

Initial Environmental Examination (Draft)

June 2018

Sri Lanka: Science and Technology Human
Resource Development Project
—Proposed Faculty of Computing and Technology
Building Complex, University of Kelaniya, Sri Lanka
(Part II-Annexes)

CURRENCY EQUIVALENTS

(as of 31 May 2018)

Currency unit	–	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	\$0.00633
\$1.00	=	SLRs158.03

NOTE

In this report, "\$" refers to US dollars unless otherwise stated.

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INITIAL ENVIRONMENT EXAMINATION FOR UNIVERSITY OF
KELANIYA FACULTY OF COMPUTING AND TECHNOLOGY

PART II: ANNEXES

ANNEX 01: GREEN BUILDING APPLICATION

කාර්යාලීය ප්‍රයෝජනය සඳහා
ලියාපදිංචි අංකය :
සංක්‍රම අංකය :
දිනය :



කෘතීමය සංවර්ධන අධිකාරිය
හරිත තොරතුරු හිමි සඳහා අයදුම්පත්‍රය

සහායක
 කෘතීමය සංවර්ධන අධිකාරිය.

01. ඉල්ලුම්කරුගේ තොරතුරු :-

ඉදිකිරීමට යෝජිත තොරතුරු හිමිලේ අයත් ආයතනය :

ලිපිනය:.....

ආයතනය අයත් අවිනෝය-යය :

ඉදිකිරීමට යෝජිත තොරතුරු හිමිලේ සම්පත්කරු වනකීම් දරණ නිලධාරියාගේ

නම :

සහායක :

දුරකථනය අංකය :

02. තොරතුරු හිමිලේ ඉදිකිරීමට යෝජිත ස්ථානය පිළිබඳ තොරතුරු :-

ස්ථානය:.....

පළාත් පාලන ආයතනය :

ලිපිනය :

යෝජිත භූමියට පිවිසිය හැකි පාර්ශවය පැහැදිලි කරගතකින් දක්වන්න :

03. ඉඩමේ විස්තරය :-

ඉඩමේ ප්‍රමාණය:.....

ඉඩමේ මුල් / වර්තමාන භාවිතය:.....

යෝජිත තොරතුරු හිමිලේ ස්වභාවය:.....

➤ ඉහත සඳහන් කර ඇති තොරතුරු වලට අනුව ඉදිකරනු ලබන තොරතුරු හිමිලේ හරිත තොරතුරු හිමිලේ සංකල්පයට අනුව ඉදිකිරීමට බලාපොරොත්තු වන බැවින් ඒ සඳහා අවසර ලබාදෙන්න හා පිළිගන්නා ලෙස දෙපාර්තමේන්තුවෙන් ඉල්ලා පිටිමි.

දිනය :


.....
 ආයතන ප්‍රධානියාගේ / බලයලත් නිලධාරියාගේ
 අත්සන

ANNEX 02: SLLRDC LAND TRANSFERRING LETTER

(2-65)

මහලංකර හා බිත්තාගිරි සංවර්ධන අමාත්‍යාංශය
ශ්‍රී ලංකා ඉඩම් නොබිඳීමේ සහ සංවර්ධනය කිරීමේ සංස්ථාව

ආගමන ජනන ශිල්ප ආයතනය
සමස්ත ප්‍රධාන කාර්යාල කොටස
ශ්‍රී ලංකා මහජන රාජ්‍ය සංවර්ධන අමාත්‍යාංශය



MINISTRY OF MEGAPOLIS & WESTERN DEVELOPMENT
SRI LANKA LAND RECLAMATION AND DEVELOPMENT CORPORATION

දුරකථන: 011 287565, 2875485 ගැටලු: 011 287565, 2875485 P.O. Box 68, No. 93, Sri Jayawardenepura Mawatha, Welikada, Colombo 11.

විභාගය: පිම්බේ 304
2017.01.04

ලංකාවේ ඉඩ, සැලසිය හැකි ව්‍යාපෘති සැලසිය

මහත්මියන,

සැලකිය යුතුම ඉඩම් වලට ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

ලබන සංදේශ අදාළ අංක 2016.12.01 දිනැති මිසිටර් පැවරුමක් වශයෙනි.

ඒ අනුව සැලසුම් අංක 116 එස්එල්එල්ඊඩීසී හි සැ.අ. 2.3 හා 4 දරණ ඉඩම් කොටස් පිම්බේගමන් පව්වා දිස්ත්‍රික්කයේ ඉදහමු හාස්තු ලේඛන රු.431,743,867.86 හා ඉදහමු කොටස් කම්බිකිරීමේ හේතුවෙන් වන අතර ඒ සඳහා බිඳුම් සටහන හදු අංක RK/0041853 දරණ 2016.12.23 දිනැති රජයේ භුමි සමාජ අමුණා මගින් වෙත පවරයි.

පිම්බේගමන් පව්වාවේ පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

මෙහිදී පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

මෙහිදී පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

මෙහිදී පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

මෙහිදී පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

මෙහිදී පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

මෙහිදී පිම්බේගමන් පව්වාවේ ඉදහමු ඉඩම් කොටසක් පර්යන්ත නාස්තූන් පිටිය ඉදහමු අඟහලු සංවර්ධන සංවිධානය සංවිධාන සඳහා සැලකිය හැකි ව්‍යාපෘතිය වෙත පැවරීම.

ORIGINAL

KELANIYA LAND RECLAMATION AND DEVELOPMENT CORPORATION
No. 12, Sri Jayawardenepura Mawatha, Wellisala, Rajagaha
Telephone: 2867555, 2867703

RECEIPT

R. No. 22/2006/2014
Date:

UNIVERSITY OF KELANIYA

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Amount Received Rs. ₹ 64,58,000/-
Rupees Sixty four hundred thirty one thousand seven hundred forty five thousand eight hundred sixty seven and cents eighty six only

On Account of UNIVERSITY OF KELANIYA
ALLOCATION OF LAND AT KELANIYA TO UNIVERSITY OF KELANIYA

Sum of Rs. _____ Payable as stamp duty is computed in this receipt.
Reg.No. 409010563-6001

PEOPLES Payment Mode CHEQUE DELIVERED BY

Bank / Branch Commercial Bank / Rs. _____

Subject to realization of cheques

0052167

Cashier [Signature]

ANNEX 03: CHECK LIST

Rapid Environmental Assessment (REA) Checklist

Instructions:

- (i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (SDES) for endorsement by the Director, SDES and for approval by the Chief Compliance Officer.
- (ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.
- (iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title:

Sri Lanka University of Sri Jayewardenepura – New Computing and Engineering Faculty Development Project

Sector Division:

Engineering Faculty

Screening Questions	Yes	No	Remarks
A. Project Siting Is the project area...			
▪ Densely populated?		X	Kelaniya is a densely populated urban area.
▪ Heavy with development activities?		X	Reclaimed area is identified for development.
▪ Adjacent to or within any environmentally sensitive areas?		X	
• Cultural heritage site		X	
• Protected Area		X	
• Wetland	X		Land to be developed is filled marshland adjoining a larger canal and wetland area. (see site plan and map)
• Mangrove		X	
• Estuarine		X	
• Buffer zone of protected area		X	
• Special area for protecting biodiversity		X	
• Bay		X	
B. Potential Environmental Impacts Will the Project cause...			
▪ Impacts on the sustainability of associated sanitation and solid waste disposal systems and their interactions with other urban services.	X		Site located in urban setting, whether there is no proper waste disposal plan it may occur problems with urban services.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> Deterioration of surrounding environmental conditions due to rapid urban population growth, commercial and industrial activity, and increased waste generation to the point that both manmade and natural systems are overloaded and the capacities to manage these systems are overwhelmed? 	X		Already site is in urban setting. The project area developed as malty sectorial. So rapid population growth, increasing commercial activities are natural for this setting.
<ul style="list-style-type: none"> Degradation of land and ecosystems (e.g. loss of wetlands and wild lands, coastal zones, watersheds and forests)? 	X		Proposed site is filled wetland and other nearby land also wetlands.
<ul style="list-style-type: none"> Dislocation or involuntary resettlement of people? 		X	None
<ul style="list-style-type: none"> Disproportionate impacts on the poor, women and children, Indigenous Peoples or other vulnerable group? 		X	
<ul style="list-style-type: none"> Degradation of cultural property, and loss of cultural heritage and tourism revenues? 		X	
<ul style="list-style-type: none"> Occupation of low-lying lands, floodplains and steep hillsides by squatters and low-income groups, and their exposure to increased health hazards and risks due to pollutive industries? 		X	
<ul style="list-style-type: none"> Water resource problems (e.g. depletion/degradation of available water supply, deterioration for surface and ground water quality , and pollution of receiving waters)? 	X		Probability is high since it is a low lying wetland area unless proper management is enforced.
<ul style="list-style-type: none"> Air pollution due to urban emissions? 		X	
<ul style="list-style-type: none"> Risks and vulnerabilities related to occupational health and safety due to physical, chemical and biological hazards during project construction and operation? 	X		Electronic waste and hazardous waste will be used during lab trails in the university. Therefore, migratory measures such as hazardous waste management plan should be adopted within the premises during operation of the university.
<ul style="list-style-type: none"> Road blocking and temporary flooding due to land excavation during rainy season? 	X		Possible, especially since filled area with a big canal running alongside development area.
<ul style="list-style-type: none"> Noise and dust from construction activities? 	X		
<ul style="list-style-type: none"> Traffic disturbances due to construction material transport and wastes? 	X		Main A1(Colombo- Kandy) road traffic may be hindered due to transportation of construction material to the site.
<ul style="list-style-type: none"> Temporary silt runoff due to construction? 	X		Possible with earth filling.
<ul style="list-style-type: none"> Hazards to public health due to ambient, household and occupational pollution, thermal inversion, and smog formation? 		X	
<ul style="list-style-type: none"> Water depletion and/or degradation? 		X	Contribution to water degradation of canal and wetland possible during construction and operations unless managed properly.
<ul style="list-style-type: none"> Overpaying of ground water, leading to land subsidence, lowered ground water table, and salinization? 	X		Water table and soil testing should be carried out immediately.

Screening Questions	Yes	No	Remarks
<ul style="list-style-type: none"> ▪ Contamination of surface and ground waters due to improper waste disposal? 	X		Should be considered seriously as it is a wetland environment but should take in to account that there is a large solid waste recycling dump in close proximity to the development site.
<ul style="list-style-type: none"> ▪ Pollution of receiving waters resulting in amenity losses, fisheries and marine resource depletion, and health problems? 		X	Not necessarily as a result of this development. Canal is already clogged with water hyacinth (invasive species) which will anyway lower the water quality.
<ul style="list-style-type: none"> ▪ Large population influx during project construction and operation that causes increased burden on social infrastructure and services (such as water supply and sanitation systems)? 		X	
<ul style="list-style-type: none"> ▪ Social conflicts if workers from other regions or countries are hired? 		X	
<ul style="list-style-type: none"> ▪ Risks to community health and safety due to the transport, storage, and use and/or disposal of materials such as explosives, fuel and other chemicals during operation and construction? 		X	
<ul style="list-style-type: none"> ▪ Community safety risks due to both accidental and natural hazards, especially where the structural elements or components of the project are accessible to members of the affected community or where their failure could result in injury to the community throughout project construction, operation and decommissioning? 		X	This is not a public area and with proper signage, it should not be an issue.

A Checklist for Preliminary Climate Risk Screening

Country/Project Title:

Sector :

Subsector:

Division/Department:

Screening Questions		Score	Remarks ¹
Location and Design of project	Is siting and/or routing of the project (or its components) likely to be affected by climate conditions including extreme weather-related events such as floods, droughts, storms, landslides?	1	
	Would the project design (e.g. the clearance for bridges) need to consider any hydro-meteorological parameters (e.g., sea-level, peak river flow, reliable water level, peak wind speed etc.)?	1	
Materials and Maintenance	Would weather, current and likely future climate conditions (e.g. prevailing humidity level, temperature contrast between hot summer days and cold winter days, exposure to wind and humidity hydro-meteorological parameters likely affect the selection of project inputs over the life of project outputs (e.g. construction material)?	0	
	Would weather, current and likely future climate conditions, and related extreme events likely affect the maintenance (scheduling and cost) of project output(s)?	0	
Performance of project outputs	Would weather/climate conditions, and related extreme events likely affect the performance (e.g. annual power production) of project output(s) (e.g. hydro-power generation facilities) throughout their design life time?	0	

Options for answers and corresponding score are provided below:

Response	Score
Not Likely	0
Likely	1
Very Likely	2

Responses when added that provide a score of 0 will be considered low risk project. If adding all responses will result to a score of 1-4 and that no score of 2 was given to any single response, the project will be assigned a medium risk category. A total score of 5 or more (which include providing a score of 1 in all responses) or a 2 in any single response, will be categorized as high risk project.

Result of Initial Screening (Low, Medium, High): Medium

OtherComments: _____

Prepared by: _____

¹ If possible, provide details on the sensitivity of project components to climate conditions, such as how climate parameters are considered in design standards for infrastructure components, how changes in key climate parameters and sea level might affect the siting/routing of project, the selection of construction material and/or scheduling, performances and/or the maintenance cost/scheduling of project outputs.

INDIGENOUS PEOPLES IMPACT CATEGORIZATION

Date: 09/02/2017

A. Instructions			
<p>(i) The project team completes and submits the form to the Environment and Safeguards Division (RSES) for endorsement by RSES Director, and for approval by the Chief Compliance Officer (CCO).</p> <p>(ii) The classification of a project is a continuing process. If there is a change in the project components or/and site that may result in category change, the Sector Division submits a new form and requests for recategorization, and endorsement by RSES Director and by the CCO. The old form is attached for reference.</p> <p>(iii) The project team indicates if the project requires broad community support (BCS) of Indigenous Peoples communities. BCS is required when project activities involve (a) commercial development of the cultural resources and knowledge of indigenous peoples, (b) physical displacement from traditional or customary lands; and (c) commercial development of natural resources within customary lands under use that would impact the livelihoods or the cultural, ceremonial, or spiritual use that define the identity and community of indigenous peoples.</p> <p>(iv) In addition, the project team may propose in the comments section that the project is highly complex and sensitive (HCS), for approval by the CCO. HCS projects are a subset of category A projects that ADB deems to be highly risky or contentious or involve serious and multidimensional and generally interrelated potential social and/or environmental impacts.</p>			
B. Project Data			
Country/Project No./Project Title		: Sri Lanka University of Kelaniya – New Computing and Technology Faculty Development Project	
Department/ Division		: Department of Applied Computing	
Processing Stage		: Preliminary	
Modality		:	
<input type="checkbox"/> Project Loan	<input type="checkbox"/> Program Loan	<input type="checkbox"/> Financial Intermediary	<input type="checkbox"/> General Corporate Finance
<input type="checkbox"/> Sector Loan	<input type="checkbox"/> MFF	<input type="checkbox"/> Emergency Assistance	<input type="checkbox"/> Grant
<input type="checkbox"/> Other financing modalities:			
C. Indigenous Peoples Category			
<input checked="" type="checkbox"/> New		<input type="checkbox"/> Recategorization — Previous Category <input type="checkbox"/>	
<input type="checkbox"/> Category A	<input type="checkbox"/> Category B	<input checked="" type="checkbox"/> Category C	<input type="checkbox"/> Category FI
D. Project requires the broad community support of affected Indigenous Peoples communities.		<input type="checkbox"/> Yes	<input checked="" type="checkbox"/> No
E. Comments			
Project Team Comments:		SDES Comments:	
There are no indigenous people within or in the surrounding areas. This is an urban area.			
F. Approval			
Proposed by:		Reviewed by:	
Project Team Leader, {Department/Division}		Social Safeguard Specialist, SDES	
Date:		Date	
		:	
		Endorsed by:	
A.K.S.S.S. Atapattu, Director/Safeguards, TMS Company (Pvt) Ltd		Director, SDES	
Date: 22		Date	
		:	

Endorsed by: Director, {Division} Date:	Approved by: _____	<input type="checkbox"/> Highly Complex and Sensitive Project
	Chief Compliance Officer Date: :	

Indigenous Peoples Impact Screening Checklist

KEY CONCERNS (Please provide elaborations on the Remarks column)	YES	NO	NOT KNOWN	Remarks
A. Indigenous Peoples Identification				
1. Are there socio-cultural groups present in or use the project area who may be considered as "tribes" (hill tribes, schedules tribes, tribal peoples), "minorities" (ethnic or national minorities), or "indigenous communities" in the project area?		✓		
2. Are there national or local laws or policies as well as anthropological researches/studies that consider these groups present in or using the project area as belonging to "ethnic minorities", scheduled tribes, tribal peoples, national minorities, or cultural communities?		✓		
3. Do such groups self-identify as being part of a distinct social and cultural group?		✓		
4. Do such groups maintain collective attachments to distinct habitats or ancestral territories and/or to the natural resources in these habitats and territories?		✓		
5. Do such groups maintain cultural, economic, social, and political institutions distinct from the dominant society and culture?		✓		
6. Do such groups speak a distinct language or dialect?		✓		
7. Has such groups been historically, socially and economically marginalized, disempowered, excluded, and/or discriminated against?		✓		
8. Are such groups represented as "Indigenous Peoples" or as "ethnic minorities" or "scheduled tribes" or "tribal populations" in any formal decision-making bodies at the national or local levels?		✓		

KEY CONCERNS (Please provide elaborations on the Remarks column)	YES	NO	NOT KNOWN	Remarks
B. Identification of Potential Impacts				
9. Will the project directly or indirectly benefit or target Indigenous Peoples?		✓		
10. Will the project directly or indirectly affect Indigenous Peoples' traditional socio-cultural and belief practices? (e.g. child-rearing, health, education, arts, and governance)		✓		
11. Will the project affect the livelihood systems of Indigenous Peoples? (e.g., food production system, natural resource management, crafts and trade, employment status)		✓		
12. Will the project be in an area (land or territory) occupied, owned, or used by Indigenous Peoples, and/or claimed as ancestral domain?		✓		
C. Identification of Special Requirements <i>Will the project activities include?</i>				
13. Commercial development of the cultural resources and knowledge of Indigenous Peoples?		✓		
14. Physical displacement from traditional or customary lands?		✓		
15. Commercial development of natural resources (such as minerals, hydrocarbons, forests, water, hunting or fishing grounds) within customary lands under use that would impact the livelihoods or the cultural, ceremonial, spiritual uses that define the identity and community of Indigenous Peoples?		✓		
16. Establishing legal recognition of rights to lands and territories that are traditionally owned or customarily used, occupied or claimed by indigenous peoples ?		✓		
17. Acquisition of lands that are traditionally owned or customarily used, occupied or claimed by indigenous peoples?		✓		

D. Anticipated project impacts on Indigenous Peoples

Project component/ activity/ output	Anticipated positive effect	Anticipated negative effect
1. LIST ALL PROJECT COMPONENT / ACTIVITY / OUTPUTS HERE	---- INDICATE EFFECTS TO IPS OR PUT N/A AS NECESSARY	
2.		
3.		
4.		
5.		

Note: The project team may attach additional information on the project, as necessary.

INVOLUNTARY RESETTLEMENT IMPACT CATEGORIZATION

Date: _____

A. Instructions (i) The project team completes and submits the form to the Environment and Safeguards Division (RSES) for endorsement by RSES Director, and for approval by the Chief Compliance Officer (CCO). (ii) The classification of a project is a continuing process. If there is a change in the project components or/and site that may result in category change, the Sector Division submits a new form and requests for recategorization, and endorsement by RSES Director and by the CCO. The old form is attached for reference. (iii) In addition, the project team may propose in the comments section that the project is highly complex and sensitive (HCS), for approval by the CCO. HCS projects are a subset of category A projects that ADB deems to be highly risky or contentious or involve serious and multidimensional and generally interrelated potential social and/or environmental impacts.					
B. Project Data Country/Project No./Project Title : Sri Lanka University of Kelaniya – New Computing and Technology Faculty Development Project Department/ Division : <u>Department of Applied Computing</u> Processing Stage : <u>Preliminary</u> Modality : _____ <input type="checkbox"/> Project Loan <input type="checkbox"/> Program Loan <input type="checkbox"/> Financial Intermediary <input type="checkbox"/> General Corporate Finance <input type="checkbox"/> Sector Loan <input type="checkbox"/> MFF <input type="checkbox"/> Emergency Assistance <input type="checkbox"/> Grant <input type="checkbox"/> Other financing modalities: _____					
C. Involuntary Resettlement Category <div style="text-align: center;"> <input checked="" type="checkbox"/> New <input type="checkbox"/> Recategorization — Previous Category [] </div> <table style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td style="width: 25%; border-right: 1px dashed black;"><input type="checkbox"/> Category A</td> <td style="width: 25%; border-right: 1px dashed black;"><input type="checkbox"/> Category B</td> <td style="width: 25%; border-right: 1px dashed black;"><input checked="" type="checkbox"/> Category C</td> <td style="width: 25%;"><input type="checkbox"/> Category FI</td> </tr> </table>		<input type="checkbox"/> Category A	<input type="checkbox"/> Category B	<input checked="" type="checkbox"/> Category C	<input type="checkbox"/> Category FI
<input type="checkbox"/> Category A	<input type="checkbox"/> Category B	<input checked="" type="checkbox"/> Category C	<input type="checkbox"/> Category FI		
D. Comments Project Team Comments: No resettlement issues – no inhabitants currently or previously. Land was formerly marsh land which was acquired by Sri Lanka Land Reclamation and Development Corporation (SLRDC) in 2017 and filled before selling to the University of Kelaniya. See Annex 02 letters providing cabinet approval for ownership of land.	SDES Comments:				
E. Approval					
Proposed by: _____ Project Team Leader, {Department/Division} Date:	Reviewed by: _____ Social Safeguard Specialist, SDES Date:				
_____ Social Development Specialist, {Department/Division} Date:	Endorsed by: _____ Director, SDES Date:				

Endorsed by:	Approved by:	<input type="checkbox"/> Highly Complex and Sensitive Project
Director, {Division} Date:	Chief Compliance Officer Date:	

Involuntary Resettlement Impact Categorization Checklist

Probable Involuntary Resettlement Effects	Yes	No	Not Known	Remarks
Involuntary Acquisition of Land				
1. Will there be land acquisition?		✓		
2. Is the site for land acquisition known?		✓		
3. Is the ownership status and current usage of land to be acquired known?		✓		
4. Will easement be utilized within an existing Right of Way (ROW)?		✓		
5. Will there be loss of shelter and residential land due to land acquisition?		✓		
6. Will there be loss of agricultural and other productive assets due to land acquisition?		✓		
7. Will there be losses of crops, trees, and fixed assets due to land acquisition?		✓		
8. Will there be loss of businesses or enterprises due to land acquisition?		✓		
9. Will there be loss of income sources and means of livelihoods due to land acquisition?		✓		
Involuntary restrictions on land use or on access to legally designated parks and protected areas				
10. Will people lose access to natural resources, communal facilities and services?		✓		
11. If land use is changed, will it have an adverse impact on social and economic activities?		✓		
12. Will access to land and resources owned communally or by the state be restricted?		✓		
Information on Displaced Persons:				
Any estimate of the likely number of persons that will be displaced by the Project? [] No [] Yes If yes, approximately how many? _____				
Are any of them poor, female-heads of households, or vulnerable to poverty risks? [] No [] Yes				
Are any displaced persons from indigenous or ethnic minority groups? [] No [] Yes				

Note: The project team may attach additional information on the project, as necessary.

ANNEX 04: SUMMARY OF STAKEHOLDER CONSULTATION MEETING

SUMMARY OF STAKEHOLDER CONSULTATION MEETING HELD ON UNIVERSITY OF KELANIYA

Date – 03rd May 2018. **Time** – 9.30 am – 11.15 am.

Location – Senate room, University of Kelaniya

Invitees: Government officer & Private Sector representatives

- Architecture, State Engineering Corporation in Sri Lanka
- Admin Grama Niladhari, Kelaniya DS office
- Grama Niladhari, Himbutuwelgoda
- Grama Niladhari, Dalugama
- S.P.M, MÄGA Engineering (Pvt) Ltd.

University of Kelaniya Representatives

- Deputy Vice Chancellor
- Dean, Faculty of Computing and Technology
- Assistant Registrar, Faculty of Computing and Technology
- P.H.I., University of Kelaniya
- Bursar, University of Kelaniya
- Head of the Department, Department of Applied Computing
- Senior Lecturer, Department of Applied Computing
- Senior Assistant Secretary, Laws and Records
- Curator, Landscaping Division
- Project Manager
- Assistant Registrar, General Administration

Student representatives

- K.T. Rukmal
- P.H.T. Wickramage
- M.K.Y. Maduwanthi
- G.A.S. Dilini
- W.A. Amila Madhushan

Representation from the Community

- Incumbent, Shanthi Viharaya in Kelaniya

Consultant firm representatives

- Director of TMS Company – Dr. Sithara Atapattu
- Environmental Compliance Consultant ADB – Charmini Kodituwakku
- Project Manager of TMS Company – Yasundara weerasekara

Matters Presented at the Meeting

- a) Brief introduction about purpose of the meeting
- b) Brief introduction about the proposed site location (where the land is located / how the take land for proposed project).
- c) Objective of the meeting (location / key findings / flood risk / Bio Diversity)
- d) Presentation of draft proposal of Faculty of Computing and Technology Building Complex.
- e) Stakeholder Discussion

Section (c) was presented by the Environmental Compliance Consultant from TMS and Section (a, b) presented by Professor Lakshman Senevirathna, Deputy Vice Chancellor in University of Kelaniya. Presentations were made in Sinhala. Section (d) presented by Ms. T.S. Madhushani, Architecture in State Engineering Corporation in Sri Lanka.

Method of information dissemination and collection:

- Notes were taken on the discussion
- A feedback questionnaire in local language (Sinhala) was presented at the common forum and then asked each of the stakeholder to express their views regarding the question. The issue that were broadly covered in the questioner was:
 - Current Flood levels observed in the project associated area
 - Nature of environmental problems presented in the surrounding and the issues and concerns.
 - Disturbance due to project work for the surrounding community
 - Improvement of the drainage in the canal system associated with the project.
 - Issue of environmental pollution concerning solid and waste water waste disposal.
 - Stability of the building and foundation of the proposed building. Evaluation of current situation of other building.
 - Access road and accessibly issues from the main road
- Discussion were based on adoption of possible migratory measures for environmental issues that were encountered as result of project activities.
- Record of the Meeting: General information of the participants such as Name, name of the organization the participant belongs to along with their signature was recorded during the public consultation meetings and is attached in the report

Common issues and concerns raised at public consultation meetings

1. Mrs. Charmini (ADB/TMS environmental compliance consultant specialist) raised the question on accessibility of the site. Dr. Gamini Wijayarathna, Dean of the Faculty of Computing and Technology pointed out that this issue was resolved and that the SLLRDC has provided an alternative access road for the site. He mentioned that this road will be constructed by SLLRDC and handed over to the UOK.
2. Administrative Grama Niladhari of Kelaniya DS officer Mr. K.R.W.K. Kaththota stated that the selected project land was previously a wetland with abandoned paddy field. He said that SLLRDC had carried out the land development without an EIA to assess the hydrological or the biodiversity impact. He pointed out that the Colombo waste transfer site that is located 80 m from the site will have an impact on the proposed project. Already there is leachate that is released from this dump site that is impacting on the surrounding environment and smell and odor are some of the problems. Because of that there are harmful issues on the wetland and the biodiversity.
3. Mr. Kaththota appraised the fact that a stakeholder meeting was called by UOK at the onset of the project. He pointed out that before SLLRDC took over the land for development the areas were a rich biodiversity habitat. He asked as to what measures have been proposed on biodiversity conservation. Ms Charmini in response to his question stated that a habitat enrichment program has been proposed for the site. She added that as per the findings of the RBA the recommended species of trees and shrubs will be planed during landscape activities.
4. On the issues of reduced water flow in the project associated canal system, Pradeshiya saba representative pointed out that the Hume Pipes on Mudun Ela and other streams were not adequate to carry the water flow and should be replaced with alternative box culverts. He further explained that the stagnation and reduced flow rate in these canals were due to narrow opening in these water canal systems that accumulates debris and result in blockage.
5. He added that the solid waste deposit site which is 80m to the site is maintained by the Pradeshiya saba and that is unregulated and is dumping the leachate to the canal without any form of treatment. He also questioned why there was no representation from the Kelaniya divisional secretariat to address the problems associated with the waste deposition site. And he pointed out that currently there was an issue on untreated water being directly discharged in to the local drainage on the Colombo Kandy highway.
6. Furthermore, the Pradeshiya saba representative pointed out that the Mudun Ela required to be cleaned once in three months. He explained that Mudun Ela invasive species like *Eichonia*, *Salvinia* need to be mechanically removed to improve the water flow. Therefore, when the proposed development activity is planned to ensure that the canal reservation is maintained in order to employ such mechanical removal of these invasive species.

7. Dr. Gamini Wijayarathna, Dean of the Faculty of Computing and Technology in response to the replacement of the narrow culvert pointed out that they would consult SLLRDC and try to replace the culverts with other better options. Dr Chamli pointed out that the land adjoins the Mudun Ela and tributary canal on the extreme western boundary was not under their faculty but was under the post graduate institute of Pali and Buddha Sasana.
8. Ms. T.S. Madushani an Architect from the State Engineering Corporation in Sri Lanka presented the draft layout proposal for Faculty of Computing and Technology. In her presentation she mentioned that this draft proposal was done in compliance with the UDA and Colombo municipal council guidelines. She explained that in their design they have allowed for 15m reservation on the Mudun Ela. Dr Chamli explained that the detailed designs were not available and that will be entrusted to another company to design. In her draft proposal she said that she had included space for a waste water treatment plant to treat the water before discharge to the canal.
9. Ms Charmini raised the question on adoption of green building certificate for the proposed building. Ms. Madushani in response stated that they would adopt Green building concept and follow the regulations proposed by UDA. Dr Chamli said that they will seek guidance from a green consultant to comply with the requirements to obtain the green building certificate that will be in the bidding document.
10. Ms. Madushani briefed the forum on the building that will come up in phase 01 of construction. This would include academic building and administrative building in the phase 01 along with the canteens. This Academic building will consist of space for parking, canteen, lecture halls, faculty library, laboratories, staff area and auditorium. In phase 02 of construction will consist of academic building, student canteen, health center, gymnasium, and bookshop.
11. Ven. Ambanpola Silarathana Thero the incumbent of Shanthi Viharaya in Kelaniya one of the residents adjoining the project said that the smell and odor from the waste deposit was an issue of concern. He added that according to his observation that waste dump has increased over time. In response to this, Mr. Kaththota (Admin Grama Niladhari) pointed out that the waste was collected on this site as only a temporary measure until the permanent solution was implemented. This waste will be eventually transported through wanwasala railway station to Puttalm. Furthermore, he pointed out that Metro Colombo solid waste management project will begin in 2020 that all the waste that is collected from Colombo will be received at this transfer site and processed and transferred to the land fill in Aruwakkalu, Puttalam. The proposed project will eliminate haphazard open waste dumping at the adjoining site by Kelaniya Pradeshiya Sabah (KPS) as the waste generated within the KPS will be handled through the new project.
12. The Ven. Ambanpola Silarathana Thero pointed another issue. That during the monsoonal period the flooding level has increased over the years. Currently there are 6 floors in the temple building which is the heights in the area. Thero was concerned about possible increased flooding due to the proposed development at the site. Mrs. Charmini (ADB/ TMS consultant) answered that the flood risk assessment for the area has not properly address this issue. However, detailed engineering designs and the consultation with the SLLRDC will ensure that the impact of flooding will be

mitigated. Dr Chamlie ensures that they will coordinate with SLLRDC on this issue and adopt the mitigatory measures that will be proposed.

13. Mrs. Charmini from ADB/TMS consultant further said that there is an Environmental officer in PIU who will coordinate and mitigate the project associated problems during construction and operation.
14. Mr Bandara Senior project manager and Mr Susil Kumara of MÄGA Engineering (Pvt) Ltd mentioned that flooding is common with the development in the project associated areas. It has been aggravated since the construction of the Colombo Katunayake highway and associated reclamation of land. These current developments should be done on piles and not by filling since the bedrock is highly unstable. He invited us to visit their concrete batching site to assess the situation. And also, their land is tipping and would not be suitable even for a car park. And he pointed due to unstable geological conditions of boggy soil the building has tipped nearly 6, 7 ft.
15. The representative from Kelaniya Pradeshiya Saba explained the development proposed for the Mahara, Mudun Ela water drainage. He pointed out that new bridge is implemented by Ministry of Megapolis and Western Development.
16. Mr. G.A.L.P. Wimalarathna the Public Health Inspector assigned to the University of Kelaniya informed that waste management was an issue in the university premises and dengue was prevalent vector born disease among the students.
17. The students at the Faculty of Computing and Technology addressing the forum said that they are waiting the proposed development. They were positive and appreciative of the academic staff for bring such a proposal. At the moment they are training in a makeshift facility which does not have adequate space and equipment. In reply to the question raised students explained that there practiced separation and sorting out of solid waste in color-coded bins. But there was not comprehensive waste management strategy devoted for the university campus.
18. After that Mr. N.M. Aruna Shantha who is the curator in charge of the university landscaping said that composting was done on organic waste generated from the university premises.
19. At the end of the session, Dean of the Faculty of Computing and Technology Dr. Gamini Wijayarathna thanking the gathering and the organisers, resource persons for their participation at the meeting.

THE KEY INFORMANT MEETING

Report: On 3rd of May 2018 at 12.00pm after the stakeholder meeting our team (Dr Sithar Attapattu, Charmini Kodituwakku, Yasundara Weerasekera) were invited to visit the MÄGA Engineering (Pvt) Ltd at No 977/1, Mudunela Wedamulla, Kelaniya concrete batching site 145m from the project site. We met with Mr Bandara Senior project manager and Mr Susil Kumara of MÄGA Engineering (Pvt) Ltd at their project office in Mudunella Wedamulla. The office has been established since 2006 and since then flood conditions have been the norm for their site during the monsoonal seasons.

They briefed us on the following:

- a) Photographic record of flooding events in the project site and MÄGA Engineering (Pvt) Ltd concrete batching plant from years 2010 to 2016 (plates 1 & 2, 3). Mr Bandara said that in 2016 when 120mm of rain was recorded in a day their site was flooded and that their work force commuted in raft to the site.
- b) Tube wells on site contained acidic water and was not suitable for construction or as drinking water.
- c) Discussed instability of the bed rock due to the underlying geological forces of hydrostatic pressure and water clogged soil conditions. Photographic record of floor fractures of 4mm were recorded during our site inspection (refer plates 4&5).
- d) On the issue of ground improvement of the proposed site and reclamation of the land he said that it was not feasible considering the high groundwater table and the geotechnical conditions of the proposed site.
- e) Issues of blocked canal system adjoin the project access road. He pointed as result of improper disposal of garbage and infrequent cleaning schedules the project associated canal systems are frequently blocked.



Figure 01

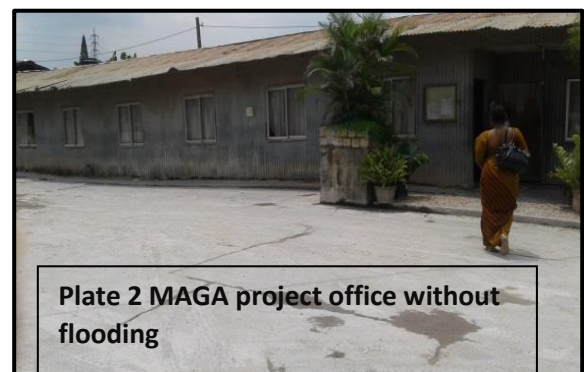


Figure 02



Figure 03

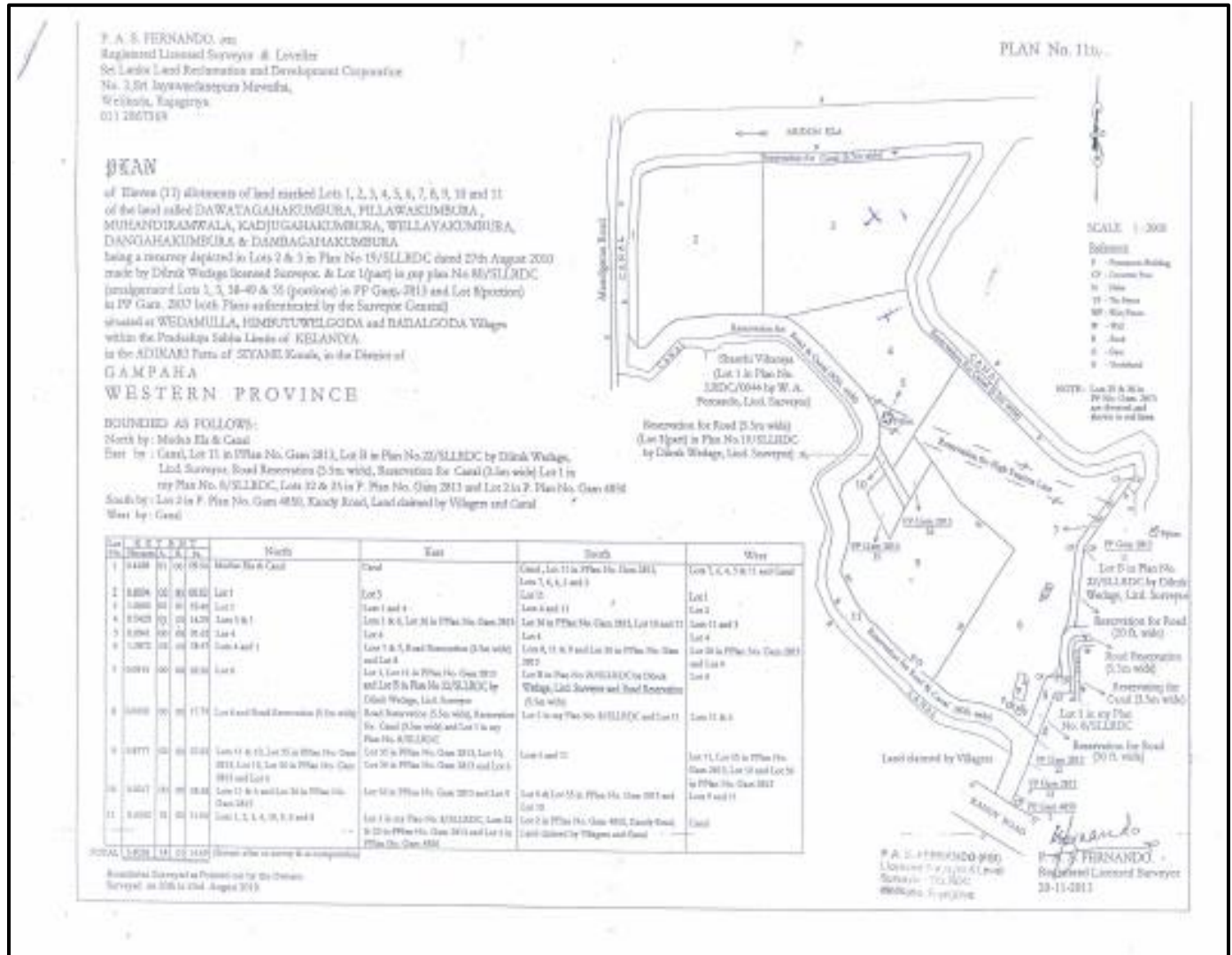


Figure 04

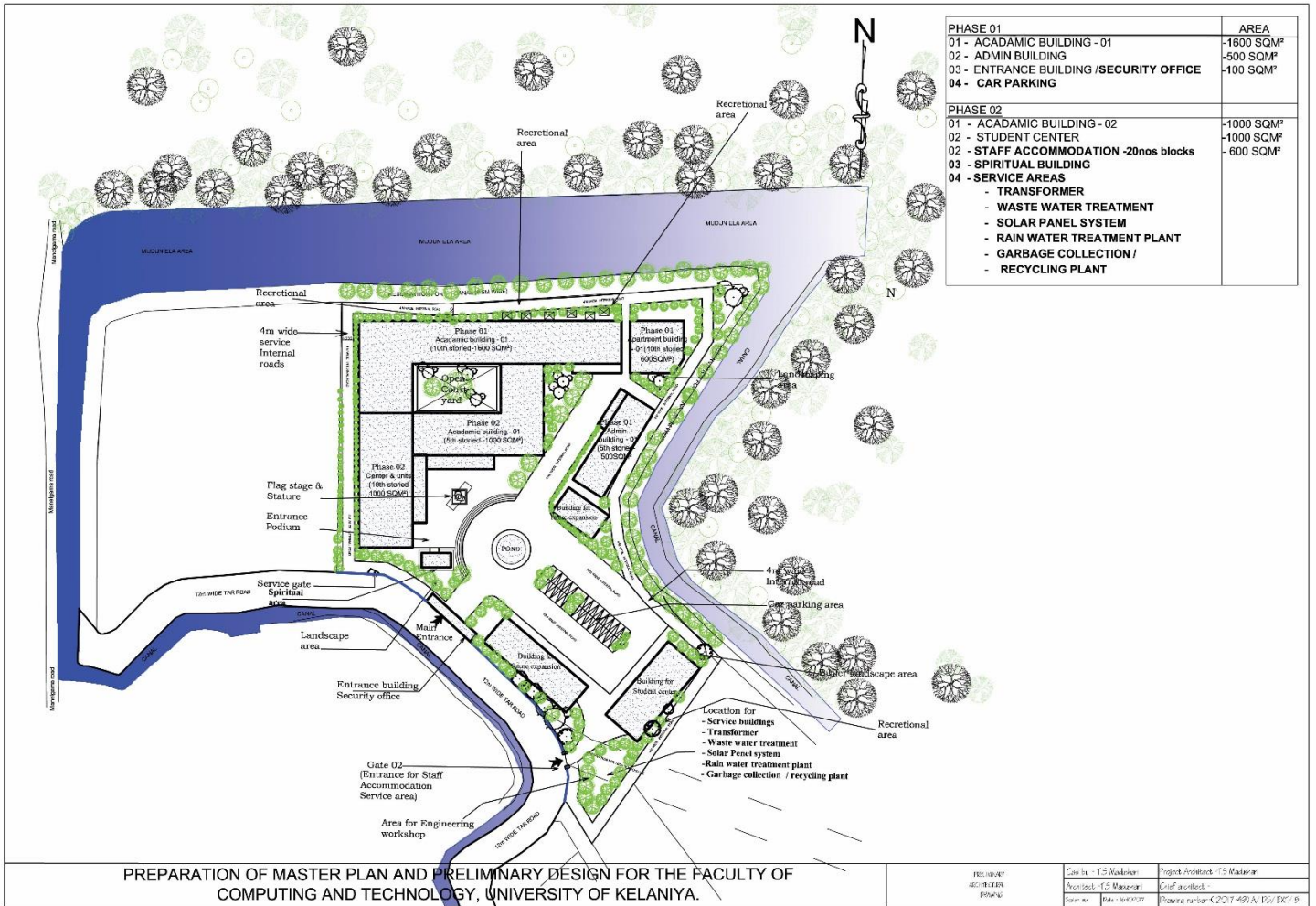


Figure 05

ANNEX 05: SURVEY PLAN



ANNEX 06: MASTER PLAN





SEC CONSULTANTS
ARCHITECTS, ENGINEERS AND QUANTITY SURVEYORS
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**PREPARATION OF MASTER PLAN AND PRELIMINARY DESIGN
FOR THE FACULTY OF COMPUTING AND TECHNOLOGY,
UNIVERSITY OF KELANIYA.**

ARCHITECTURAL 3D VIEW

ANNEX 07: FLOOR PLAN

ANNEX 08: APPLICABLE ENVIRONMENTAL LEGISLATIONS

Applicable Environmental legislations

a) Environmental Impact Assessment

Sri Lankan Government recognizes Environmental Impact Assessment as an effective tool for the purpose of integrating environmental considerations with development planning. EIA/IEE considered as a means of ensuring that the likely effects of new development projects on the environment are understood before development is allowed to proceed.

The legal provision for EIA in Sri Lanka was first included in the Coast Conservation Act No. 57 of 1981 (see below). The broader legal framework for the EIA process in Sri Lanka was laid down by the amendments made to NEA in 1988 through National Environmental (Amendment) Act No. 56 of 1988. The provision relating to EIA is contained in Part IV C of the National Environmental Act. The procedure stipulated in the Act for the approval of projects provides for the submission of two types of reports Initial Environmental Examination (IEE) report and Environmental Impact Assessment (EIA) report. Such reports are required in respect of “prescribed projects” included in a Schedule in an Order published by the Minister of Environment in terms of section 23 Z of the act in the Gazette Extra Ordinary No. 772/22 dated 24th June 1993. This amendment makes EIA mandatory for whole of Sri Lanka and transformed Central Environment Authority (CEA) into enforcement and implementing agency.

Any developmental activity of any description whatsoever proposed to be established within one mile of the boundary of any National Reserve, should receive the prior written approval of the Director of Wildlife Conservation. EIA/IEE will be requires if the project is located near FFPO designated five categories of protected areas.

The EIA process is implemented through designated Project Approving Agencies (PAAs). PAA’s are those organizations that are directly connected with such a prescribed project. At present, 23 state agencies have been recognized by the Minister as PAA’s including Ceylon Tourist Board. A given organization cannot act both as the PAA as well as the project proponent. In such cases the CEA will designate an appropriate PAA. Similarly, when there are more than one PAA the CEA must determine the appropriate PAA. In the event of doubt or difficulty in identifying the appropriate PAA, CEA itself will function as the PAA. At present, there are 31 such PAAs to deal with review and approval of environmental plans

In order for a project to be approved the project proponent should submit either an Initial Environmental Examination (IEE) report or an Environmental Impact Assessment (EIA) report. Once an EIA report has been submitted there is mandatory period of 30 days during which the public can inspect the document and comment on the report. Further, a public hearing may be held to provide an opportunity to any member of the public to voice their concerns. A decision whether to approve the project will be made only after public consultation is done and necessary major issues are resolved.

b) Environmental Protection License

The Environmental Protection License (EPL) is a regulatory/legal tool under the provisions of the National Environmental Act. The CEA issues Environmental Protection Licenses (EPL) to medium and high polluting industries under section 23(A) of the NEA. The regulations are gazette under Gazette Extraordinary No. 1533/16 dated January 25,2008, for a variety of sectors involving in manufacturing, construction or services which need to obtain Environment Protection Licenses (EPL) The Environmental License (EPL) procedure for the control of pollution. Regulations pertaining to this process have been published in 1990 and are available with the CEA. The EPL issued to an industry or development activity and is legally binding and violation of conditions in the license is a punishable offence under the NEA. EPLs are issued by the CEA or a designated body which can be local authorities for low polluting industries, Board of Investment (BOI) for BOI industries. In the North Western Province, where a separate Provincial Environmental Authority exists, the EPLs are issued by the North Western Provincial Environmental Authority (NWPEA).

The EPL procedure has been introduced to prevent or minimize the release of discharges and emissions into the environment from industrial activities in compliance with national discharge and emission standards, to provide guidance on pollution control for polluting processes and to encourage the use of pollution abatement technology such as cleaner production, waste minimization etc. Here the industries are classified into three lists named A, B and C. List A comprise of 80 potentially high polluting industries, List B comprise of 33 medium polluting industries and List C comprise of 25 low polluting industrial activities. These projects will come under List B or List C.

EPL's for List A and List B industries are issued by the relevant Provincial/ District offices of the CEA while EPL; s for List C industries are issued by the relevant local authority. The EPL issued for List A industries are valid for a period of one year while List B and List C industries are valid for a period of three years, from the effective day of the issue of license.

For List A and List B industries the project proponent must submit a duly filled application (can be obtained from CEA headquarters, provincial and district offices or downloaded from www.cea.lk) for each prescribed activity to provincial or district office of CEA who will evaluate the application and determine the relevancy of issuing an EPL and the adequacy of the details furnished and determine and appropriate inspection fee. Then the project proponent must pay the prescribed fee to CEA headquarters, provincial or district office of CEA and submit the receipt to the relevant provincial or district office of the CEA. Then a team of officers will carry out an inspection and submit a report based on the site visit and the information provided. If the Issue of EPL is recommended the project proponent can obtain the EPL upon payment of license fee.

For List C industries issue of EPL is delegated to local authorities (Municipal councils, Urban councils or Pradeshiya Sabha). The procedure to be followed is the same except the Local Authority will appoint a Technical Evaluation Committee (TEC) that will make the final decision regarding the issue of EPL based on the field assessment report and information furnished by the industrialist. The EPL can be renewed by submitting a renewal application three month prior to the date of expiry to the relevant authority who will conduct afield inspection and determine whether the EPL should be renewed.

c) Fauna and Flora Protection Ordinance (FFPO) Amended Act No. 49 of 1993

EIA provisions are also included in the Fauna and Flora (Amended) Act No. 49 of 1993. According to this Act, any development activity of any description what so ever proposed to be established within one mile from the boundary of any National Reserve, is required to be subjected to EIA/IEE, and written approval should be obtained from the Director General, Department of Wildlife Conservation prior to implementation of such projects. The EIA/IEE process under the FFPO is similar to that described in the NEA.

Under the FFPO five categories of protected areas are established viz, Strict nature reserve, National parks, Nature reserve, Jungle Corridors etc. According to the act any development activity of any description what so ever proposed to be established within a national reserve of within one mile of any boundary of any national reserve is required to be subjected to EIA/IEE and written approval should be obtained from the Director general Department of Wild life and Conservation prior to implementation of such projects. The FFPO follows a similar process as the NEA in conducting scoping, setting the TOR, preparation of EA, review of EA, public consultation and disclosure.

d) The Constitution of Sri Lanka (Articles 18, 27(14), Articles 154 (A), 9, 19 and (III) 17)

The Constitution of Sri Lanka contains several provisions relating to the environment such as Article 18 (“It is the duty of every person of Sri Lanka to protect nature and conserve its riches”) and Article 27 (14) (“The state shall protect, preserve and improve the environment for the benefit of the community”). The 13th Amendment to the Constitution created new institution at the provincial level for environmental protection and management. Each provincial government under this Amendment has legislative and executive powers over environmental matters (Articles 154 (A), 9, 19 and (III) 17). Using such provincial legislative and executive powers, the North Western Provincial Council adopted the North Western Provincial Environmental Authority to supervise and monitor environmental activities in the North Western Province of Sri Lanka.

e) Pradeshiya Sabha Act No. 15 of 1987

Section 12 (2) of the Pradeshiya Sabha Act authorizes the appointment of a committee at the divisional level to advice on environmental matters. Section 105 of the Act prohibits polluting water or any streams, while Section 106 refers to pollution caused by industry and related offences. The Pradeshiya Sabha grants permission for construction activities within its jurisdiction. Such construction will have to comply with environmental requirements stipulated with permits. It also ensures that public health issues are efficiently dealt with and solid waste collection and disposal are appropriately done under this Act.

f) Flood Protection Ordinance, Act No. 22 of 1955

This ordinance provides necessary provisions to acquire land or buildings or part of any land or building for the purpose of flood protection.

g) State Land Ordinance, Act No. 13 of 1949

The State Land Ordinance provides guidelines for:

- (i) The protection of natural water springs, reservoirs, lakes, ponds, lagoons, creeks, canals, and aqueducts.
- (ii) The protection of the source, course and bed of public streams.
- (iii) The construction or protection of roads, paths, railways, and other means of internal communication systems.
- (iv) The prevention of soil erosion.
- (v) The preservation of water supply sources.

Section 75 of the Ordinance highlights riparian proprietors' rights and duties. The occupier of land on the banks of any public lake or public stream has the right to use water in that water body for domestic purpose, but cannot diverted water through a channel, drain or pipe or by any other mechanical device.

h) Soil Conservation Act, No. 25 of 1951

The Soil Conservation Act provides for the conservation of soil resources, prevention or mitigation of soil erosion, and for the protection of land against damage by floods and droughts. Under the Act, it is possible to declare any area defined as an erodible area and prohibit any physical construction. The following activities are also prohibited under Act:

- (i) weeding of land or other agricultural practices that cause soil erosion;
- (ii) use of land for agriculture purposes within water sources and banks of streams;
and
- (iii) Exploitation of forests and grassland resources and setting fire in restricted areas.

a) Sri Lanka Land Reclamation and Development Corporation Act No 15 of 1968

The act provides for the establishment of Sri Lanka Land Reclamation and Development Corporation for the development and reclamation of land according to the National policy relating to land Reclamation and Development. It has powers to prohibit the reclamation of development areas. Has powers to declare a wetland to a low line area if it is identified as significant in terms of ecology or environmentally. As per the recent amendment to the act, by act no. 35 of 2006 the corporation will be empowered to take legal action against unauthorized reclamation activities and pollution of inland water bodies as well.

i) Civil Aviation Act, No. 14 of 2010

This act to make provision for the regulation, control and matters related to civil aviation to give effect to the convention on international civil aviation and for matters connected therewith and incidental thereto.

j) Mines and Minerals Act No. 33 of 1992

Under this Act, mining falls within the purview of the Geological Survey and Mines Bureau (GSMB). Mining of minerals including sand must be done with a license issued by the GSMB.

Mining is not permitted within archaeological reserves or within specified distances from such monuments. New mining licenses are subject to the EIA process, if the type and extent of mining is listed under the EIA regulations. Additionally, GSMB has the power to stipulate conditions including cash deposits and insurance policy for the protection of environment. Regulations made by GSMB under the Act cover a variety of environmental stipulations, criteria and conditions for licensing and operating mines. This also covers the disposal of mine wastes. The Act also deals with the health, safety and welfare of miners. Mining rights on public and private land are subject to licensing by GSMB, and all minerals wherever situated belonging to the State. The right to mine public land parcels are subjected to the EA procedures.

k) Forest Ordinance, No 17 of 1907 (and amendments)

The Forest Ordinance of Sri Lanka is the law for conservation, protection and management of forest and forest resources. It regulates tree felling, transport of timber, and other forest related matters. The Forest Ordinance was amended by several Acts - Act 34 of 1951, No. 49 of 1954, Act 13 of 1966, Act 56 of 1979, Act 13 of 1982, and Act 84 of 1988. The Act 23 of 1995 replaced the old Ordinance. Under Section 4 of Act 23 of 1995, the Minister who is in charge of forests can declare any specified area of government land or the whole or any specified part of any reserve forest which has unique ecosystems, genetic resources or a habitat or rare and endemic species of flora, fauna, and microorganisms and of threatened species which need to be preserved in order to achieve an ecological balance in the area by preventing landslides and fire hazards. Under Section 5 of the Act, a Forest Officer has powers to stop any public or private watercourse which goes through a reserved forest. It shall be lawful for the District Secretary to determine the amount of compensation to be paid in case that the water course adversely affects the interests or one or more individuals.

Under Section 6 of the Act, the following activities are prohibited:

- (i) trespassing or permits cattle to trespass;
- (ii) damage by negligence in felling any tree, cutting or dragging any timber;
- (iii) willfully strips off the bark or leaves from, or girdles, lop, taps, burns or otherwise damages any trees;
- (iv) poisons water;
- (v) mine stone, burns lime or charcoal, or collects any forest produce; and
- (vi) extracts coral or shells or digs or mines for gems or other minerals

l) National Water Supply and Drainage Board Law of No. 2 of 1974

The National Water Supply and Drainage Board (NWSDB) is the principle water supply and sanitation agency in Sri Lanka. It was established in January 1975 under the Law No. 2 of 1974. NWSDB develops, provides, operates and controls water supply and distributes water for public, domestic and industrial purpose.

m) National Policy for Rural Water Supply and Sanitation of 2001

The National Policy for Rural Water Supply and Sanitation, approved by the cabinet in 2001, has laid down a framework for water supply and sanitation services to the rural sector, which is defined as any Grama Niladhari Division within a Pradeshiya Sabha area except for those in formertown council areas. It provides guidelines on the delivery of minimum water requirements to ensure health, and on levels of service in terms of quantity of water, haulage distance, adequacy of the source, equity, quality, flexibility for upgrade, and acceptable safe water supply systems.

The Policy prescribes ventilated, improved pit latrines as basic sanitation facilities and defines other acceptable options that include piped sewer with treatment, septic tanks with soakage pits, and water-sealed latrines with disposable pits. For rural water supply and sanitation, the Policy defines the roles and responsibilities of the government, provincial councils, local authorities, community-based organizations (CBO), non-governmental organizations (NGOs), private sector, and international donors. It also sets the scope of regulations for which the provincial councils and local authorities can enact statutes and by-laws.

n) Prevention of Mosquito Breeding, Act No. 11 of 2007

This Act was enacted to prevent and eradicate mosquito-borne diseases such as dengue. Under this Act, it shall be the duty of every owner or occupier of any premises to remove and destroy open tins, bottles, boxes, coconut shells, split coconuts, used tires, or any other article or receptacle found in such premises, and to maintain water wells in such premises to prevent breeding of mosquitoes. People are also bound to empty any artificial pond or pools at least once in a week. Shrubs, undergrowth and all other types of vegetation other than ornamental vegetation and food plants are to be removed.

o) The Urban Development Authority, Law, No 41 of 1978

The Urban Development Authority (UDA) promotes integrated planning and implementation of social, economic and physical development of areas which are declared as urban development areas under the UDA Act. UDA provides technical support to local councils who require assistance in developing plans. It has the authority to develop plans when local authorities fail to do. The UDA monitors urban areas, including 1 km. inland from the coasts in all areas of the coastal zone, and develops land use policies for designated development areas.

p) Municipal Council Ordinances and Acts – Urban Council Ordinance 61 of 1939, Act 29 of 1947, Act 18 of 1979, and Act 13 of 1979

The Municipal Councils and Urban Councils share with Pradeshiya Sabhas powers regarding the approval of buildings plans, control of solid waste disposal, sewerage and other public utilities. Under these laws, new constructions and modifications to current buildings require approval of Municipal or Urban Council or Pradeshiya Sabha. Municipal and Urban councils follow planning and building guidelines of UDA.

The Environmental Policy, NEA and its amendments, and several other pieces of legislation relevant to SSEP outlined above show that environmental policies and the legal or regulatory framework is comprehensive and adequate to address and manage potential environmental impacts and risks associated with its refurbishment and construction activities.

q) Land Acquisition Act No. 09 in 1950 and subsequent amendments in 1983 and 1986

Land Acquisition act No 9 of 1950 provides a detailed procedure for acquiring land and sets out a process with inbuilt safeguards. The Act makes provision for the acquisition of land for public purpose. The actual public purpose can result from development programs initiated by various government Departments and agencies from a multitude of sectors. Under the Act land could be acquired either through a normal procedure or expedited process. In terms of regular process there is provision for the calling of objections from the public prior to proceeding with the acquisition. Land Acquisition Act provides limited grievance mechanism. The Act provides compensation based on market value. It also provides a mechanism through which objections to an acquisition of land can be made. A limited grievance mechanism is available relating to the quantum of compensation to be received.

r) National Involuntary Resettlement Policy

The National Resettlement Policy (NIRP) is adopted in 2001 for the benefit of the persons displaced by the process of land acquisition for development purpose. NIRP ensures that people affected by development projects are treated in fair and equitable manner and to ensure that they are not impoverished in the process. It also enables establishing the framework for project planning and implementation. Involuntary resettlement is not encouraged and if it is unavoidable affected persons should be adequately compensated to reestablish them. Compensations should be based on replacement cost and grievance redress mechanisms should be in place to resolve issues emanating from land acquisition. However BFL has not acquired land to expand their industry but land has been purchased from the private entities or obtains land on lease.

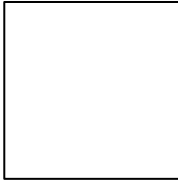
s) Land Acquisition Regulations, 2008

These regulations may be cited as the Land Acquisition Regulations, 2008. The basis of assessing the market value of any land or the compensation for any injurious affection caused by the acquisition of any land under this Act.

These Regulations establish the basis for assessing the market value of any land or the compensation for any injurious affection caused by the acquisition of land. Market Value should be assessed as follows: in case part of a land is acquired and when its value as a separate entity deems to realize a value proportionately lower than the Market Value of the main land the compensation should be proportionate to the value of the main land. When the date of intention to acquire was published, the building is used or is intended to be used for occupation and or business purposes, the difference between the cost of re-construction and the value of building, based for determination of Market Value under Section 1.1, should be paid as an additional compensation. Value based on development potential could be considered for paddy lands acquired where permission to fill such lands have been granted by the Agrarian Services Commissioner General. When an acquired building is occupied by a tenant/statutory tenant protected under the provisions of the Rent Act, No. 7 of 1972 (as amended thereafter) the compensation should be ascertained in proportion having regard to the provisions of Rent (Amendment) Act, No. 26 of 2006.

ANNEX 09: BIQ

Application No



Central Environmental Authority
BASIC INFORMATION QUESTIONNAIRE
**Essential information to determine the environmental approval
requirement of projects**

(Note: Use separate sheets as and when required)

1. BACKGROUND INFORMATION

- 1.1. Project Title: Proposed building for Faculty of Computing and Technology University of Kelaniya
- 1.2. Name of the Project Proponent: University of Kelaniya
(Company/Firm/Individual)

1.3. Details of the Project Proponent:

Postal Address: University of Kelaniya, Dalugama, Kelaniya 11600.

Phone No:

Fax No:

E-mail Address:

1.4. Details of the Contact Person:

Name: Dr Chamli Pushpakumara

Designation: Head of the Department, Department of Applied Computing. Faculty of Computing and Technology

Phone No: 071 5147879

Fax No:

E-mail Address: chamli@kln.ac.lk

2. PROJECT LOCATION DETAILS

2.1. Location of the project:

Province/s: Western Province

District/s: Gampaha District

Divisional Secretariat Division/s: Kelaniya

Local Authority/s: Kelaniya Pradeshiya Saba

(Provide location in 1:50,000 scale Toposheet)

2.2. Physical scale or the extent of the project site (in ha): 1.0002209619 ha
(*Provide Survey plan*)

2.3. Does the project wholly or partly fall within any area specified below?

Area	Yes	No	Remarks
100m from the boundaries of or within any area declared under the National Heritage Wilderness Act No.4 of 1988		✓	
100m from the boundaries of or within any area declared under the Forest Ordinance (Chapter451)		✓	
Coastal Zone as defined in the Coast Conservation Act. No.57 of1981		✓	
Any erodible area declared under the Soil Conservation Act(Chapter450)		✓	
Any flood area declared under the Flood Protection Ordinance (Chapter449)		✓	
Any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act No.15 of 1968 as amended by Act No.52 Of1982	✓		The areas are surrounded with flood retention area
60meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having width of more than 25 meters at any point of its course.		✓	
Any reservation beyond the full supply level of a reservoir.		✓	
Any archaeological reserve, ancient or protected monuments as defined or declared under the Antiques Ordinance (Chapter188)		✓	
Any area declared under the Botanic Gardens Ordinance (Chapter446)		✓	
Within 100meters from the boundaries of or within, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (Chapter469)		✓	
Within 100meters from the high flood level contour of or within a public lake as defined in the Crowns Lands Ordinance (Chapter 454) including those declared under section 71 of the said Ordinance		✓	
Within a distance of one mile of the boundary of a National Reserve declared under the Fauna and Flora Protection Ordinance		✓	

2.4. Present ownership of the project site:

State	Private	Other (Specify)
✓		

(If state owned, please submit a letter of consent of the release of land from the state agency

2.5 Present land use type of the project site (approximate % of the total project site):

Land use type	%	Land use type	%
Marsh/mangrove	25	Bare land	
Water bodies	5	Paddy	
Dense forest		Tea	
Sparse forest		Rubber	
Scrub forest		Coconut	
Grass land		Built-up area	70
Home gardens		Any other (Specify)	

3. **PROJECT DETAILS**

3.1. Objective/sof the project:

This project aims to increase the technology-oriented work force which will contribute to transform Sri Lankans growing economy. Under this Project the University of Kelaniya (UOK) will build a new Faculty of Computing and Technology (FCT) in KelaniyaIt will be geared to fill job in industries such as ICT, manufacturing, logistics and services. This will ensure that these graduates will have a competitive edge to secure jobs both locally and internationally.

3.2. Present stage of the project in the project cycle:

(i)	Pre-feasibility	✓
(ii)	Feasibility	Done
(iii)	Design	Completed
(iv)	Other (specify)	Not yet

3.3. Type of the project (Please tick the relevant cage/s):

Land development/clearing	✓	Hotels /Recreational Facilities	
Timber extraction/tree felling		Housing and building	
Reclamation of Land/wetland	✓	Resettlement	
Conversion of forests into non-forest uses		Laying of gas and liquid (excluding water) transferring pipe lines	
Urban development	✓	Mining	
Portand Harbour Development		Tunneling	
Transportation system		Fisheries and aquaculture	
River basin development/Irrigation		Disposal of solid/liquid/hazardous wastes	
Power generation and transmission		Salterns	
Surface/ground water extraction		Any other (Specify)	
Industry/Industrial Estates and Parks			

3.4. Physical scale or the magnitude of the project:

The extent of the building is:

Phase I of the project will involve the construction of the 10-story academic building (1600sqm²), 5 storied administration building (500sqm²), apartment building (600 sqm²) building for student centers, location for service building, transformers, waste

water treatment, solar panel system, rain water treatment plant, garbage collection / recycling plant.

Phase II include 5 storied academic building (1000sqm²) for staff accommodation and provide lodging for exchange students , 10 storied center units (1000 sqm²) this will include center units such as industry interaction center and business center (3000 sq ft), e- learning center (5000 sq ft), nano technology center (16200 sq ft), cyber security and computer forensic center (2000 sq ft), center for data and science (2000 sq ft), business incubator (1000 sq ft).

First phase– 2700 sqm²

Second phase– 31000 sqm²

Total - 33700 sqm²

3.5. Major components of the project:

The proposed FCT Development project will involve construction of a new faculty with facilities to conduct lectures for technology students. The FCT will be with several storied buildings and will be constructed in two phases. It will include laboratory facilities for chemistry, physics, electronics, two labs for bio chemistry, research lab, bio technology, engineering technology, industry technology lab and a product design lab. It will also include two computer labs that will train 150 students at a time

3.6. Project layout plan (Conceptual): Attached

3.7. Project process/s interms of:

Inputs including resources such as raw materials, water, and energy used in construction/operational phases of the project and source of such resources

Outputs (including products and by-products)

Major types of equipment/technology to be used

Please contact contractor of the project & detailed desing enginers and the PIU for details and fill in

3.8. Does the project involve any of the following activities other than the major project activities?

	Activity	Ye s	No	If yes please quantify
(i)	Reclamation of land/wetland	✓		
(ii)	Conversion of forests into non-forest uses		✓	
(iii)	Clearing of lands	✓		
(iv)	Extraction of timber		✓	
(v)	Mining and mineral extraction		✓	
(vi)	Lying of pipelines	✓		
(vii)	Tunneling		✓	
(viii)	Power generation & transmission		✓	
(ix)	Resettlement		✓	
(x)	Extraction of surface/groundwater	✓		
(xi)	Disposal of wastes(solid/liquid/hazardous)	✓		

3.9. Amount of capital investment:

Foreign: (ADB loan)	24,995,550 USD
Local:	2,698,480 USD

3.10. Proposed timing and schedule including phased development: 24 months

3.11. Details of availability of following services/infrastructure facilities:

(i) Roads/access (Specify): Colombo Kandy A1 Road and Kelaniya Pradeshiya saba road from the SLLRDC sand deposit area

(ii) Water (Specify): liters per day

(iii) Power (Specify): CEB grid and generator

(iv) Telecommunication (Specify): Sri Lanka Telecom

(v) Common waste water treatment facilities (To be filled by UOK): Waste water will be directed to a waste water treatment plants and the sludge will be removed in determined intervals. Sewage will be emptied with emptied in gully bowsers with the assistance of the Kelaniya Pradeshiya Saba

(vi) Common solid waste management facilities (Specify): Develop a solid waste management plan for FCT and temporarily come to an agreement with the Kelaniya Pradeshiya saba

(vii) Any other (Specify): Flood risk assessment. Development of proper water drainage network of the project site, clean and maintain the canal system associated with the project

3.12. Will the development result in displacement of people or property: (Quantify)? No

3.13. Will the development result in change of way of life of local people? Yes. Project associated community could provide lodging and other services such as catering for students and provision of telecommunication facilities and photocopying.

3.14. Will the project have plans for future expansion with/without land/space: demands? Yes. The land would be fully utilized for development during the two phases of construction of FCT.

3.15. Information on likely impacts of the project (Please tick the relevant category/s):

Impact/s	Yes	No	Short term	Medium term	Long term
• Impacts on people & human health	✓		✓		
• Impacts on fauna/flora/sensitive habitats	✓		✓		

● Impacts on soils and land use	✓		✓		
● Impacts on water quality (surface and ground)	✓			✓	✓
● Impacts on drainage/hydrology	✓			✓	✓
● Impacts on air quality	✓		✓	✓	
● Generation of excessive noise and vibration	✓		✓	✓	
● Impacts on landscape/visual environment	✓				✓
● Impacts on historical and cultural resources		✓	-		
● Presence and aggravation of hazards		✓	-		
● Any other (Specify)					

3.16. Information and measures being considered to mitigate likely impacts of the project cited under: with the supervision of the consultant appointed for this project- Building department

3.17. Relationship with other existing /planned: developments:

The FCT graduates will be able to gain industrial training in the Biyagam and katunayakey export processing zones. Therefore, the project is located in environment that is easilt accessible for training.

3.18. Details of any other permits required for the project:

- Environment Clearance –EPL for the three canteen that will provide food for over 600 students
- Consent from relevant government agencies –Kelaniya Pradesiya Saba approval on the desng plans and the proposed drainage system for flood water
- SLLRDC: approval on development of the land and site preparation and cannal maintenance
- Green building certificate- UDA

4. OTHER

Provide any other information that may be relevant

I..... certify that the information provided above is true and correct to the best of my knowledge. I am aware that this information will be utilized indecision making.

Name:Designation:

Signature: Date:

For Office Only

1. Date of receipt of the application:
2. Payment of EIA administration fee: Date of payment:
Amount: Receipt No: Code No:
3. Site inspection information: Date of inspection:

Name/s of the officers:

Special comments regarding significant environmental concerns (based on the site inspection):

4. Required approval under Part IVC of NEA:

Yes	No

5. If need to go through the EIA process appropriate PAA:
6. Other remarks:

ANNEX 10: FLOOD RISK ASSESSMENT

FLOOD RISK ASSESSMENT REPORT FOR PROPOSED SCIENCE AND TECHNOLOGY SITE AT DALUGAMA - KELANIYA FOR KELANIYA UNIVERSITY



Prepared by:

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Consulting Engineer/ Hydrologist

For:

TMS Company (Pvt)Ltd

110/A/1-1/2

Sunethradevi Road

Kohuwala, Nugegoda

EXECUTIVE SUMMARY

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Executive Summary

1. The project area is located within the downstream of the Mudun ela basin. The watershed of Mudun ela is bounded by Wattala in the north, Kelaniya in the east, Kelani river flood bund in the south, and Colombo - Negombo road in the west as shown in figure 1.1. This can be identified under 3 catchment sub sectors as follows.
 - i. Peliyagoda
 - ii. Dalugama - Telengapatha
 - iii. Naramminiya- East of Kandy Road
2. Drainage into Kelani River is through three culverts cum flood gates. (two at Oliyamulla close to Wattala and other one at Pethiyagoda).The internal main drainage system is managed by Sri Lanka Land reclamation and Development Corporation.
3. The observed flood levels of Kelani River at Nagalagama Street which is very close to the proposed project area, has been recorded as follows.
 - a. 3.87 m MSL in Year 1947
 - b. 2.88 m MSL in Year 1989
 - c. 2.29 m MSL in Year 2016
4. Average height of the flood bund along the Kelani River is at 4.57 m MSL in the vicinity of the project area. However due to low elevation of marshy area, it is subject to local flooding in its own catchment during rainy season. Therefore, well designed drainage scheme for the Mudun ela project is being implemented by SLLRDC.
 - a. The whole area has been provided with an improved storm water drainage system, main canals and lakes have been proposed to convey maximum discharge from respective areas to the outlet as shown in the figure: 1.2
 - b. Three pumping stations cum regulators have been proposed by SLLDC & the Irrigation department. One is already constructed at Peliyagoda and other two are proposed at Oliyamulla and Pethiyagoda as shown in the figure: 6.14
5. A very detailed analysis has been carried out to determine flood impact of the proposed project subjected to the current maintenance aspect, flood situation and flood mitigation approach.

The gated structure and pumps associated with the flood protection defenses along the lower reaches of the Kelani river, provides a measure of protection to the proposed project location from Kelani floods. Average protection level is around 25 year return period.

6. A very detailed assessment has been completed to analyze the flood situation and flood mitigation approach, as given below.

Situation as at present:

- a. Existing average fill level of the project area: 1.50 m MSL
- b. Observed recent flood level in Year 2010: 2.10 m MSL
- c. 25-year return period flood level for existing condition: 2.40 m MSL
- d. 50-year return period flood level for existing condition: 2.50 m MSL
- e. 100-year return period flood level for existing condition: 2.70 m MSL
- f. DPC level of an unprotected house in the vicinity: 2.04 m MSL
(already flooded in 2010)
- g. DPC level of a protected house in the vicinity: 3.35 m MSL

Situation after implementation of Proposed Drainage Proposals:

- Expected flood level after implementation of proposed pumping station and rehabilitation of drainage system.
- Expected 25year flood level after drainage improvement: 1.50 m MSL
- Expected 50-year flood level after drainage improvement: 1.60 m MSL
- Expected 100-year flood level after drainage improvement: 1.70 m MSL

7. Conclusion

Detailed assessment of risk has been carried out taking into consideration of the catchment characteristics, location of the project site, Topography, proposed master plan, existing drainage network, degree of flood and historic observed data. Accordingly, the Model Studies provided the following results.

1. From model results for existing situation, it was found that the existing ground level of the project site is not protected for 25-year return period.
2. From the model results, it was observed that the expected flood level after implementation of proposed pumping station and rehabilitation of drainage system are as given below:

- Expected 25year flood level after drainage improvement: 1.50 m MSL
- Expected 50-year flood level after drainage improvement :1.60 m MSL
- Expected 100-year flood level after drainage improvement: 1.70 m MSL

This shows that even after implementation of proposed drainage improvements, it is not possible to expect safety of the project at 1.5 m MSL without raising the existing ground at this location.

It is to be mentioned that the required level of the reclamation site depends on two factors.

- a. Protection level of the proposed infrastructures
 - b. Maintenance of the sewerage system during floods.
3. From the photos and also due to reasons given below it is not possible to have much confidence that maintenance aspect of the drainage system would function satisfactorily.
- a. Main canal system with pumping station is being maintained by SLLR&DC.
 - b. Regular maintenance of the downstream main peripheral drain and culvert across the Colombo – Katunayake expressway are being maintained by Road Development Authority.
 - c. Local drainage is being maintained by the Peliyagoda Urban council.

Taking into consideration the above facts it can be concluded that there is no risk of flooding during extreme (25 year and 50 year and 100-year floods) on the project site which are above 2.50 m MSL. Therefore, it is recommended to fill the project site at least up to 2.75 m MSL by keeping minimum freeboard. DPC level of the proposed building should be 0.50 m above the final reclamation level.

1.0 Introduction

Proposed project is located within the Mudun ela scheme which had been reclaimed so as to meet the needs of urban expansion. The total extent of low-lying marshy land originally available for development in the Mudun ela watershed was 322 ha, having an elevation that ranges from -1.00 m MSL to 4.00 m MSL. This is bounded by Wattala in the north, Kelaniya in the East, Kelani river flood bund in the south and Colombo - Negombo road in the west (See Fig:1.1). Original project proposal prepared by SLLRDC is shown on the attached map (see figure:1.2).

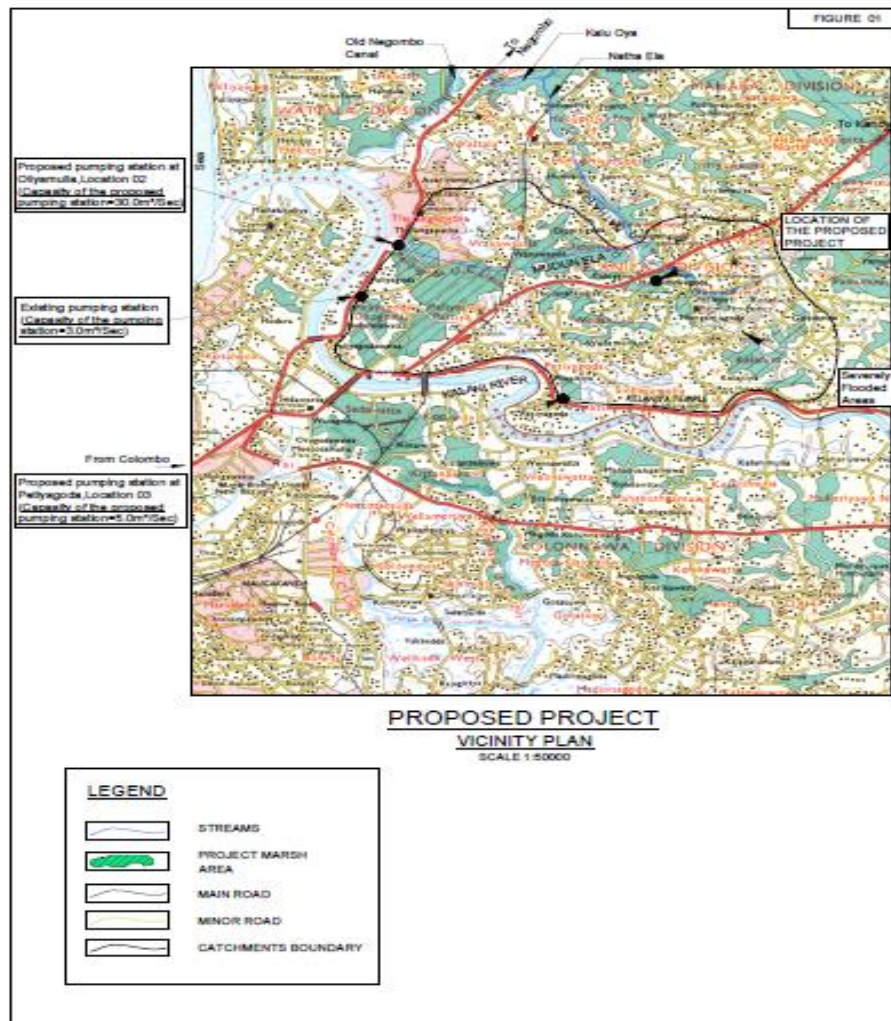


Figure 1 – 1 Mudun ela Watershed showing Project area

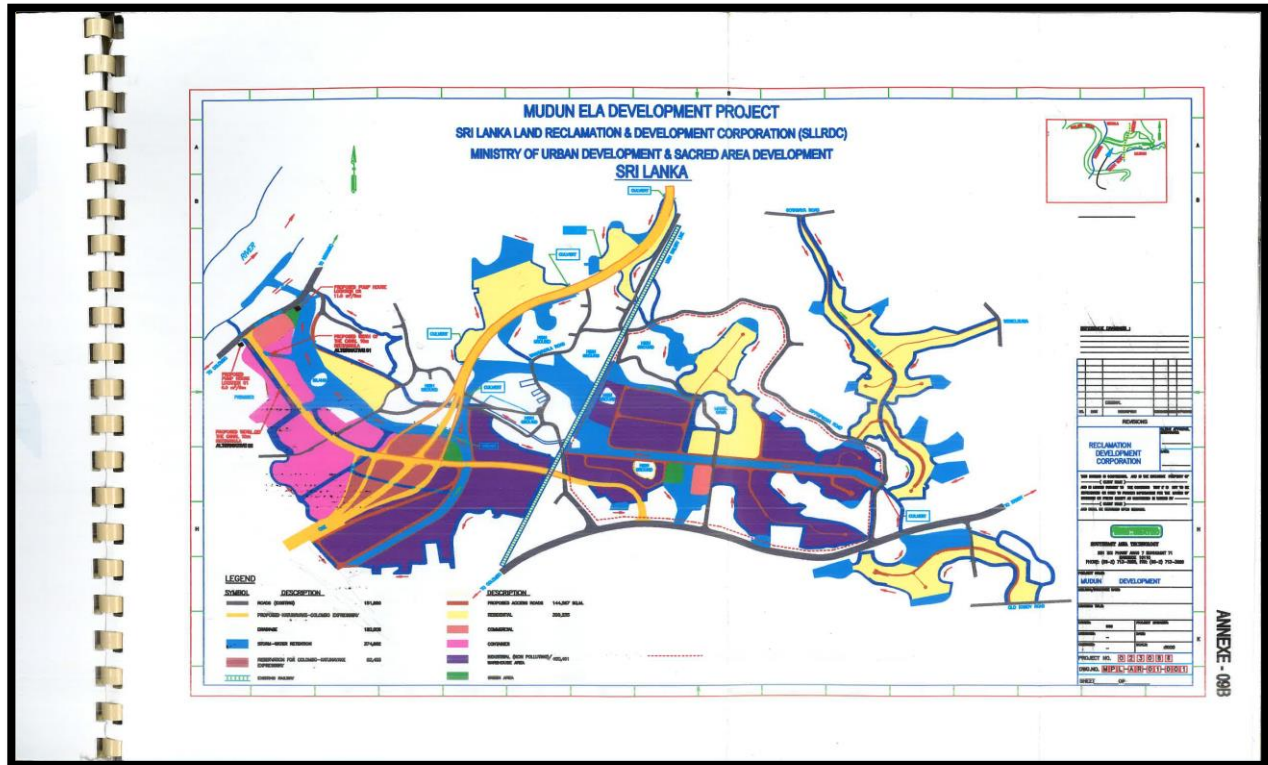


Figure 1-2 Storm water Master drainage plan for Mudun Ela watershed of the project site

2.0 Need of the Impact Assessment

The main cause for flooding can be attributed to

- Discharge from catchment area itself.
- Floods in the lower basin due to heavy rain in the upper catchment of the Kelani River.
- Insufficient discharge from the Kelani river outfall due to the high tide effect from the sea.
- Insufficient canal capacity to carry high runoff.

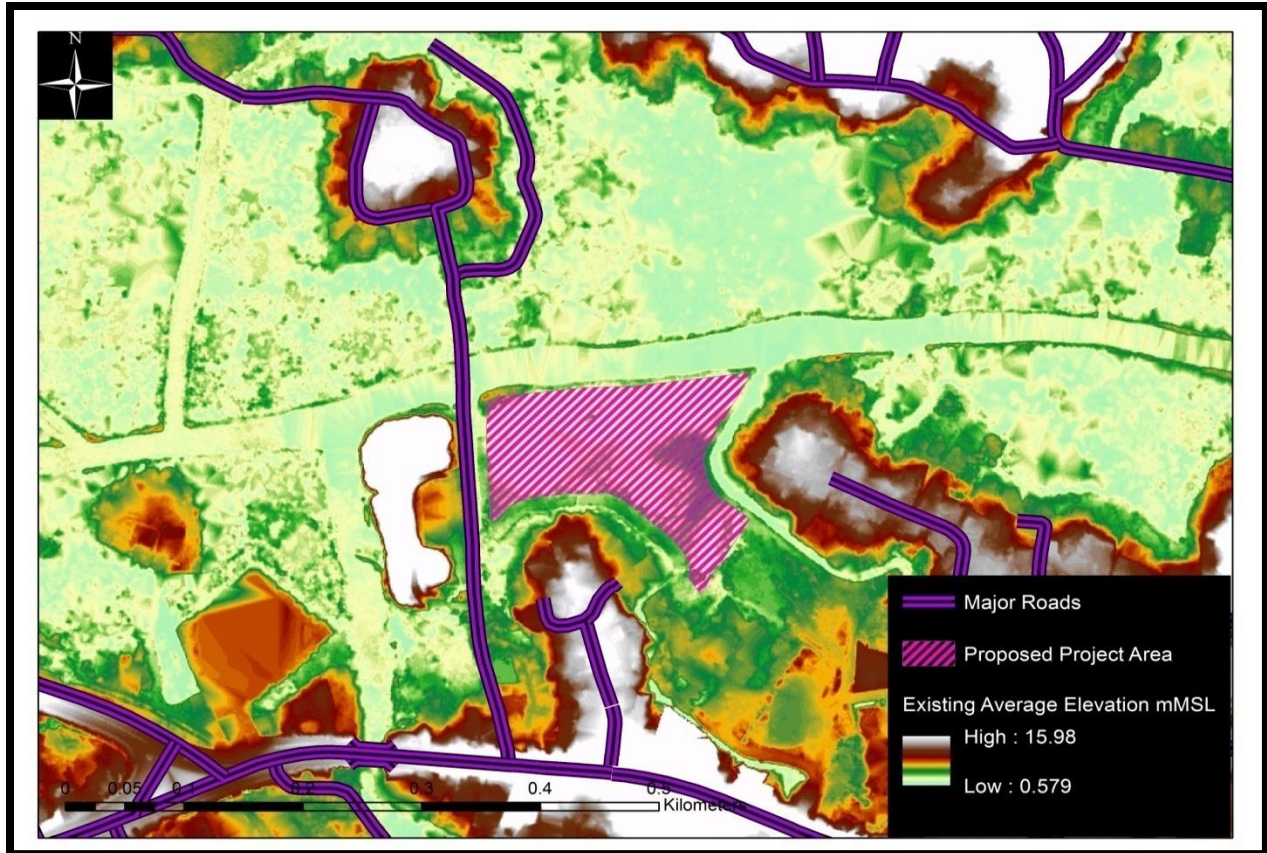


Figure 2 -1 Location of the Project shown on Google Image

In view of rapid development of low land areas, resulting in depletion of retention areas it is necessary to examine periodically the feasibility of carrying out projects of this nature. (see figure 2.1)

This watershed consists of many streams finally flowing into Kelani river through Oliyamulla, Peliyagoda and Petihyagoda outfalls (See figure 6.14). Existing gates at these outfalls are being closed during high flood in the Kelani river. This is the most severe boundary condition to the proposed project site.

3.0 Tasks to be carried out

- i. Rainfall analysis and development of updated IDF curves.
- ii. Setting up of hydrological and hydraulic models.
- iii. Calculation of probable floods and generation of flood inundation maps and their floods risk to the proposed project

4.0 Data collection

The following set of data and maps have been collected from relevant stake holders.

1. Topographic maps to a scale 1:50,000 and 1: 10,000 from survey department.
2. Rainfall data for Katunayake and Colomborainfall stations from Meteorological Department.
3. Contour survey maps, cross sections of the drains prepared by licensedsurveyors.
4. Relevant information collected from Sri Lanka Land Reclamation Development Corporation, Irrigation department, Road development authority, data gathered from people in the vicinity and flood levels already marked at site. Recorded water levels inside Mudun Ela watershed from previous projects. Data used in previous studies.

Colombo – Katunayake expressway Study in August 2002 and May 2001.

Data used in storm water drainage plan for the Colombo metropolitan region in March 2003 and latest studies carried out by SLLRDC.

5.0 Atmospheric Analysis

The study area is situated in the western province of Sri Lanka, where the mean annual values of atmospheric parameters in the range temperatures 25 - 27.5⁰C, rainfall 1,500 - 2,000mm, wind speed 5-20km/hr and pressure 1008-1010 hecto Pascal. Seasonal and monthly variations of atmospheric parameters were analyzed by using the data obtained from Metrological Department. Average annual rainfall specially for Colombo and Katunayake are 2,325mm and 2,125mm respectively.

5.1 Rainfall intensity analysis

The catchment areas of the individual plots in the project under consideration for effective drainage Sub basins are comparatively small (See figure 5.1).

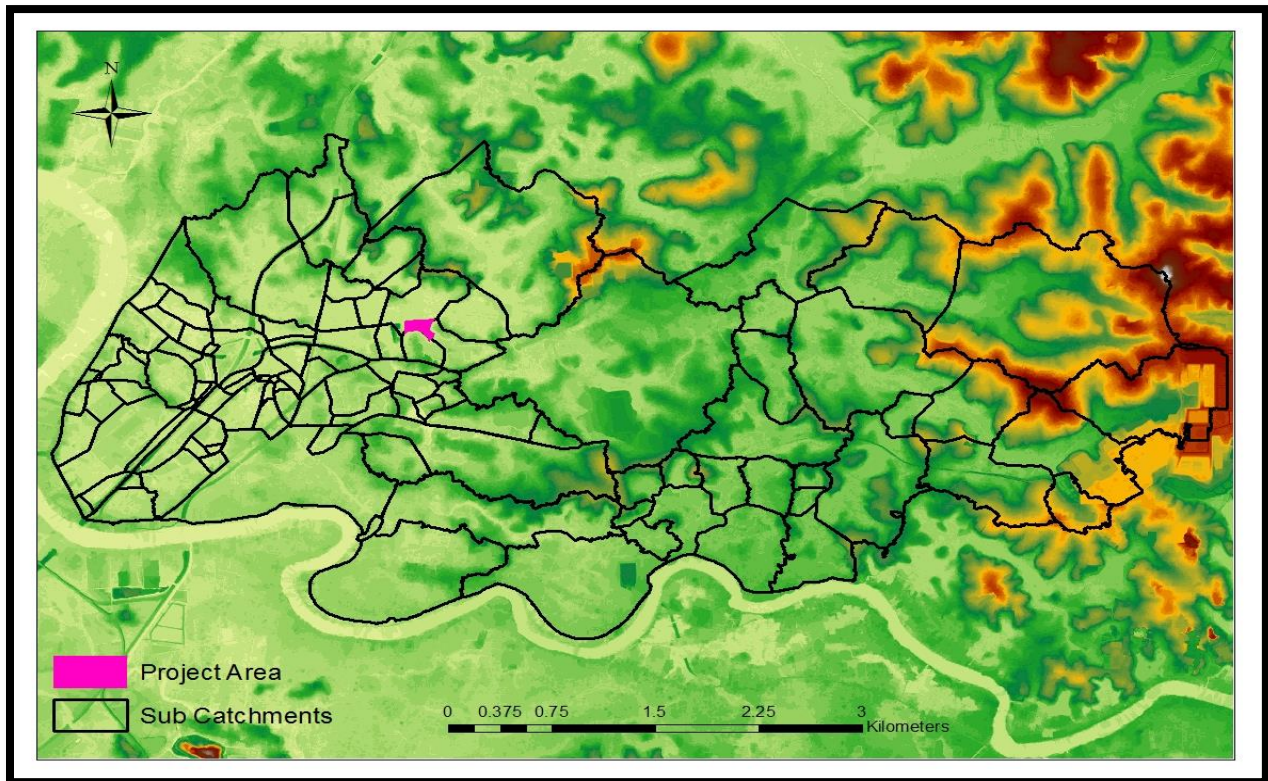


Figure 5.1: Effective Sub Catchment of the project area

Therefore, time of concentration (TC) as defined in surface hydrology is very short. Therefore, development of intensity duration frequency curves for Katunayaka and Colombo Metrological stations have been comprehensively studied and presented in thereport.IDF curves at Colombo rainfall station has been used for the analysis due to higher Intensity values as shown in the table5.1,5.2,5.3,5.45.5,5.6,5.7,5.8 and Figure 5.2,5.3 5.4 &5.5.

Year	Maximum rainfall (mm/day)	Year	Maximum rainfall (mm/day)
1981	153.3	1996	124.7
1982	154.7	1997	117.2
1983	194.1	1998	137.2
1984	109.8	1999	284.6
1985	135.7	2000	141.7
1986	100.2	2001	94.1
1987	151.2	2002	132.4
1988	151.2	2003	110.5
1989	114.2	2004	96.5
1990	110.3	2005	270.1
1991	77.1	2006	163.9
1992	493.7	2007	131.6
1993	158.4	2008	111.0
1994	94.1	2009	207.0
1995	126.3	2010	440.2

Table 5.1: Annual Maximum Rainfall for Colombo(mm/day)

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	38.87	45.54	50.74	58.97	63.78	68.33
0.5	58.91	68.01	74.45	83.95	89.17	93.48
1	79.46	91.77	100.63	114.69	123.79	132.47
2	96.48	113.94	128.08	152.86	171.24	190.58
3	104.07	125.76	144.72	179.58	206.85	236.61
4	108.40	133.64	156.92	200.96	236.48	276.12
5	111.25	139.55	166.65	219.05	262.30	311.40
6	113.22	144.24	174.84	234.96	285.48	343.62
12	118.92	161.52	208.08	306.00	393.72	500.04
18	121.14	171.36	229.50	356.58	475.02	623.16
24	122.40	178.56	245.52	397.44	542.88	728.64

Table 5.2: Depth Duration Frequency values for Colombo

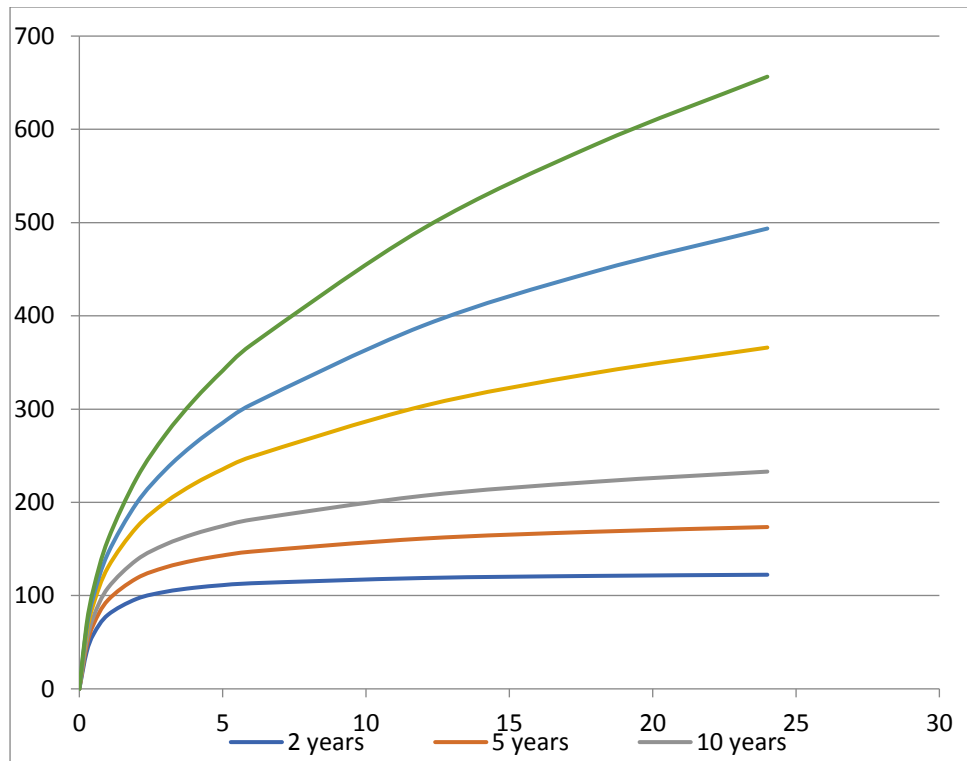


Figure 5.2: Depth -Duration frequency curve for Colombo

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	155.49	182.14	202.96	235.86	255.11	273.32
0.5	117.81	136.01	148.9	167.89	178.33	186.96
1	79.46	91.77	100.63	114.69	123.79	132.47
2	48.24	56.97	64.04	76.43	85.62	95.29
3	34.69	41.92	48.24	59.86	68.95	78.87
4	27.1	33.41	39.23	50.24	59.12	69.03
5	22.25	27.91	33.33	43.81	52.46	62.28
6	18.87	24.04	29.14	39.16	47.58	57.27
12	9.91	13.46	17.34	25.5	32.81	41.67
18	6.73	9.52	12.75	19.81	26.39	34.62
24	5.1	7.44	10.23	16.56	22.62	30.36

Table 5.3: Intensity Duration frequency values for Colombo

Return Period (in Years)	Equation (Intensity I = mm/ hr, T in minutes)
2	$I = 6871.16(T + 31.3)^{-0.988}$
5	$I = 5891.17(T + 28.9)^{-0.919}$
10	$I = 4837.53 (T + 26.4)^{-0.852}$
25	$I = 3492.79 (T + 22.2)^{-0.746}$
50	$I = 2733.50 (T + 19.1)^{-0.671}$
100	$I = 2138.46 (T + 16.1)^{-0.598}$

Table 5.4: IDF Equations for different return period at Colombo

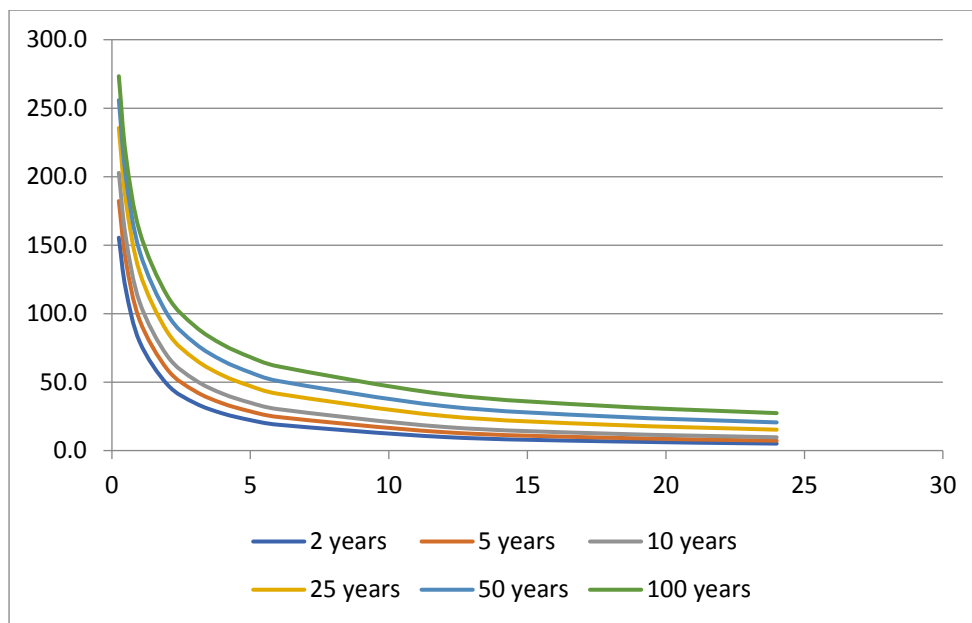


Figure 5.3: Intensity Depth Duration Frequency Curves for Colombo rainfall stations

Observed 24 hrs Maximum Rainfall				2 nd Highest 24 hrs Rainfall				3 rd Highest 24 hrs Rainfall			
No	Year	Month & date	Rain fall	No	Year	Month & date	Rain fall	No	Year	Month & date	3 rd Max
1	1998	18-Jul	213.3	1	1998	15-May	151.3	1	1998	8-Nov	122.2
2	1999	20-Apr	266.8	2	1999	12-Oct	195.6	2	1999	13-Oct	191.1
3	2000	8-Jan	181.8	3	2000	30-Sep	178.7	3	2000	7-Nov	91.1
4	2001	2-Jun	127.4	4	2001	26-Oct	75.4	4	2001	7-May	71.4
5	2002	19-Oct	164.9	5	2002	16-Oct	130.9	5	2002	8-Apr	56.5
6	2003	7-Mar	100.2	6	2003	28-Apr	93.0	6	2003	29-Sep	92.0
7	2004	14-Dec	71.8	7	2004	26-Sep	71.4	7	2004	12-Dec	60.0
8	2005	21-Nov	222.5	8	2005	8-Oct	150.6	8	2005	22-Nov	82.6
9	2006	27-Oct	166.7	9	2006	18-Nov	118.6	9	2006	25-Oct	69.9
10	2007	3-May	129.2	10	2007	22-Oct	104.5	10	2007	18-Dec	78.0
11	2008	15-Mar	128.2	11	2008	9-Mar	120.3	11	2008	19-Oct	117.5
12	2009	27-Jan	88.3	12	2009	21-Nov	63.1	12	2009	9-Apr	62.2
13	2010	18-May	177.5	13	2010	10-Nov	160.6	13	2010	12-May	111.9
14	2011	14-Oct	75.6	14	2011	30-Oct	64.1	14	2011	9-Dec	57.9
15	2012	16-Oct	105.8	15	2012	14-Feb	100.4	15	2012	29-Nov	84.5
16	2013	3-May	261.3	16	2013	12-Sep	114.4	16	2013	5-May	72.2

Table 5.5: observed 24 hr maximum rainfall events at Katunayake

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	36.85	42.02	45.93	51.11	55.02	58.93
0.5	55.82	65.91	73.54	83.64	91.27	98.91
1	76.63	93.35	105.99	122.72	135.37	148.01
2	101.79	132.00	154.85	185.08	207.94	230.79
3	114.02	148.74	174.97	209.70	235.97	262.20
6	130.41	174.30	207.54	251.43	284.67	317.90
12	140.99	188.54	224.45	272.00	308.07	343.98
24	189.58	262.61	317.75	390.78	445.93	501.07
48	242.64	339.22	412.54	509.12	582.45	655.78
72	273.64	379.16	458.75	564.27	643.85	723.44

Table 5.6: Depth Duration Frequency Values for Katunayake

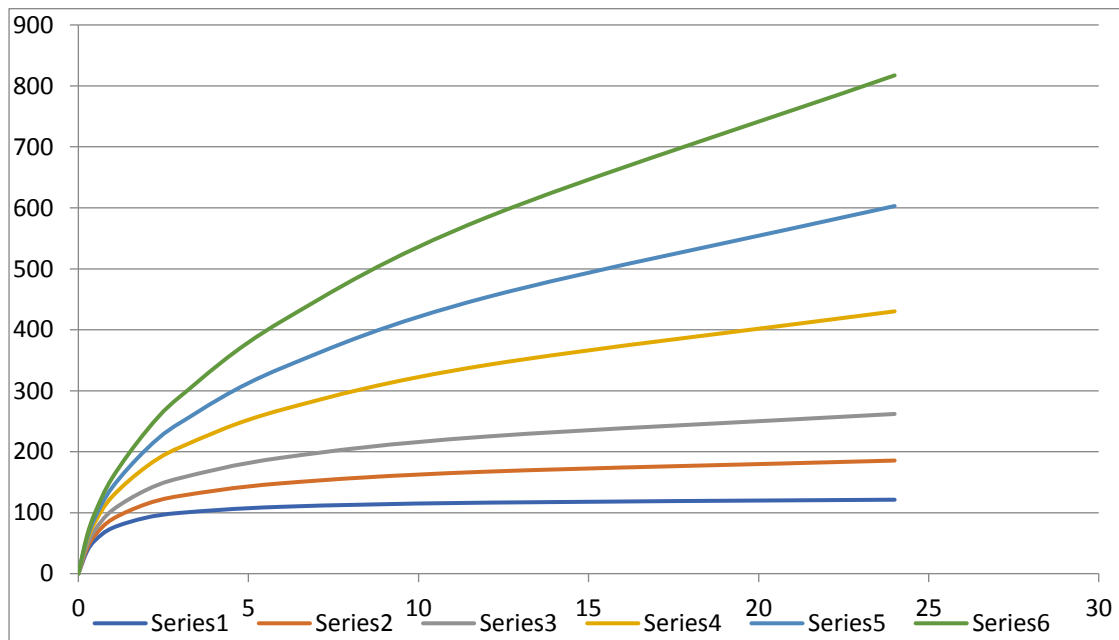


Figure 5.4: Depth Duration Frequency Curves for Katunayake

Duration in Hours	Return period in years					
	2	5	10	25	50	100
0.25	144.37	164.31	184.42	213.13	228.28	244.70
0.5	109.93	124.61	139.43	157.97	168.20	177.46
1	74.32	84.96	96.11	110.76	120.90	130.55
2	47.30	57.82	68.59	84.60	97.38	110.39
3	34.05	42.51	51.44	65.83	77.92	90.63
6	17.99	24.04	30.64	42.66	53.43	65.45
12	8.87	12.57	16.81	25.49	33.72	43.43
24	5.39	8.47	12.13	20.47	28.87	39.42

Table5.7: Intensity Duration Frequency Values for Katunayake

Return Period (in Years)	Equation (Intensity I = mm/ hr, T in minutes)
2	$I = 6042.878(T + 31.7)^{-0.972}$
5	$I = 4601.597(T + 29.9)^{-0.876}$
10	$I = 3798.453 (T + 28.4)^{-0.803}$
25	$I = 2659.96 (T + 24.6)^{-0.686}$
50	$I = 2012.0 (T + 22.3)^{-0.601}$
100	$I = 1566.503 (T + 19.2)^{-0.526}$

Table 5.8: IDF Equations for different return period at Katunayake

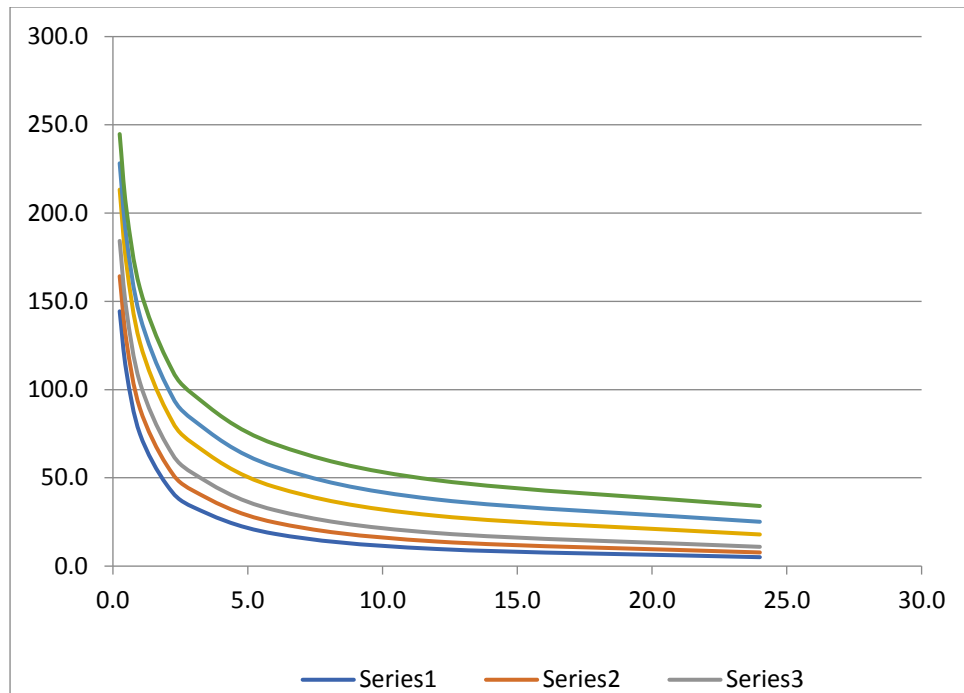


Figure 5.5: Intensity Depth Duration Frequency Curves for Katunayake rainfall stations

By considering the long term continuous rain, 12hr design storms was developed for the model analysis for the different return period based on the rainfall analysis. Design event was derived for 15-minute intervals so that the quick response for small catchment taken into account. Long term continuous rain (12hr) has to be selected due to vast scenario has occurred when the downstream water level is high due to heavy rain storm in the rain water sheds.

The alternative block method was applied for the development of the design storm and the peak rainfall was placed at the middle. Since this a 12-hour event, the depression storage may be filled within the initial few hours and the infiltration model also sufficiently saturated when the peak rainfall arrives and thereby this may be regarded as a possible worst scenario and sufficient degree of factor of safety is achieved

The calculation procedure of deriving the design rainfall is given in Table 5.9,5.10,5.11,5.12 and a graphical interpretation of the event is given in Figure 5.6,5.7,5.8, and 5.9.

Development of Design Rainfall for (25 ARI) $I = 3492.79 (T + 22.2)^{-0.746}$

	Duration (hrs)	Duration (minutes)	Intensity (mm/hr)	Depth (mm)	Incremental Depth (mm)	Ranking	
1	0.25	15	235.26	58.81491185	58.81491185	6.291852712	11
2	0.5	30	182.72	91.36088209	32.54597024	7.597632078	9
3	0.75	45	151.34	113.5053313	22.14444921	9.666205646	7
4	1.00	60	130.22	130.2201224	16.71479105	13.42254276	5
5	1.25	75	114.91	143.6426651	13.42254276	22.14444921	3
6	1.50	90	103.25	154.8706292	11.22796408	58.81491185	1
7	1.75	105	94.02	164.5368348	9.666205646	32.54597024	2
8	2.00	120	86.52	173.0371573	8.500322437	16.71479105	4
9	2.25	135	80.28	180.6347894	7.597632078	11.22796408	6
10	2.50	150	75.01	187.5131614	6.878372035	8.500322437	8
11	2.75	165	70.47	193.8050141	6.291852712	6.878372035	10
12	3.00	180	66.54	199.6094007	5.804386652	5.804386652	12

Table 5.9: Values for 25yr Design Event

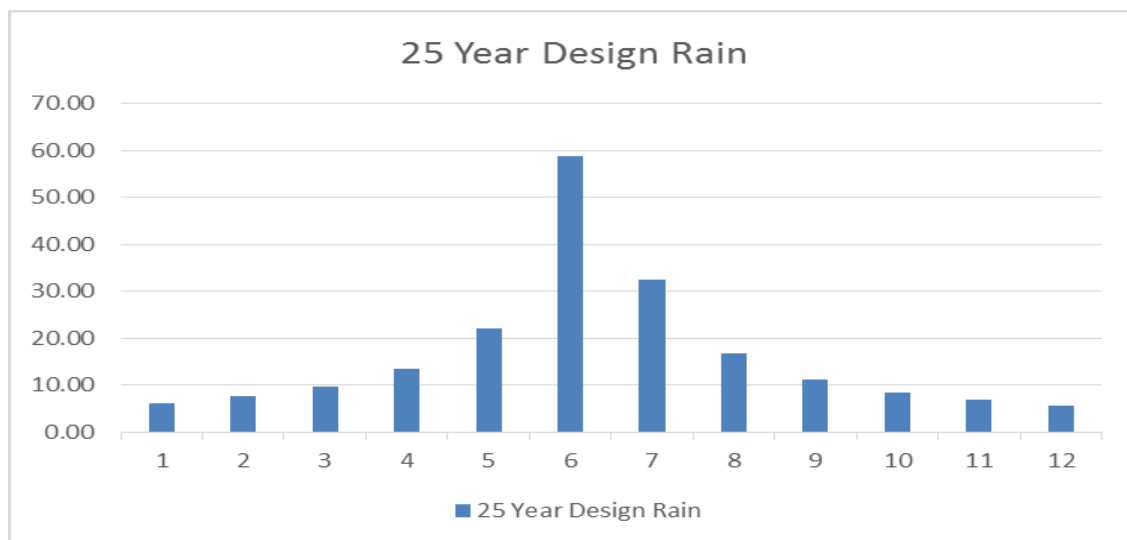


Figure 5.6: Design Hydrograph for 25yr Return Period

Development of Design Rainfall for (50ARI) - = $2733.50 (T + 19.1)^{-0.671}$							
	Duration (hrs)	Duration (minutes)	Intensity (mm/hr)	Depth (mm)	Incremental Depth (mm)	Ranking	
1	0.25	15	256.00	64.00013626	64.00013626	8.52936069	11
2	0.50	30	200.45	100.2243853	36.22424906	10.02450453	9
3	0.75	45	167.62	125.7125407	25.48815541	12.32743153	7
4	1.00	60	145.56	145.5602047	19.84766403	16.37842268	5
5	1.25	75	129.55	161.9386274	16.37842268	25.48815541	3
6	1.50	90	117.31	175.9664731	14.02784571	64.00013626	1
7	1.75	105	107.60	188.2939047	12.32743153	36.22424906	2
8	2.00	120	99.67	199.3317913	11.03788668	19.84766403	4
9	2.25	135	93.05	209.3562959	10.02450453	14.02784571	6
10	2.50	150	87.42	218.5620353	9.205739391	11.03788668	8
11	2.75	165	82.58	227.091396	8.52936069	9.205739391	10
12	3.00	180	78.35	235.0517654	7.960369489	7.960369489	12

Table 5.10: Values for 50 yr Design Event

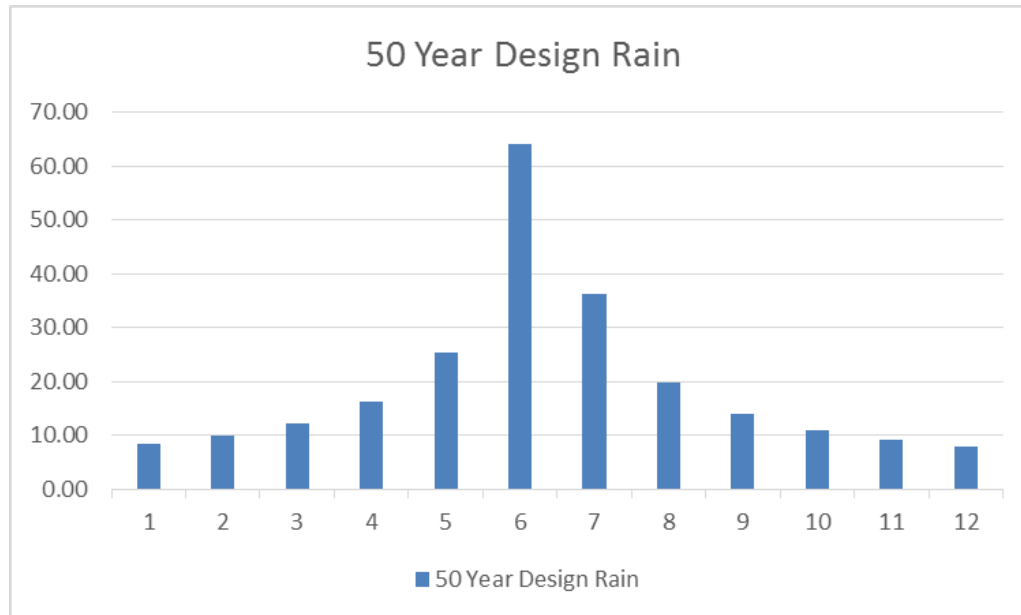


Figure 5.7: Design Hydrograph for 50yr Return Period

5.1.1 Variation of sea water levels

The variation of sea water level during high tide and low tide is important as the excess storm water from all basins eventually discharge to Kelani river and sub sequently to the sea as an emergency outlet. Record of high tidal level at Colombo harbor in April to June 2002. (See table 5.11)

Date(Time)		Tidal Level (above MSL)
Apr. 12	2002(15:00)	0.51m
Apr. 13	2002(15:00)	0.53m
Apr. 14	2002(15:00)	0.53m
Apr. 26	2002(15:00)	0.54m
Apr. 27	2002(15:00)	0.64m
Apr.28	2002(16:00)	0.66m
Apr.29	2002(16:00)	0.63m
Apr.30	2002(16:00)	0.52m
Jun.12	2002(15:00)	0.51m
Jun.13	2002(16:00)	0.54m

Table 5.11: High tide level at Colombo Harbor April to June 2002

Considering the situation above, the assumption that high tide level of over 0.60m above MSL occurs during a flood event is reasonable. Source: Sri Lanka Ports Authority.

6.0 Study Approach

6.1 MATHEMATICAL MODEL

Theoretical background of HEC HMS and HEC RAS Model

HEC HMS and HEC RAS model requires a range of input data to simulate the water levels and flow in the selected area. The HEC HMS RR model describes the run off in terms of surface flow in catchments and HEC RAS HD model presents the flow in main canal and cross drains.

Input data required for HEC HMS RR model:

Rainfall data, Catchment data, Area, Length, Slope, Land use data, Soil data

Input data required for HEC RAS HD model: Network data, Main canal, cross drains, Bridges, culverts, and other hydraulic structures

Boundary conditions in terms of water levels

HEC HMS RR Model

The Unit Hydrograph Method (UHM) estimates the runoff for single storm events. This method divides the storm rainfall into excess rainfall (runoff) and water loss (infiltration).

The SCS loss model uses a curve number that characterises the catchment in terms of soil type and land use characteristics. The model operates with three different levels of the antecedent moisture conditions.

Excess rainfall from basins and transformation to runoff is determined using the US Soil Conservation Service (SCS) Curve Number method, based on SCS unit hydrograph.

Antecedent Moisture Condition (AMC) defines the level of moisture in the ground before rain starts. Level I specifies dry conditions, level II specifies average moisture condition, while level III specifies wet condition. In the present study AMC III was used in HEC HMSmodel since it gives the maximum discharge values compared to other AMC conditions

HEC RAS HD Model

As HEC RAS HD Model is a physically based system, data related to the detailed physical characteristics of the model must be available as inputs if realistic model results are to be expected. With the help of these data, HEC RAS solves ‘Saint Venant’ equations, consists of continuity and conservation of momentum equations, based on some assumptions to obtain the time series of water level and discharge along the river profile.

Data Required

The basic data requirement for the HEC RAS HD model is as follows;

(i) Geometric and Topographic data

These data are necessary to provide an adequate geometrical and topographical description of the river network, off-stream storage areas, and all important hydraulic structures.

The layout of the river system is determined from suitable bathymetric maps or aerial photographs. The location of the main channel confluences and bifurcations, areas subject to inundation, and the network of discharge exchange between storage areas must be identified.

Cross sections are required at approximately regular intervals along the main channel and these data should ideally extend on either bank up to high flood levels. The cross section spacing should sufficiently be close to adequately describe the longitudinal variation in channel geometry.

Areas adjacent to the river subjected to inundation are also needed to be identified, and their storage capacities at various flood stages need to be determined.

(ii) Hydrometric data

Hydrometric data is required at the model boundaries for the operation of the model and is also necessary to enable the model to calibrate and verify against the actual events. The main types of hydrometric data required are:

Water Levels:

These are required for model operation at all specified water level boundaries, or at discharge boundaries where a rating curve is available for conversion to discharges. Water levels are also required at internal points for model calibration purposes.

Discharges:

These are required for model operation at all points specified as discharge points

HEC HMS model

6.2 HEC HMS

The Hydrologic Modeling System (HMS), developed by US Army is designed to simulate the complete hydrologic processes of dendritic watershed systems. The software includes many traditional hydrologic analysis procedures such as event infiltration, unit hydrographs, and hydrologic routing. HEC-HMS also includes procedures necessary for continuous simulation including Evapo-transpiration, and soil moisture accounting.

In addition to the above HMS is capable of hydrologic routing of systems comprises of hydrologic elements such as sub basins, reservoirs, spillways, dam breaks etc.

6.3 Idealization of the basin

The idealization of this network in to the HEC HMS Model is shown in Figure 6.1.

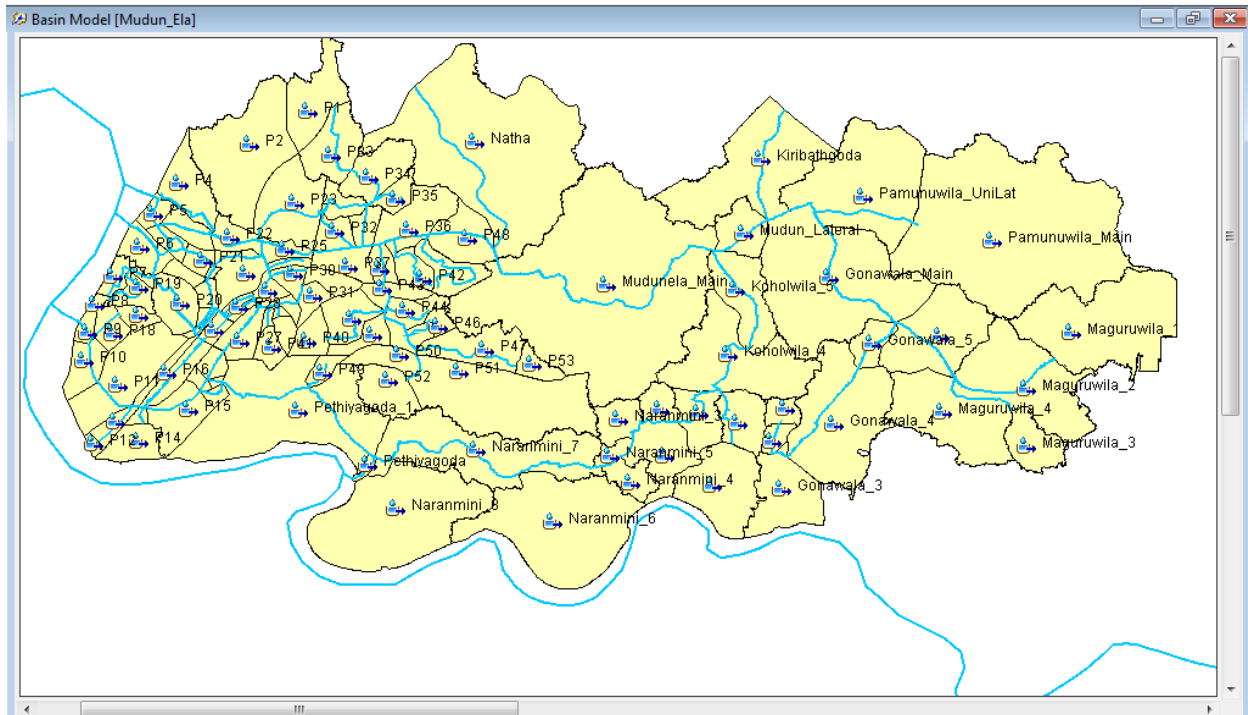


Figure 6.1- HEC HMS Sub Basin Model

6.4 Loss method

There are many loss methods available within HMS depending on the purpose. Since this is an event modeling, SCS curve number method was used.

The general equation for the SCS curve number method is as follows:

Considering the nature of land use, the CN value was used as 60 for this study after evaluating CN values used for other projects.

Sample hydrograph for specific sub basin from HEC HMS Model is shown in Figure

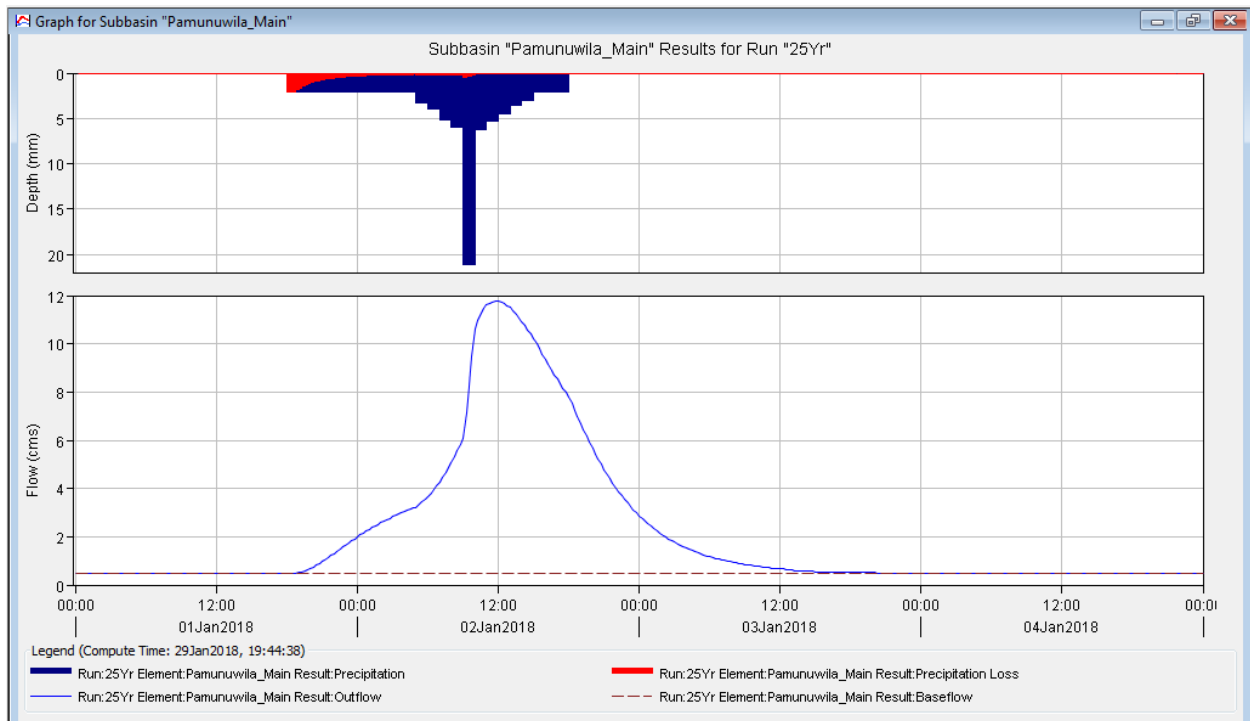


Figure 6.2 - 25 Year Flood Hydrograph for Specific Sub Basin

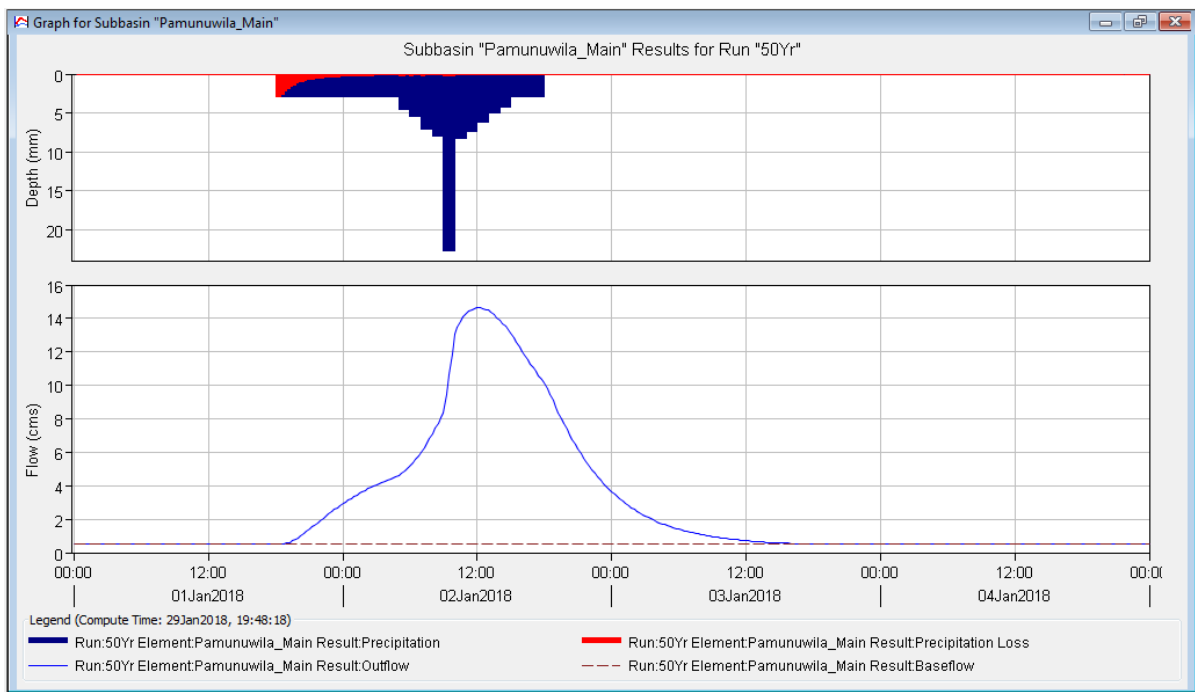


Figure 6.3 - 50-year Flood Hydrograph for Specific Sub Basin

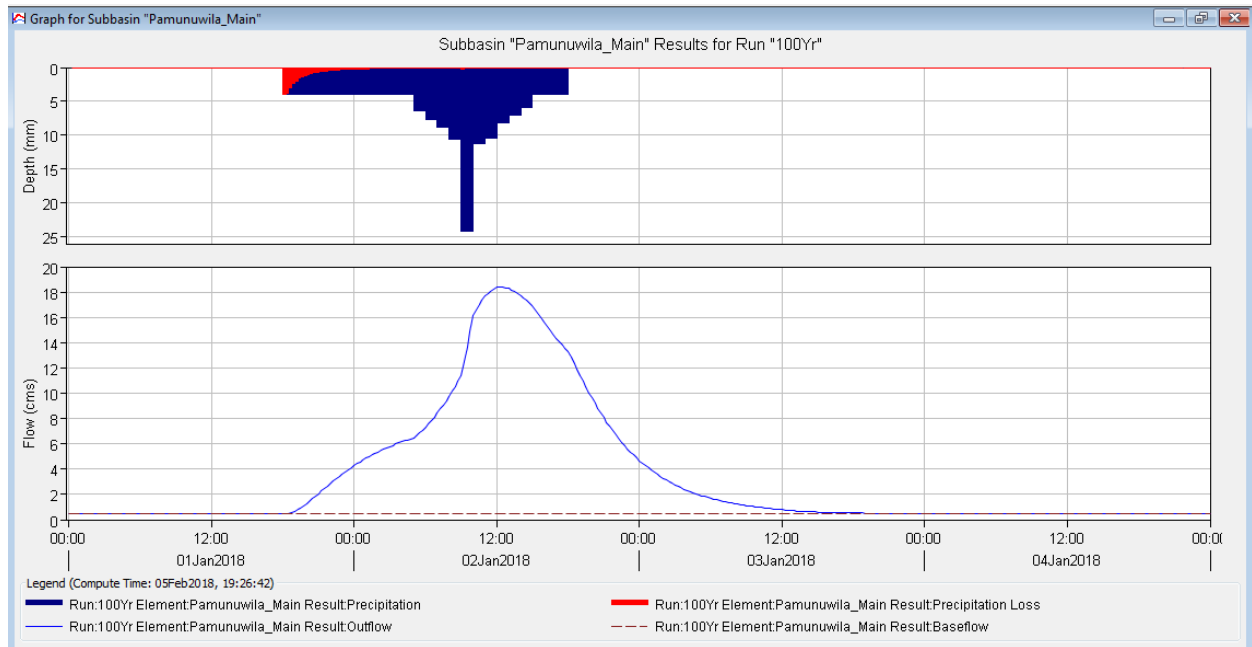


Figure 6.4 100 Year Flood Hydrograph for Specific Sub Basin

6.5 Hydraulic Modeling

The hydraulic modeling will simulate the process after the runoff enters to canal network while hydrologic model described above simulates the runoff from rainfall. The output of hydrologic model would be the input for the hydraulic model. HEC RAS Model software was used for the hydraulic modeling of this study.

6.6 HEC RAS 2D modeling

HEC RAS is now capable of 2D modeling subject to availability of a good digital elevation model. The combined digital elevation models obtained as above was used for the 2D modeling of the macro area. The grid interval was taken as 20m. HEC RAS Model set up is shown in Figure 6.4.

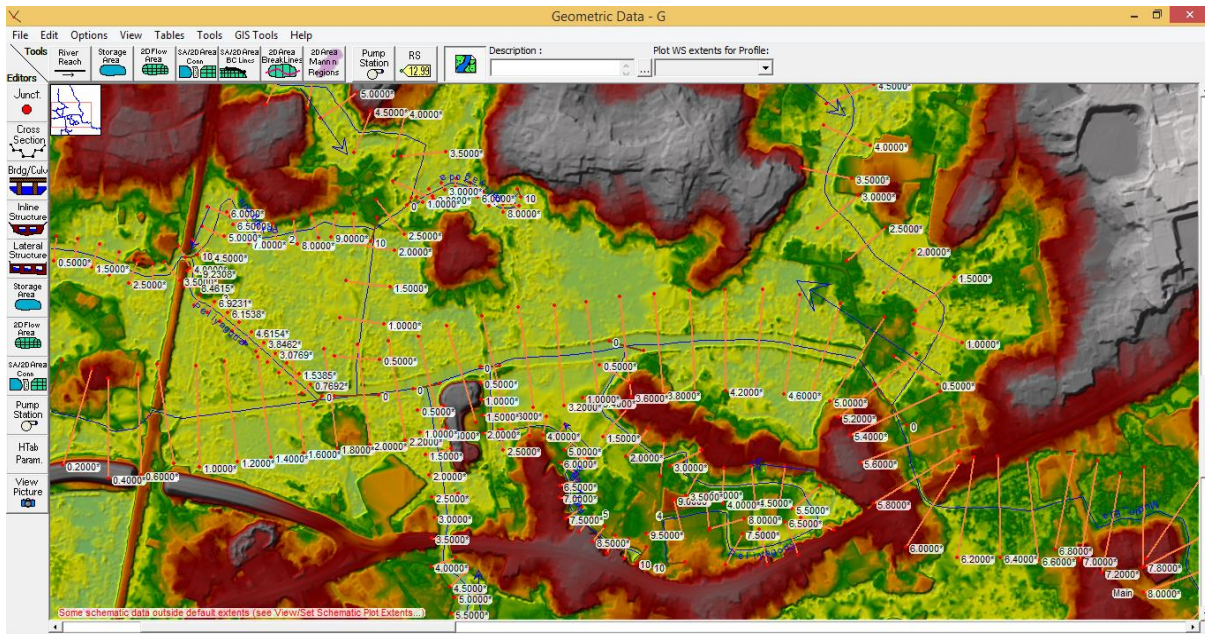


Figure 6.5 - HEC RAS 2D Model Net Work

Model Calibration & Verification details are shown in following maps and figures.



(Figures 6.5, 6.6, 6.7, 6.8 & table 6.1)

Figure 6.6- Nearest Rainfall Station of The Project

	Colombo	Angoda	Welisara
13-May-16	2.6	8.2	22.3
14-May-16	76.4	28.5	77.2
15-May-16	256.9	261.5	197.5
16-May-16	26	20.2	5.7
17-May-16	19.5	18	13.2
18-May-16	0.9	8.5	34.2
19-May-16	9.8	15.2	39.3
20-May-16	0.8	10.5	2
21-May-16	1.8	8.5	0

Table 6.1 Rainfall Event in May 2016

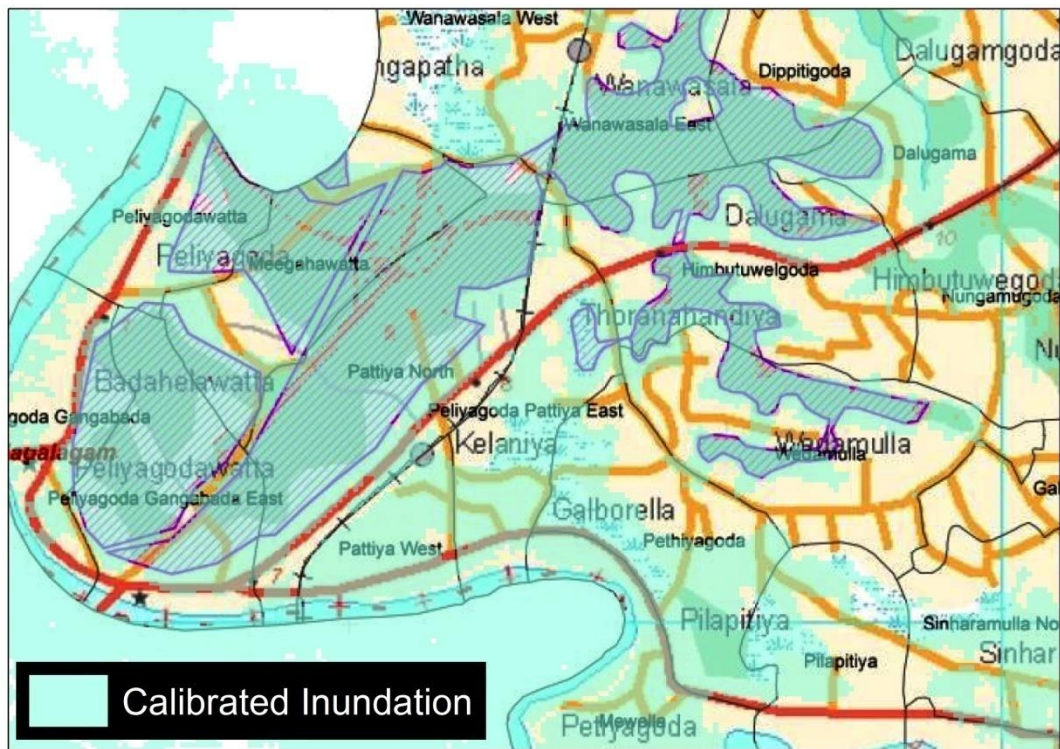


Figure 6.7 - Calibrated Inundation

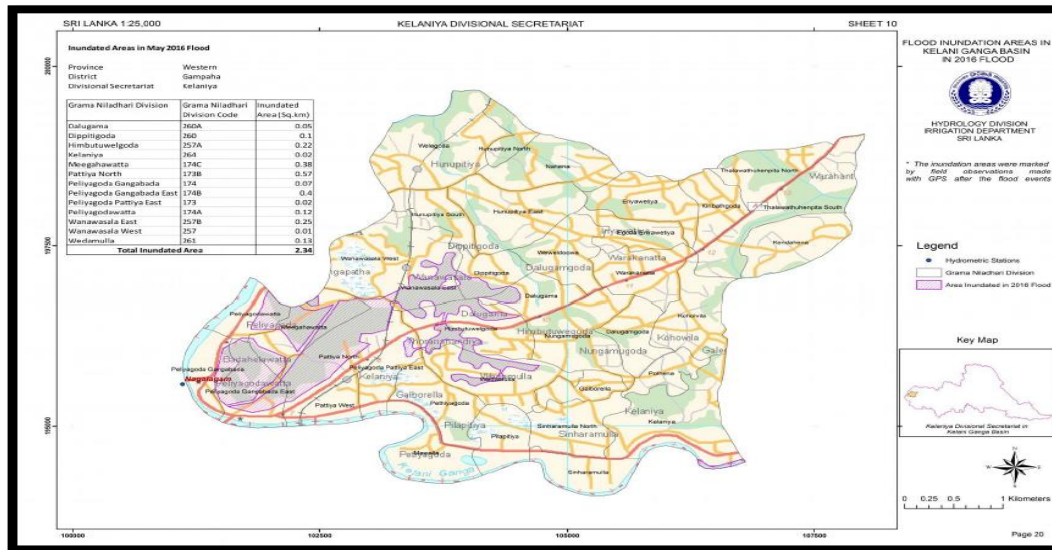


Figure 6.8 - Verification Inundation



Figure 6.9 - Observed flood in year 2010. Flood in the vicinity of the Project:2.10mMSL

6.7 Flood inundation

Flood inundations can be obtained in the form of raster GIS data sets as indicated in Figure 6.9, 6.10 & 6.11, 6.12 for 25 & 50-year return period at existing and proposed conditions.

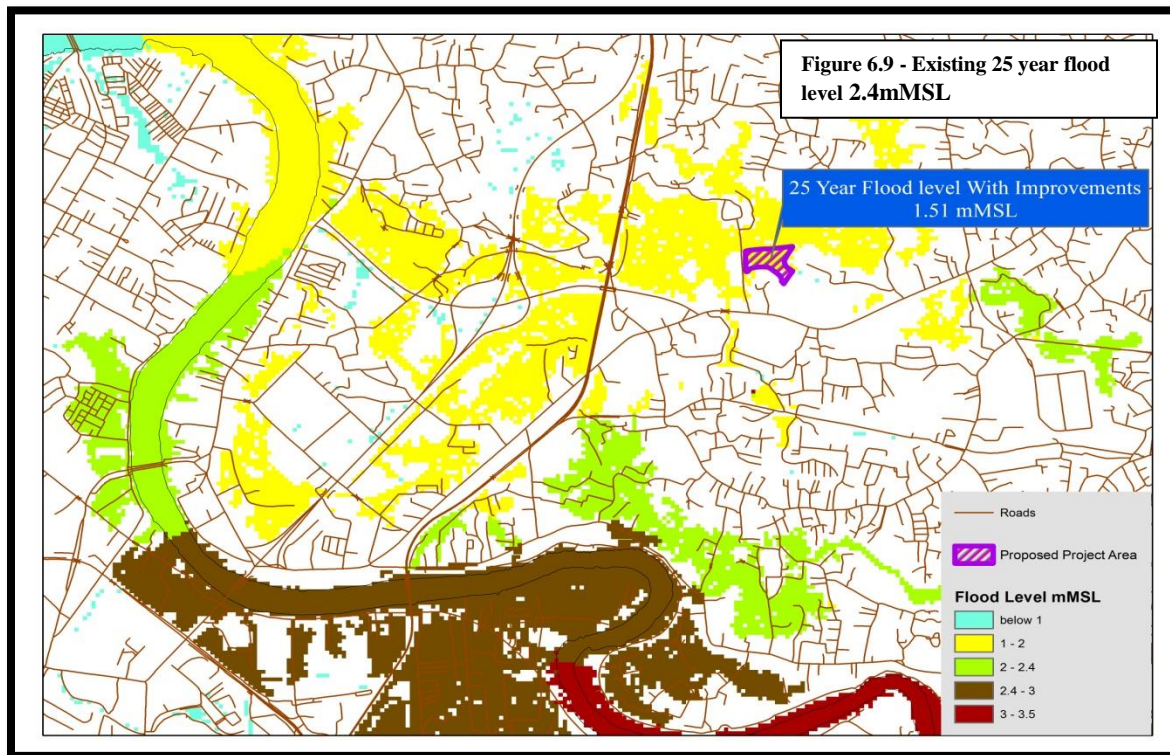


Figure 6.10 - Existing 25-year flood level 2.4mMSL

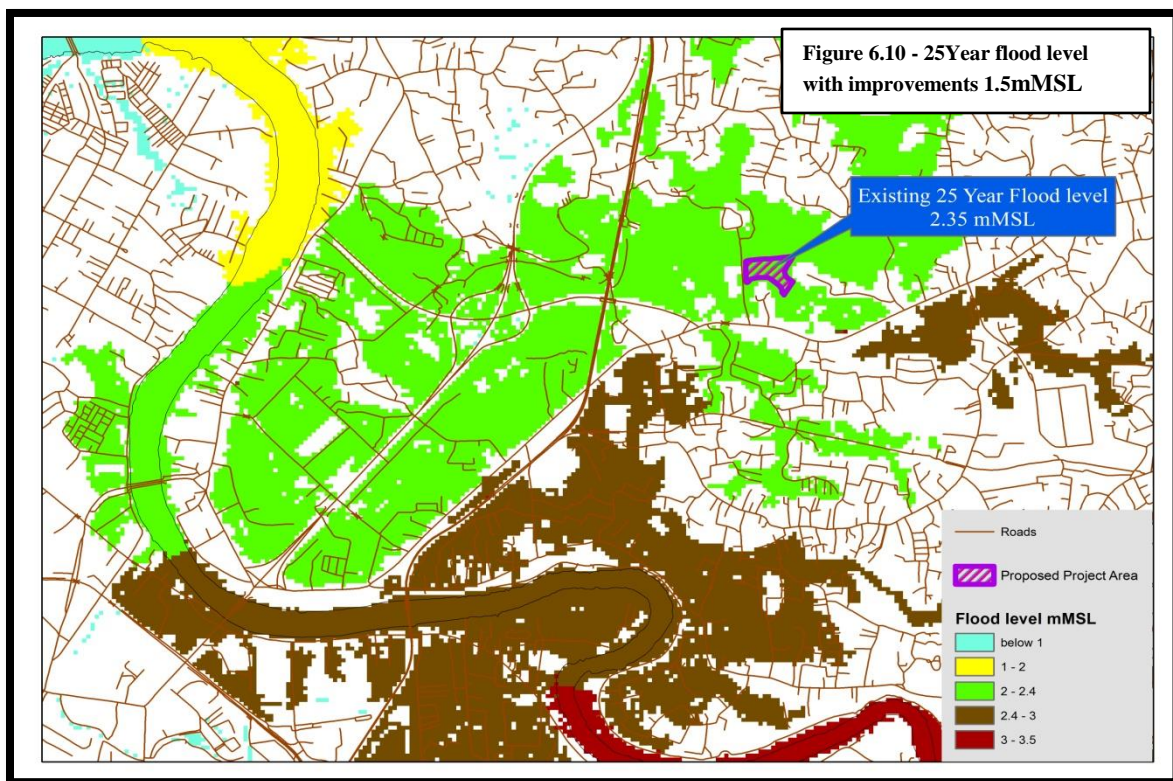


Figure 6.11 - 25Year flood level with drainage improvements 1.5mMSL

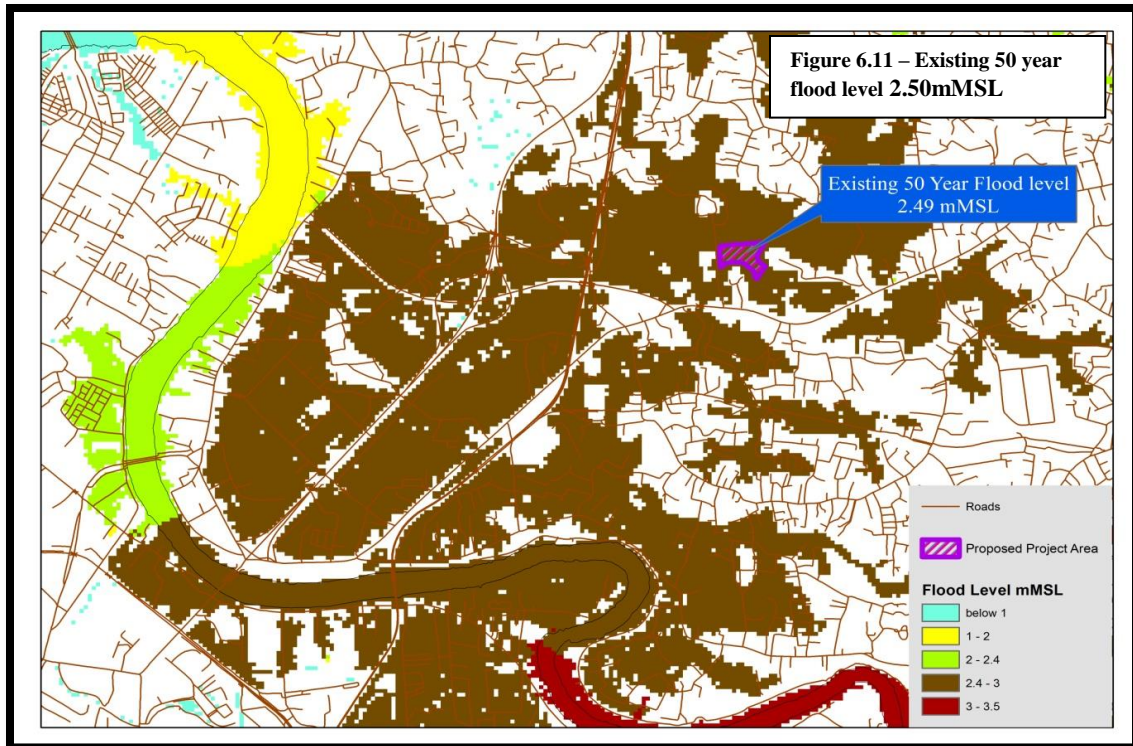


Figure 6.12 – Existing 50-year flood level 2.50mMSL

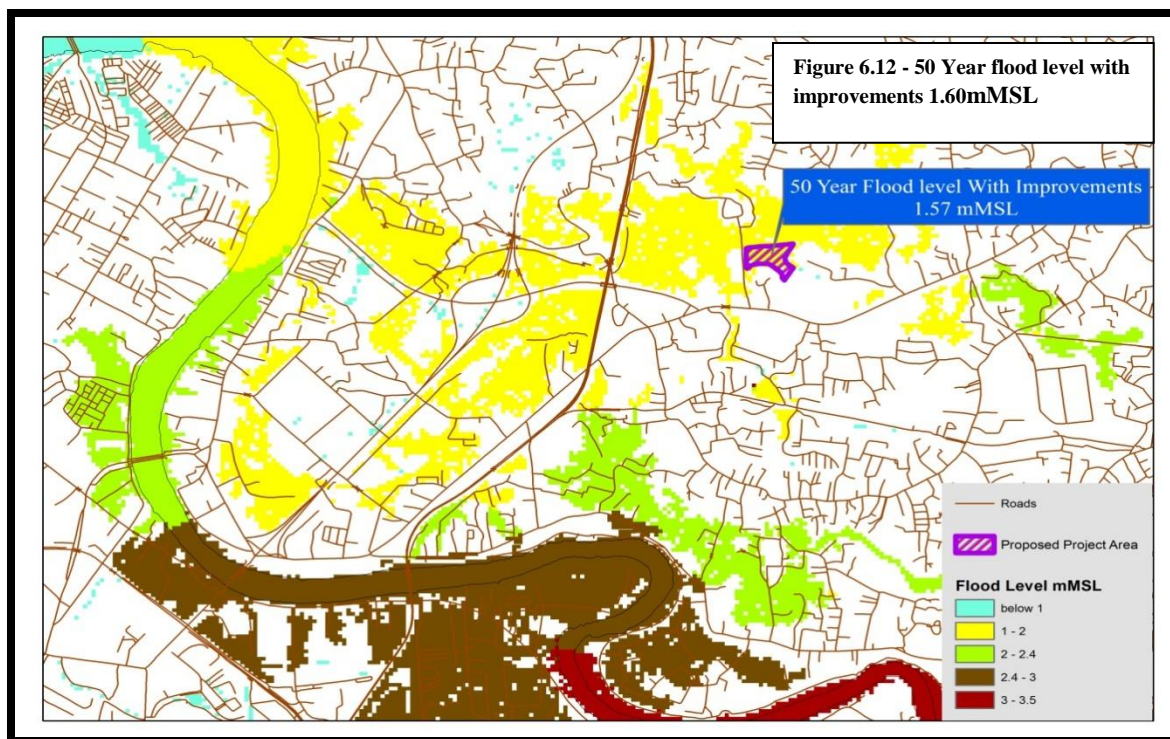


Figure 6.13 - 50 Year flood level with drainage improvements 1.60mMSL

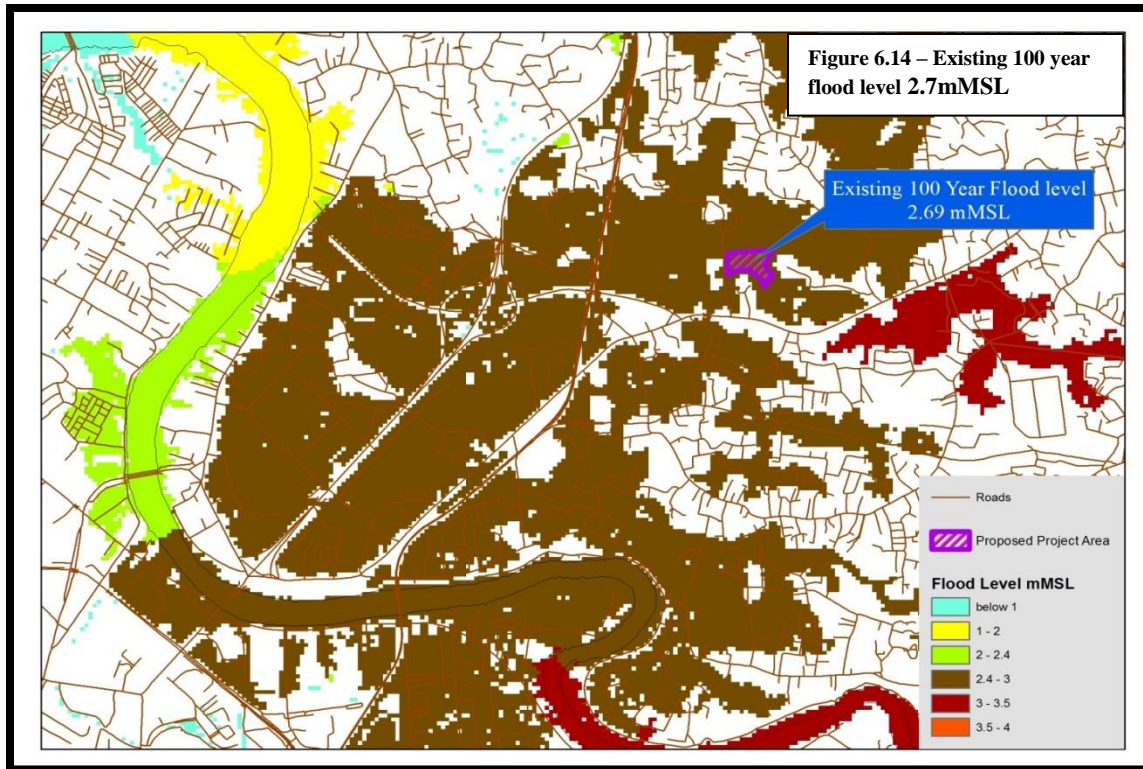


Figure 6.14 - Existing 100 Year flood level 2.70 m MSL

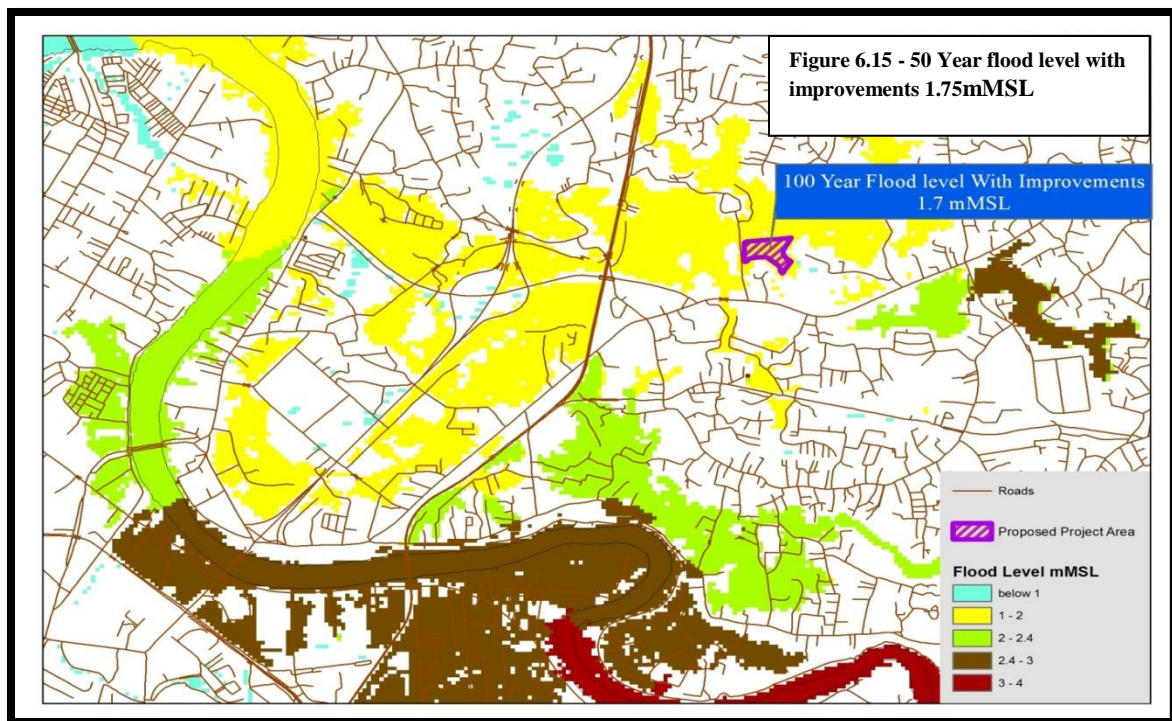


Figure 6.15 - 100 Year flood level with drainage improvement 1.75 m MSL

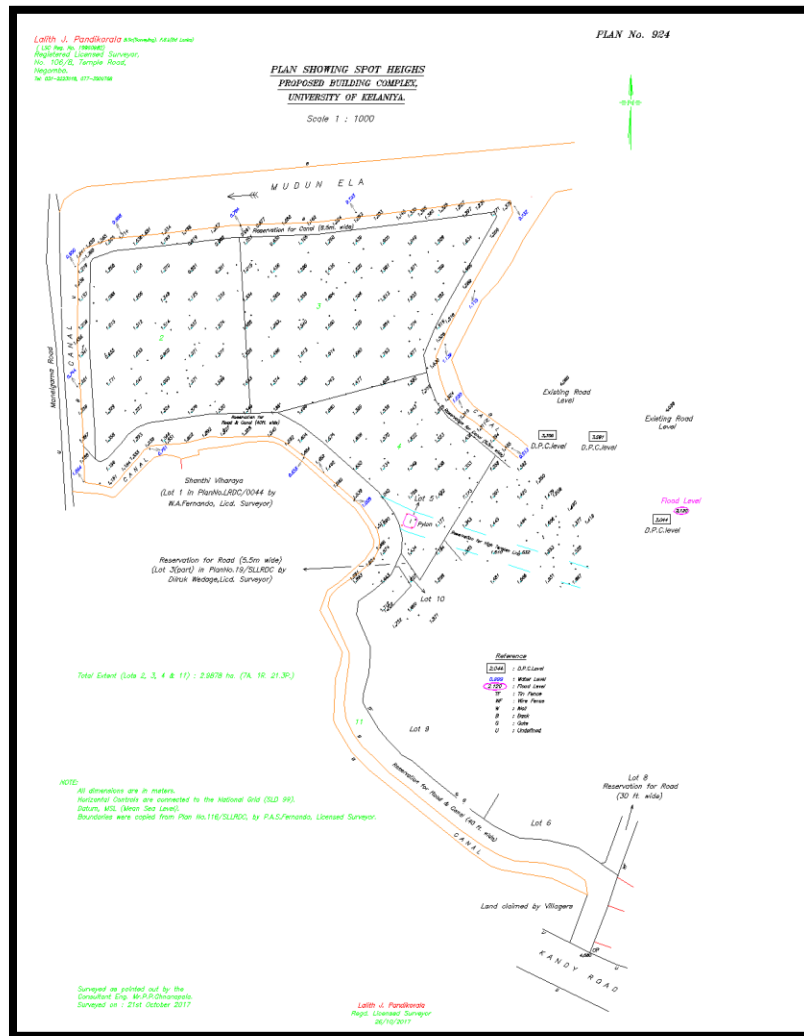


Figure 6.16: Project area with Spot levels with respect to m MSL

6.8 Flood Mapping

Flood Mapping is important to identify the area under flooding during a storm and depth of flooding. In order to 100% accurate flood mapping, a 02D hydraulic modeling exercise is needed.

6.8.1 Creation of Digital Elevation Model (DEM)

The spot levels of the area were available from the spot heights. Analysis software such as “Surfer” and “ArcGIS” were used to creation of DEM from the spot heights. The created sample of DEM is shown in Figure5.11.

6.8.2 Flood Mapping

The total amount of flooded water volume can be taken from the nodal flooding output of HEC RAS Model. Thereafter, ArcGIS software was used to put this water volume in to DEM and observe the extent of flooding and the depth of flooding. This combination of Model results and ArcGIS was used to obtain flooded water volume, flood level, flood extent and flood depth. Latest updated drainage proposals are shown in Figure 6.14.

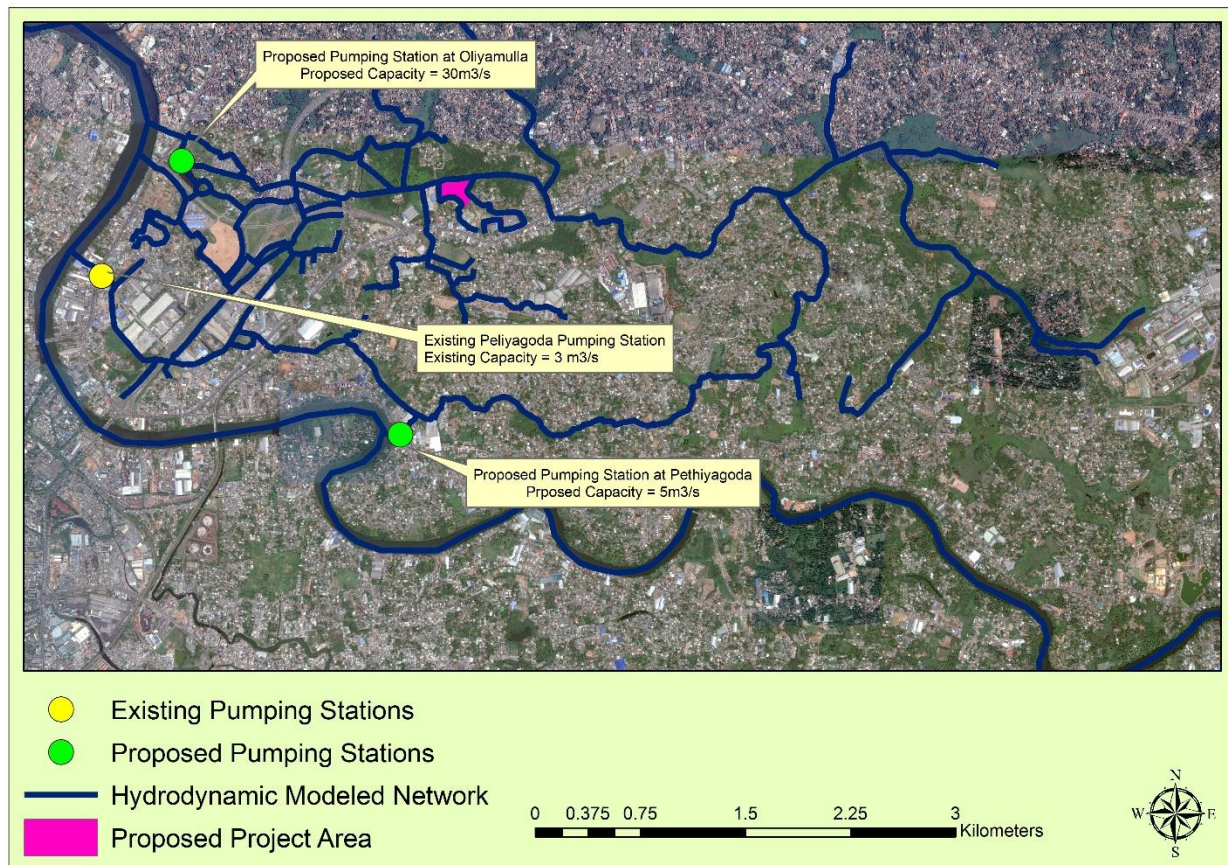


Figure 6.17: Future proposal to reduce flooding in the Mudun ela basin

7.0 Recommendation

A very detailed assessment has been completed to analyze the flood situation and flood mitigation approach, as given below.

Situation as at present:

- a. Existing average fill level of the project area: 1.50 m MSL
- b. Observed recent flood level in Year 2010: 2.10 m MSL
- c. 25-year return period flood level for existing condition: 2.35 m MSL
- d. 50-year return period flood level for existing condition: 2.49 m MSL
- e. DPC level of an unprotected house in the vicinity: 2.04 m MSL
(already flooded in 2010)
- f. DPC level of a protected house in the vicinity: 3.35 m MSL

Situation after implementation of Proposed Drainage Proposals:

- Expected flood level after implementation of proposed pumping station and rehabilitation of drainage system.
- Expected 25year flood level after drainage improvement: 1.50 m MSL
- Expected 50-year flood level after drainage improvement: 1.60 m MSL
- Expected 100-year flood level after drainage improvement: 1.70 m MSL

8.0 Conclusion

Detailed assessment of risk has been carried out taking into consideration of the catchment characteristics, location of the project site, Topography, proposed master plan, existing drainage network, degree of flood and historic observed data. Accordingly, the Model Studies provided the following results.

1. From model results for existing situation, it was found that the existing ground level of the project site is not protected for 25-year return period.
2. From the model results, it was observed that the expected flood level after implementation of proposed pumping station and rehabilitation of drainage system are as given below:

- Expected 25-year flood level after drainage improvement: 1.50 m MSL
- Expected 50-year flood level after drainage improvement: 1.60 m MSL
- Expected 100-year flood level after drainage improvement: 1.70 m MSL

This shows that even after implementation of proposed drainage improvements, it is not possible to expect safety of the project at 1.5 m MSL without raising the existing ground at this location.

It is to be mentioned that the required level of the reclamation site depends on following factors.

- a. Protection level of the proposed infrastructures
 - b. Maintenance of the sewerage system during floods.
 - c. Surface drainage system within the project area for future development
3. From the photos taken in the vicinity of the site and also due to reasons given below it is not possible to have much confidence that maintenance aspect of the drainage system would function satisfactorily.
- a. Main canal system with pumping station is being maintained by SLLR&DC.
 - b. Regular maintenance of the downstream main peripheral drain and culvert across the Colombo – Katunayake expressway are being maintained by Road Development Authority.
 - c. Local drainage is being maintained by the Peliyagoda Urban council.

Taking into consideration the above facts it can be concluded that there is no risk of flooding during extreme (25 year and 50-year floods) on the project site which are above 2.50 m MSL. Therefore, it is recommended to fill the project site at least up to 2.75 m MSL by keeping minimum freeboard.

DPC level of the proposed buildings should be 0.50 m above the recommended fill level.

DPC level of the proposed building should be 3.25 m MSL.



Existing View of the Downstream of the Pipe Culvert Across the Main canal
(Opening is not adequate) - 30 m span bridge



Existing View of the Downstream Main Canal



Existing View of the Upstream of the Pipe Culvert Across the Main canal
(Opening is not adequate) - Minimum requirement is 30 m span bridge



Existing View of the Proposed Project Area (1.0 m above the normal water level)
Existing average fill level is 1.50 m MSL



Existing View of the Downstream Garbage Dumping Project



Existing View of the Retention area located by the side of the Project



Existing View of the protected houses Adjoining to the Project - DPC level of the house is 3.35 m MSL

ANNEX 11: BIO DIVERSITY ASSESSMENT

**Report on the Present Ecological Status of the Proposed
Technology faculty building site of University of Kelaniya
and its surrounding Wetland Habitat**

March 2018

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2. Methodology

2a. Study Area: The study area is a flat marshy land located in the low country wet zone. It belongs to the WL3 agro ecological zone and floristic region 1 (coastal and marine belt). The area receives an annual average rainfall of 2000-2500mm and an average annual temperature is around 27°C. Elevation in the study site is less than 10 m above mean sea level.

2b. Period of field survey, sampling frequency and time: The survey was carried out in January and February, 2018. Initially, the whole study site was rapidly surveyed to identify different micro habitat types available as well as to identify accessible routes to the study area. Based on this initial survey, sampling points and transects were selected for various taxonomic groups as well as to cover all the micro habitats identified. Mostly transects were along the canal embankments, roads and along other higher ground since it was difficult to walk on muddy reed beds and to cross the canals with polluted water. Circular point transects were used to observe birds in certain locations. Fishes were sampled only at accessible locations to canals where less-slopy embankments are available. All the sampled sites were accessed by foot but no boats were used. The field survey team comprised of five persons with expertise on flowering plants, terrestrial fauna and ichthyofauna. The same sampling points and transects were used for the flowering plants and terrestrial fauna while different sampling points were selected to sample the fish. Faunal sampling was repeated twice in two months in the same plots & transects. The surveyed time period was well within the migratory bird season and was good for seasonal faunal groups such as dragonflies and butterflies since it had rains in December. Floral sampling was done only once since there is no any considerable changes within two months in the vegetation. The study site is shown in map 1.



Map 1: The location map of study area.

Boundary of the study site is marked in **red**.

Boundary of the proposed developing site is marked in **yellow**.

Sampling points of fishes are marked in **blue**.

Boundary of the adjacent garbage dump is marked in **rose**.

All vertebrate fauna as well as some indicator groups of invertebrates such as butterflies, dragonflies and mollusacans were studied. Floral study focused on all the families of flowering plants (Angiosperms) while non- flowering plants were not considered. Sampling method used for each group is as follows.

2c. Sampling methods:

Fauna: Line transects survey, variable circular plots survey and opportunistic observations were used to determine the status of terrestrial fauna. Either direct or indirect evidence were used to record the existence of the species. An 8 x 42 binocular was used to aid in the sampling of birds, butterflies and dragonflies. Fish and dragonfly larvae samples were collected in selected locations covering major aquatic habitats (Map 1) using long stalked hand nets (10 random casts/site) and hand traps. Further information was collected from neighbouring community on the local names of fish found in the canals.

Flora: Plots of 10 m width and variable lengths were selected within line transects marked along accessible routes to conduct the terrestrial flora survey. At places where the walking is restricted, circular plots were used. Floating and emergent aquatic plants were identified by direct visual observations. Submerged plants were identified by observing through water surface, when the water is clear enough to see the bottom. Plants that could not be identified in the field were photographed in detail using a DSLR camera fitted with a macro lens, and later identified using literature.

Techniques used for each taxonomic group are listed in the following table.

Taxonomic Group	Technique
Birds	Variable circular plots in selected locations in different times of the day, Line transect observations at accessible routes (both direct observations and indirect observations such as calls, feathers were used for identification)
Mammals	Opportunistic observations in the study area (both direct and indirect observations such as scat and foot prints were used for identification) Traps were not used for the study of small mammals due to limited time available
Reptiles	Opportunistic observations (direct observations only), plot clearing in selected locations
Amphibians	Opportunistic observations with special attention in wet places such as canals, ponds and undergrowth. Log turning was also done in terrestrial habitats.
Fish	Hand nets (10 random casts/site), hand traps in selected locations, Opportunistic observations by surface viewing.
Butterflies	Line transects and opportunistic observations (both adult stage and larval stage were identified)
Dragonflies	Opportunistic observation (both adult stage and larval stage were identified) with special attention at water bodies.

Sampling locations of the terrestrial flora & fauna

Plot	Latitude (N)	Longitude (E)	Alt (ft)	Vegetation type
1	6.9711	79.9029	18	Sedges
2	6.9705	79.9021	14	Sedges and semi aquatic herbs
3	6.9729	79.9025	19	Annona woodland
4	6.9716	79.9034	19	Annona woodland
5	6.9712	79.9040	12	Annona and semi aquatic herbs
6	6.9715	79.9053	22	Annona woodland
7	6.9725	79.9047	21	Disturbed vegetation
8	6.9727	79.9042	22	Home garden
9	6.9724	79.9059	28	Annona woodland
10	6.9718	79.9082	21	Annona woodland
11	6.9717	79.9091	14	Sedges
12	6.9705	79.9085	17	Annona woodland
13	6.9720	79.9045	11	Panicum & herbs
14	6.9693	79.9060	23	Panicum & herbs

Note: When the sample is a line transect, values of the center point is given

Sampling locations of the terrestrial flora & fauna

Plot	Latitude (N)	Longitude (E)	Alt (ft)	Vegetation type
1	6.9718	79.9017	15	<i>Eichhornia crassipes</i>
2	6.9705	79.9016	12	<i>Eichhornia crassipes</i>
3	6.9710	79.9039	11	No vegetation
4	6.9705	79.9041	9	No vegetation
5	6.9705	79.9058	21	<i>Hydrilla verticillata</i>
6	6.9713	79.9060	22	No vegetation
7	6.9714	79.9074	19	No vegetation

Observed species were identified using most recent field guide books which are given follow.

Flora: Vlas & Vlas (2014), Vlas & Vlas (2008), Dassanayake & Fosberg (1980 – 1991), Dassanayake, Fosberg & Clayton (1994 – 1995), Dassanayake & Clayton (1996 – 2000) and Dassanayake, Clayton & Shaffer-Fehre (2006)

Birds: Kotagama & Ratnavira (2017), Warakagoda *et. al.* (2012), Harrison (2011)

Mammals: Phillips (1935), Yapa & Rathnaweera (2013), Kotagama and Goonatilake (2013)

Reptiles: Somaweera (2006), Somaweera & Somaweera (2009)

Amphibians: Manamendra-Arachchi & Pethiyagoda (2006)

Fish: de Silva et. al. (2015), Goonathilake (2007)

Butterflies: Jayasinghe (2015), Jayasinghe et. al. (2016)

Dragonflies: Bedjanič et. al. (2007), Bedjanič et. al (2014), Sumanapala (2017)

Nomenclature for fauna used in this document are mainly in accordance with the National Red list 2012 of Sri Lanka, with some minor changes according to recent scientific updates. The plant list is according to the - Angiosperms Phylogeny Group ver. III (2015). Conservation status of the Flora and Fauna are also according to the National Red list 2012 (MoE, 2012). Note that the conservation status was not provided for the introduced fish, introduced plants and migratory birds as introduced species and migratory species was not assessed during the national redlisting process.

3. Study Findings

3a. Habitats

The study area belongs to the Chilaw to Hikkaduwa bio-region (region 12) where coastal marshes and lagoons, pocketed mangrove habitats, sandstone rocky habitats and sandstone reefs are the main ecosystem types. Further, the study area belongs to the floristic region 1 (the coastal and marine belt) and agro ecological region WL3 that receives the lowest rainfall in the western province with a relatively dry period from January to mid March. The study site is managed by Sri Lanka Land Reclamation and Development Co-ordination and is maintained largely as a wetland which gather local flood of the high ground where settlements are abundant. Water of this wetland drains in to the Kelani River which is at about 2 km in direct distance to the wetland. Further about in two more kilometers, Kelani river drains in to the sea. Although the canals of the study area are large enough to capture the local flood, drainages are poor due to the bottle necks in the downstream parts of the canal. This reason increases the pollutant contamination in the water. Since the wetland is surrounded by urbanized areas, impact of anthropogenic activities are evident. At the moment following micro habitats can be found within the study area with ecotones.

1. Reed & grass dominated vegetation
2. Annona woodland
3. Disturbed scrubland
4. Land filled habitat
5. Aquatic habitats

Overview of the habitats

Reed and grass dominated vegetation

About 20% of the study area falls within this category and it is more evident towards the western side of the site. Dominant large sedge species of this vegetation are *Actinoscirpus grossus* and *Rhynchospora corymbosa*. Among these sedges some grasses and ferns are distributed. It is apparent that *Annona glabra* is gradually invading this micro habitat. This area has a deep sinking mud layer and therefore can retain lot of water even during the dry spells. However, a considerable amount of water drains into the main canals at present as they have been deepened and widened recently. Reed associated birds and some water birds are found in this habitat. This habitat provides a good micro habitat for male dragonflies by providing perching places and for otters by providing hiding habitat.

Annona woodland

Woodland consisting of *Annona glabra* covers about 50% of the study area. More than 90% of the vegetation in this habitat was made out of this invasive plant species. It grows densely so that it covers the canopy completely and prevents any sunlight penetrating in to the ground. This creates a highly shaded condition and very few plants can grow in the ground layer other than some fern species and lianas, which are usually species that grow in shaded forest conditions. Ground of this *Annona* woodland also consist of mud and its boundary is clearly demarcated when the mud meets laterite soil at the high ground. Although this type of *Annona* woodlands is being used as breeding colonies by water birds in some of the wetlands found in the Colombo district, breeding bird colonies were not observed among *Annona* woodlands in the study area. However, it should be noted that the study period does not fall within the general breeding period of birds which could also be a reason for this observation. It appears that this is a suitable hiding habitat for fishing cat, since pug marks of this species was regularly found on mud.

Disturbed Scrubland

About 5% of the total study area is subjected to illegal garbage dumping. This area is mainly consisting of sparse vegetation of exotic weeds and shrubs. This micro habitat is in a slightly higher elevation than the previous two vegetation types. Butterflies are quite common in this habitat since it provides open sunny condition as well as flowering plants for nectar and egg laying.

Land filled habitat

This is the area where the development is proposed and it is already filled up by laterite soil. The invasive grass species, *Panicum maximum* is growing in this habitat at an exponential rate. Other herbaceous weeds are growing in the places where the grass is still not invaded. No any tree cover is found in this habitat. A large group of Egrets, Black Headed Ibis and Painted Storks were observed feeding busily on fish in a water hole in this filled area. This water hole is not connected to any canal and it is evident that the land has been flooded at some time which permits the fishes to breed there.

Aquatic habitats

About 5% of the study area covers surface water bodies, which are mainly canals with stagnated water, since the flow rate is very low. Water quality of the canals looks not good since they had black colored water. Small canal along the eastern boundary of the proposed building site looks to have fairly unpolluted water, but it had more turbidity. Surface of many of the main canals are covered with invasive plant species *Eichhornia crassipes*, while its eastern end mostly had a free surface due to manual removal of the plant. Two *Nymphaea* species were found only at the western

section of the canal, which seems to be planted. Only few dragonfly species and fish species found in the habitat.

3b. Species

Flora

A total of 131 angiosperm species belonging to 49 families were identified within the study area. Highest number of species were represented by the family Fabaceae (19 species) followed by families Convolvulaceae & Malvaceae (08 species each). 26 families were represented by only a single species (Table 1). The detailed list of plant species observed in the study site is given in Annex 1 Table 1.

Table 1. Plant families that make up the vegetation observed in different micro ecosystems and number of species belonging to each family.

Family	No. of species	Family	No. of species
Fabaceae	19	Annonaceae	1
Convolvulaceae	8	Boraginaceae	1
Malvaceae	8	Combretaceae	1
Compositae	7	Hydrocharitaceae	1
Euphorbiaceae	7	Linderniaceae	1
Rubiaceae	7	Loganiaceae	1
Cyperaceae	6	Loranthaceae	1
Amaranthaceae	5	Lythraceae	1
Araceae	4	Melastomataceae	1
Poaceae	4	Menispermaceae	1
Verbenaceae	4	Molluginaceae	1
Moraceae	3	Muntingiaceae	1
Phyllanthaceae	3	Myristicaceae	1
Acanthaceae	2	Myrtaceae	1
Apocynaceae	2	Nyctaginaceae	1
Arecaceae	2	Pandanaceae	1
Cleomaceae	2	Plantaginaceae	1
Commelinaceae	2	Polygonaceae	1
Cucurbitaceae	2	Pontederiaceae	1
Lamiaceae	2	Rhizophoraceae	1
Nymphaeaceae	2	Sapindaceae	1
Onagraceae	2	Sapotaceae	1
Solanaceae	2	Symplocaceae	1
Alismataceae	1	Typhaceae	1
Anacardiaceae	1		

Among the total number of recorded species, 83 (63.35 %) species were native to Sri Lanka while the remaining 48 (36.65 %) species are either naturalized exotic species or invasive alien species. No any endemic plant species were found in the study area. Most of the native plants in the site were common species, where 73 of them were listed as ‘Least Concern’ and 4 species as ‘Near threatened’ in National Red Data List, 2012. Three species which belong to ‘threatened’ categories were recorded in the study site (Table 2).

Table 2. The threatened species recorded in the study site

Family	Species	Sinhala name	NCS	DS
Cucurbitaceae	<i>Gymnopetalum scabrum</i>		VU	Native
Cyperaceae	<i>Lepironia articulata</i>	weg mka	VU	Native
Rubiaceae	<i>Exallage auricularia</i>	.eg fld<	VU	Native

Abbreviations: NCS – National Conservation Status; DS – Distribution Status; VU – Vulnerable

Although the typical habitat of *Gymnopetalum scabrum* is found in low country dry zone (Dassanayake, 1997), a densely grown mat of this liana was found here on a waste land, which is completely open for the direct sunlight. This area was highly disturbed due to unauthorized garbage dumping. Such growths of this species were also observed at a wetland near Rajagiriya and Muthurajawela recently. *Lepironia articulata* prefers saline swamps and back marshes along the coast and Muthurajawela is one of the few known localities for this species (Dassanayake, 1985). Due to its low elevation, occasional saline water intrusions to this area in severe drought periods makes a good habitat for the species. This species was found commonly in open marshy area of the study site and many dragonflies were observed occupying these plants as their perching places within their territory. *Exallage auricularia* is an herbaceous species that restricts its distribution to lower and lower montane wet zone of Sri Lanka (Dassanayake, 1998) which prefers shady and fairly wet conditions. It is commonly used as a green leaf vegetable by local people. This species was quite commonly found at the eastern border of the study site adjacent to home gardens.

Three species of aquatic plants were found in the canals. *Nymphaea pubescence* and recently confirmed *Nymphaea rubra* were growing together in a restricted area where the water quality looks to be good. The submerged aquatic species *Hydrilla verticillata* was abundantly found irrespective of the water quality. Apart from these aquatic species, there were several water-associated species in canal embankments i.e. *Commelina* spp., *Lindernia* spp. Western part of the mud land covered

with many sedges together with some ferns. Although this site is situated in close proximity to the sea, no any mangrove species were recorded.

High percentage of exotics in species composition (36.65 %) reveals that this site has undergone through lot of anthropogenic activities. This study site is already heavily invaded by many alien invasive species. During the study, 8 out of the 33-plant species listed as invasive alien species and 4 out of the 15 species listed as potentially invasive alien species were recorded within the study site (Table 3).

Table 3. Invasive alien species and potentially invasive alien species recorded in the study site.

Scientific Name	Common Name
Alien invasive species	
<i>Alstonia macrophylla</i>	හවරි නූග, යකඩමරන්, අවටෝනියා, ගිනිකුරු ගස්
<i>Typha angustifolia</i>	හම්බු පන්
<i>Annona glabra</i>	වෙල් අනෝදා, වෙල් ආත්තා
<i>Eichhornia crassipes</i>	ජපන් ජබර
<i>Mikania cordata</i>	.i mdz
<i>Lantana camara</i>	ගඳපාන, කටු හිඟුරු, රට හිඟුරු
<i>Pennisetum polystachion</i>	රිලා වල්ග
<i>Panicum maximum</i>	ගිණි තණ, රට තණ, ගිනිකිරිස්ස
Potential alien invasive species	
<i>Ludwigia peruviana</i>	බෙරු දියනිල්ල, වෙල් කරාබු
<i>Mimosa diplotricha</i>	je,a ksosl=ind
<i>Muntingia calabura</i>	ජෑම්
<i>Acacia auriculiformis</i>	

Most abundant invasive species were *Annona glabra* and *Eichhornia crassipes*. Eastern side of the study area is completely covered with *Annona glabra* making no room for sedges and grasses which are the typical species of this kind of mud land. This species has completely altered the open grassland habitat in to a forested habitat. Its canopy refrains the sunlight coming down to the bottom which restricts the growth of native species. It has been observed that soil is heaping as mud mounds at the bases of *Annona* trees, making the inundating low ground in to a highland. Thousands of seedlings are coming up on these mounds. Many ripe fruits eaten by animals were found on the ground. However, the animals that feed on the fruits could not be ascertained. People working at the site claim that the fruits are eaten mainly by the terrapins that inhabit the canals.

Western side of the study area has only few of these trees, but there is a great potential to change the habitat type completely, if precautions are not get.

Eichhornia crassipes is widely spread in all the canals within the study site except for the sub canal along the eastern border. This canal has less polluted water. It was observed that SLLR&DC has recently removed the plants from some canals and put them on the embankments. But there is a potential for re-infesting since all the other adjacent canals consist of this species. This species a major problem in water logging in canals at Colombo as well as it changes the habitat conditions of the water surface as well as canal bottom. Sunlight intrusion to the bottom is highly affected by *Eichhornia*, which eventually destroy the submerged aquatic plants. Lack of the submerged plants results in reduction of dissolved oxygen. Once a group of Murrells were observed breathing air bubbles through an opening on water surface surrounded by *E. crassipes*, probably due to low oxygen content in water.

Panicum maximum is coming up in the proposed building site, which is a filled wetland. Other species are found in low densities.

Fauna

The recorded fauna species of the study area comprised of 119 vertebrates and 60 invertebrate species (Table 4). Avifauna is the most diverse taxa observed with 67 species while butterflies are the second diverse group with 33 species. The detailed list of animal species observed in the study site is given in Annex 1, Tables 2-8.

Table 4. Summary of the Faunal Species Recorded During the Study.

Taxa	Species	Endemics	Exotic ¹	Threatened				NT
				CR	EN	VU	Total	
Dragonflies	21	0	0	0	0	1	1	4
Butterflies	33	0	0	0	0	1	1	1
Mollusacans	06	1	1	0	0	0	0	1
Freshwater								
Fish	14	0	4	0	0	0	0	0
Amphibians	07	1	0	0	0	0	0	1
Reptiles	18	2	0	0	0	0	0	1
Birds	67	0	7	0	0	0	0	2
Mammals	13	1	0	0	2	1	3	0

Total	179	5	12	0	2	3	5	10
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Abbreviations used: **1** - Migratory species of birds were listed under this category; **CR** - Critically Endangered; **EN** - Endangered; **VU** - Vulnerable; **NT** - Near Threatened

Most of the recorded species are common and widespread species with low conservation status. Only five species recorded are listed as threatened species in the 2012 National Red List of Sri Lanka. Two mammal species recorded were in the 'endangered' category. A troop of endemic species, Sri Lanka Purple-faced langur inhabits home gardens adjacent to study site where they reach the site at its boundaries when tall trees are available. They are not visiting the *Annona* forest, since its canopy is not high enough for these strictly arboreal species. This troop represent the western sub species. Fishing cat is the other species that is categorized in 'endangered' category. Although it is wide spread species in Sri Lanka, number of individuals are quite rare since it requires specific micro habitat as well as due to a carnivorous species who is at the top level of the food chain. Fishing cat is a nocturnal species searches for fish, which is its main food source. During the day time it requires a hiding place to sleep, where the *Annona* woodland in the study site provides a reasonable habitat. Otter is another mammal frequents in aquatic habitat, which need attention of conservation. Its food source and habitat requirments are same as the fishing cat and it is used to be only nocturnal in urban areas. Resident population of Blue-tailed Bee-eater – *Merops philippinus* is considered as a threatened species in the previous evaluation, however the population found in the study area is purely a migratory group. Migratory population is very common and not recognized as a threatened species.

Marsh Dancer - *Onychargia atrocyana* and Blue Glassy Tiger - *Ideopsis similis* are the two-invertebrate species in the study site which fall within threatened categories. The damselfly, Marsh dance prefers the shady habitats adjacent to open marshes. This micro habitat conditions are provided by the *Annona* woodland in eastern part of the study site. The butterfly Blue Glassy Tiger has a unique distribution mainly in the western coastal areas of the country. Although *Tylophora tenassima* - its larval food plant in these coastal marshes was not recorded during the survey, there is a possibility to exist the plant in adjacent areas.

Only five endemic species of fauna were recorded during the survey period within the study area. These comprised of a mammal species, Sri Lanka Purple-faced langur (*Semnopithecus vetulus*), two reptiles namely Common Lankaskink (*Lankascincus fallax*) and Sri Lanka Checkered Keelback (*Xenochrophis asperrimus*), one amphibian Common shrub frog (*Pseudophilautus popularis*) and one molluscan, *Acavus phoenix*. Out of these only the Purple-faced langur is

recognized as a species with the risk of extinction at the national level while other four are widespread endemics.

Out of the 67 species of avifauna recorded 07 are migratory and arrive in Sri Lanka only during the North-South migratory period. None of these species are recognized as globally threatened migratory species thus they have a low conservation priority. However, the habitats in the area are important for many migrants that use the site as a feeding ground as well as a stopover site during their annual migration.

Only few fresh water fish species which can survive in hardy conditions were found in the canals due to its polluted water. Among the recorded species, four of them are exotics. Most common species in the canal was Sucker Mouth Catfish (*Pterygoplichthys multiradiatus*) which is followed by Nile Tilapia (*Oreochromis niloticus*) and Guppy (*Poecilia reticulata*) respectively. Out of these, Sucker Mouth Catfish is considered as an alien invasive species and the latter two as potential alien invasive species. These species definitely make a huge impact on remaining native fish species. Asian Groundling (*Brachythemis contaminata*) was the most abundant dragonfly species, which can survive in the contaminated water. All the vegetation in canal embankments were removed for free flow of water, an activity that destroys the breeding and hiding habitats of native fishes.

4 Conclusions and Recommendations

Based on the findings of the field surveys, the study site supports a moderately rich assemblage of fauna and flora including few species of endemic and threatened species. However, there are many drivers of change operating on the wetland ecosystems such as spreading of invasive species, encroachment, unregulated waste disposal to the ground as well as to water and changes in the hydrology as a result of flood management. Since the area of this wetland is very small, it is hard to sustain the eco system against the environmental pressure that comes from the surrounding. Therefore, it is prudent to develop and maintain the selected site making minimum effect to the existing wetland.

Based on the findings of this study the following recommendations can be made.

1. Several species of invasive alien plants and animals have become established in terrestrial, semi-terrestrial and aquatic habitats. Spread of invasive species leads to reduction in species richness as well as endemic and threatened species due to deterioration of habitats.

Therefore, invasive alien species that are detrimental to the ecosystem should be removed completely. Outright removal may not be an option in the case of some of the species as they are providing necessary ecosystem functions. Thus, selective replacement of such exotic and alien invasive species with native species should be done.

- Native plant species are recommended for the garden of the proposed site. Following are some of the species that can be planted.

Family	Species	Sinhala name	Habit
Sapotaceae	<i>Mimusops elengi</i>	uQKu,	Tree
Calophyllaceae	<i>Calophyllum bracteatum</i>	j,q lSk	Tree
Myrtaceae	<i>Syzygium caryophyllatum</i>	ox	Shrub
Melastomataceae	<i>Melastoma malabathricum</i>	uy fndaúáhd	Shrub
Phyllanthaceae	<i>Glochidion zeylanicum</i>	yqKqlsrs,a,	Shrub
Phyllanthaceae	<i>Margaritaria cyanosperma</i>	lrö	Tree
Phyllanthaceae	<i>Bridelia moonii</i>	m;a lE,	Tree
Apocynaceae	<i>Wrightia antidysenterica</i>	boao	Shrub
Bignoniaceae	<i>Stereospermum tetragonum</i>	ÿKq u@,	Tree
Calophyllaceae	<i>Calophyllum inophyllum</i>	fodU	Tree
Combretaceae	<i>Terminalia bellirica</i>	nq^	Tree
Dilleniaceae	<i>Dillenia retusa</i>	f.dvmr	Tree
Elaeocarpaceae	<i>Elaeocarpus serratus</i>	fjr^	Tree
Euphorbiaceae	<i>Mallotus tetracoccus</i>	nQ lekao	Tree
Lamiaceae	<i>Clerodendrum infortunatum</i>	mSkak	Shrub
Lauraceae	<i>Cinnamomum verum</i>	l=re÷	Tree
Lauraceae	<i>Litsea longifolia</i>	r;a lE,sh	Tree
Lecythidaceae	<i>Barringtonia racemosa</i>	osh ñfo,a,	Tree
Fabaceae	<i>Erythrina fusca</i>	hla trny	Tree
Lythraceae	<i>Lagerstroemia speciosa</i>	uqre;	Tree

- Natural vegetation and natural slope in canal embankments should be maintained within the canal reservation. Concrete walls or Gabion walls not recommended.
- A drainage management plan should be developed for the site to ensure that the canal embankments do not become eroded, which would destroy the marginal vegetation.
- Wast water should not be released to the wetland without doing necessary treatments. Proper solid waste disposal method should be conducted ensuring the quality of the wetland.
- Large garbage dump adjacent to the developing sight might cause health problems in students. It is recommended to take necessary actions on this matter.

7. Illegal garbage dumping & firing including asbastose dust is going on in the wetland patch of study area. This is a greath threat to neighboring houses at the moment and it will be a helth issue to sudents of the new faculty building. It is recommended to take nessasary actions on this matter together with SLLR&DC.
8. Chemicals should not be released in to the water both during construction and operational stage of any activities that are carried out in the developing site. It is recommended to do a flood risk assessment before proceeding in to the planning the building and priority should be taken to refrain from keeping the hazardous materials and chemicals that can be spread during a flood.

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Annex 1

Table 1. Detailed list of flowering plants observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **DD** - Data Deficient; **EN** - Endangered; **IAS** - Invasive Alien Species; **LC** - Least Concern; **NE** - Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Species	Sinhala name	NCS	DS
1	Acanthaceae	<i>Asystasia gangetica</i>	mqrēla" rs,d mqrēla	LC	Native
2	Acanthaceae	<i>Hygrophila ringens</i>	ks,a mqrēla	LC	Native
3	Alismataceae	<i>Limnocharis flava</i>	osh f.dajd	NE	Exotic
4	Amaranthaceae	<i>Achyranthes aspera</i>	lr,a yen" .ia lr,a yen" lr,aiefnda	LC	Native
5	Amaranthaceae	<i>Aerva lanata</i>	fmd,al=vq m<d" fmd,a m<d	LC	Native
6	Amaranthaceae	<i>Alternanthera sessilis</i>	uql=Kqjekak" ó lka m,d	LC	Native
7	Amaranthaceae	<i>Amaranthus viridis</i>	l+r ;im,d" iqy+l+r	LC	Native
8	Amaranthaceae	<i>Celosia argentea</i>	lsβ yekao" ly l=l=Æ lru,a" iqy je,sjekak	LC	Native
9	Anacardiaceae	<i>Lannea coromandelica</i>	ysla	LC	Native
10	Annonaceae	<i>Annona glabra</i>	fj,a wfkdaod" fj,a w;a;d	NE	Exotic
11	Apocynaceae	<i>Alstonia macrophylla</i>	yjrs kq." hlvurka" wŪfgdakshd" .sksl+re .ia	NE	Exotic
12	Apocynaceae	<i>Alstonia scholaris</i>	rela w;a;k" we;a uv" .ia rela w;a;k	LC	Native
13	Araceae	<i>Colocasia esculenta</i>	.y," foais w," lsβ w," we;a fyā," .reā" ynr," lÆ flā," fifj,a w,	LC	Native
14	Araceae	<i>Lasia spinosa</i>	fldys," weŪs,s fldys," uy fldys," fldfydú,	LC	Native
15	Araceae	<i>Pistia stratiotes</i>	Èh mrāe,a" Èh mrke,a,	LC	Native
16	Araceae	<i>Pothos scandens</i>	fmdagd je,a	LC	Native
17	Arecaceae	<i>Areca catechu</i>	mqlja	NE	Exotic
18	Arecaceae	<i>Caryota urens</i>	ls;=,a	LC	Native
19	Boraginaceae	<i>Heliotropium indicum</i>	osñ ih" we;a fydĒ" we;a ieáh" we;afidĒ	LC	Native
20	Cleomaceae	<i>Cleome rutidosperma</i>		NE	Exotic
21	Cleomaceae	<i>Cleome viscosa</i>	j,a wn" rka udksiai" nQ jÆ wn	LC	Native
22	Combretaceae	<i>Terminalia catappa</i>	fldŪgīnd" fldŪgka	NE	Exotic
23	Commelinaceae	<i>Commelina benghalensis</i>	osh fufkarsh	LC	Native
24	Commelinaceae	<i>Commelina diffusa</i>	.srd m<d" ;K m<d	LC	Native
25	Compositae	<i>Cyanthillium cinereum</i>	uŪq,a l=Uqrejekak" fudKrl=vqīih" j;= mdž	LC	Native
26	Compositae	<i>Eclipta prostrata</i>	lslsβç" iqy lsβç" lní" lsi,ka	LC	Native

27	Compositae	<i>Mikania cordata</i>	.i mdç" flfy,a mdç" uy lsysôh" j;= mdç" fou< je,a	NE	Exotic
28	Compositae	<i>Struchium sparganophorum</i>		NE	Exotic
29	Compositae	<i>Synedrella nodiflora</i>		NE	Exotic
30	Compositae	<i>Tridax procumbens</i>	jiq iqo	NE	Exotic
31	Compositae	<i>Xanthium strumarium</i>	j,a rUqgka" W!re fliai" wjä	LC	Native
32	Convolvulaceae	<i>Aniseia martinicensis</i>	fmd;= m<d	NE	Exotic
33	Convolvulaceae	<i>Ipomoea aquatica</i>	lxl=x	LC	Native
34	Convolvulaceae	<i>Ipomoea asarifolia</i>	ii ;Uqre" r;= ii ;Uqre	NE	Exotic
35	Convolvulaceae	<i>Ipomoea carnea</i>		NE	Exotic
36	Convolvulaceae	<i>Ipomoea nil</i>	l, k" l,urej" ;d,s	NE	Exotic
37	Convolvulaceae	<i>Merremia emarginata</i>	fld;=re neoao	NT	Native
38	Convolvulaceae	<i>Merremia umbellata</i>	lsrs uy" uy uy	LC	Native
39	Convolvulaceae	<i>Xenostegia tridentata</i>	yjrs uy" ySka uy	LC	Native
40	Cucurbitaceae	<i>Coccinia grandis</i>	fldajlald" fli lelsß	LC	Native
41	Cucurbitaceae	<i>Gymnopetalum scabrum</i>		VU	Native
42	Cyperaceae	<i>Actinoscirpus grossus</i>		LC	Native
43	Cyperaceae	<i>Cyperus procerus</i>		LC	Native
44	Cyperaceae	<i>Cyperus sphacelatus</i>		NE	Exotic
45	Cyperaceae	<i>Lepironia articulata</i>	weg mka	VU	Native
46	Cyperaceae	<i>Rhynchospora corymbosa</i>		LC	Native
47	Cyperaceae	<i>Scleria poiformis</i>	fmd;= fld<" fmd;= mka" fmd;=	LC	Native
48	Euphorbiaceae	<i>Acalypha indica</i>	l=mamfiksh	LC	Native
49	Euphorbiaceae	<i>Croton aromaticus</i>	je,a lemafamáhd	LC	Native
50	Euphorbiaceae	<i>Croton hirtus</i>	.x fjo" j,a ;smams,s	NE	Exotic
51	Euphorbiaceae	<i>Euphorbia heterophylla</i>		NE	Exotic
52	Euphorbiaceae	<i>Macaranga peltata</i>	lekao" m;a lekao	LC	Native
53	Euphorbiaceae	<i>Microstachys chamaelea</i>	r;a msgjlald	LC	Native
54	Euphorbiaceae	<i>Ricinus communis</i>	t@re" f; a t@re	NE	Exotic
55	Hydrocharitaceae	<i>Hydrilla verticillata</i>	y,afmkaks	LC	Native
56	Lamiaceae	<i>Hyptis suaveolens</i>	w,s ;,	NE	Exotic
57	Lamiaceae	<i>Leucas zeylanica</i>	.eg ;=U	LC	Native
58	Fabaceae	<i>Acacia auriculiformis</i>		NE	Exotic
59	Fabaceae	<i>Aeschynomene americana</i>		NE	Exotic
60	Fabaceae	<i>Albizia saman</i>	mks udr" udr" mdfr udr" meks lr,a" jeys .ia	NE	Exotic
61	Fabaceae	<i>Alysicarpus vaginalis</i>	wiajekak" r;= wiajekak	LC	Native
62	Fabaceae	<i>Calopogonium mucunoides</i>		NE	Exotic

63	Fabaceae	<i>Centrosema pubescens</i>		NE	Exotic
64	Fabaceae	<i>Desmodium heterocarpon</i>	we;a W÷msh,sh	LC	Native
65	Fabaceae	<i>Desmodium heterophyllum</i>	uy W÷msh,sh	LC	Native
66	Fabaceae	<i>Desmodium triflorum</i>	ySka W÷msh,sh" iqÿ .egÈh	LC	Native
67	Fabaceae	<i>Macroptilium atropurpureum</i>		NE	Exotic
68	Fabaceae	<i>Macroptilium lathyroides</i>		NE	Exotic
69	Fabaceae	<i>Mimosa diplotricha</i>	je,a ksosl=ïnd	NE	Exotic
70	Fabaceae	<i>Mimosa pudica</i>	ksÈl=ïnd" oeÈkakkdre" ySka ksÈl=ïnd	NE	Exotic
71	Fabaceae	<i>Pueraria phaseoloides</i>		NE	Exotic
72	Fabaceae	<i>Senna alata</i>	nQ f;dar" rg f;dar" we;a f;dar" r;a f;dar	NE	Exotic
73	Fabaceae	<i>Senna occidentalis</i>	meKs f;dar" ysj,a f;dar	LC	Native
74	Fabaceae	<i>Sesbania bispinosa</i>		LC	Native
75	Fabaceae	<i>Tadehagi triquetrum</i>	ndf,d,shd	LC	Native
76	Fabaceae	<i>Vigna adenantha</i>	j,a uE	NE	Exotic
77	Linderniaceae	<i>Lindernia rotundifolia</i>		LC	Native
78	Loganiaceae	<i>Mitrasacme indica</i>		NT	Native
79	Loranthaceae	<i>Dendrophthoe falcata</i>	fo~i ms<s,	LC	Native
80	Lythraceae	<i>Lawsonia inermis</i>	urf;dKaä	LC	Native
81	Malvaceae	<i>Ceiba pentandra</i>	mQ;ka bUq,a" fldÜg" fldÜg mQ/Èka	LC	Native
82	Malvaceae	<i>Hibiscus rostellatus</i>		NE	Native
83	Malvaceae	<i>Melochia corchorifolia</i>	.ia l+r" .,a l+r" uy .,a l+r	LC	Native
84	Malvaceae	<i>Microcos paniculata</i>	fldyq lrs,a,	LC	Native
85	Malvaceae	<i>Sida rhombifolia</i>	ySka nei,	LC	Native
86	Malvaceae	<i>Urena lobata</i>	mÜg wem," wem," ySka wem," mgq wem,	LC	Native
87	Malvaceae	<i>Urena sinuata</i>	mÜg wem," ySka wem,	LC	Native
88	Malvaceae	<i>Waltheria indica</i>	mQkkslals	LC	Native
89	Melastomataceae	<i>Melastoma malabathricum</i>	fndaúáhd" lgl; fndaúáhd" uy fndaúáhd" lgl;jd	LC	Native
90	Menispermaceae	<i>Tinospora sinensis</i>	nQ ls " j,a ls " ri ls	DD	Native
91	Molluginaceae	<i>Mollugo pentaphylla</i>		LC	Native
92	Moraceae	<i>Ficus amplissima</i>	t< kq.	LC	Native
93	Moraceae	<i>Ficus benghalensis</i>	uy kq.	LC	Native
94	Moraceae	<i>Ficus racemosa</i>	wÜáald" ÈUq,a	LC	Native
95	Muntingiaceae	<i>Muntingia calabura</i>	cEi	NE	Exotic
96	Myristicaceae	<i>Horsfieldia irya</i>	brsh	LC	Native
97	Myrtaceae	<i>Syzygium caryophyllatum</i>	ox" ySka ox	LC	Native

98	Nyctaginaceae	<i>Boerhavia diffusa</i>	msg iqy m<d" msg iqy idrK	LC	Native
99	Nymphaeaceae	<i>Nymphaea pubescens</i>	we;a 'z" 'z	LC	Native
100	Nymphaeaceae	<i>Nymphaea rubra</i>		NE	Native
101	Onagraceae	<i>Ludwigia hyssopifolia</i>		LC	Native
102	Onagraceae	<i>Ludwigia peruviana</i>	fnre Èhks,a," fj,a lrdnq	NE	Exotic
103	Pandanaceae	<i>Pandanus kaida</i>	jegflhshd	LC	Native
104	Phyllanthaceae	<i>Glochidion zeylanicum</i>		LC	Native
105	Phyllanthaceae	<i>Phyllanthus amarus</i>	msgjld	LC	Native
106	Phyllanthaceae	<i>Phyllanthus reticulatus</i>	je,a lhs," .ia yïue,a," lhs,	LC	Native
107	Plantaginaceae	<i>Scoparia dulcis</i>	j,a fld;a;u,a,s	NE	Exotic
108	Poaceae	<i>Axonopus compressus</i>	fmd;= ;K	NE	Exotic
109	Poaceae	<i>Bambusa vulgaris</i>	ly WK	NE	Exotic
110	Poaceae	<i>Panicum maximum</i>	.sKs ;K" rg ;K" .skslS/iai	NE	Exotic
111	Poaceae	<i>Pennisetum polystachion</i>		NE	Exotic
112	Polygonaceae	<i>Persicaria barbata</i>	r;= lsUq,a jekak	LC	Native
113	Pontederiaceae	<i>Eichhornia crassipes</i>	cmka cnr	NE	Exotic
114	Rhizophoraceae	<i>Carallia brachiata</i>	ojg" Wifíßh	NT	Native
115	Rubiaceae	<i>Exallage auricularia</i>	.eg fld<	VU	Native
116	Rubiaceae	<i>Nauclea orientalis</i>	nla ó" rg nla ó" nlsks" u, nlsks" msh" msh,a	LC	Native
117	Rubiaceae	<i>Richardia brasiliensis</i>		NE	Exotic
118	Rubiaceae	<i>Spermacoce alata</i>		NE	Exotic
119	Rubiaceae	<i>Spermacoce ocymifolia</i>		NE	Exotic
120	Rubiaceae	<i>Spermacoce remota</i>		NE	Exotic
121	Rubiaceae	<i>Spermacoce verticillata</i>		NE	Exotic
122	Sapindaceae	<i>Cardiospermum halicacabum</i>	fmfk, je,a" je,a fmfk,	LC	Native
123	Sapotaceae	<i>Mimusops elengi</i>	uQKu,a" uQ.=K" uql=re" isxy flair	NT	Native
124	Solanaceae	<i>Physalis angulata</i>		NE	Exotic
125	Solanaceae	<i>Solanum torvum</i>	f.dak ngq" ;singq	LC	Native
126	Symplocaceae	<i>Symplocos cochinchinensis</i>	fndaUq	LC	Native
127	Typhaceae	<i>Typha angustifolia</i>	yinq mka	LC	Native
128	Verbenaceae	<i>Lantana camara</i>	. mdk" lgq ysÖ=re" rg ysÖ=re	NE	Exotic
129	Verbenaceae	<i>Phyla nodiflora</i>	ysruk oe;a;	LC	Native
130	Verbenaceae	<i>Stachytarpheta cayennensis</i>		NE	Exotic
131	Verbenaceae	<i>Stachytarpheta urticifolia</i>		NE	Exotic

Table 2: Detailed list of mammals observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English name	Sinhala name	NCS	DS
1	Pteropodidae	<i>Pteropus giganteus</i> (Brunnich, 1782)	Flying fox	ud-jjq,d	LC	Native
2	Vespertilionidae	<i>Pipistrellus tenuis</i> (Temminck, 1840)	Pigmy pipistrel	ySka fldia weg-jjq,d	LC	Native
3	Cercopithecidae	<i>Semnopithecus vetulus</i> (Erleben, 1777)	Sri Lanka Purple-faced langur	Y%S ,xld lç-j÷rd	EN	Endemic
4	Felidae	<i>Prionailurus viverrinus</i> (Bennett, 1833)	Fishing cat	y÷ka Èúhd	EN	Native
5	Herpestidae	<i>Herpestes brachyurus</i> Gray, 1837	Brown mongoose	fndr uq.áhd	LC	Native
6	Mustelidae	<i>Lutra lutra</i> (Linnaeus, 1758)	Otter	Èh-n,a,d	VU	Native
7	Viverridae	<i>Paradoxurus hermaphoditus</i> (Pallas, 1777)	Palm cat	W.=vqjd	LC	Native
8	Viverridae	<i>Viverricula indica</i> (Desmarest, 1817)	Ring-tailed civet	Wre,Ejd	LC	Native
9	Hystricidae	<i>Hystrix indica</i> (Kerr, 1792)	Porcupine	b;a;Ejd	LC	Native
10	Muridae	<i>Bandicota bengalensis</i> (Gray 1835)	Mole rat	ySka W!re-óhd	LC	Native
11	Muridae	<i>Bandicota indica</i> (Bechstein, 1800)	Malabar bandicoot	W!re-óhd	LC	Native
12	Muridae	<i>Rattus rattus</i> (Linnaeus, 1758)	Common rat	fmdý f.a óhd	LC	Native
13	Sciuridae	<i>Funambulus palmarum</i> (Linnaeus, 1766)	Palm squirrel	f,akd	LC	Native

Table 3: Detailed list of birds observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	Common English name	Common Sinhala Name	NCS	DS
1	Anatidae	<i>Dendrocygna javanica</i> (Horsfield, 1821)	Lesser Whistling-duck	ySka ;U fiarejd	LC	Resident
2	Picidae	<i>Dinopium benghalense</i> (Linnaeus, 1758)	Black-rumped Flameback	.sksmg ms,s)lEr,d	LC	Resident

3	Pittidae	<i>Pitta brachyura</i> (Linnaeus, 1766)	Indian Pitta	wúÉÑhd	NE	Migrant
4	Ramphastidae	<i>Megalaima rubricapillus</i> PE (Gmelin, 1788)	Crimson-fronted Barbet	r;auQK;a fldÜfgdrejd	LC	Resident
5	Ramphastidae	<i>Megalaima zeylanica</i> (Gmelin, 1788)	Brown-headed Barbet	fmdf<dia fldÜfgdarejd	LC	Resident
6	Alcedinidae	<i>Alcedo atthis</i> (Linnaeus, 1758)	Common Kingfisher	u,a ms<syqvqjd	LC	Resident
7	Alcedinidae	<i>Ceryle rudis</i> (Linnaeus, 1758)	Pied Kingfisher	f.daur ms<syqvqjd	LC	Resident
8	Alcedinidae	<i>Halcyon smyrnensis</i> (Linnaeus, 1758)	White-Throated Kingfisher	f., iqÿ ueÈ- ms<syqvqjd	LC	Resident
9	Meropidae	<i>Merops philippinus</i> Linnaeus, 1766*	Blue-tailed Bee-eater	ks,a fm iÖ=yrhd	NE	Migrant
10	Cuculidae	<i>Centropus sinensis</i> (Stephens, 1815)	Greater Coucal	weál=l=<d	LC	Resident
11	Cuculidae	<i>Eudynamis scolopaceus</i> (Linnaeus, 1758)	Asian Koel	fldjq,d	LC	Resident
12	Psittacidae	<i>Psittacula krameri</i> (Scopoli, 1769)	Rose-ringed Parakeet	?k .srjd	LC	Resident
13	Apodidae	<i>Cypsiurus balasiensis</i> (Gray,1829)	Asian Palm-swift	wdishd ;,a-;=ß;hd	LC	Resident
14	Strigidae	<i>Otus bakkamoena</i> Pennant, 1769	Collared Scops-owl	Irmá lkaniaid	LC	Resident
15	Strigidae	<i>Ninox scutulata</i> (Raffles, 1822)	Brown Hawk-owl	ÿUqre Wl=iqniaid	LC	Resident
16	Columbidae	<i>Stigmatopelia chinensis</i> (Scopoli, 1786)	Spotted Dove	wç fldfnhshd	LC	Resident
17	Rallidae	<i>Amaurornis phoenicurus</i> (Pennant, 1769)	White-breasted Waterhen	<h iqÿ fldrjlald	LC	Resident
18	Rallidae	<i>Porphyrio porphyrio</i> (Linnaeus, 1758)	Purple Swamphen	oi ueÈ-ls;,d	LC	Resident
19	Jacanidae	<i>Hydrophasianus chirurgus</i> (Scopoli, 1786)	Pheasant-Tailed Jacana	iejq,a-Èhiekd" mka l=l=<d	LC	Resident
20	Scolopacidae	<i>Actitis hypoleucos</i> (Linnaeus, 1758)	Common Sandpiper	fmdÿ is,s;a;d	NE	Migrant

21	Recurvirostridae	<i>Himantopus himantopus</i> (Linnaeus, 1758)	Black-Winged Stilt	lÆmsh bm,amdjd	LC	Resident
22	Charadriidae	<i>Vanellus indicus</i> (Boddaert, 1783)	Red-Wattled Lapwing	r;a háu,a lsr,d	LC	Resident
23	Laridae	<i>Chlidonias hybrida</i> (Pallas, 1811)	Whiskered Tern	w¿msh ldÕ=a,sysKshd	NE	Migrant
24	Accipitridae	<i>Accipiter badius</i> (Gmelin, 1788)	Shikra	l=re¿f.dhd	LC	Resident
25	Accipitridae	<i>Haliastur indus</i> (Boddaert, 1783)	Brahminy Kite	nuqKq mshdl=iaid	LC	Resident
26	Accipitridae	<i>Pernis ptilorhyncus</i> (Temminck, 1821)	Oriental Honey-Buzzard	isÆ nUrl=iaid	NT	Resident
27	Accipitridae	<i>Spilornis cheela</i> (Latham, 1790)	Crested Serpent-eagle	isÆ i¾4ml=iaid	LC	Resident
28	Podicipedidae	<i>Tachybaptus ruficollis</i> (Pallas, 1764)	Little Grebe	mqaÑ f.ô;=rejd	LC	Resident
29	Anhingidae	<i>Anhinga melanogaster</i> Pennant, 1769	Oriental Darter	wysldjd	LC	Resident
30	Phalacrocoracidae	<i>Phalacrocorax niger</i> (Vieillot, 1817)	Little Cormorant	mqaÑ Èhldjd	LC	Resident
31	Phalacrocoracidae	<i>Phalacrocorax fuscicollis</i> Stephens, 1826	Indian Cormorant	bkaÿ Èhldjd	LC	Resident
32	Ardeidae	<i>Ardea cinerea</i> Linnaeus, 1758	Grey Heron	w¿ fldld	LC	Resident
33	Ardeidae	<i>Ardea purpurea</i> Linnaeus, 1766	Purple Heron	lrje,a fldld	LC	Resident
34	Ardeidae	<i>Ardeola grayii</i> (Sykes, 1832)	Indian Pond-heron	lK fldld	LC	Resident
35	Ardeidae	<i>Bubulcus ibis</i> (Linnaeus, 1758)	Cattle Egret	f.ß fldld	LC	Resident
36	Ardeidae	<i>Casmerodius albus</i> (Linnaeus, 1758)	Great Egret	iqÿ-uy fldld	LC	Resident
37	Ardeidae	<i>Egretta garzetta</i> (Linnaeus, 1766)	Little Egret	mqaÑ wkq-fldld	LC	Resident
38	Ardeidae	<i>Ixobrychus sinensis</i> (Gmelin, 1789)	Yellow Bittern	ly ueá-fldld	NT	Resident
39	Threskiornithidae	<i>Threskiornis melanocephalus</i> (Latham, 1790)	Black-headed Ibis	ysi l¿ oEle;a;d	LC	Resident

40	Pelecanidae	<i>Pelecanus philippensis</i> Gmelin, 1789	Spot-billed Pelican	;s;afydg meia;=vqjd	LC	Resident
41	Ciconiidae	<i>Anastomus oscitans</i> (Boddaert, 1783)	Asian Openbill	újr;=vqjd	LC	Resident
42	Ciconiidae	<i>Mycteria leucocephala</i> (Pennant, 1769)	Painted Stork	,;=jelshd	LC	Resident
43	Chloropseidae	<i>Chloropsis jerdoni</i> (Blyth, 1844)	Jerdon's Leafbird	c¾okaf.a fld<ßishd	LC	Resident
44	Laniidae	<i>Lanius cristatus</i> (Linnaeus, 1758)	Brown Shrike	ÿUqre inß;a;d	NE	Migrant
45	Corvidae	<i>Corvus splendens</i> Vieillot, 1817	HouseCrow	fld<U lmqgd	LC	Resident
46	Artamidae	<i>Artamus fuscus</i> Vieillot, 1817	Ashy Woodswallow	w¿ jk,sysKshd	LC	Resident
47	Oriolidae	<i>Oriolus xanthornus</i> (Linnaeus, 1758)	Black Hooded Oriole	lyl=re,a,d	LC	Resident
48	Dicruridae	<i>Dicrurus caerulescens</i> (Linnaeus, 1758)	White-bellied Drongo	ljqvd	LC	Resident
49	Monarchiidae	<i>Terpsiphone paradisi</i> (Linnaeus, 1758)	Asian Paradise Flycatcher	wdishd /yekaudrd	LC	Resident
50	Aegithinidae	<i>Aegithina tiphia</i> (Linnaeus, 1758)	Common Iora	fmdÿ wfhdardjd	LC	Resident
51	Muscicapidae	<i>Copsychus saularis</i> (Linnaeus, 1758)	Oriental Magpie Robin	fmd,alsÉpd	LC	Resident
52	Muscicapidae	<i>Saxicoloides fulicatus</i> (Linnaeus, 1766)	Indian Robin	l¿lsÉpd	LC	Resident
53	Sturnidae	<i>Acridotheres tristis</i> (Linnaeus, 1766)	Common Myna	uhskd	LC	Resident
54	Hirundinidae	<i>Hirundo hyperythra</i> Blyth, 1849	Red rumped swallow	ks;U r;a jeys,sysKshd	LC	Resident
55	Pycnonotidae	<i>Pycnonotus cafer</i> (Linnaeus, 1766)	Red-vented Bulbul	fldKavhd	LC	Resident
56	Pycnonotidae	<i>Pycnonotus luteolus</i> (Lesson, 1841)	White Browed Bulbul	neu iqÿ fldKavhd	LC	Resident
57	Cisticolidae	<i>Prinia hodgsonii</i> Blyth, 1844	Gray-breasted Prinia	,h¿ m%Skshd	LC	Resident
58	Cisticolidae	<i>Prinia inornata</i> Sykes, 1832	Plain Prinia	ir, m%Skshd	LC	Resident

59	Sylviidae	<i>Acrocephalus dumetorum</i> (Blyth, 1849)	Blyth's Reed-warbler	í,hs;a mka /úhd	NE	Migrant
60	Sylviidae	<i>Orthotomus sutorius</i> (Pennant, 1769)	Common Tailorbird	nÜáÉpd	LC	Resident
61	Timaliidae	<i>Turdoides affinis</i> (Jerdon, 1845)	Yellow Billed Babbler	fou,sÉpd	LC	Resident
62	Dicaeidae	<i>Dicaeum erythrorhynchos</i> (Latham, 1790)	Pale Billed Flowerpecker	,d;=vq ms<,sÉpd	LC	Resident
63	Nectariniidae	<i>Nectarinia lotenia</i> (Linnaeus, 1766)	Long Billed Sunbird	Èla;=vq iQálald	LC	Resident
64	Nectariniidae	<i>Nectarinia zeylonica</i> (Linnaeus, 1766)	Purple Rumped Sunbird	ks;U oï iQálald	LC	Resident
65	Motacillidae	<i>Dendronanthus indicus</i> (Gmelin, 1789)	Forest Wagtail	jk ye,fmkaod	NE	Migrant
66	Estrildidae	<i>Lonchura punctulata</i> (Linnaeus, 1758)	Scaly Breasted Munia	<h ldhgre ù l=re,a,d	LC	Resident
67	Estrildidae	<i>Lonchura striata</i> (Linnaeus, 1766)	White Rumped Munia	ks;U iqÿ ù l=re,a,d	LC	Resident

Table 4: Detailed list of reptiles observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	Sinhala name	NCS	DS
1	Crocodylidae	<i>Crocodylus palustris</i> Lesson, 1831	Mugger crocodile / Marsh crocodile	ye, lsUq,d	NT	Native
2	Bataguridae	<i>Melanochelys trijuga</i> (Schweigger, 1812)	Black turtle	.,a bind	LC	Native
3	Agamidae	<i>Calotes calotes</i> (Linnaeus, 1758)	Green garden lizard	m<d lgqiaid	LC	Native
4	Agamidae	<i>Calotes versicolor</i> (Daudin, 1802)	Common garden lizard	.rd lgqiaid	LC	Native
5	Gekkonidae	<i>Hemidactylus frenatus</i> Schlegel in Duméril & Bibron, 1836	Common house-gecko	iq,n f.a yQkd	LC	Native
6	Gekkonidae	<i>Hemidactylus parvimaclatus</i> Deraniyagala, 1953	Spotted housegecko	mq,a,s f.a yQkd	LC	Native
7	Scincidae	<i>Lankascincus fallax</i> (Peters, 1860)	Common lankaskink	iq,n ,laySrçjd	LC	Endemic
8	Scincidae	<i>Lygosoma punctatus</i> (Gmelin, 1799)	Dotted skink	;s;a ySrçyslk,d	LC	Native
9	Varanidae	<i>Varanus bengalensis</i> (Daudin, 1802)	Land monitor	;;f.dhd	LC	Native
10	Varanidae	<i>Varanus salvator</i> (Laurenti, 1768)	Water monitor	lnrf.dhd	LC	Native
11	Natricidae	<i>Amphiesma stolatum</i> (Linnaeus, 1758)	Buff striped keelback	wyrl+lald	LC	Native
12	Natricidae	<i>Xenochrophis asperrimus</i> (Boulenger, 1891)	Checkered keelback	Èh fmd<Öd" Èh nßhd	LC	Endemic
13	Homalopsidae	<i>Cerberus rynchops</i> (Schneider, 1799)	Dog-faced water snake	l=Kq Èh lçjd	LC	Native
14	Colubridae	<i>Lycodon aulicus</i> (Linnaeus, 1758)	Wolf snake	wt roklhd	LC	Native

15	Colubridae	<i>Ptyas mucosa</i> (Linnaeus, 1758)	Rat snake	.erâhd	LC	Native
16	Elapidae	<i>Naja naja</i> (Linnaeus, 1758)	Indian cobra	khd" kd.hd	LC	Native
17	Viperidae	<i>Daboia russelii</i> (Shaw & Nodder, 1797)	Russell's viper	;s;a fmd<.d	LC	Native
18	Viperidae	<i>Hypnale hypnale</i> (Merrem, 1820)	Merrem's Hump nose viper	fmdf<dka f;,siaid	LC	Native

Table 5: Detailed list of amphibians observed at the study site

Abbreviations used: DS - Distribution Status; NCS - National Conservation Status_Red List 2012; EN - Endangered; LC - Least Concern; NE – Not Evaluated; NT - Near Threatened; VU - Vulnerable.

No.	Family	Scientific Name	English Name	Sinhala Name	NCS	DS
1	Bufonidae	<i>Duttaphrynus melanostictus</i> Schneider, 1799	Common toad	f.hs f.înd	LC	Native
2	Microhylidae	<i>Kaloula taprobanica</i> (Parker, 1934)	Sri Lankan bullfrog	úis;=re r;=ueâhd	LC	Native
3	Dicroglossidae	<i>Euphlyctis cyanophlyctis</i> (Schneider, 1799)	Indian skipper frog	W;a m;k ueâhd	LC	Native
4	Dicroglossidae	<i>Euphlyctis hexadactylus</i> (Lesson, 1834)	Indian green frog	iheÖ's,s m,d ueâhd	LC	Native
5	Dicroglossidae	<i>Fejervarya cf. syhadrensis</i> (Annandale, 1919)	Common paddy field frog	fj,a ueâhd	LC	Native
6	Dicroglossidae	<i>Hoplobatrachus crassus</i> (Jerdon, 1853)	Jurdon's bullfrog	c ³ / ₄ vkaf.a Èh ueâhd	LC	Native
7	Rhacophoridae	<i>Pseudophilautus popularis</i> Megaskumbura & Manamendra- Arachchi, 2005	Common shrub frog	iq,N mÿre ueâhd	NT	Endemic

Table 6: Detailed list of fish species observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	Sinhala name	NCS	DS
1	Cyprinidae	<i>Puntius vittatus</i> (Day,1865)	Silver Barb	nKaä ;s;a;hd" fmdä fm;shd" bms,slvhd	LC	Native
2	Cyprinidae	<i>Rasbora dandiya</i> (Valenciennes, in Cuvier & Valenciennes, 1844)	Broad line Strip Rasbora	oKaähd" l=vuiaid	LC	Native
3	Cyprinidae	<i>Rasbora microcephalus</i> (Jerdon, 1849)	Narrow line Rasbora	lsß oKaähd" l=vuiaid	LC	Native
4	Heteropneustidae	<i>Heteropneustes fossilis</i> (Bloch,1797)	Stinging Catfish	yqx.d" ly yqx.d" f,a yqx.d	LC	Native
5	Anguillidae	<i>Anguilla bicolor</i> Mc Clelland, 1844	Level Finned Eel	uv wd d" llal=gq wd d" l<mq wd d	LC	Native
6	Channidae	<i>Channa punctata</i> (Bloch,1794)	Spotted Snakehead	uv lkhd" uv wrdr" uvlßhd	LC	Native
7	Channidae	<i>Channa striata</i> (Bloch,1793)	Murrel	„,d" y,am;a uy	LC	Native
8	Aplocheilidae	<i>Aplocheilus parvus</i> (Raj,1919)	Dwarf Panchax	l<mq y hd" Wv y hd	LC	Native
9	Cichlidae	<i>Etroplus suratensis</i> (Bloch, 1785)	Green Chromide	fldr,shd" u,a fldr,shd	LC	Native
10	Cichlidae	<i>Oreochromis niloticus</i> (Linnaeus, 1758)	Nile Tilapia	;s,dmshd	NE	Exotic
11	Anabantidae	<i>Anabas testudineus</i> (Bloch,1795)	Climbing Perch	ldjshd" fmd,a ldjshd	LC	Native
12	Loricariidae	<i>Pterygoplichthys multiradiatus</i> (Hancock, 1828)	Sucker Mouth Catfish	gexls iqoaod	NE	Exotic
13	Osphronemidae	<i>Trichopodus pectoralis</i> Regan, 1910	Snake Skin Gourami	fj,a .=rdñ	NE	Exotic
14	Poeciliidae	<i>Poecilia reticulata</i> Peters, 1859	Guppy	fj,a .mams \$ idß .mams	NE	Exotic

Table 7: Detailed list of butterflies observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	NCS	DS
1	Papilionidae	<i>Graphium agamemnon</i> Linnaeus, 1758	Tailed Jay	LC	Native
2	Papilionidae	<i>Papilio clytia</i> Linnaeus, 1758	Mime	LC	Native
3	Papilionidae	<i>Papilio polytes</i> Linnaeus, 1758	Common Mormon	LC	Native
4	Pieridae	<i>Catopsilia pomona</i> Fabricius, 1775	Lemon Emigrant	LC	Native
5	Pieridae	<i>Catopsilia pyranthe</i> Linnaeus, 1758	Mottled Emigrant	LC	Native
6	Pieridae	<i>Delias eucharis</i> Drury, 1773	Jezebel	LC	Native
7	Pieridae	<i>Eurema hecabe</i> Linnaeus, 1764	Common Grass Yellow	LC	Native
8	Pieridae	<i>Leptosia nina</i> Fabricius, 1793	Psyche	LC	Native
9	Nymphalidae	<i>Danaus chrysippus</i> Linnaeus, 1758	Plain Tiger	LC	Native
10	Nymphalidae	<i>Danaus genutia</i> Cramer, 1779	Common Tiger	LC	Native
11	Nymphalidae	<i>Euploea klugii</i> Moore, 1888	Brown King Crow	LC	Native
12	Nymphalidae	<i>Ideopsis similis</i> Linnaeus, 1764	Blue Glassy Tiger	VU	Native
13	Nymphalidae	<i>Junonia iphita</i> Cramer, 1779	Chocolate Soldier	LC	Native
14	Nymphalidae	<i>Melanitis leda</i> Linnaeus, 1763	Common Evening Brown	LC	Native
15	Nymphalidae	<i>Mycalesis perseus</i> Fabricius, 1775	Common Bushbrown	LC	Native
16	Nymphalidae	<i>Neptis hylas</i> Linnaeus, 1758	Common Sailor	LC	Native
17	Nymphalidae	<i>Parantica aglea</i> Stoll, 1782	Glassy Tiger	LC	Native
18	Nymphalidae	<i>Phalanta phalantha</i> Drury, 1773	Leopard	LC	Native
19	Nymphalidae	<i>Tirumala limniace</i> Cramer, 1775	Blue Tiger	LC	Native
20	Nymphalidae	<i>Ypthima ceylonica</i> Hewitson, 1864	White Four-ring	LC	Native
21	Lycaenidae	<i>Chilades lajus</i> Stoll, 1780	Lime Blue	LC	Native
22	Lycaenidae	<i>Euchrysops cnejus</i> Fabricius, 1798	Gram Blue	LC	Native
23	Lycaenidae	<i>Jamides bochus</i> Stoll, 1782	Dark Cerulean	LC	Native
24	Lycaenidae	<i>Jamides celeno</i> Cramer, 1775	Common Cerulean	LC	Native
25	Lycaenidae	<i>Lampides boeticus</i> Linnaeus, 1767	Pea Blue	LC	Native
26	Lycaenidae	<i>Spalgis epeus</i> Westwood, 1851	Apefly	LC	Native
27	Lycaenidae	<i>Zesius chrysomallus</i> Hübner, 1819	Redspot	LC	Native
28	Lycaenidae	<i>Zizina otis</i> Fabricius, 1787	Lesser Grass Blue	LC	Native
29	Lycaenidae	<i>Zizula hylax</i> Fabricius, 1775	Tiny Grass Blue	LC	Native

30	Hesperiidae	<i>Ampittia dioscorides</i> Fabricius, 1793	Bush Hopper	LC	Native
31	Hesperiidae	<i>Parnara bada</i> Moore, 1878	Smallest Swift	NT	Native
32	Hesperiidae	<i>Suastus gremius</i> Fabricius, 1798	Indian Palm Bob	LC	Native
33	Hesperiidae	<i>Taractrocera maevius</i> Fabricius, 1793	Common Grass Dart	LC	Native

Table 8: Detailed list of Odonates observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

No.	Family	Scientific Name	English Name	NCS	DS
1	Coenagrionidae	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	Wandering Wisp	LC	Native
2	Coenagrionidae	<i>Onychargia atrocyana</i> Selys, 1865	Marsh Dancer	VU	Native
3	Coenagrionidae	<i>Ischnura senegalensis</i> (Rambur, 1842)	Common Bluetail	LC	Native
4	Coenagrionidae	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	Yellow Waxtail	LC	Native
5	Coenagrionidae	<i>Pseudagrion microcephalum</i> (Rambur, 1842)	Blue Sprite	LC	Native
6	Platynemididae	<i>Copera marginipes</i> (Rambur, 1842)	Yellow Featherleg	LC	Native
7	Gomphidae	<i>Ictinogomphus rapax</i> (Rambur, 1842)	Rapacious Flangetail	LC	Native
8	Aeshnidae	<i>Gynacantha dravida</i> Lieftinck, 1960	Indian Duskhawker	NT	Native
9	Libellulidae	<i>Brachydiplax sobrina</i> (Rambur, 1842)	Sombre Lieutenant	LC	Native
10	Libellulidae	<i>Orthetrum luzonicum</i> (Brauer, 1868)	Marsh Skimmer	NT	Native
11	Libellulidae	<i>Orthetrum sabina</i> (Drury, 1770)	Green Skimmer	LC	Native
12	Libellulidae	<i>Acisoma panorpoides</i> Rambur, 1842	Asian Pintail	LC	Native
13	Libellulidae	<i>Brachythemis contaminata</i> (Fabricius, 1793)	Asian Groundling	LC	Native
14	Libellulidae	<i>Crocothemis servilia</i> (Drury, 1770)	Oriental Scarlet	LC	Native
15	Libellulidae	<i>Diplacodes trivialis</i> (Rambur, 1842)	Blue Percher	LC	Native
16	Libellulidae	<i>Neurothemis intermedia</i> (Rambur, 1842)	Paddyfield Parasol	NT	Native
17	Libellulidae	<i>Neurothemis tullia</i> (Drury, 1773)	Pied Parasol	LC	Native
18	Libellulidae	<i>Rhodothemis rufa</i> (Rambur, 1842)	Spine-legged Redbolt	NT	Native
19	Libellulidae	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	Variagate Flutterer	LC	Native
20	Libellulidae	<i>Pantala flavescens</i> (Fabricius, 1798)	Globe Skimmer, Wandering Glider	LC	Native

21	Libellulidae	<i>Tramea limbata</i> (Desjardins,1832)	Sociable Glider	LC	Native
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Table 9: Detailed list of mollusacans observed at the study site

Abbreviations used: **DS** - Distribution Status; **NCS** - National Conservation Status_Red List 2012; **EN** - Endangered; **LC** - Least Concern; **NE** – Not Evaluated; **NT** - Near Threatened; **VU** - Vulnerable.

Fresh water Molluscar

No.	Family	Species	NCS	DS
1	Ampullariidae	<i>Pomacea canaliculata</i>	NE	Native
2	Unionidae	<i>Lamellidens consobrinus</i>	NE	Native

Land Molluscar

3	Ariophantidae	<i>Cryptozona bistrialis</i> (Beck 1837)	LC	Native
4	Ferussaciidae	<i>Digoniaxis cingalensis</i> (Benson 1863)	LC	Native
5	Achatinidae	<i>Lissachatina fulica</i> (Bowdich 1822)	NE	Exotic
6	Acavidae	<i>Acavus phoenix</i> (Pfeiffer 1854)	NT	Endemic

Figures

Some of the flora found in the study site



Gymnopetalum scabrum (NCS – VU)



Lepironia auriculata (NCS – VU)



Exallage auricularia (NCS – VU)



Mimusops elengi (NCS – NT)



Eichhornia crassipes (invasive species)



Annona glabra (invasive species)

Some of the fauna found in the study site



Asian Groundling (NCS – LC)



Wandering Wisp (NCS – LC)



Duttaphrynus melanostictus (NCS – LC)



Euphlyctis cyanophlyctis (NCS – LC)



Palm Squirrel (NCS – LC)



Green Garden Lizard (NCS – LC)

ANNEX 12: AIR QUALITY PARAMETERS

THE NATIONAL ENVIRONMENTAL ACT, NO. 47 OF 1980

Regulations

The National Environmental (Ambient Air Quality) Regulations, 1994, published in *Gazette Extraordinary*, No. 850/4 of December, 1994 are hereby amended by the substitution for the Schedule to that regulation of the following :-

“SCHEDULE

Pollutant	Averaging Time*	Maximum Permissible Level		+ Method of measurement
		μgm^{-3}	ppm	
1. Particulate Matter - Aerodynamic diameter is less than $10\ \mu\text{m}$ in size (PM_{10})	Annual	50	—	Hi-volume sampling and Gravimetric or Beta Attenuation
	24 hrs.	100	—	
2. Particulate Matter - Aerodynamic diameter is less than $2.5\ \mu\text{m}$ in size ($\text{PM}_{2.5}$)	Annual	25	—	Hi-volume sampling and Gravimetric or Beta Attenuation
	24 hrs.	50	—	

Pollutant	Averaging Time*	Maximum Permissible Level		+ Method of measurement
		μgm^{-3}	ppm	
3. Nitrogen Dioxide (NO_2)	24 hrs.	100	0.05	Colorimetric using saltzman Method or equivalent Gas phase chemiluminescence
	8 hrs.	150	0.08	
	1hr.	250	0.13	
4. Sulphur Dioxide (SO_2)	24 hrs.	80	0.03	Pararosaniline Method or equivalent Pulse Fluorescent
	8 hrs.	120	0.05	
	1hrs.	200	0.08	
5. Ozone (O_3)	1 hr.	200	0.10	Chemiluminescence Method or equivalent Ultraviolet photometric
6. Carbon Monoxide (CO)	8 hrs.	10,000	9.00	Non-Dispersive Infrared Spectroscopy ⁺
	1 hr.	30,000	26.00	
	Any time	58,000	50.00	

* Minimum number of observations required to determine the average over the specified period —

- 03 hour average - 03 consecutive hourly average
- 08 hour average - 08 hourly average
- 24 hour average - 18 hourly average
- Yearly average - 09 monthly average with at least 02 monthly average each quarter.

+ By using Chemicals or Automatic Analysers.

ANNEX 13: COMPLAINS FORM

