Environmental Monitoring Report

Semi-Annual Report
For the period covered July to December 2016
Project Number: 47381-002
May 2017

SRI: Mahaweli Water Security Investment Program

Final Report (Annexes 8 to 10)

Prepared by Ministry of Mahaweli Development and Environment with the assistance of Program Management, Design and Supervision Consultant (Joint Venture Lahmeyer International GmbH – GeoConsult ZT GmbH) for Democratic Socialist Republic of Sri Lanka and the Asian Development Bank.

Democratic Socialist Republic of Sri Lanka
Ministry of Mahaweli Development and Environment

Mahaweli Water Security Investment Program

SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

Period : July - December 2016

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Program Management, Design and Supervision Consultant

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SEMI-ANNUAL ENVIRONMENTAL MONITORING REPORT

Period: July - December 2016

ANNEX 8 : IUCN PROPOSAL FOR UEC-ICB-1 ON PRIORITY SPECIES TRANSLOCATION

Proposal for priority species translocation from Package 01 area of UECP

December 2016

Introduction

One plant species and four animal species have been identified by previously submitted report "Recommendations on Priority Areas Identified for Commencement of Constructions in the Upper Elahara Canal Project" as priority species for translocation from UEC package 1 area before the land clearance for commence the construction work. Following methodology and estimate budget is prepared in order to completion of above proposed work based on the latter dated 19th December 2016 with the title of "Upper Elahera Canal Project Request cost estimates for the translocation of fauna and flora"

Objective of the Proposed Activity

To translocate priority species from the UEC package 01 area before commence the land clearance.

Priority species are; *Dendrolobium tringulare* (a plant) *Euplecta layardi* (A Land Snail) *Theobaldius parma* (A Land Snail) *Oziothelphusa minneriyaensis* (A Freshwater Crab) *Rhinophis philippinus* (Cuvier's earth snake)

	
Oziothelphusa minneriyaensis	*Theobaldius parma*
	
Euplecta layardi	*Rhinophis philippinus*

Priority Animal species

Methodology for Collection and Translocation

Plant - *Dendrolobium tringulare*

The Dendrolobium tringulare plant will be searched in possible habitats along the channel trace. All individual plants will be removed including the already identified specimens from the site. First, each individual plant will be temporarily put into a large sealed polythene bags in order to avoid dehydration. Later, the removed plants will be planted in nursery bags and transported to the nursery until planting period starts. As it is impossible to replant these plants in a suitable habitat it is recommended to keep these removed plant under nursery care up until October 2017 on time for the second inter monsoon rains.

Animals

For the animals in this project, sampling will be carried out day and night* in order to search priority animal species which is needed to be translocated in following order below. It is proposed to carryout animal rescue progarmme just before the land clearance in order to avoid recolonization.

(*Euplecta layardi/ Theobaldius parma*) - Land Snails
Night sampling from 6.30pm to 9.30pm will be carried out due to the nocturnal habitat of these two species. Tree trunks, branches and fallen logs will be searched to collect the land snails. Collected specimens will be temporally transferred to specimen jars or bags until they can be released the following morning.

Oziothelphusa minneriyaensis - Freshwater Crab
Seasonal stream beds will be searched for freshwater crabs. All the collected specimens will be temporarily transferred to the specimen collection bottle.

Rhinophis philippinus - Cuvier's Earth Snake

Cuvier's earth snake is a fossorial snake which lives in soil and under the decaying logs. The ground and logs will be searched for this species.

***** However, night samplings depend on the access to the site during the night and also to the movement of the elephants.

Site Selection for Translocation

Rescued animals (land snails and snakes) will be released the following day into suitable terrestrial habitats located in adjacent areas. The captured population of *Oziothelphusa minneriyaensis* will be released to nearby seasonal or perennial streams. Depending on the number of specimen that will be collected from each species, this will decide the number of locations which will be used for translocations.

Recording and Reporting

All species that are collected from the area will be recorded with GPS location. The GPS locations of species are expected to provide reports that include GPS points for the total translocated individuals.

Required Support from the Project Office

- Permission to enter the Elahera-Girithale sanctuary
- Permission to collect and translocate species
- The required support from the DWC field officer that includes thunders and guns for protection
- Coordination support to hire village labors (Two or three persons)
- Find nursery mechanisms to protect the removed plants (*Dendrolobium tringulare*)

Proposed budget for UEC package 01 translocation

Budget for Priority Animal Species Translocation at UEC package 01 area*

Description	Unit	Unit Price	No. of Units	Amount (LKR)
Staff Cost				
Project team Leader - Devaka Weerakoon	Days	20,000	0.5	10,000
Field team coordinator - Naalin Perera	Days	10,000	5	50,000
Fauna Ecologist - Sampath Goonatilake	Days	12,500	4	50,000
Land Snail Assistant - Rohana Jayasekara	Days	7,500	4	30,000
Transport and field expenses				
Travel to site and on site transportation	Km	60	600	36,000
Perdium for field work (Four officers and driver)	man days	3,500	16	56,000
Translocation				
Field equipments and field consumables	Lump	2,000	1	2,000
payment for DWC officer	man days	1,000	3	3,000
payment for DWC officer (Night Sampling)	man days	1,000	2	2,000
Total				**237,000**

Budget for Priority Plant Species Translocation at UEC package 01 area*

Description	Unit	Unit Price	No. of Units	Amount (LKR)
Staff Cost				
Project team Leader - Devaka Weerakoon	Days	20,000	0.5	10,000
Field team coordinator - Naalin Perera	Days	10,000	4	40,000
Flora Assistant - Thanga Wijewickrama	Days	7,500	3	22,500
Transport and field expenses				
Travel to site and on site transportation	Km	60	550	33,000
Perdium for field work (Four officers and driver)	man days	3,500	9	31,500
Translocation				
Field equipments and field consumables	Lump	3,000	1	3,000
Labour hiring (Two Persons)	man days	1,000	6	6,000
payment for DWC officer	man days	1,000	3	3,000
Total				**149,000**

* Budget is not included cost for nursery care and replanting of *Dendrolobium tringulare* in forthcoming rainy season.

ANNEX 9 : ECOLOGICAL SURVEY FOR NWPCP-NCB-1

Recommendations on Priority Areas Identified for Commencement of Constructions in the North-western Province Canal project

NCB I Package - Nalanda reservoir to Galewela via Wemadilla Tank Human Elephant Conflict Management Plan for North Western Province Canal Project (NWPCP) MMDE / MWSIP/ ADB/ NWPCP/ 3267-3268- SRI / Consult / HECM / NCB / 2016 / 005

November 2016

Report submitted by IUCN Sri Lanka Country Office to Mahaweli Water Security Investment Program of the Ministry of Mahaweli Development and Environment as part of the consultancy service deliverables for the 'Human Elephant Conflict Management Plan for North Western Province Canal Project (NWPCP) MMDE / MWSIP/ ADB/ NWPCP/ 3267-3268- SRI / Consult / HECM / NCB / 2016 / 005'

Cover picture – Devahoova feeder canal near diversion point at Galewela. Sampath de Alwis Goonatilake @IUCN Sri Lanka

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ABBREVIATIONS

BrR	Breeding Resident
CEA	Central Environmental Authority
NCS	National Conservation Status
CR	Critically Endangered
CR (PE)	Critically Endangered (possibly extinct)
DD	Data Deficient
EN	Endangered
END	Endemic Species
IAS	Invasive Alien Species
IUCN	International Union for Conservation of Nature
NT	Near Threatened
SpS	Species Status
VU	Vulnerable
WV	Winter Visitor

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We would like to show our gratitude to the NWPC Project manager Mr. (Eng.) Ashoka Perera, Engineer Assistant, Mr. Jayatilake Kashshapa and Environment officer Mr. Rohana Kumara for logistical support, and numerous other help extended to us during the survey. We are also grateful to Mr. Mr. N A Sisirakumara (Project Director, WSP), and Mr. P. Moonamalae, (Environment Manager) for their support and assistance in coordinating the field work.

1. INTRODUCTION

1.1 Project background

The North Western Province Canal Project (NWPCP) involves a trans-basin diversion of water from the Mahaweli River to the Hakwatuna Oya and Upper Mi Oya Basins. This project will be carried out in two stages:

Stage 1 (2015-2019) will involve diverting 30 MCM of water from Nalanda reservoir through Wemedilla reservoir, Dewahuwa feeder canal, to the proposed Maha Kithula and Maha Kiriula reservoirs and Palukadawala, Ambakolawewa, Attaragalla, and Mediyawa reservoirs, feeding parts of the right bank of the upper catchment of the Mi Oya basin. This will involve construction of new canals, renovation of existing canals and various structures associated with tanks and canals, renovation and enhancing the carrying capacity of two reservoirs. (See Map 1.)

Figure 2. Map of the entire Northwestern Canal Project (Source: Perera, 2016)

Environmental impacts of the NWPC project

Stage 2 (2018-2024), a further 100 MCM will be transferred annually to this system from downstream of the Bowatenna irrigation tunnel through Lenadora once the Moragahakanda and Kaluganga reservoirs and Upper Elahera Canal are completed (2019). (See Map 1.)

Whilst these activities will enhance the water availability for agriculture, thereby increasing agricultural production, as well as improving the socio-economic status of communities, the project will also have significant short and long-term environmental impacts, especially on the wildlife that inhabits the project affected area. Based on the findings of the EIA study conducted for the NWP canal project three major impacts on wildlife have been identified. These include:

Loss of habitat: Construction of the two reservoirs, *Mahakirula* and *Makakithula* and a 1.4 km long, earthen canal linking the two reservoirs will be carried out within the Kahalla-Pallekele Sanctuary, one of the few protected areas found in the northwestern region of Sri Lanka. These activities will result in an estimated 400 ha of habitat loss in the Kahalla-Pallekele Sanctuary (325 ha will be inundated with the construction of the two reservoirs and 75 ha will be cleared to establish the link canal).

Habitat fragmentation and loss of critical species: The project will result in the establishment of the NWP canal with an estimated length of 78.6 km. Establishment of the canal will have two main impacts on the wildlife that is found in the habitats traversed by the canal. Firstly, it will impair the free movement of terrestrial species, as the canal will function as a direct physical barrier. Secondly, animals attempting to cross the canal may fall into the canal, resulting in injury or death to such animals. The establishment of the canal and the two reservoirs will also result in removal of vegetation present along the canal trace and the tank beds of the two proposed tanks. These areas may be inhabited by critical species (rare, endemic or threatened species), which are incapable of moving out of these areas without human assistance and therefore, will perish resulting in local or total extirpation of such species.

Escalation of Human-elephant Conflict : The area that will receive water under the project can be classified as a high Human-elephant Conflict (HEC) area. At present, most of the crop fields are not cultivated during the *Yala* season because of the scarcity of irrigation water. As a result, elephants use such lands as their dry season feeding grounds. When the project augments irrigation water supply to these areas, cultivation will take place in the *Yala* season as well, which will deprive elephants of their feeding grounds (an estimated extent of 10,000 to 12,000 ha of seasonal elephant habitat will be lost due to changes in cropping patterns). This will lead to an escalation of the human elephant conflict, which, in turn, will result in the reduction of the project benefits.

Therefore, one of the conditions imposed by the project approving agency, the Central Environmental Authority (CEA), during project approval is to prepare and implement a Wildlife Management Plan (WMP), with a special emphasis on mitigation of human-elephant conflict in the area. The project proponent, in turn, contracted IUCN, Sri Lanka to prepare the WMP which will be completed in June 2017. However, since the project proponent has indicated that work under the NCB I package (a 5 km stretch from Nalanda reservoir or Ebbavala anicut to Wemedilla tank and 5+770 km from Wemedilla to Nabadagahawatta), needs to be undertaken before the completion of WMP, it was agreed to undertake some of the work that should be done during stage 2 of the WMP such as translocation and transplanting of animal and plant species that are of conservation significance that inhabits the area affected by the project will be undertaken during Stage 1. Therefore, this study was undertaken to investigate the area affected by the NCB I package (a 5 km stretch from Nalanda reservoir or Ebbavala anicut to Wemedilla tank and 5+770 km from Wemedilla to Nabadagahawatta), to determine whether there are any critical habitats or species in the areas impacted by the construction work under package 1 and if so to make changes in the construction corridor to avoid the impact and failing that to translocate/ transplant any critical species to a suitable location(s).

1.2 Objective

Objective of the present study is to identify whether the area affected by NCB I package (a 5 km stretch from Nalanda reservoir or Ebbavala anicut to Wemedilla tank and 5+770 km from Wemedilla to Nabadagahawatta) will have a significant impact on critical habitats or species with a special emphasis on freshwater fish, and if such an impact (s) was identified, to provide recommendations to avoid or minimize such impacts.

2. METHODOLOGY

The aim of this study has been to identify the anticipated habitat changes that would arise due to flow of excess water in to the Welimitiyawa Oya, Wemedilla tank and Devahuwa feeder canal. Further, the impact of habitat clearance in order to establish the 535 m long bypass canal from Wemedilla tank to Devahuwa feeder canal. Finally, the habitat changes that will result on either side of existing Devahoova feeder canal up to diversion point due to converting it from an earthen to a concrete canal.

Since, most of the anticipated changes will take place in the aquatic ecosystems, the present study focused mainly on the impacts on freshwater fish fauna and other associated aquatic faunal and floral species found along the Welimitiyawa Oya, Wemedilla tank and existing Devahuwa feeder canal.

The study area can be divided in to four main sections based on the anticipated effects on habitats and species.

1. Welimitiya Oya - Between Ebbavala and Wemedilla Tank
2. Wemedilla Tank
3. New bypass canal - From Wemedilla tank to Existing Devahoova feeder canal
4. Existing Devahoova canal - Between the confluence with the bypass canal up to the diversion point

2.1 Flora

Floral species found along the trace of the proposed bypass canal from Wemedilla tank to the existing Devahoova feeder canal was studied. Species identification was based on the current field identification books as well as comparison with herbarium specimens.

Table 1: Key references used for the identification and classification of flora

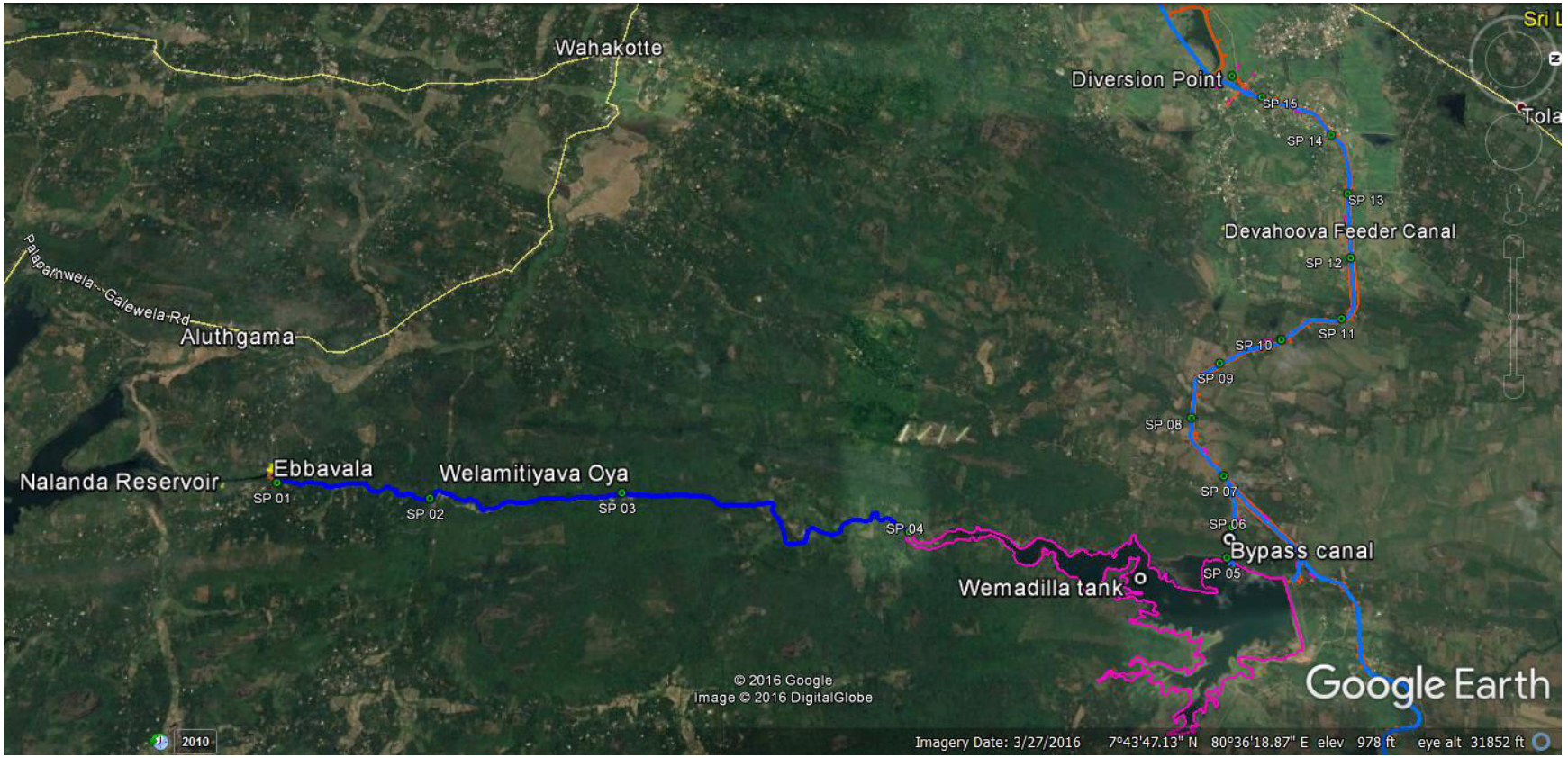
Subject	Source
Invasive species	MoE 2015
Taxonomic identification	Ashton *et al.* 1997; Dassanayake and Fosberg (1980 - 1991); Dassanayake *et al.* (1994-1995); Dassanayake and Clayton (1996 -1999), Senaratne, 2001; Vlas and Vlas, 2008 & 2013.
Medicinal value	Sugathadasa *et al.* 2008.
Plant classification and conservation status	MoE, 2012.

2.2 Fauna

Aquatic fauna as well as aquatic associates inhabiting the Welimitiyawa Oya, Wemedilla tank and Devahuwa feeder canal was studied. For this purpose, 15 sampling points were established in these sites (see map 02). Fishes fauna was studied by use of cast nets, hand nets as well as visual observations made by snorkeling in these water bodies as well as from the two banks of the stream or canal. Species identification was done by using the most recent field identification guides.

Table 2: Key references used for the identification and classification of fauna

Subjects		Reference Source
Species Identification	**Aquatic snails**	Raheem and Naggs, 2006
	Dragonflies	Bedjanic *et al.* 2007; Bedjanic *et al.* 2014.
	Butterflies	D' Abrera, 1998; Jayasinghe *et al.,* 2013.
	Reptiles	Somaweera, 2006; Somaweera and Somaweera, 2009
	Birds	Harrison, 1999; Warakagoda, et al., 2012
	Mammals	Phillips, 1935; Kotagama and Goonatilake, 2013.
Nomenclature		MoE, 2012.
Conservation status		MoE, 2012.



Map 02. Sampling points along the package stretch. (SP -Sampling Points).

2.3 Species pioritization

The species observed in the area that was identified for land clearing or aquatic ecosystems that will be subjected to change in flow regimes or habitat character were evaluated to identify whether any of the species observed required translocation or transplantation to a safer site before commencing the construction work. The process of selection of priority species is a means by which species are shortlisted for translocation or transplanting. This is done based on a multi criteria analysis. For each criterion, a score is assigned based on several sub criteria. Each species was scored against the criteria, and those that receive a higher score are chosen for translocation/ transplantation.

Criteria used for flora

1. **Status of the species:** indigenous (1); common endemic or common new spp. (2); restricted endemic or restricted new spp. (3) point endemic or point new spp. (4).
2. **Distribution**: island wide (0), 4 bioclimatic zones (1); 3 bioclimatic zones (2); 2 or 1 bioclimatic zones (3); 1 Bioclimatic zone and restricted to project area (4).
3. **Use value**: Non-use (0); crop wild relative (3); other use (3); crop wild relative and other use (4)
4. **Conservation**: Nationally NT (1); Nationally DD/NE (2); Nationally VU (3); Nationally EN (4); Nationally CR (5); Nationally CR (PE) (6); Globally NT (1.5); Globally DD/NE (2.5); Globally VU (3.5); Globally EN (4.5); Globally CR (5.5); Globally CR (PE) (6.5).

Criteria used for fauna

1.`**Status of species:** indigenous (1); common Endemic or common new spp. (2); restricted Endemic or restricted new spp. (3); point endemic or point new spp. (4).
2. **Distribution**: islandwide (0); 4 bioclimatic zones (1); 3 bioclimatic zones (2); 2 or 1 bioclimatic zones (3); 1 bioclimatic zone and restricted to project area (4).
3. **Impact of Project**: Positive impact (-2); no impact (0); negative impact (+2).
4. **Conservation**: Nationally NT (1); Nationally DD/NE (2); Nationally VU (3); Nationally EN (4); Nationally CR (5); Nationally CR (PE) (6); Globally NT (1.5); Globally DD/NE (2.5); Globally VU (3.5); Globally EN (4.5); Globally CR (5.5); Globally CR (PE) (6.5).

3. RESULTS

A total of 167 faunal species and 59 plant species were recorded within the area that will be affected due to various construction activities that will be carried out under package I. The flora recorded included two endemic (*Argyreia populifolia* and *Vernonia zeylanica*) species and 20 species listed as exotic species. The exotic flora observed also included seven species of invasive alien plants. The detailed list of flora and fauna observed in the 15 sampling sites are given in Annex 1 and 2 respectively.

Table 1. Summary of faunal species observed in the areas affected by the package I

Taxonomic Group	Recorded from Sri Lanka				
	Total	NS	WT	BP	EC
Snails	3	1	1	2	2
Dragonflies	11	5	3	6	9
Butterflies	27	10	6	6	21
Crabs	1	1	0	0	1
Fishes	30	17	22	0	15
Amphibians	5	3	2	1	2
Reptiles	13	12	10	9	8
Birds	68	38	57	33	53
Mammals	19	9	16	7	9
Total	177	96	117	64	120

Table 2. list of IAS plants recorded from the study area

No	Family (APG III)	Species	English name	Sinhala name
1	Asteraceae	*Chromolaena odorata*	Siam Weed,	Podi singno maran
2	Asteraceae	*Mikania cordata*	Mile-a-minute	Gam palu, Kehel palu
3	Fabaceae	*Leucaena leucocephala*	Wild tamarind, Ipil ipil	Ipil-Ipil
4	Fabaceae	*Mimosa pigra*	Giant mimosa, Catclaw mimosa	Yoda nidikumba,
5	Poaceae	*Panicum maximum*	Guinea grass	Gini tana , Rata tana,
6	Poaceae	*Pennisetum polystachion*	Foxs tail grass	Nari valiga
7	Verbenaceae	*Lantana camera*	Common lantana	Ganda-pana, Garda-pana

3.1 Fauna diversity of the Natural stream between Nalanda reservoir and Wemedilla Tank

Taxonomic Group	Recorded from Sri Lanka					Conservation Status					
	Total	Native	Endemic	Migrant	Exotic	CR (PE)	CR	EN	VU	NT	DD
Land snails	1	1	1	0	0	0	0	0	0	0	0
Dragonflies	5	1	1	0	0	0	0	1	0	0	0
Butterflies	10	0	0	0	0	0	0	0	0	0	0
Crabs	1	1	0	0	0	0	0	1	0	0	0
Fishes	17	15	1	0	2	0	0	0	2	0	0
Amphibians	3	3	0	0	0	0	0	0	0	0	0
Reptiles	12	12	1	0	0	0	0	0	0	0	0
Birds	38	0	3	5	0	0	0	0	0	0	0
Mammals	9	9	2	0	0	0	1	0	1	0	0
Total	96	42	9	5	2	0	1	2	3	0	0

3.2.Funal diversity observed in and arund the Wemedilla Tank

Taxonomic Group	Recorded from Sri Lanka										
	Total	Native	Endemic	Migrant	Exotic	CR (PE)	CR	EN	VU	NT	DD
Land snails	1	1	0	0	0	0	0	0	0	0	0
Dragonflies	3	3	0	0	0	0	0	0	0	0	0
Butterflies	6	6	1	0	0	0	0	0	0	0	0
Crabs	0	0	0	0	0	0	0	0	0	0	0
Fishes	22	15	4	0	7	0	0	0	1	0	0
Amphibians	2	2	0	0	0	0	0	0	0	0	0

Reptiles	10	10	0	0	0	0	0	0	0	0	0
Birds	57	49	3	8	0	0	0	0	1	1	0
Mammals	16	0	2	0	2	0	0	0	1	1	0
Total	117	86	10	8	9	0	0	0	3	2	0

3.3. Floral and faunal diversity bserved along the trace of the bypass canal from Wemedilla tank to existing Devahoova feeder canal

A total of 27 plant species were recorded including two species that are endemic (*Argyreia populifolia* and *Vernonia zeylanica*) to Sri Lanka and eight species that are listed as exotic. A total of 64 faunal species were recorded including two endemic species. None of the faunal and floral species observed in the bypass canal trace is listed as Nationally Threatened species

Fauna diversity observed along the proposed bypass canal trace

Taxonomic Group	Recorded from Sri Lanka										
	Total	Native	Endemic	Migrant	Exotic	CR (PE)	CR	EN	VU	NT	DD
Land snails	2	1	0	0	1	0	0	0	0	0	0
Dragonflies	6	6	0	0	0	0	0	0	0	0	0
Butterflies	6	6	1	0	0	0	0	0	0	0	0
Crabs	0	0	0	0	0	0	0	0	0	0	0
Fishes	0	0	0	0	0	0	0	0	0	0	0
Amphibians	1	1	0	0	0	0	0	0	0	0	0
Reptiles	9	9	0	0	0	0	0	0	0	0	0
Birds	33	27	1	5	0	0	0	0	0	0	0
Mammals	7	5	0	0	3	0	0	0	0	0	0
Total	64	55	2	5	4	0	0	0	0	0	0

3.4. Floral and faunal diversity observed along the existing Devahoova feeder canal from the confluence with bypass canal up to diversion point

Total of 58 plant species were recorded in this section of the feeder canal including them endemic (*Argyreia populifolia* and *Vernonia zeylanica*) species and 20 exotic species. The faunal assemblage recorded comprise of 120 species including 9 endemic species and 4 species listed as Nationally Threatened.

Fauna diversity along the Devahoova feeder canal

Taxonomic Group	Recorded from Sri Lanka										
	Total	Native	Endemic	Migrant	Exotic	CR (PE)	CR	EN	VU	NT	DD
Snails	2	1	0	0	1	0	0	0	0	0	0
Dragonflies	9	9	0	0	0	0	0	0	0	0	0
Butterflies	21	21	1	0	0	0	0	0	0	0	0
Crabs	1	1	1	0	0	0	0	1	0	0	0
Fishes	15	13	3	0	2	0	0	0	2	0	0
Amphibians	2	2	0	0	0	0	0	0	0	0	0
Reptiles	8	8	0	0	0	0	0	0	0	0	0
Birds	53	46	3	7	0	0	0	0	0	0	0
Mammals	9	6	1	0	3	0	0	0	1	0	0
Total	120	107	9	7	6	0	0	1	3	0	0

4. THREATS TO HABITAT AND SPECIES

4.1 Threats to habitats

The Welamitiyawa Oya will not be subjected to any structural or flow regime changes and therefore the habitats in the stream will not undergo any changes from the present situation due to the proposed activities under package 1. The Devahoova feeder canal will be changed from an earthen canal at present to concrete lined canal which will change the habitats and microhabitats in this stretch of the canal which is 4.25 km long.

4.2 Threats to species

Flora: A single tree species, *Diospyros ebenum* listed as Endangered was found along the trace of the proposed bypass canal. Prioritization criteria listed in Section 2.3 was applied for this species and it did not qualified as a priority species that needs mitigatory action. This could be ascribed for the fact that this species shows a wide distribution within the dry zone, yet listed as endangered due to overexploitation. Therefore, none of the plant species observed requires any special mitigation measures.

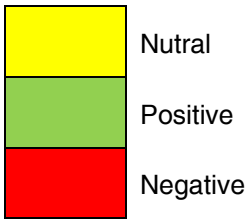
Family (APG III)	Species	English	Sinhala	Uses	Species status	NCS	GCS
Ebenaceae	*Diospyros ebenum*	Ebony	Kaluwara	None	IND	EN	DD

Fauna: Altogether 26 species of fauna that are listed as endemic/ threatened (refer table below) were recorded in the sampling sites which were tested using the prioritisation criteria given in section 2.3 and none of the 26 species came out as a priority species. As in the case of plants, the 26 species of endemic or threatened species observed show a wide distribution in the dry zone or in Sri Lanka and therefore does not come out as high priority species that require special mitigation measures. The proposed changes will have a positive influence on many of the aquatic species as the proposed changes will result in increased water availability. However, it should be noted that two species, *Oziothelphusa minneriyaensis* (freshwater crab) and *Pethia melanomaculata* (Tic-tac-to Barb) will be negatively affected as lining the feeder canal will remove the microhabitat requirement of these two species. *Oziothelphusa **m**inneriyaensis* use the canal bank to make their burrows which will no longer possible once the canal is lined with concrete. *Pethia melanomaculata* prefers shallow areas of the canal covered with vegetation which will be lost once the canal is lined with concrete. However, this will not have a significant negative impact on these two species as they show a wide distributed in the dry zone and the habitat that will be lost (Devahoova feeder canal) is not a part of its natural habitat, but one that was created by man about 15 years ago.

NO	Group	Family	Scientific Name	SpS	CoS	Effect Due to habitat change (1 indicates presence and 0 indicates absence)			
						NS	WT	BP	EC
1	**Snail**	Paludomidae	*Paludomus sp.*	END	NE	1	0	0	0

NO	Group	Family	Scientific Name	SpS	CoS	Effect Due to habitat change (1 indicates presence and 0 indicates absence)			
						NS	WT	BP	EC
2	Dragonfly	Cholorocyphidae	*Libellago greeni*	**END**	**EN**	1	0	0	0
3	Dragonfly	Libellulidae	*Trithemis festiva*	IND	VU	1	0	0	0
4	Butterfly	Papilionidae	*Troides darsius*	**END**	LC	1	0	0	0
5	Butterfly	Pieridae	*Appias galane*	**END**	LC	0	1	1	1
6	**Crab**	Gecarcinucidae	*Oziothelphusa minneriyaensis*	**END**	EN	1	0	0	1
7	Fish	Cyprinidae	*Esomus thermoicos*	**END**	LC	1	1	0	1
8	Fish	Cyprinidae	*Garra ceylonensis*	END	**VU**	1	0	0	0
9	Fish	Cyprinidae	*Labuca lankensis*	**END**	**VU**	1	1	0	1
10	Fish	Cyprinidae	*Pethia melanomaculata*	**END**	**VU**	0	0	0	1
11	Fish	Cyprinidae	*Puntius thermalis*	**END**	LC	1	0	0	0
12	Fish	Cyprinidae	*Systomus spilurus*	**END**	DD	0	1	0	0
13	Fish	Bagridae	*Mystus nanus*	**END**	LC	0	1	0	0
14	Fish	Siluridae	*Ompok ceylonensis*	**END**	**NE**	0	1	0	0
15	Reptiles	Scincidae	*Eutropis greeri*	**END**	NE	1	0	0	0
16	**Birds**	Phasianidae	*Gallus lafayetii*	**END**	LC	1	1	0	0
17	**Birds**	Picidae	*Dinopium psarodes*	**END**	LC	1	1	0	1
18	**Birds**	Picidae	*Chrysocolaptes stricklandi*	**END**	LC	1	0	0	0
19	**Birds**	Charadriidae	*Charadrius dubius*	WV	VU	0	1	0	0
20	**Birds**	Accipitridae	*Ichthyophaga ichthyaetus*	BrR	NT	0	1	0	0

NO	Group	Family	Scientific Name	SpS	CoS	Effect Due to habitat change (1 indicates presence and 0 indicates absence)			
						NS	WT	BP	EC
21	**Birds**	Hirundinidae	*Hirundo daurica*	**END**	LC	0	1	1	1
22	Mammals	Cercopithecidae	*Macaca sinica*	**END**	LC	1	1	0	1
23	Mammals	Mustelidae	*Lutra lutra*	IND	**VU**	1	1	0	1
24	Mammals	Viverridae	*Paradoxurus montanus*	**END**	**CR**	1	0	0	0
25	Mammals	Cervidae	*Muntiacus muntjak*	IND	NT	0	1	0	0
26	Mammals	Tragulidae	*Moschiola meminna*	**END**	LC	0	1	0	0



Abbreviations; NS - Natural Stream (Wemadilla Oya), WT - Wemadilla Tank, BP - Bypass Canal, EC - Existing Canal

5. CONCLUSIONS AND RECOMMENDATIONS

Only one tree species *Diospyros ebenum* was found along the proposed trace of the bypass canal met the basic requirement for applying prioritization criteria and having done so it did not qualify as a priority species that needs special mitigation. Likewise, 26 plant species met the basic requirement for applying prioritization criteria but none of the 26 species qualify as a priority species that needs special mitigation.

However, two species *Pethia melanomaculata and Oziothelphusa minneriyaensis* will be negatively affected due to habitat loss as in the Devahoova feeder canal as it will be converted from and earthen canal to a concrete lined canal. However, this cannot be considered as a significant impact

Special consideration has to be given to IAS management. Seven IAS plant species were recorded from the area and out of this *Mimosa pigra* and *Leucaena leucocephala* should be managed as the level of infestation is at a manageable state, especially at the Wemadilla, Ebbavala and Devahoova feeder canal area.

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ANNEXURES

Annex 1: Recorded floral species

	Family (APG III)	Species	English	Sinhala	Medicinal Plant	Species ststus	CoS (2012 RL)	GCS	total	BP	EC
1	Acanthaceae	*Hygrophila schulli*	Marsh barble	Katu ikiriya,	MP	IND	LC		1		1
2	Anacardiaceae	*Lannea coromandelica*	Wodier Jhingam	Hik	MP	IND	LC		1	1	1
3	Apocynaceae	*Carissa spinarum*		Heen-Karamba, Karamba	MP	IND	LC		1		1
4	Apocynaceae	*Nerium oleander*	Oleander	Kaneru	MP	EXO			1		1
5	Arecaceae	*Phonix pusilla*	Small wild date palm	Indi , Wal indi	MP	IND	LC		1		1
6	Apocynaceae	*Calotropis gigantea*	Giant milkweed,	Ela Wara,	MP-H	IND	LC		1		1
7	Apocynaceae	*Dregea volubilis*		Anguna,	MP	IND	LC		1		1
8	Asparagaceae	*Asparagus racemosus*	Wild asparagus	Hatawariya,	MP	IND	LC		1		1
9	Asteraceae	*Chromolaena odorata*	Siam Weed,	Podi singno maran	MP	EXO			1	1	1
10	Asteraceae	*Mikania cordata*	Mile-a-minute	Gam palu, Kehel palu	MP	EXO			1	1	1
11	Asteraceae	***Vernonia zeylanica***		Hin-botiya, Papula,	MP	END	LC		1		1
12	Bignoniaceae	*Sterospermum colais*		Lunumidella, Dunu-madala	MP	IND	LC		1	1	1
13	Combretaceae	*Terminalia arjuna*	Arjun	Kumbuk, Kumbalu	MP	IND	LC		1		1
14	Connvolvulaceae	***Argyreia populifolia***		Girithilla	MP	END	LC		1		1
15	Cyperaceae	*Cyperus haspan*		Hal-pan	MP	IND	LC		1		1
16	Ebenaceae	*Diospyros ebenum*	Ebony	kaluwara		IND	EN	DD	1	1	1
17	Phyllanthaceae	*Flueggea leucopyrus*	Water caltrop	Heen Katu pila,	MP	IND	LC		1		1
18	Euphorbiaceae	*Ricinus communis*	Castor oil plant,	Endaru	MP	EXO			1		1
19	Fabaceae	*Abrus precatorius*	Crab's eyes,	Olinda, Hunida	MP	IND	LC		1	1	1
20	Fabaceae	*Acacia leucophloea*		Katu-Andara, Maha-Andara	MP	IND	LC		1		1
21	Fabaceae	*Albizia lebbeck*	Parrot tree / Siris tree	Mara, Suriyamara	MP	IND	NT		1		1
22	Fabaceae	*Albizia saman*	Rain tree	Pini mara / Mara, Para mara	MP	EXO			1		1
23	Fabaceae	*Bauhinia racemosa*		Maila	MP	IND	LC		1		1

	Family (APG III)	Species	English	Sinhala	Medicinal Plant	Species ststus	CoS (2012 RL)	GCS	total	BP	EC
24	Fabaceae	*Cassia fistula*	Indian laburnum	Ehela, Erahandi, Erahendi	MP	EXO			1	1	1
25	Fabaceae	*Clitoria ternatea*	Butterfly pea	Katarodu, Nil-katarolu	MP-H	IND	LC		1		1
26	Fabaceae	*Derris canarensis*		Kalu kala wel / Diya kala wel	MP	IND	NT		1	1	1
27	Fabaceae	*Leucaena leucocephala*	Wild tamarind, Ipil ipil	Ipil-Ipil	MP	EXO			1	1	1
28	Fabaceae	*Mimosa invisa*	Giant false sensitve plant	Wel Nidikumba		EXO			1	1	1
29	Fabaceae	*Mimosa pudica*	Sensitive plant, Touch me not	Nidi-kumba	MP	EXO			1	1	1
30	Fabaceae	*Senna alata*	Candle bush, Candle stick, Ringworm shrub	Bu-Tora, Rata-tora,	MP-H	EXO			1		1
31	Fabaceae	*Senna auriculata*	Matara tea, Tanner's cassia	Ranawara	MP-H	IND			1		1
32	Fabaceae	*Senna occidentalis*	Coffee-senna, Coffee-weed, Fedid cassia	Peni-Tora, Hiwal Tora	MP	IND	LC		1	1	1
33	Fabaceae	*Tamarindus indica*	Indian date, Tamarind	Siyambala,	MP	EXO			1		1
34	Fabaceae	*Tephrosia purpurea*	Common tephrosia, Fishpoison,	Pila, Katuru pila, Gam pila	MP-H	IND	LC		1	1	1
35	Lamiaceae	*Ocimum tenuiflorum*	Sacred basil, Holi basil	Maduru-tala,	MP-H	IND	LC		1	1	1
36	Malvaceae	*Gossypium arboreum*	Cotton, Indian cotton / common cotton	Kapu	MP	EXO			1		1
37	Meliaceae	*Azadirachta indica*	Margosa, Neem	Kohomba	MP	EXO			1	1	1
38	Meliaceae	*Walsura trifoliolata*		Kiri koan / Mal petta	MP	IND			1		1
39	Moraceae	*Artocarpus heterophyllus*	Jak, Yak, Jak fruit	Kos	MP	EXO			1	1	1
40	Moraceae	*Ficus racemosa*	Cluster fig, Gulafig / Cluster fig / Atti	Attikka	MP-H	IND	LC		1		1
41	Moraceae	*Streblus taxoides*	Fig-lime	Gongotu, Katupila, Polkatu	MP	IND	LC		1	1	1
42	Moringaceae	*Moringa oleifera*	Horse radish tree, Drumstic tree	Murunga	MP	EXO			1		1
43	Myrtaceae	*Syzygium cumini*	Java plum, Jambol,	Ma-Dan, Dan	MP	IND	LC		1	1	1

	Family (APG III)	Species	English	Sinhala	Medicinal Plant	Species ststus	CoS (2012 RL)	GCS	total	BP	EC
			Black plum								
44	Apocynaceae	*Hemidesmus indicus*	Indian sarssaparilla	Heen-iramusu, Iramusu	MP	IND	LC		1	1	1
45	Poaceae	*Panicum maximum*	Guinea grass	Gini tana , Rata tana,	MP	EXO			1	1	1
46	Poaceae	*Pennisetum polystachion*	Fox tailed grass	Nari waliga		EXO			1		1
47	Rhamnaceae	*Zizyphus mauritiana*	Indian Jujube, Chinese apple,	Maha-Debara,	MP	IND	LC		1	1	1
48	Rubiaceae	*Morinda coreia*	Morinda tree	Ahu	MP-H	IND	LC		1	1	1
49	Rutaceae	*Limonia acidissima*	Elephant-apple, Wood-apple	Divul	MP	IND	LC		1	1	1
50	Rutaceae	*Pleiospermium alatum*		Tunpath-Kurundu	MP	IND	LC		1	1	1
51	Sapindaceae	*Cardiospermum halicacabum*	Ballon vine	Penela-wel, Wel penela	MP	IND	LC		1	1	1
52	Sapindaceae	*Schleichera oleosa*	Ceylon oak / Lac tree	Kon	MP	IND	LC		1	1	1
53	Malvaceae	*Berrya coridifolia*	Trincomalee wood	Halmilla	MP	IND	LC		1		1
54	Malvaceae	*Grewia damine*	Dhaman	Daminiya, Damunu	MP	IND	LC		1	1	1
55	Malvaceae	*Muntingia calabura*	Jamaican chrry, Jam-tree	Jam	MP	EXO			1	1	1
56	Typhaceae	*Typha agustifolia*	Bullrush, Cat-tail,	Hambu-pan	MP	IND	LC	LC	1		1
57	Verbenaceae	*Lantana camera*	Common lantana, Pickly lantana,	Ganda-pana, Garda-pana	MP	EXO			1	1	1
58	Verbenaceae	*Stachytarpheta indica*	Dog's tail	Balunakuta / Nil nakuta	MP	OQ			1	1	1
59	Lamiaceae	*Vitex altissima*		Milla,Kaha-Milla, , Miyan-milla,		IND	NT		1	1	1

Annex 2: Recorded faunal species

Snails

No	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	ES
1	Achatinidae	*Lissachatina fulica*	Giant African snail		EXO	NE	0	0	1	1
2	Ampullariidae	*Pila globosa*	Aquatic snail		IND	NE	0	1	1	1
3	Paludomidae	*Paludomus sp.*	Aquatic snail		END	NE	1	0	0	0
							1	**1**	**2**	**2**

Dagonflies

No	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Cholorocyphidae	*Libellago greeni*	Green's Gem		**END**	**EN**	1	0	0	0
2	Protoneuridae	*Anax indicus*	Elephant Emperor		IND	LC	0	0	0	1
3	Libellulidae	*Orthetrum sabina*	Green Skimmer		IND	LC	0	0	1	1
4	Libellulidae	*Brachythemis contaminata*	Asian Groundling		IND	LC	1	1	1	1
5	Libellulidae	*Crocothemis servilia*	Oriental Scarlet		IND	LC	0	0	0	1
6	Libellulidae	*Diplacodes trivialis*	Blue Percher		IND	LC	0	0	1	1
7	Libellulidae	*Neurothemis tullia*	Pied Parasol		IND	LC	0	0	0	1
8	Libellulidae	*Trithemis festiva*	Indigo Dropwing		IND	VU	1	0	0	0
9	Libellulidae	*Rhyothemis variegata*	Varigated Flutter		IND	LC	0	0	1	1
10	Libellulidae	*Pantala flavescens*	Wandering Glider		IND	LC	1	1	1	1
11	Libellulidae	*Tramea limbata*	Sociable Glider		IND	LC	1	1	1	1
							5	**3**	**6**	**9**

Butterflies

No	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Papilionidae	*Pachliopta hector*	Crimson rose	Maha rosa papilia	IND	LC	1	1	1	1
2	Papilionidae	*Papilio demoleus*	Lime butterfly	Kaha papilia	IND	LC	0	0	0	1
3	Papilionidae	*Papilio polymnestor*	Blue mormon	Maha nilaya	IND	LC	1	0	0	1

No	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
4	Papilionidae	*Papilio polytes*	Common mormon	Kalu papilia	IND	LC	0	0	0	1
5	Papilionidae	*Troides darsius*	Ceylon birdwing	Maha kurulu piya papiliya	**END**	LC	1	0	0	0
6	Pieridae	*Appias galane*	Lesser albatross	Kuda sudana	**END**	LC	0	1	1	1
7	Pieridae	*Catopsilia pomona*	Lemon emigrant	Kaha piyasariya	IND	LC	0	0	0	1
8	Pieridae	*Catopsilia pyranthe*	Mottled emigrant /	Thith-piya piyasariya	IND	LC	0	0	0	1
9	Pieridae	*Colotis amata*	Small salmon arab	Punchi rosa sudana	IND	LC	0	0	0	1
10	Pieridae	*Delias eucharis*	Jezebel	Podu Maha-sudda	IND	LC	0	0	0	1
11	Pieridae	*Eurema hecabe*	Common grass yellow	Maha kahakolaya	IND	LC	0	1	1	1
12	Nymphalidae	*Acraea violae*	Tawny costor	Thambily panduru-boraluwa	IND	LC	0	0	0	1
13	Nymphalidae	*Danaus chrysippus*	Plain tiger	Podu koti-thambiliya	IND	LC	1	1	1	1
14	Nymphalidae	*Danaus genutia*	Common tiger	Iri Koti-thambiliya	IND	LC	1	0	0	1
15	Nymphalidae	*Euploea core*	Common crow	Podu kaka-kotithiyaya	IND	LC	1	1	0	1
16	Nymphalidae	*Hypolimnas misippus*	Danaid Eggfly	Kela Alankarikya	IND	LC	0	0	0	1
17	Nymphalidae	*Junonia almana*	Peacock pansy	Monera alankarikya	IND	LC	0	0	0	1
18	Nymphalidae	*Junonia atlites*	Grey pansy	Aluwan alankarikya	IND	LC	0	0	0	1
19	Nymphalidae	*Neptis hylas*	Common sailor	Gomara selaruwa	IND	LC	0	0	0	1
20	Nymphalidae	*Parantica aglea*	Glassy tiger	Suduwan nil-kotithiya	IND	LC	0	0	0	1
21	Nymphalidae	*Tirumala limniace*	Blue tiger	Podu nil-kotithiya	IND	LC	0	0	1	0
22	Nymphalidae	*Ypthima ceylonica*	White four-ring	Podu heen-dumburuwa	IND	LC	0	0	0	1
23	Lycaenidae	*Actyolepis puspa*	Common Hedge Blue	Mal Panduru-nilaya	IND	LC	1	0	0	0
24	Lycaenidae	*Castalius rosimon*	Common Pierrot	Podu Mal-nilaya	IND	LC	1	0	0	0
25	Lycaenidae	*Prosotas nora*	Common Lineblue	Podu Nil-iriya	IND	LC	1	0	0	1
26	Lycaenidae	*Spindasis vulcanus*	Common Silverline	Podu Ridee-nilaya	IND	LC	0	0	1	0
27	Hesperiidae	*Hasora chromus*	Common Banded awl	Irilieesa	IND	LC	1	1	0	0
							10	**6**	**6**	**21**

Freshwater Crabs

No	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Gecarcinucidae	*Oziothelphusa minneriyaensis*			**END**	EN	1	0	0	1
							1	0	0	1

Freishwater fishes

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Cyprinidae	*Amblypharyngodon melettinus*	Silver carplet	Soraya	IND	LC	1	1	0	1
2	Cyprinidae	*Catla catla*	Catla	Catla	**EXO**	NE	0	1	0	0
3	Cyprinidae	*Cirrhunus mirigal*	Mirigal	Mirigal	**EXO**	NE	0	1	0	0
4	Cyprinidae	*Cyprinus carpio*	Common carp	Rata carpaya	**EXO**	NE	0	1	0	0
5	Cyprinidae	*Devario malabaricus*	Giant Danio	Dankola Sayala	IND	LC	1	1	0	1
6	Cyprinidae	*Esomus thermoicos*	Flying barb	Revul Dandiya	**END**	LC	1	1	0	1
7	Cyprinidae	*Garra ceylonensis*	Stone sucker	Gal Pandiya	END	**VU**	1	0	0	0
8	Cyprinidae	*Hypothalmichthys nobilis*	Bighead carp	Hisa loku capaya	**EXO**	NE	0	1	0	0
9	Cyprinidae	*Labeo rohita*	Rohu	Rohu/ rahu	**EXO**	NE	0	1	0	0
10	Cyprinidae	*Labuca lankensis*	Lanka labuca	Lanka karaedaya	**END**	**VU**	1	1	0	1
11	Cyprinidae	*Pethia melanomaculata*	Tic tac-toe barb	Depulliya	**END**	**VU**	0	0	0	1
12	Cyprinidae	*Puntius bimaculatus*	Redside barb	Ipili Kadaya	IND	LC	1	0	0	1
13	Cyprinidae	*Puntius dorsalis*	Longsnouted bard	Bimtholla	IND	LC	1	0	0	1
14	Cyprinidae	*Puntius thermalis*	Swamp barb	Kota Pethiya	**END**	LC	1	0	0	0
15	Cyprinidae	*Rasbora microcephalus*	Thin line Rasbora	Caveri Randiya	IND	LC	1	1	0	1
16	Cyprinidae	*Systomus spilurus*	Olive barb	Mas Pethiya	**END**	DD	0	1	0	0
17	Cobitidae	*Lepidocephalichthys thermalis*	Common spiny loach	Thith Ahirawa	IND	LC	1	0	0	1
18	Bagridae	*Mystus zeylanicus*	Sri Lanka mystus	Path ankutta	**END**	LC	0	1	0	0
19	Bagridae	*Mystus vittatus*	Striped dwarf catfish	Iri ankutta	IND	LC	1	1	0	1
20	Siluridae	*Ompok ceylonensis*	Dry-zone Butter catfish	Walapoththa	**END**	**NE**	0	1	0	0
21	Heteropneustidae	*Heteropneustes fossilis*	Stinging catfish	Hunga	IND	LC	0	1	0	0
22	Cichlidae	*Oreochromis mosambicus*	Tilapia	Tilapia/ Koraliya	**EXO**	AIS	1	1	0	1
23	Cichlidae	*Oreochromis niloticus*	Tilapia	Tilapia/ Koraliya	**EXO**	NE	1	1	0	1

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
24	Gobiidae	*Awaous melanocephalus*	Scribbled goby	Bali Weligouva	IND	LC	1	1	0	1
25	Gobiidae	*Glossogobius giuris*	Bar Eyed Goby	Maha gan weligouva	IND	LC	1	1	0	1
26	Anabantidae	*Anabas testudineus*	Climbing perch	Kavaiya / Pol kavaiya	IND	LC	0	1	0	0
27	Mastacembelidae	*Mastacembelus armetus*	Marbled spiny eel	Gan theliya	IND	LC	1	1	0	0
28	Channidae	*Channa gachua*	Brown snakehead	Paradel Kanaya	IND	LC	0	0	0	1
29	Channidae	*Channa punctata*	Spotted snakehead	Mada Kanaya	IND	LC	1	0	0	0
30	Channidae	*Channa striata*	Murrel	Loola	IND	LC	0	1	0	0
							17	**22**	**0**	**15**

Amphibian

	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Bufonidae	*Duttaphrynus melanostictus*	Common house toad	Sulaba geai gemba	IND	LC	1	0	0	0
2	Dicroglossidae	*Euphlyctis cyanophlyctis*	Skipper frog	Utpatana madiya	IND	LC	1	0	0	0
3	Dicroglossidae	*Euphlyctis hexadactylus*	Sixtoe green frog	SaEangili pala madiya	IND	LC	0	1	0	1
4	Dicroglossidae	*Zakerana shyadrensis*	Common paddy field frog	Sulaba vel madiya	IND	LC	1	1	0	1
5	Dicroglossidae	*Hoplobatrachus crassus*	Jerdon's bull frog	Jerdonge hala madiya	IND	LC	0	0	1	0
							3	**2**	**1**	**2**

Reptiles

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	PB	EC
1	Bataguridae	*Melanochelys trijuga*	Parker's black turtle	Parkerge gal ibba	IND	LC	1	0	0	0
2	Agamidae	*Calotes calotes*	Green garden lizard	Pala katussa	IND	LC	1	1	1	1
3	Agamidae	*Calotes versicolor*	Common garden lizard	Gara katussa	IND	LC	1	1	1	1
4	Gekkonidae	*Hemidactylus frenatus*	Common house-gecko	Sulaba gehuna	IND	LC	1	1	1	0

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	PB	EC
5	Scincidae	*Eutropis carinata*	Common skink	Sulaba hikanala	IND	LC	0	0	0	1
6	Scincidae	*Eutropis greeri*	Lowland Green little skink	Pahatharata Pingu hikanala	**END**	NE	1	0	0	0
7	Varanidae	*Varanus bengalensis*	Land monitor	Talagoya	IND	LC	1	1	1	1
8	Varanidae	*Varanus salvator*	Water monitor	Kabaragoya	IND	LC	1	1	1	0
9	Pythonidae	*Python molurus*	Indian python	Pimbura	IND	LC	1	1	1	0
10	Colubridae	*Ahaetulla nasuta*	Green vine snake	Ahaetulla	IND	LC	1	1	0	1
11	Colubridae	*Ptyas mucosa*	Rat snake	Gerandiya.	IND	LC	1	1	1	1
12	Elapidae	*Naja naja*	Indian cobra	Naya	IND	LC	1	1	1	1
13	Viperidae	*Daboia russelii*	Russell's viper	Tith polonga.	IND	LC	1	1	1	1
							12	**10**	**9**	**8**

Birds

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Phasianidae	*Gallus lafayetii*	Sri Lanka Junglefowl	Sri Lanka Wali-kukula	**END**	LC	1	1	0	0
2	Phasianidae	*Pavo cristatus*	Indian Peafowl	Monora	BrR	LC	0	1	1	1
3	Turnicidae	*Turnix suscitator*	Barred Button-quail	Bola Watuuruwa	BrR	LC	0	1	0	0
4	Picidae	*Dendrocopos mahrattensis*	Yellow-crowned Woodpecker	Kaha-silu Gomara-karela	BrR	NT	0	1	0	0
5	Picidae	*Dinopium psarodes*	Sri Lanka Lesser Flameback	Sri Lanka Rath-karela	**END**	LC	1	1	0	1
6	Picidae	*Chrysocolaptes stricklandi*	Sri Lanka Greater Flameback	Lepita Maha-karela	**END**	LC	1	0	0	0
7	Ramphastidae	*Megalaima zeylanica*	Brown-headed Barbet	Polos Kottoruwa	BrR	LC	1	1	1	1
8	Ramphastidae	*Megalaima haemacephala*	Coppersmith Barbet	Rathlaye Kottoruwa	BrR	LC	0	0	0	1
9	Alcedinidae	*Alcedo atthis*	Common Kingfisher	Mal Pilihuduwa	BrR	LC	1	1	0	1
10	Alcedinidae	*Pelargopsis capensis*	Stork-billed Kingfisher	Manathudu Madi-pilihuduwa	BrR	LC	1	1	0	1
11	Alcedinidae	*Halcyon smyrnensis*	White-throated Kingfisher	Layasudu Madi-pilihuduwa	BrR	LC	1	1	0	1
12	Meropidae	*Merops philippinus*	Blue-tailed Bee-eater	Nilpenda Binguharaya	BrRWV	NE	1	1	1	1
13	Cuculidae	*Eudynamys scolopacea*	Asian Koel	Kowula	BrR	LC	1	1	1	1

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
14	Cuculidae	*Centropus sinensis*	Greater Coucal	Ati-kukula	BrR	LC	1	1	1	1
15	Psittacidae	*Psittacula krameri*	Rose-ringed Parakeet	Rana Girawa	BrR	LC	1	1	1	1
16	Apodidae	*Cypsiurus balasiensis*	Asian Palm Swift	Asiaa Thal-thurithaya	BrR	LC	1	1	1	1
17	Columbidae	*Streptopelia chinensis*	Spotted Dove	Alu Kobeiyya	BrR	LC	1	1	1	1
18	Rallidae	*Amaurornis phoenicurus*	White-breasted Waterhen	Laya-sudu Korawakka	BrR	LC	0	1	0	1
19	Scolopacidae	*Actitis hypoleucos*	Common Sandpiper	Podu Siliththa	WV	NE	0	1	0	0
20	Charadriidae	*Charadrius dubius*	Little Ringed Plover	Punchi Mala Oleviya	BrR & WV	VU	0	1	0	0
21	Charadriidae	*Vanellus indicus*	Red-wattled Lapwing	Rath-yatimal Kirella	BrR	LC	0	1	1	1
22	Laridae	*Chlidonias hybrida*	Whiskered Tern	Alupiya Kangul-lihiniya	WV	NE	0	1	0	0
23	Accipitridae	*Ichthyophaga ichthyaetus*	Grey-headed Fish-eagle	Alu-his Masukussa	BrR	NT	0	1	0	0
24	Accipitridae	*Spilornis cheela*	Crested Serpent Eagle	Silu Sarapakussa	BrR	LC	1	1	1	1
25	Phalacrocoracidae	*Phalacrocorax niger*	Little Cormorant	Punchi Diyakava	BrR	LC	0	1	0	1
26	Ardeidae	*Egretta garzetta*	Little Egret	Punchi Anu-koka	BrR	LC	0	1	0	1
27	Ardeidae	*Ardea cinerea*	Grey Heron	Alu Koka	BrR	LC	0	1	0	0
28	Ardeidae	*Casmerodius albus*	Great Egret	Sudu maha-koka	BrR	LC	0	1	0	1
29	Ardeidae	*Mesophoyx intermedia*	Intermediate Egret	Sudu Madi-koka	BrR	LC	0	1	0	1
30	Ardeidae	*Bubulcus ibis*	Cattle Egret	Geri-koka	BrR	LC	0	1	0	1
31	Ardeidae	*Ardeola grayii*	Indian Pond Heron	Kana-koka	BrR	LC	1	1	0	1
32	Ardeidae	*Butorides striatus*	Straited Heron	Pala-koka	BrR	LC	0	1	0	0
33	Ciconiidae	*Anastomus oscitans*	Asian Openbill	Vivarathuduwa	BrR	LC	0	1	0	0
34	Pittidae	*Pitta brachyura*	Indian Pitta	Avichchiya	WV	NE	1	1	1	1
35	Chloropseidae	*Chloropsis jerdoni*	Blue-winged Leafbird	Nilpiya Kolarisiya	BrR	LC	1	1	1	1
36	Laniidae	*Lanius cristatus*	Brown Shrike	Bora Sabariththa	WV	NE	1	1	1	1
37	Oriolidae	*Oriolus xanthornus*	Black-hooded Oriole	Kahakurulla	BrR	LC	1	1	1	1
38	Dicruidae	*Dicrurus caerulescens*	White-bellied Drongo	Kawuda	BrR	LC	1	1	1	1
39	Monarchidae	*Terpsiphone paradisi*	Asian Paradise- flycathcher	Asia Rahanmara	BrR/WV	LC	1	1	1	1
40	Corvidae	*Corvus levaillantii*	Large-billed Crow	Kalu Kaputa	BrR	LC	1	1	1	1
41	Campephagidae	*Coracina melanoptera*	Black-headed Cuckooshrike	Kalu-his Kovul-saratiththa	BrR	LC	1	0	0	0
42	Campephagidae	*Pericrocotus cinnamomeus*	Small Minivet	Punchi Miniviththa	BrR	LC	1	0	0	1
43	Campephagidae	*Tephrodornis pondicerianus*	Common Woodshrike	Podu Wana-saratiththa	END	LC	0	0	0	1

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
44	Campephagidae	*Hemipus picatus*	Bar-winged Flycatcher-shrike	Wairapiya Masi-saratiththa	BrR	LC	0	0	0	1
45	Aegithinidae	*Aegithina tiphia*	Common Iora	Podu Iorawa	BrR	LC	1	1	1	1
46	Muscicapidae	*Muscicapa muttui*	Brown-breasted Flycatcher	Layabora Masimara	WV	NE	0	0	0	1
47	Muscicapidae	*Copsychus saularis*	Oriental Magpie Robin	Polkichcha	BrR	LC	0	0	0	1
48	Muscicapidae	*Copsychus malabaricus*	White-rumped Shama	Wana Polkichcha	BrR	LC	1	1	0	0
49	Muscicapidae	*Saxicoloides fulicata*	Indian Robin	Indu Kalukichcha	BrR	LC	0	1	1	1
50	Sturnidae	*Acridotheres tristis*	Common Myna	Mayna	BrB	LC	1	1	1	1
51	Hirundinidae	*Hirundo rustica*	Barn Swallow	Atu Wahilihiniya	WV	NE	1	1	1	1
52	Hirundinidae	*Hirundo daurica*	Red-rumped Swallow	Nithamba rathu Wahilihiniya	**END**	LC	0	1	1	1
53	Pycnonotidae	*Pycnonotus cafer*	Red-vented Bulbul	Kondaya	BrR	LC	1	1	1	1
54	Pycnonotidae	*Pycnonotus luteolus*	White-browed Bulbul	Bamasudu Kondaya	BrR	LC	1	1	1	1
55	Cisticolidae	*Prinia hodgsonii*	Grey-breasted Prinia	Grey-breasted Prinia	BrR	LC	0	1	0	1
56	Cisticolidae	*Prinia socialis*	Ashy Prinia	Alu Priniya	BrR	LC	0	0	0	1
57	Cisticolidae	*Prinia inornata*	Plain Prinia	Sarala Priniya	BrR	LC	0	0	0	1
58	Zosteropidae	*Zosterops palpebrosus*	Oriental White-eye	Peradigu Sithasiya	BrR	LC	1	1	1	1
59	Sylviidae	*Acrocephalus dumetorum*	Blyth's Reed Warbler	Blyths Panraviya	WV	NE	0	1	0	1
60	Sylviidae	*Orthotomus sutorius*	Common Tailorbird	Battichcha	BrR	LC	1	1	1	1
61	Timalidae	*Turdoides affinis*	Yellow-billed Babbler	Demalichcha	BrR	LC	1	1	1	1
62	Dicaeidae	*Dicaeum erythrorhynchos*	Pale-billed Flowerpecker	Lathudu Pililichcha	BrR	LC	1	1	1	1
63	Nectariniidae	*Nectarina zeylonica*	Purple-rumped Sunbird	Nithamba Dam Sutikka	BrR	LC	1	1	1	1
64	Nectariniidae	*Nectarina asiatica*	Purple Sunbird	Dam Sutikka	BrR	LC	0	1	1	1
65	Motacillidae	*Motacilla cinerea*	Grey Wagtail	Alu Halapenda	WV	NE	1	0	0	0
480	Motacillidae	*Anthus rufulus*	Paddyfield Pipit	Keth Varatichcha	BrR	LC	0	1	1	0
67	Estrididae	*Lonchura striata*	White-rumped Munia	Nithamba Sudu Weekurulla	BrR	LC	1	1	1	1
68	Estrididae	*Lonchura punctulata*	Scaly-breasted Munia	Laya Kayuru Weekurulla	BrR	LC	1	1	1	1
							38	**57**	**33**	**53**

Mammals

NO	Family	Scientific Name	English Name	Sinhala Name	SpS	CoS	NS	WT	BP	EC
1	Cercopithecidae	*Macaca sinica*	Sri Lanka toque monkey	Sri Lanka Rilawa	**END**	LC	1	1	0	1
2	Cercopithecidae	*Semnopithecus priam*	Grey langur	Eli-wdura	IND	LC	0	1	0	1
3	Canidae	*Canis aureus*	Jackal	Nariya / Hiwala	IND	LC	1	1	0	0
4	Canidae	*Canis familiaris*	Doestic dog	Balla	DOM	NE	0	1	1	1
5	Felidae	*Felis cattus*	Domestic cat	Balala/ Pusa	DOM	NE	0	0	1	1
6	Herpestidae	*Herpestes edwardsii*	Grey mongoose	Alu Mugatiya	IND	LC	0	1	1	1
7	Mustelidae	*Lutra lutra*	Otter	Diya-balla	IND	**VU**	1	1	0	1
8	Viverridae	*Paradoxurus hermaphoditus*	Palm civet	Uguduwa	IND	LC	1	0	0	0
9	Viverridae	*Paradoxurus montanus*	Sri Lanka Brown palm civet	Sri Lanka Sapumal Kalawedda	**END**	**CR**	1	0	0	0
10	Viverridae	*Viverricula indica*	Ring-tailed civet	Urulewa	IND	LC	1	1	0	0
11	Bovidae	*Bos indicus*	Domestic cattle	Sinhala Elaharaka	DOM	NE	0	1	1	1
12	Cervidae	*Axis axis*	Spotted deer	Tith Muwa	IND	LC	0	1	0	0
13	Cervidae	*Muntiacus muntjak*	Barking deer	Olu Muwa / Weli Muwa	IND	NT	0	1	0	0
14	Suidae	*Sus scrofa*	Wild boar	Wal Ura	IND	LC	1	1	0	0
15	Tragulidae	*Moschiola meminna*	Sri Lanka mouse-deer	Sri Lanka Meminna	**END**	LC	0	1	0	0
16	Hystricidae	*Hystrix indica*	Porcupine	Ittewa	IND	LC	0	1	0	0
17	Sciuridae	*Funambulus palmarum*	Palm squirrel	Leena	IND	LC	1	1	1	1
18	Sciuridae	*Ratufa macroura*	Giant squirrel	Dandu-leena	IND	LC	1	1	1	1
19	Leporidae	*Lepus nigricollis*	Black-naped hare	Wal Hawa	IND	LC	0	1	1	0
							9	**16**	**7**	**9**

Abbreviations; SpS - Species Status, CoS - Conservation Status, NS - Natural Stream (Wemadilla Oya), WT - Wemadilla Tank, BP - Bypass Canal, EC - Existing Canal

Annex 3: Photo-catalogue

Nalanda Reservoir near Ebbavala (upstream)

Ebbavala anicut

Sampling point 01 -Welamitiyava Oya near Ebbavala (downstream)

Sampling Point 02 - Welamitiyava Oya (downstream)

Sampling Point 03 - Welamitiyava Oya (downstream)

Sampling Point 04 –Upper Flood level of Wemadilla tank

Sampling point 05 -Wemadilla tank (near Bypass canal opening)

Sampling stretch 06 – Bypass canal path

Sampling stretch 07- Devahoova feeder canal

Sampling stretch 15 – Canal diversion point

***Pethia melanomaculata* – Endemic and Nationally vulnarable (VU)**

Habitat of *Pethia melanomaculata* at sampling point 13 (Devahoova feeder canal)

***Mimosa pigra* – Invasive plant**

***Mimosa pigra* covering either side of the natural stream at the Ebbavala.**

***Mimosa pigra* invade the left bank o the Wemadilla tank upper flood level (near sampling point 05)**

***Mimosa pigra* invade the lft bank o the Wemadilla tank upper flood level (near sampling point 05)**

Invasive plant *Leucaena leucocephala* (Ipil ipil)one of the doment IAs at the bothside of the Devahoova feeder canal

Invasive plant *Lantana camera* (ganda-pana) another doment IAs at the bothside of the Devahoova feeder canal

Fish observation from stream bank

Fish sampling using nets

Fish observation by snorkling

Fish data gathered by communication with fishermen at Wemedilla tank

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Pethia melanomaculata **(E- Tic tac-toe barb; S-Depulliya) Endemic Nationally Vulnerable (VU) species**

ANNEX 10 : GRIEVANCE REDRESS MECHANISMS NWPCP

I. Establishment of the Grievance Redress Mechanism at NWPCP

a) Below key actions were undertaken to introduce GRM and establish the GRC (*please refer Annexure 9 for GRM hand bill of MWSIP*) in conformance with the CEA approval stipulations and the ADB Safeguard Policy (SPS 2009);

No.	Theme of the program conducted	Target group	Resource persons	Date/ No. of participants
1	Overall stakeholder consultation & awareness session on the GRM (*refer pictures under no.1*)	Relevant government agencies in Kurunegala and Dambulla Districts, whre NWPCP is implemented	PIU, PMU officers	08/09/2016 86
2	Divisional level stakeholder consultation & awareness session on the GRM and initiation of Grievance Redress Committee (GRC) in Minipe	Government officers within Galewela Divisional Secretary Division	PIU officers	27/07/2016 15
3	GND level stakeholder consultation & awareness session on the GRM and Formation of Level 2 Grievance Redress Committee (GRC) in Ranweditawa GND at Galewela DSD	Farmers & Government officers within Ranweditawa Grama Niladhari Division	PIU officers	05/08/2016 30
4	GND level stakeholder consultation & awareness session on the GRM and Formation of Level 2 Grievance Redress Committee (GRC) in Danduyaya GND at Galewela DSD	Government officers within Danduyaya Grama Niladhari Division	PIU officers	08/08/2016 25
5	GND level stakeholder consultation & awareness session on the GRM and Formation of Level 2 Grievance Redress Committee (GRC) in Pahala Bambawa GND at Galewela DSD	Government officers within Pahala Bambawa Grama Niladhari Division	PIU officers	05/08/2016 12

b) Below community awareness and consultative sessions were undertaken to facilitate Project implementation;

No.	Theme of the program conducted	Target group	Resource persons	Date/ No. of participants
1	Wemedilla (NCB-1 Project area) seasonal meeting in Welamitiyawa-GND in Dambulla-DSD	Key government officers in the division and farmers	PIU officers	27/10/2016 34
2	Consultation on access roads for ICB-1 & 2 at Pibidunugama in Polpithigma -DSD	GN and villagers	PIU officers	16/08/2016 12
3	Consultation on access roads for ICB-1 & 2 at Pothuwila in Polpithigma-DSD	GN and villagers	PIU officers	16/08/2016 22
4	Consultation on access roads for ICB-1 & 2 at Herathgama in Polpithigma-DSD	GN and villagers	PIU officers	29/08/2016 33

Photographic presentation

1. Overall stakeholder consultation & awareness session 08.09.2016

2. Divisional level session for officers within Galewela DSD on the GRM 27/07/2016

3. GRC formation in Ranweditawa Grama Niladhari Division 05/08/2016

4. GRC formation in Ranweditawa Grama Niladhari Division 08/08/2016

5. GRC formation in Pahala Bambawa Grama Niladhari Division 05/08/2016