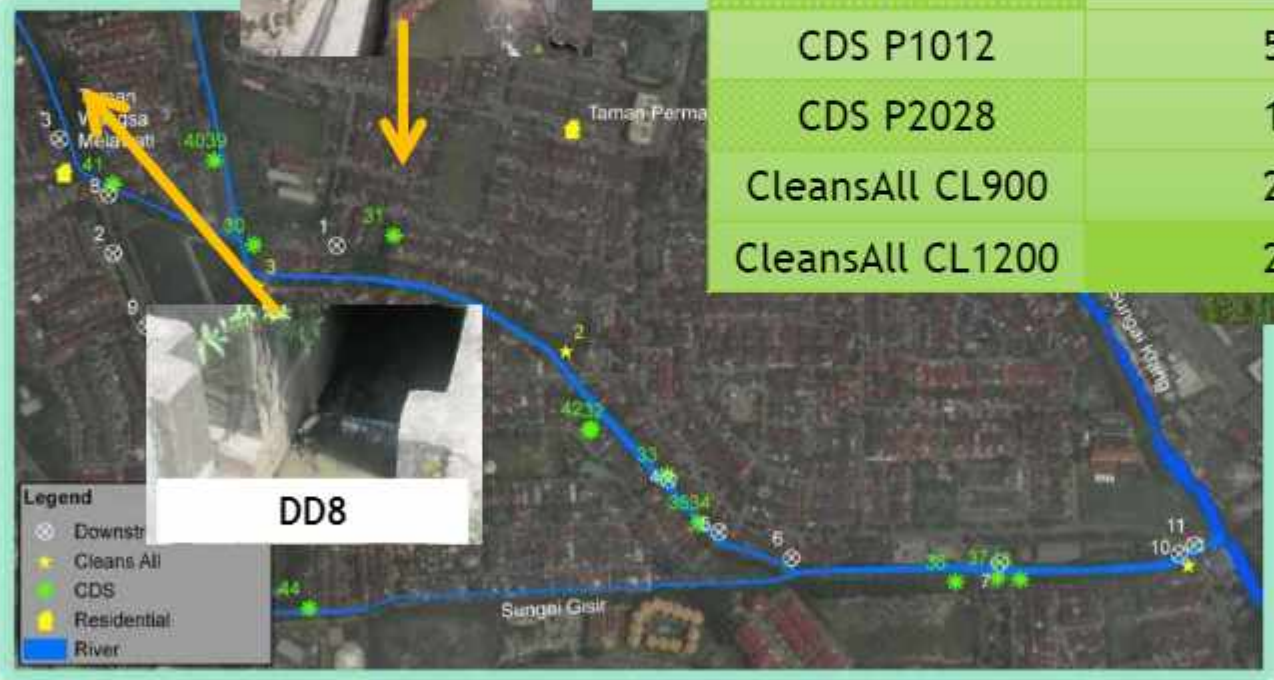
Type of GPT	Quantity
Downstream Defender	3
CDS F0909	10
CleansAll CL1350	2

LOCATION AND QUANTITY OF GPTS AT SUNGAI SERING

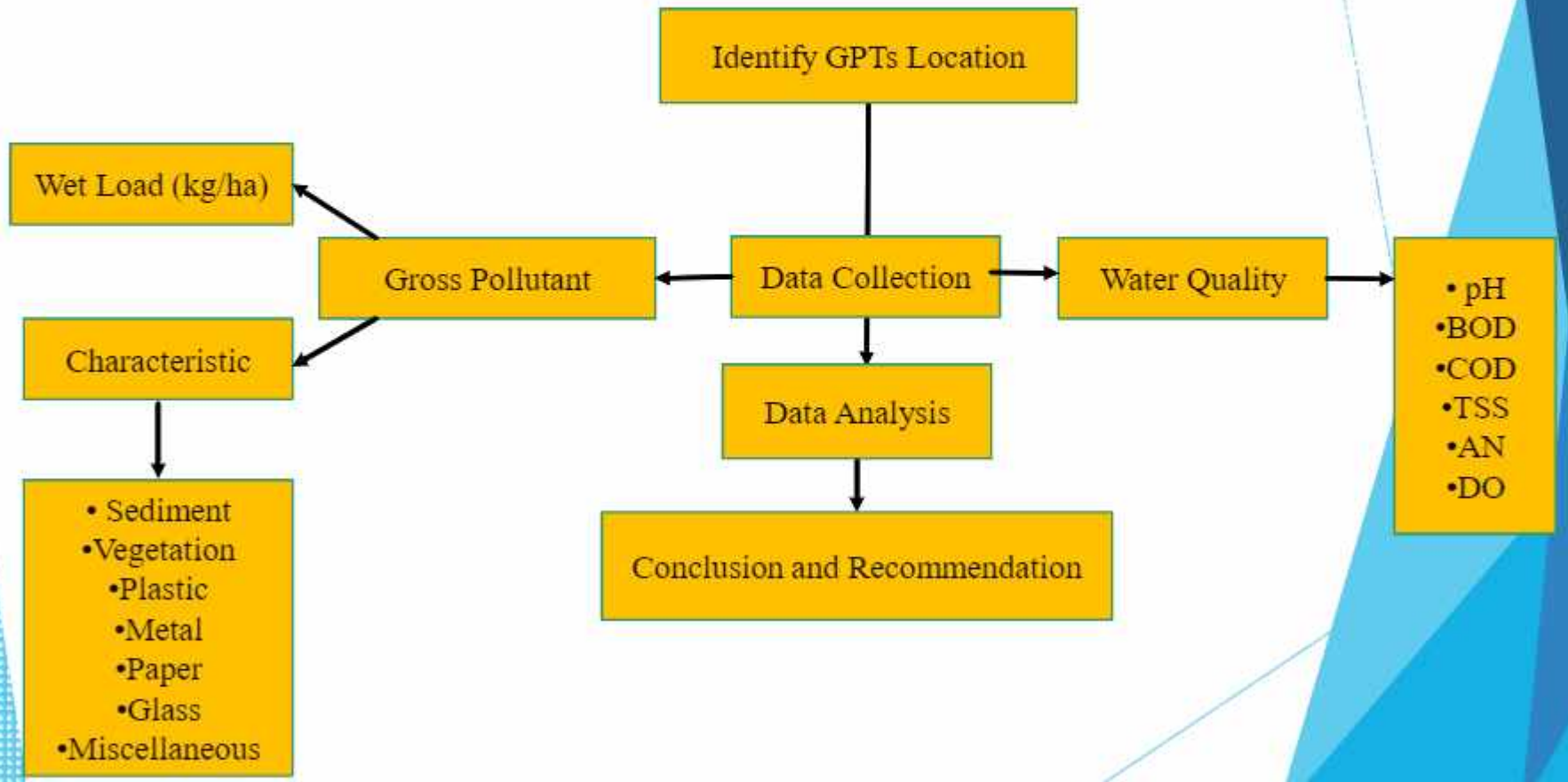
Type of GPT	Quantity
Downstream Defender	5
CDS F0908	7
CDS P1015	1
CleansAll CL1350	1

LOCATION AND QUANTITY OF GPTS AT SUNGAI GISIR

Type of GPT	Quantity
Downstream Defender	12
CDS F0908	10
CDS P1009	4
CDS P1012	5
CDS P2028	1
CleansAll CL900	2
CleansAll CL1200	2



MONITORING WORK FLOW



GPTs MAINTENANCE ACTIVITES

NTVS Type 2 at point 47 in Sungai Klang

DD 8FT at point 7 in Sungai Sering

CDS F0908 at point 15 in Sungai Gisir

CleansAll 900 at point 33 in Sungai Gisir

CleansAll cleaning process at point 33 in Sungai Gisir

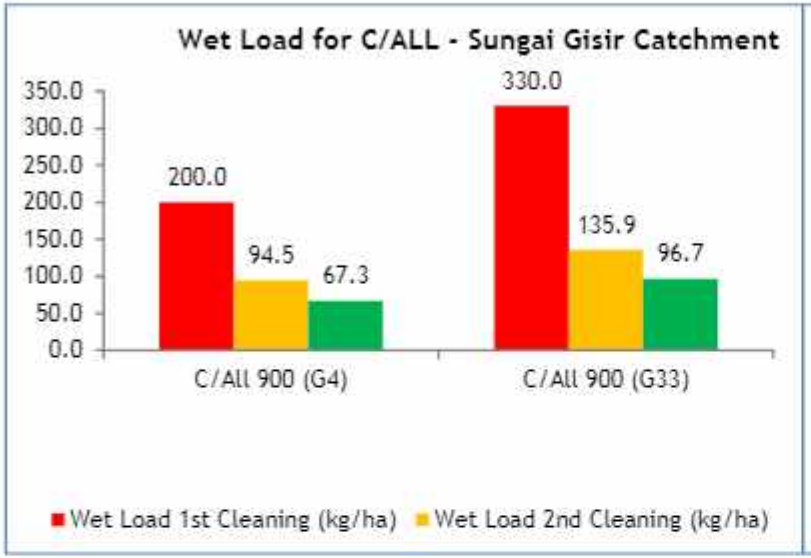
NTVS cleaning process at point 47 in Sungai Klang

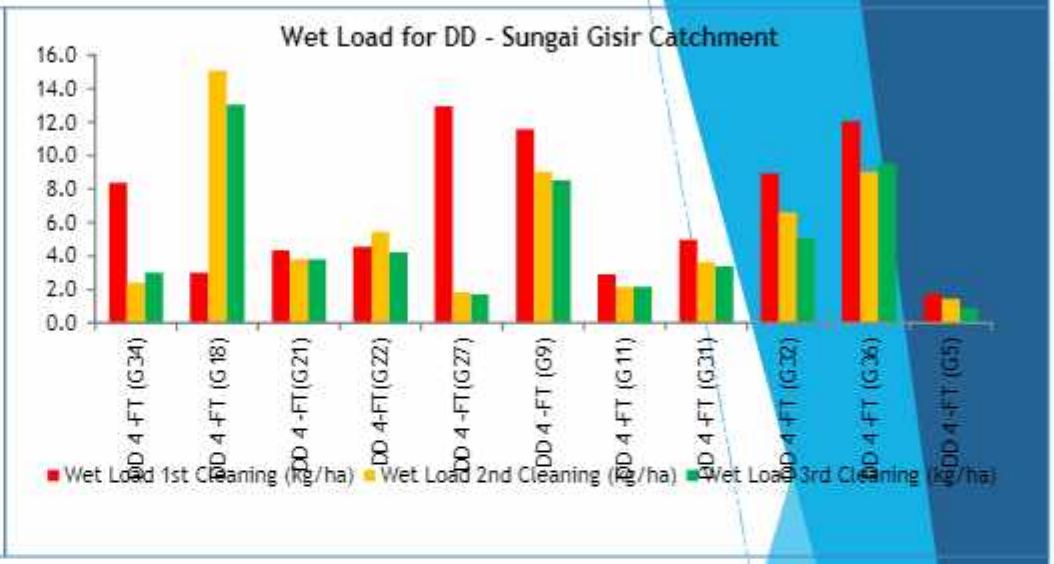
Gross Pollutants Sorting Process

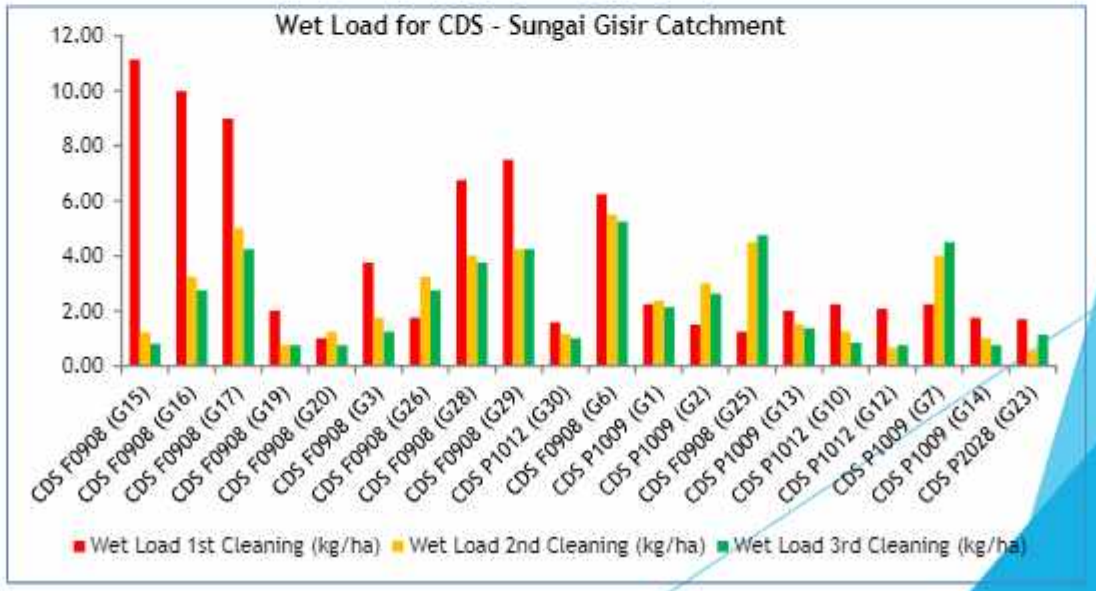
Gross pollutants obtained by CDS point 17 in Sungai Gisir

MONITORING RESULT

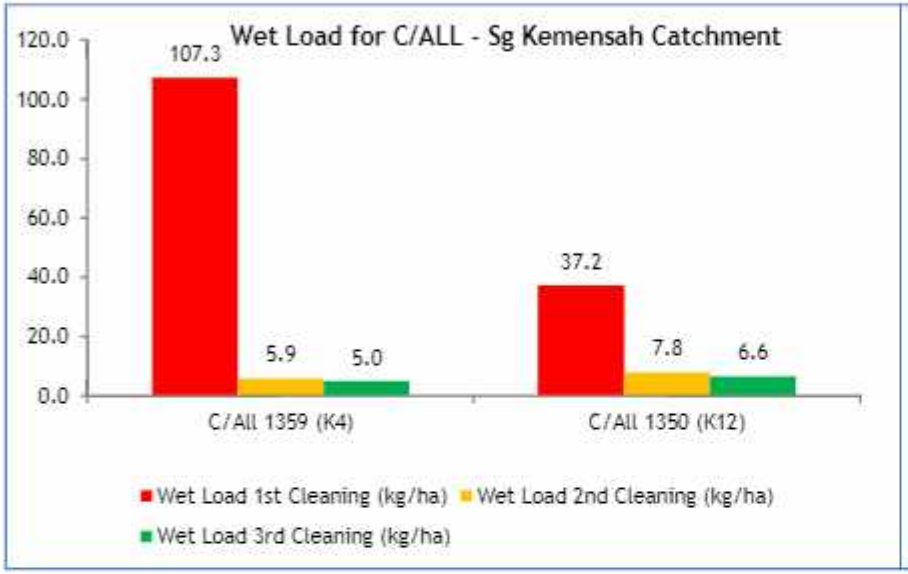
Wet Load Data– Sungai Gisir

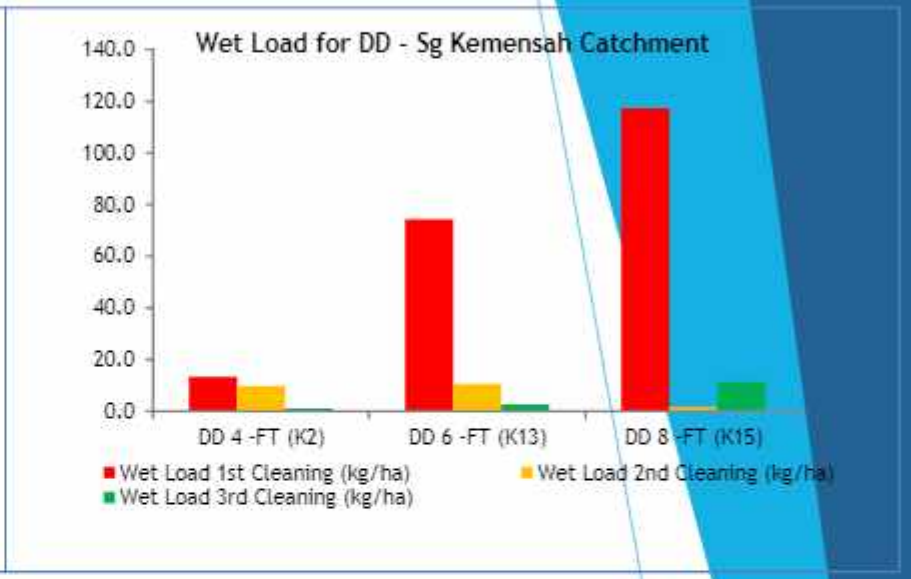


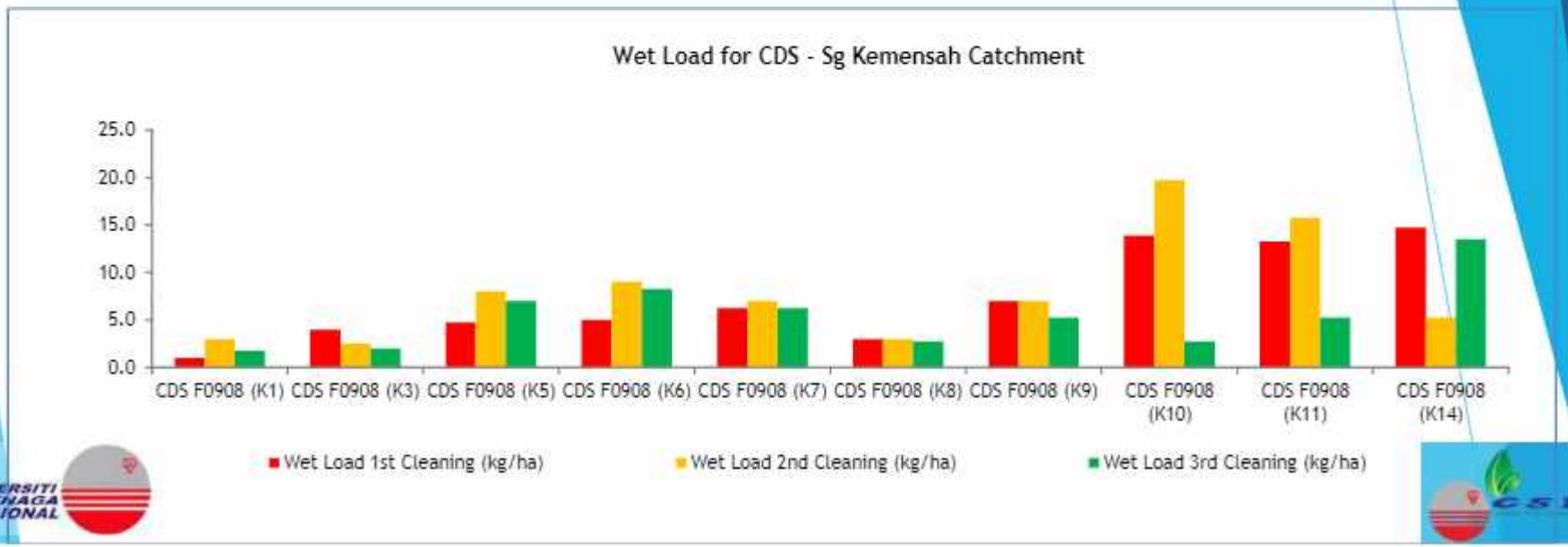




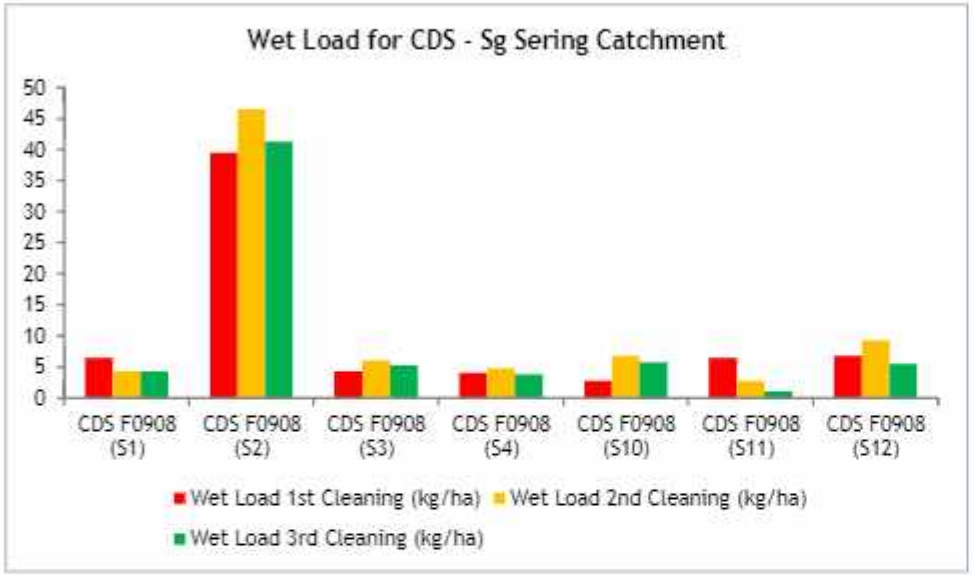
Wet Load Data– Sungai Kemensah

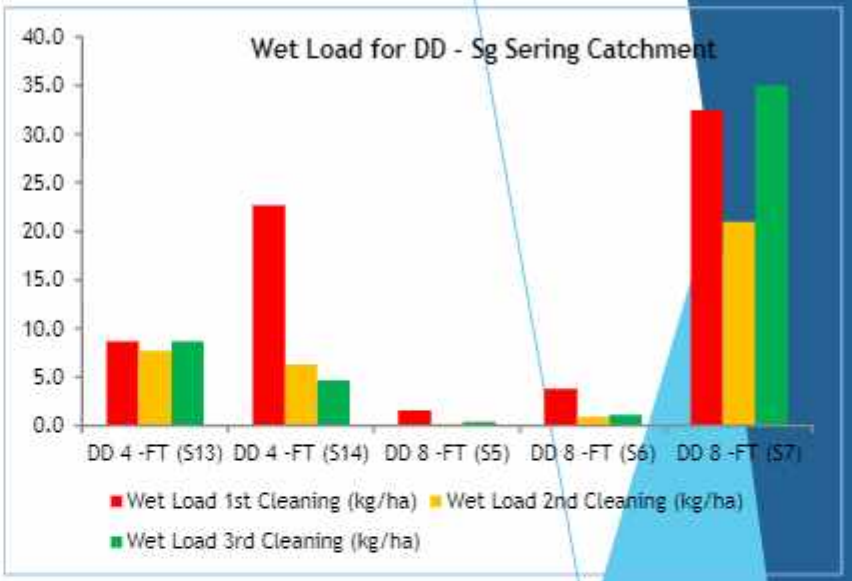


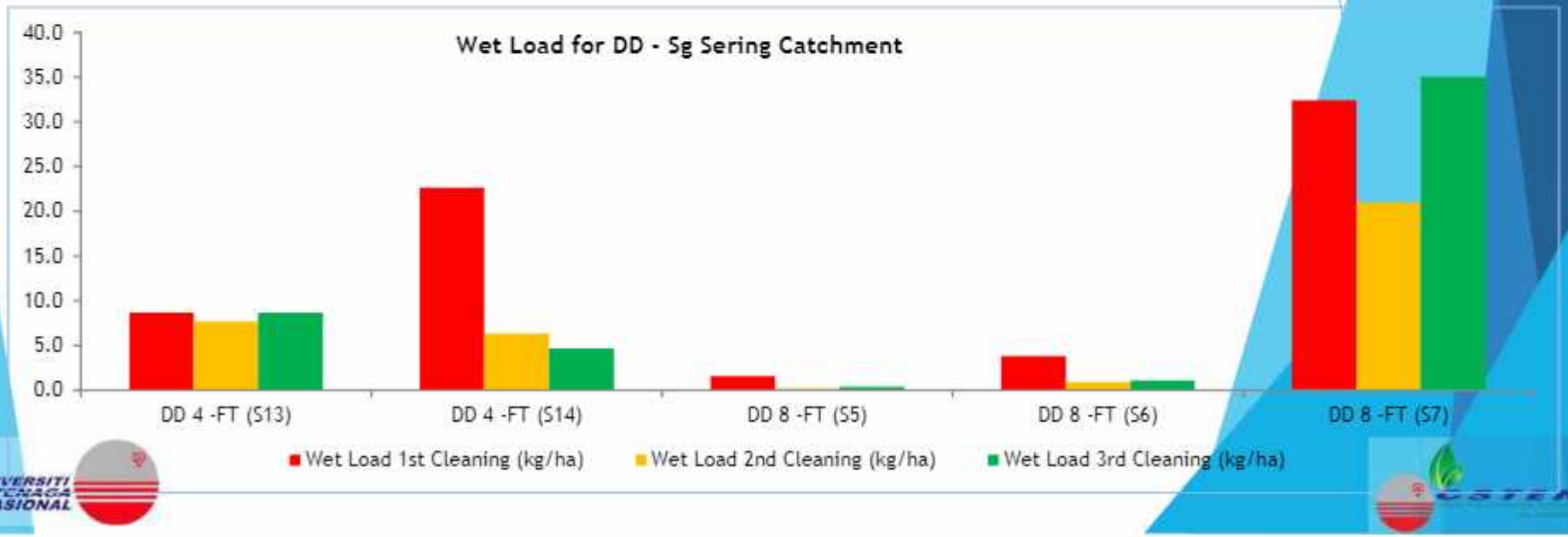




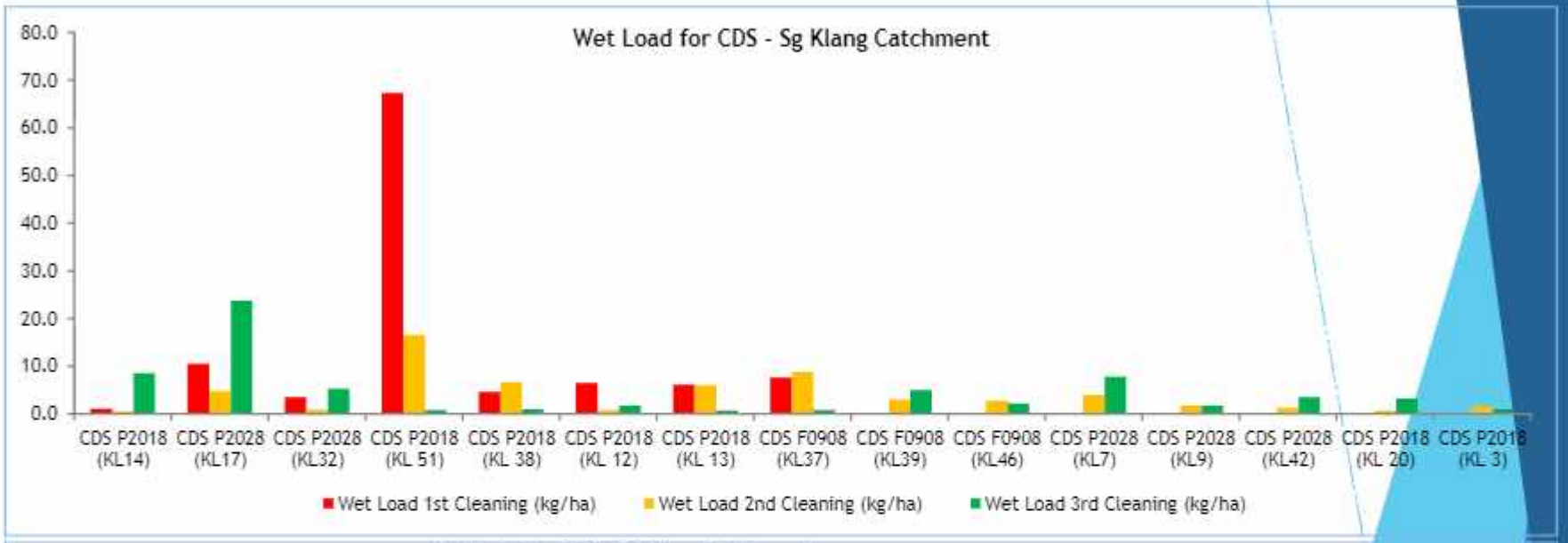
Wet Load Data– Sungai Sering

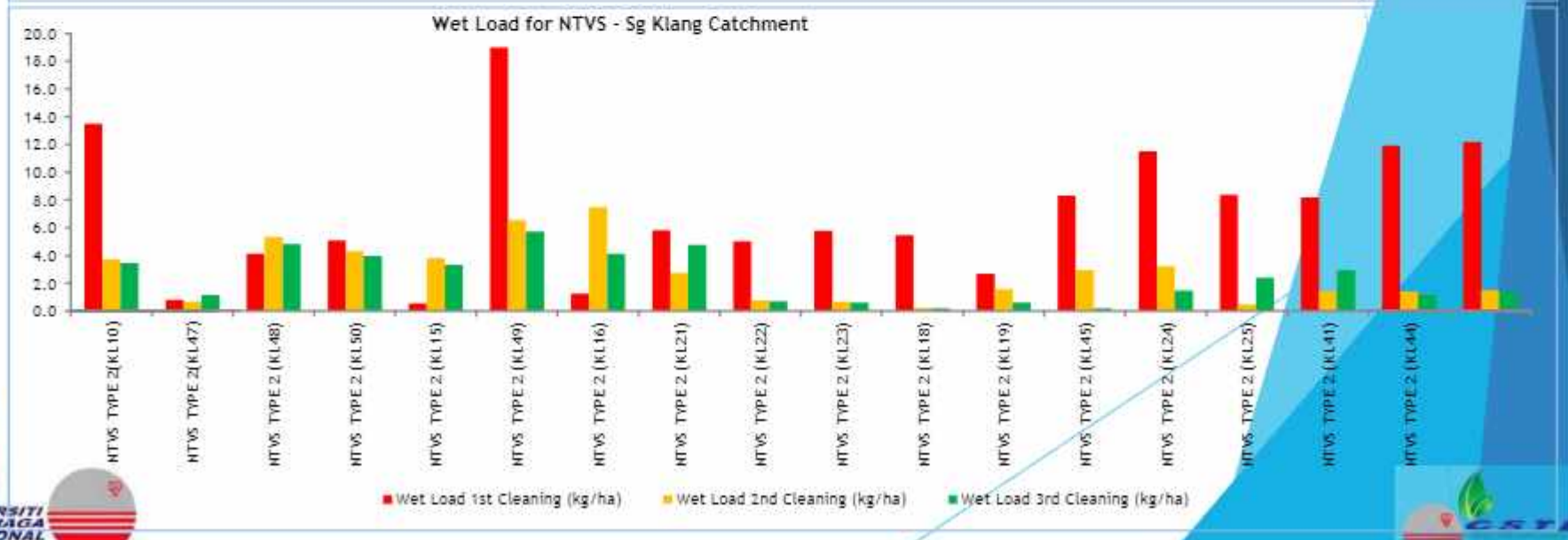






Wet Load Data for CDS – Sungai Klang





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Gross Pollutants Wet Load for Different Catchment

Catchment Name	Wet Load (kg/ha) 1st Cleaning	Wet Load (kg/ha) 2nd Cleaning	Wet Load (kg/ha) 3rd Cleaning
Sungai Gisir	632.12	341.2	265.8
Sungai Kemensah	242.63	116	81.2
Sungai Sering	139.39	116.3	116.6
Sungai Klang	125.47	111.6	126.8
Total	**1139.61**	**685.1**	**590.4**

Gross Pollutants Characterization

- The gross pollutants trapped in each type of the selected GPTs were carried back to UNITEN Civil Engineering Laboratory for sorting purpose.

- The gross pollutants are sorted into 7 categories:
  - Sediment
  - Glass
  - Metal
  - Paper
  - Vegetation
  - Plastic
  - Miscellaneous

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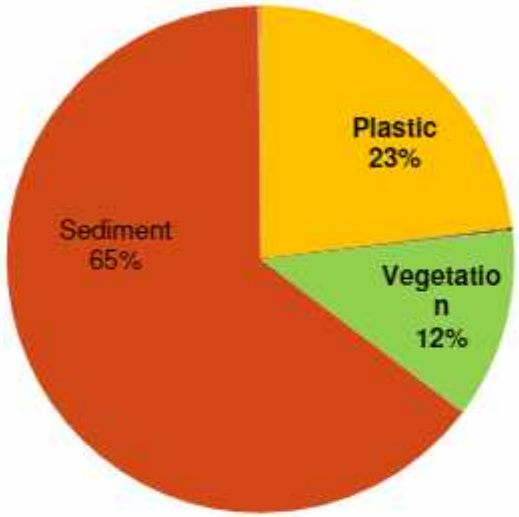
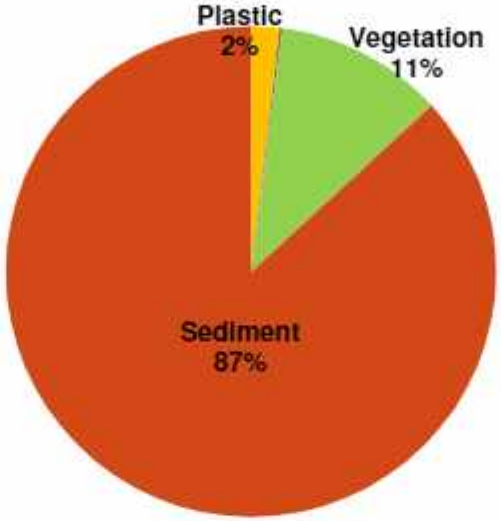
Gross Pollutants Composition & Pollutant Removal Efficiency for CleansAll 900 (G33)

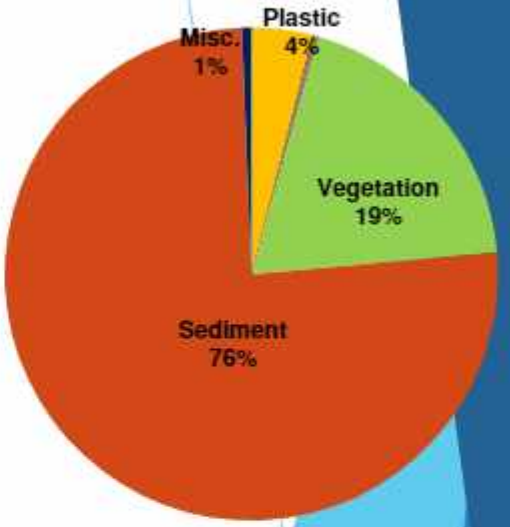
1st cleaning - (16/11/12)



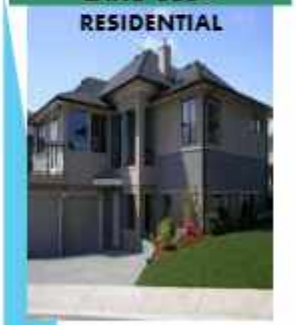
2nd cleaning - (16/12/12)



3rd cleaning - (16/01/13)



LAND USE = RESIDENTIAL



PARAMETER	Pollutant Removal C/ALL		
	1st	2nd	3rd
pH	N/A	-	17.4
Biochemical Oxygen Demand (total)	N/A	-	70.6
Chemical Oxygen Demand (Total)	N/A	-	21.2
Total Suspended Solids	N/A	-	87.3
Ammonia as N	N/A	5.9	21.9

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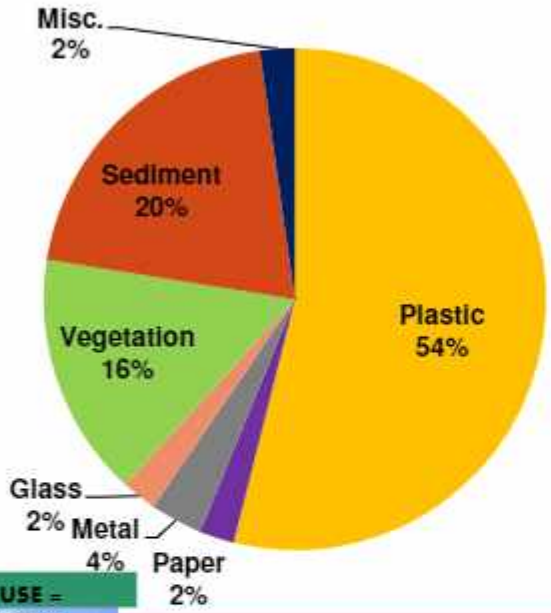
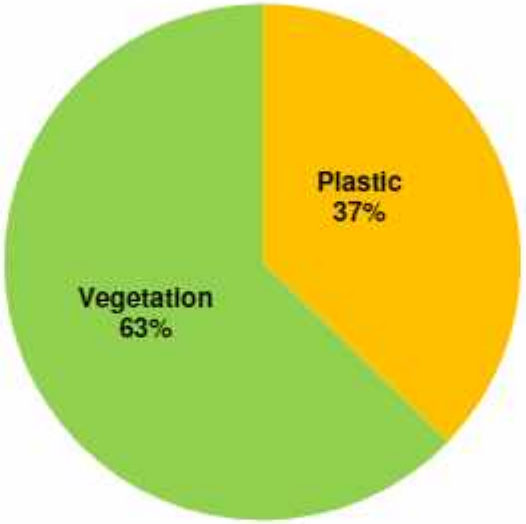
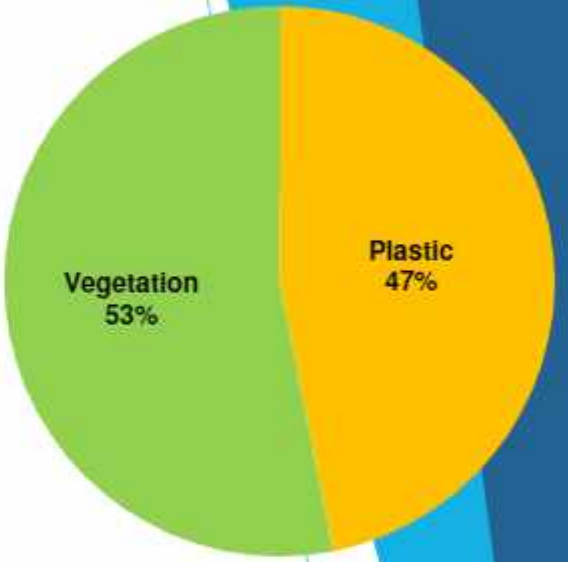
Gross Pollutants Composition & Pollutant Removal Efficiency for CDS F0908 (G15)

1st cleaning- (17/11/12) 2nd cleaning - (17/12/12) 3rd cleaning - (17/01/13)



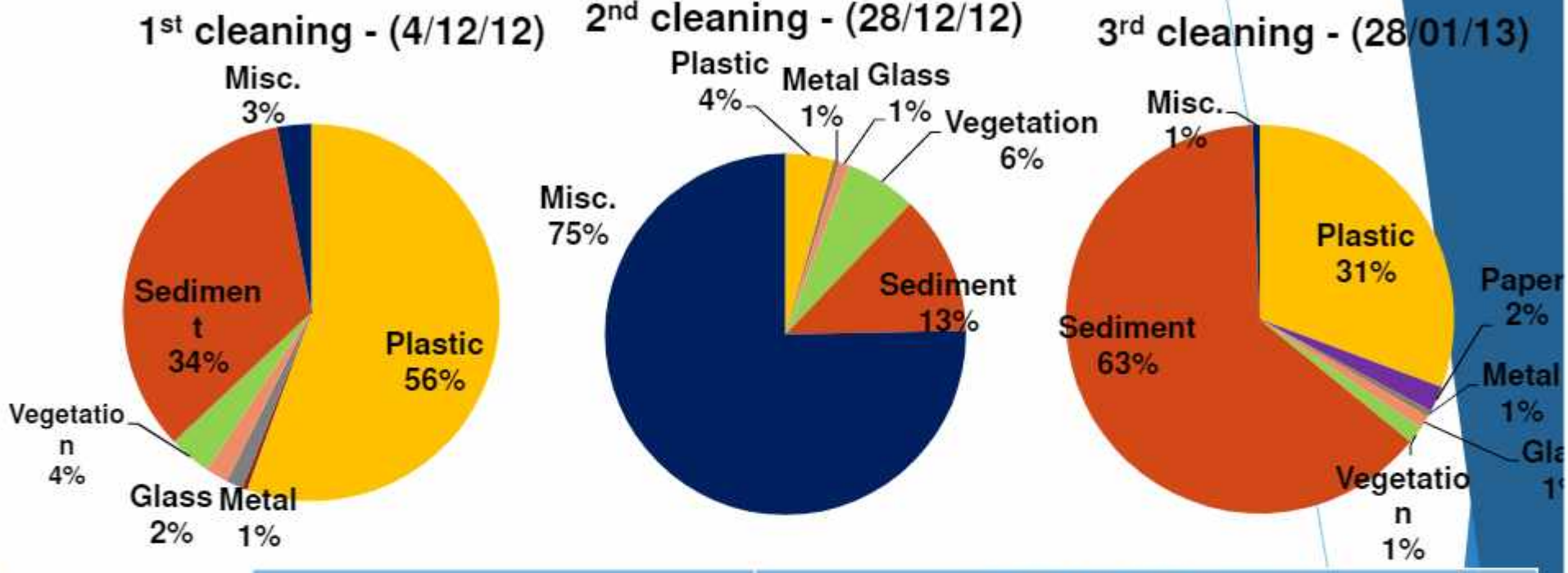


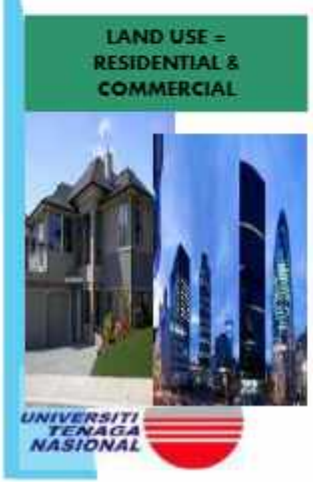


LAND USE = RESIDENTIAL

PARAMETER	Pollutant Removal		
	CDS		
	1st	2nd	3rd
pH	-	-	-
ochemical Oxygen Demand (total)	54.95	34.7	88.5
Chemical Oxygen Demand (Total)	67.08	61.1	93.7
Total Suspended Solids	19.72	78.5	96.8
Ammonia as N	-	-	74.7

Gross Pollutants Composition & Pollutant Removal Efficiency for DD (S7)

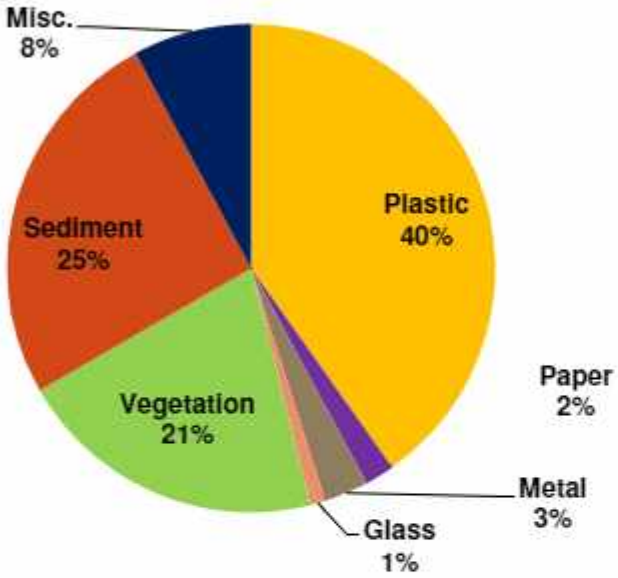




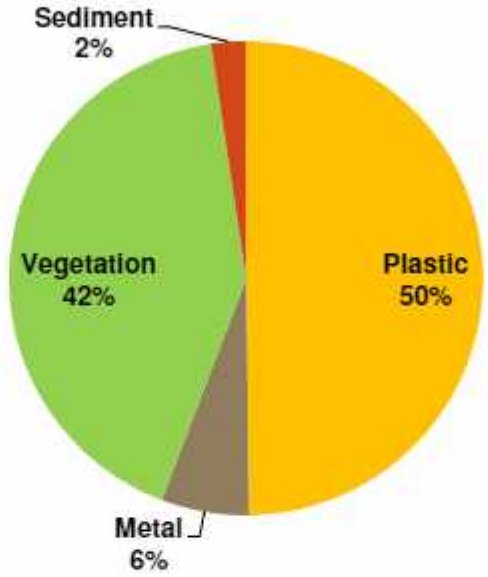
PARAMETER	Pollutant Removal		
	DD		
	1st	2nd	3rd
pH	-	1.4	1.4
Biochemical Oxygen Demand (total)	5.44	-	-
Chemical Oxygen Demand (Total)	-	-	16.7
Total Suspended Solids	-	4.2	5.2
Ammonia as N	-	18.8	33.3

Gross Pollutants Composition & Pollutant Efficiency for NTVS (KL47)

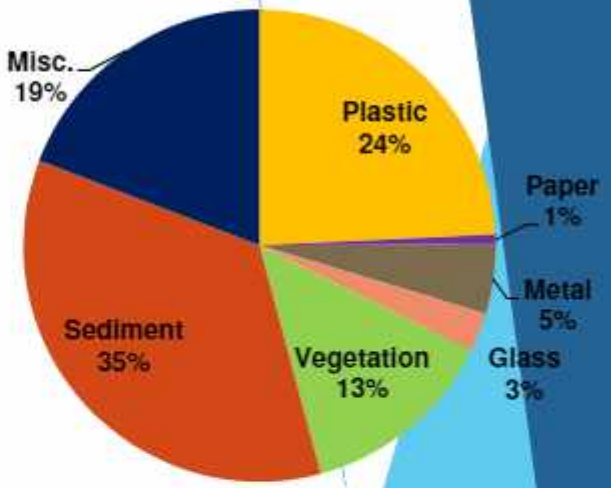
1ST cleaning - (5/12/12)



2nd cleaning - (20/12/12)



3rd cleaning - (19/01/13)



PARAMETER	Pollutant Removal		
	NTVS		
	1st	2nd	3rd
pH	-	-	1.9
Biochemical Oxygen Demand (total)	46.24	-	66.7
Chemical Oxygen Demand (Total)	46.52	6	45.9
Total Suspended Solids	16.28	29.9	66
Ammonia as N	-	-	-

WATER QUALITY ANALYSIS

- The water quality of the samples collected from the selected GPTs (inlet & outlet) were determine certified laboratory for the following parameter

1) Total suspended solids (TSS)
2) pH
3) Ammonical Nitrogen (NH_3-N)
4) Bio-chemical Oxygen Demand (BOD_5)
5) Chemical Oxygen Demand (COD)
6) Dissolved Oxygen (DO)

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PERCENTAGE REMOVAL

PARAMETER	% REMOVAL											
	C/ALL			DD			CDS			NTVS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
pH	-	-	17.4	-	1.4	1.4	-	-	-	-	-	1.9
Biochemical Oxygen Demand (total)	-	-	70.6	5.44	-	-	54.95	34.7	88.5	46.24	-	66.7
Chemical Oxygen Demand (Total)	-	-	21.2	-	-	16.7	67.08	61.1	93.7	46.52	6	45.9
Total Suspended Solids	-	-	87.3	-	4.2	5.2	19.72	78.5	96.8	16.28	29.9	66
Ammonia as N	-	5.9	21.9	-	18.8	33.3	-	-	74.7	-	-	-

CONCLUSION

- This study provides preliminary finding on the characteristics of gross pollutant trapped in GPTs (wet load & type of gross pollutants) emanated from urban area, which was obtained from GPT's operation and maintenance.
- It also measure the performance of selected gross pollutant traps installed in the study area in improving water quality.
- Ultimately, the data obtained will assist the engineers and local authorities to implement appropriate strategies for trapping gross pollutants in urban area, expand the sources for managing gross pollutants in order to rehabilitate the river system and preparing budget allocation of using GPTs in terms of installation cost and maintenance cost annually including the Life Cycle Cost analysis.

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RECOMMENDATION

To ensure the effective management of gross pollutants, the following suggestions are recommended:

- Implementation of the non-structural method (as recommended by MSMA), through public awareness regarding the importance of preserving nature and avoiding pollutants shall be actively done by all parties involved to reduce the amount of debris produced by year.
- Education can be provided through the medium of mass media, seminars, courses, and any other ways to young generation to preserve the nature and environment.
- Local authorities should be more proactive and implement the necessary acts and regulations to sustain the quality of environment.

ACKNOWLEDGEMENT

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- Special Acknowledgement to Project Leader, AP Ir Dr Lariyah Mohd Sidek & CSTEN Team Members

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RIVER OF LIFE


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