MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

Initial Environmental Examination Report for Water Treatment Plant Project, Initial Development Phase of Dawei Special Economic Zone (DSEZ), Myanmar

Final Report

30 April 2018

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Myandawei Industrial Estate Holding Pte, Ltd.

Initial Environmental Examination Report for Water Treatment Plant Project, Initial Development Phase of Dawei Special Economic Zone (DSEZ), Myanmar

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Prepared by: ERM-Siam Co Ltd.

For and on behalf of

ERM-Siam Co Ltd

Approved by: Kamonthip Ma-oon

Signed:

Position: Partner

Date: 30 April 2018

This report has been prepared by ERM-Siam Co Ltd with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

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1.1 စီမံကိန်း၏ နောက်ခံအကြောင်းအရာ

Myandawei Industrial Estate Holding Pte. Ltd. သည် သူ၏ ကုမ္ပဏီခွဲဖြစ်သည့် Myandawei Industrial Estate Co., Ltd., မှတစ်ဆင့် လုပ်ငန်းပိုင်ရှင် (နောက်ပိုင်းတွင် "လုပ်ငန်းပိုင်ရှင်" သို့မဟုတ် "စီမံကိန်းအဆိုပြုသူ" အဖြစ် သုံးနှုန်းသွားပါမည်) အဖြစ် မြန်မာနိုင်ငံရှိ ထားဝယ်အထူးစီးပွားရေးဇုန် (DSEZ) ကနဦးဖွံ့ဖြိုးရေးအဆင့် အတွက် လုပ်ငန်းစာချုပ် (Concession Agreement - CA) ကို ထားဝယ်အထူးစီးပွားရေးဇုန် စီမံခန့်ခွဲမှုကော်မတီ (DSEZMC) နှင့် ချုပ်ဆိုခဲ့ပြီး ဖြစ်ပါသည်။

ကနဦးဖွံ့ဖြိုးရေးအဆင့်တွင် အောက်ပါ စီမံကိန်းခွဲ ၉ မျိုးပါဝင် ပါသည် -

1. လမ်းကြောင်း နှစ်ခုပါ လမ်းမကြီး (ထိုင်းနိုင်ငံနယ်စပ်နှင့် DSEZ ကို ချိတ်ဆက်ထားခြင်း)၊
2. ဆိပ်ကမ်းငယ်၊
3. ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ
4. ကနဦးအဆင့် စွမ်းအင်စက်ရုံ၊
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6. ရေလှောင်တမံငယ်၊
7. ကြိုးဖုန်းဆက်သွယ်ရေး၊
8. LNG ဂိတ်
9. အငွေ့ပြန်ဓာတ်ငွေ့ (Boil-off Gas) နှင့် ယာယီစွမ်းအင်စက်ရုံများ။

စီမံကိန်းအဆိုပြုသူသည် ထားဝယ်အထူးစီးပွားရေးဇုန်-DESZ ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ၏ ကြားခံစက်မှုလုပ်ငန်းများ နှင့် မီးရရှိရေးအတွက် စက်မှုလုပ်ငန်းဆိုင်ရာရေထောက်ပံ့ပိုးနိုင်ရန် ရေသန့်စင်ရေးစက်ရုံ (WTP)၊ မသန့်စင်ရသေးသောရေ ပံ့စက်နေရာ (RWPS)၊ နှင့် မသန့်စင်ရသေးသောရေ ပံ့စက်နေရာ-RWPS မှ ရေသန့်စင်ရေးစက်ရုံ-WTP တို့ အကြား ရေထောက်ပို့ရေး ပိုက်လိုင်း (နောက်ပိုင်းတွင် "စီမံကိန်း" ဟု သုံးနှုန်းသွားပါမည်) တို့ကို ပြုလုပ်ဆောင်ရွက်ရန် စီစဉ်လျက် ရှိပါသည်။

တစ်ရက်လျှင် စုစုပေါင်း ၁၆၂,၀၀၀ ကုဗမီတာ ရေပမာဏကို အသုံးပြုရန် အဆိုပြုပြီး၊ ပယင်းဖြူ ရေလှောင်တမံတွင် သိုလှောင်ထားသော ရေကို အသုံးပြု သွားမည် ဖြစ်ပါသည်။ ရရှိလာသောရေကို သောက်သုံးနိုင်ရန် အတွက် ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့ (WHO) လမ်းညွှန်ချက်များ နှင့်/သို့မဟုတ် ထိုင်းနိုင်ငံ မက်ထရိုပိုလီတန် ရေ လုပ်ငန်းဆောင်တာ အာဏာပိုင်အဖွဲ့၏ ကလိုရင်းကြွင်းကျန်များကို စိစစ်လျက်သောက်သုံးရေ ဆိုင်ရာ စံနှုန်းများနှင့်အညီ ပြည့်မီအောင် သန့်စင်သွားမည် ဖြစ်ပါသည်။

သန့်စင်ထားသော ရေကို တစ်ဆင့်ပို့ပေးရေး နှင့် ဖြန့်ဝေရေးစနစ်မှ တစ်ဆင့် ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ ဇရိယာသို့ ဖြန့်ဝေသွားမည် ဖြစ်ပါသည်။ ထားဝယ်အထူးစီးပွားရေးဇုန်-DESZ ၏ ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ အတွက် ပတ်ဝန်းကျင် နှင့် လူမှု ထိခိုက်မှုဆန်းစစ်ခြင်း (ESIA) လေ့လာချက်

(အခြား အကြံပေးများမှ ရေးသားထားပါသည်[1]) တွင် တစ်ဆင့်ပို့ပေးရေး နှင့် ဖြန့်ဝေရေးစနစ်၏ အသေးစိတ်အချက်အလက်များကို တွေ့ရှိနိုင်ပါသည်။

1.2 ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) နယ်ပယ်

ဤ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE အစီရင်ခံစာကို စီမံကိန်းနယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းလေ့လာချက်[2] တွင် ဖော်ပြထားသည့် အဆိုပြု လုပ်ငန်းတာဝန်များ (ToR) ကို ထည့်သွင်းရန် နှင့် မြန်မာ့ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်း (၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်)[3] တွင် ဖော်ပြထားသည့် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE သတ်မှတ် ချက်များ နှင့် အညီ ဖြစ်စေရန် ပြုစုရေးသားခြင်း ဖြစ်ပါသည်။

ဤ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE အစီရင်ခံစာသည် သွယ်ဝိုက်သော ဆက်စပ်သဘာဝများ အပါအဝင် အဆိုပြု စီမံကိန်းလုပ်ငန်းများကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် ပတ်ဝန်းကျင်နှင့် လူမှုထိခိုက်မှုများကို သတ်မှတ်တင်ပြထားပါသည်။

ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE အတွက် လေ့လာမှုဧရိယာတွင် ထောက်ပံ့ရေးလုပ်ငန်းနေရာများ နှင့် စီမံကိန်းလုပ်ငန်းဧရိယာများအားလုံး ပါဝင် ပါသည်။

1.3 မူဝါဒ၊ ဥပဒေနှင့် အဖွဲ့အစည်းဆိုင်ရာနောက်ခံ

1.3.1 အမျိုးသားအဆင့်သတ်မှတ်ချက်များ

ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း ကို ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂) နှင့် ပတ်ဝန်းကျင် ထိန်းသိမ်းရေးနည်းဥပဒေများ (၂၀၁၄) နှင့် မြန်မာနိုင်ငံ၏ အမျိုးသားပတ်ဝန်းကျင်မူဝါဒ ၁၉၉၄ အရ၊ ပတ်ဝန်းကျင်နှင့်လူမှုစီမံခန့်ခွဲရေး အတွက် ဥပဒေဆိုင်ရာများကို ထောက်ပံ့ပေးသော ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်နေ့တွင် ထွက်ရှိလာသည့် မြန်မာ့ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်း ဆိုင်ရာ လုပ်ထုံးလုပ်နည်းနှင့်အညီ ပြုလုပ်ဆောင်ရွက်ခဲ့ပါသည်။

ထို့အပြင်၊ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE ကို ဆောင်ရွက်ရာတွင် ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်နေ့တွင် ထွက်ရှိလာသည့် မြန်မာ့ အမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) (NEQ) လမ်းညွှန်ချက်များ[4] နှင့် အညီ ပြုလုပ်ခဲ့ပါသည်။ လမ်းညွှန်ချက်များသည် အပြည်ပြည် ဆိုင်ရာ ဘဏ္ဍာရေးပူးပေါင်းဆောင်ရွက်ရေးအဖွဲ့ (IFC) ပတ်ဝန်းကျင် ကျန်းမာရေး နှင့် ဘေး အန္တရာယ်ကင်းရှင်းရေး (EHS) လမ်းညွှန်ချက်များအပေါ် များစွာ အခြေပြုထားပြီး၊ ဆူညံမှု နှင့် တုန်ခါမှု၊ လေထုတ်လွှတ်မှု နှင့် စွန့်ထုတ်အရည်စွန့်ထုတ်မှုများ အပါအဝင် အမျိုးမျိုးသော

[1] MIED၊ ထားဝယ် အထူးစီးပွားရေးဇုန် ကနဦးစက်မှုလုပ်ငန်းနယ်မြေစီမံကိန်း၏ ပတ်ဝန်းကျင် နှင့် လူမှုထိခိုက်မှုဆန်းစစ်ခြင်း။ United Analyst and Engineering Consultant၊ ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ။

[2] MIE ကုမ္ပဏီလီမိတက်၊ ထားဝယ် အထူးစီးပွားရေးဇုန် (DSEZ) ၏ ကနဦးဖွံ့ဖြိုးရေးအဆင့်၊ ရေသန့်စင်ရေးစက်ရုံစီမံကိန်းဆိုင်ရာ နယ်ပယ် အတိုင်းအတာသတ်မှတ်ခြင်းလေ့လာချက်၊ မြန်မာ၊ ERM၊ ၂၀၁၆ ခုနှစ် ဖေဖော်ဝါရီလ။

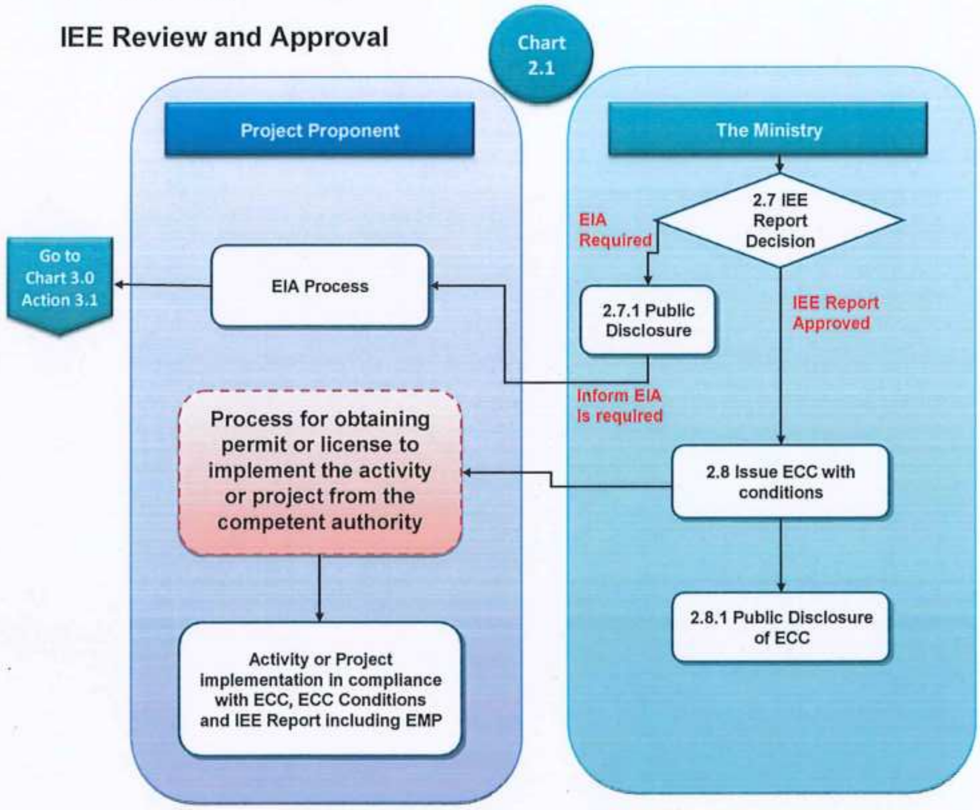
[3] MOECAF၊ ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်း၏ စီမံခန့်ခွဲရေးဆိုင်ရာညွှန်ကြားချက်၊ ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်။

[4] MOECAF၊ နောက်ဆက်တွဲ ၁၊ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၊ ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်။

ပတ်ဝန်းကျင်ဆိုင်ရာ သတ်မှတ်ချက်များ၏ ကွပ်ကဲရေးနှင့် ထိန်းချုပ်ရေးတို့အတွက် အခြေခံစနစ်ကို အထောက်အကူပြုပါသည်။

လုပ်ငန်းစဉ်၏ အကျဉ်း (ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာလုပ်ထုံးလုပ်နည်းမှ ထုတ်ယူထားပါသည်) ကို ***ပုံ ၁.၁*** တွင်ဖော်ပြထားပါသည်။

ပုံ ၁.၁ ***ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း (IEE) ဆိုင်ရာ စိစစ်သုံးသပ်ခြင်း နှင့် ခွင့်ပြုခြင်း လုပ်ငန်း စဉ် (EIA လုပ်ထုံးလုပ်နည်းမှ ရယူထားပါသည်)***



1.4 *စီမံကိန်းအကြောင်းအရာ ဖော်ပြချက် နှင့် အခြားနည်းရွေးချယ်ခြင်း*

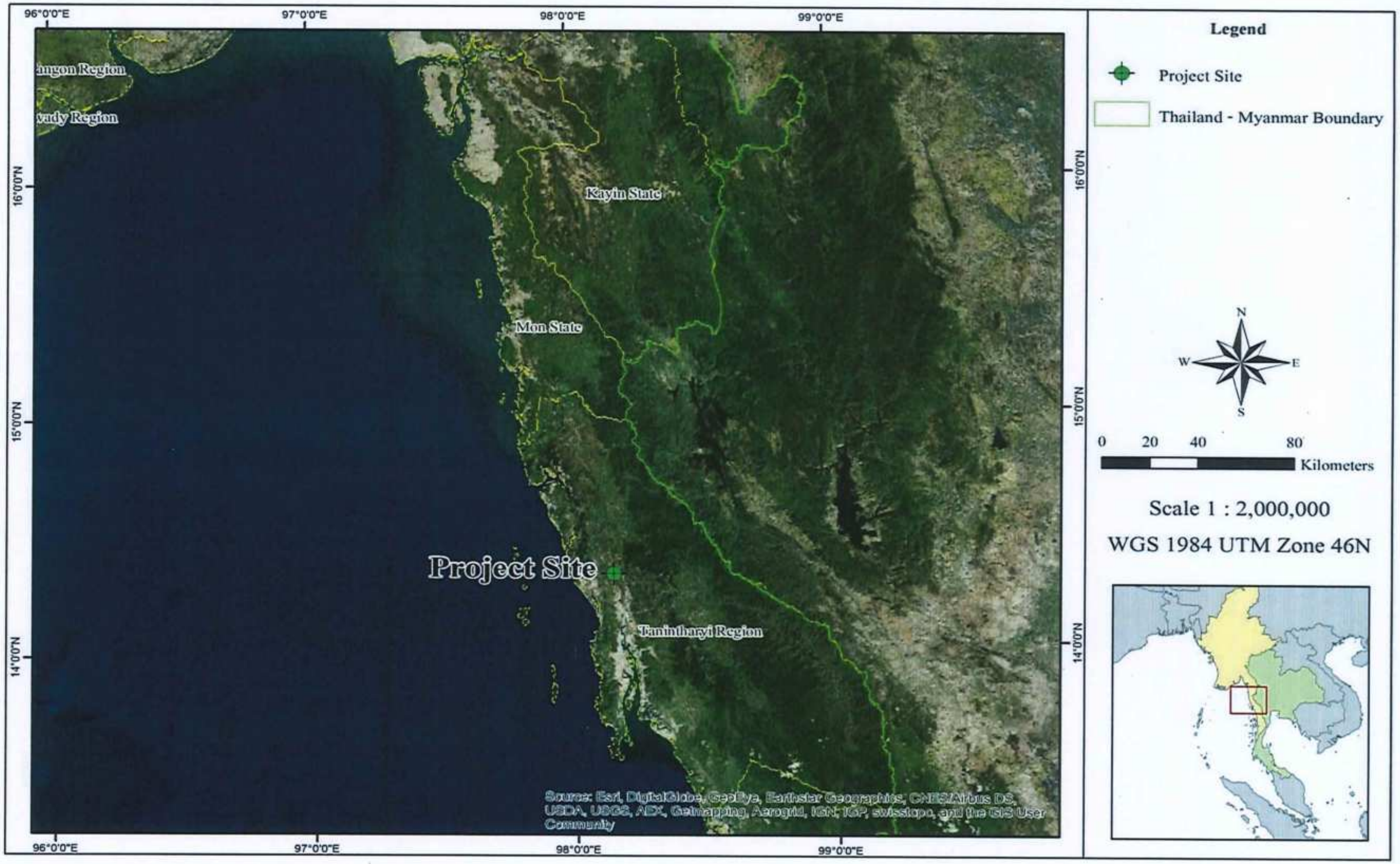
1.4.1 *စီမံကိန်းအကြောင်းအရာဖော်ပြချက်*

ထားဝယ်အထူးစီးပွားရေးဇုန်-DESZ သည် မြန်မာနိုင်ငံ၊ တနင်္သာရီတိုင်းဒေသကြီး၊ ထားဝယ်မြို့၏ မြောက်ဘက် ၂၈ ကီလိုမီတာခန့် အကွာ၊ မုတ္တမကမ်းရိုးတမ်းရှိ မောင်းမကန်ပင်လယ်အော်၏ မြောက်ဘက်နေရာတွင် တည်ရှိပါသည် (***ပုံ ၁.၂*** တွင် ဖော်ပြထား ပါသည်)။

အဆိုပြုစီမံကိန်းသည် ***ပုံ ၁.၃*** နှင့် ***ပုံ ၁.၄*** တွင်ဖော်ပြထားသကဲ့သို့ ထားဝယ်အထူးစီးပွားရေးဇုန်-DESZ ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ ၏ အရှေ့ဘက်သို့ ၁.၅ ကီလိုမီတာခန့်အကွာရှိ ပယင်းဖြူရေလှောင်တမံ (Pa Yain Byu reservoir) နှင့်ကပ်လျက် တည်ရှိပါသည်။

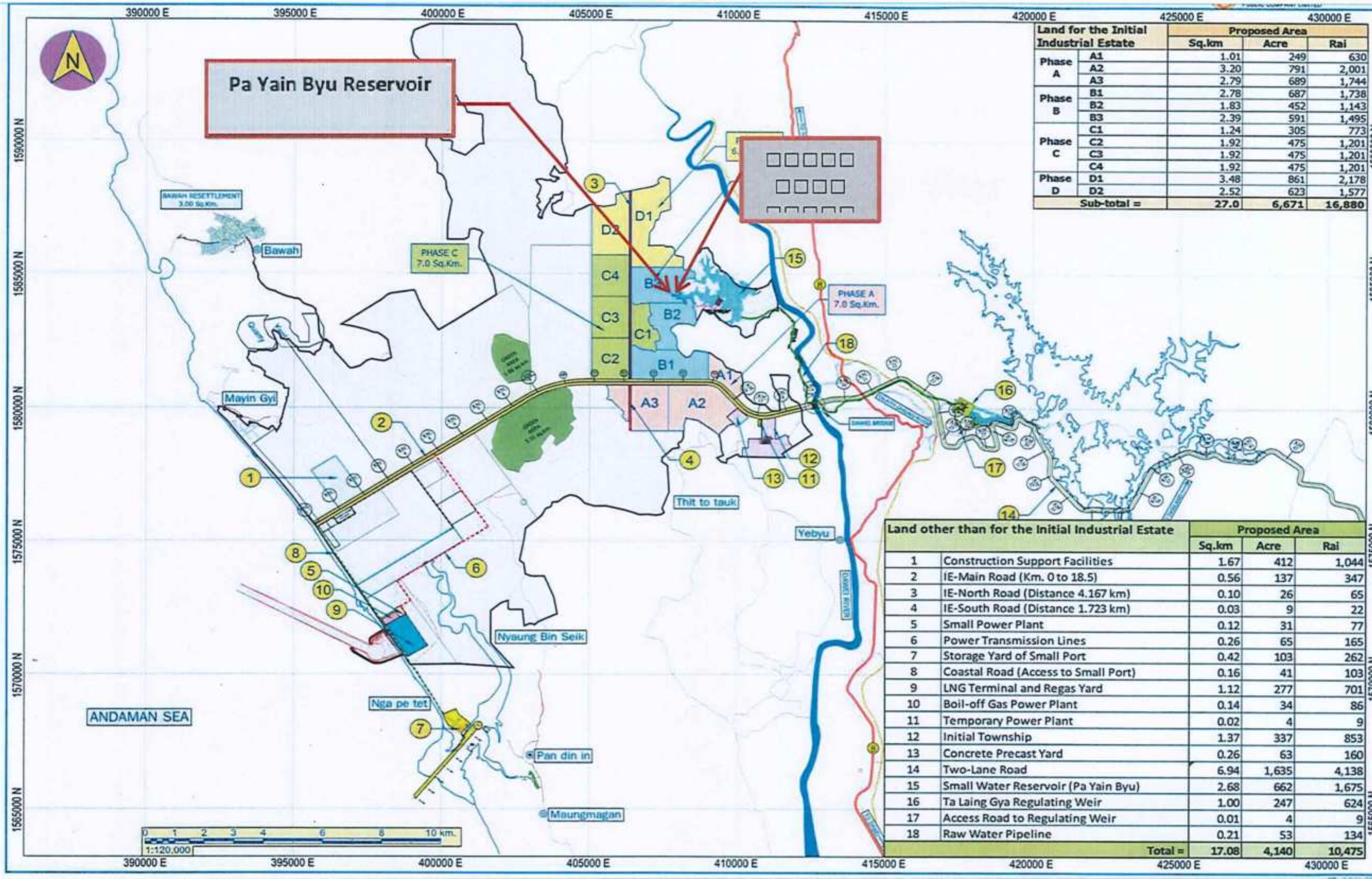
စီမံကိန်းလုပ်ငန်းနေရာနှင့်အနီးဆုံးကျေးရွာမှာ ဝက်ချောင်းကျေးရွာ(Wat Chaung Village) ဖြစ်ပြီး၊ စီမံကိန်းလုပ်ငန်းနေရာမှအနောက်ဘက်သို့ ၁.၈ ကီလိုမီတာခန့်တွင် တည်ရှိပါသည်။ ခမောင်းချောင်းကျေးရွာ (Khamaung Chaung Village) သည် စီမံကိန်းလုပ်ငန်းနေရာမှ အရှေ့မြောက်ဘက်သို့ ၃.၅ ကီလိုမီတာခန့်တွင် တည်ရှိပါသည် (***ပုံ ၁.၅*** တွင် ဖော်ပြထားပါသည်)။

ပုံ ၁.၂ မြန်မာနိုင်ငံအတွင်း ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ ၏ တည်နေရာပြမြေပုံ



ပင်ရင်း - ERM (၂၀၁၆)

ပုံ ၁.၃ ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ ဆက်စပ်သည့် စီမံကိန်း အဆိုပြုတည်နေရာပြမြေပုံ

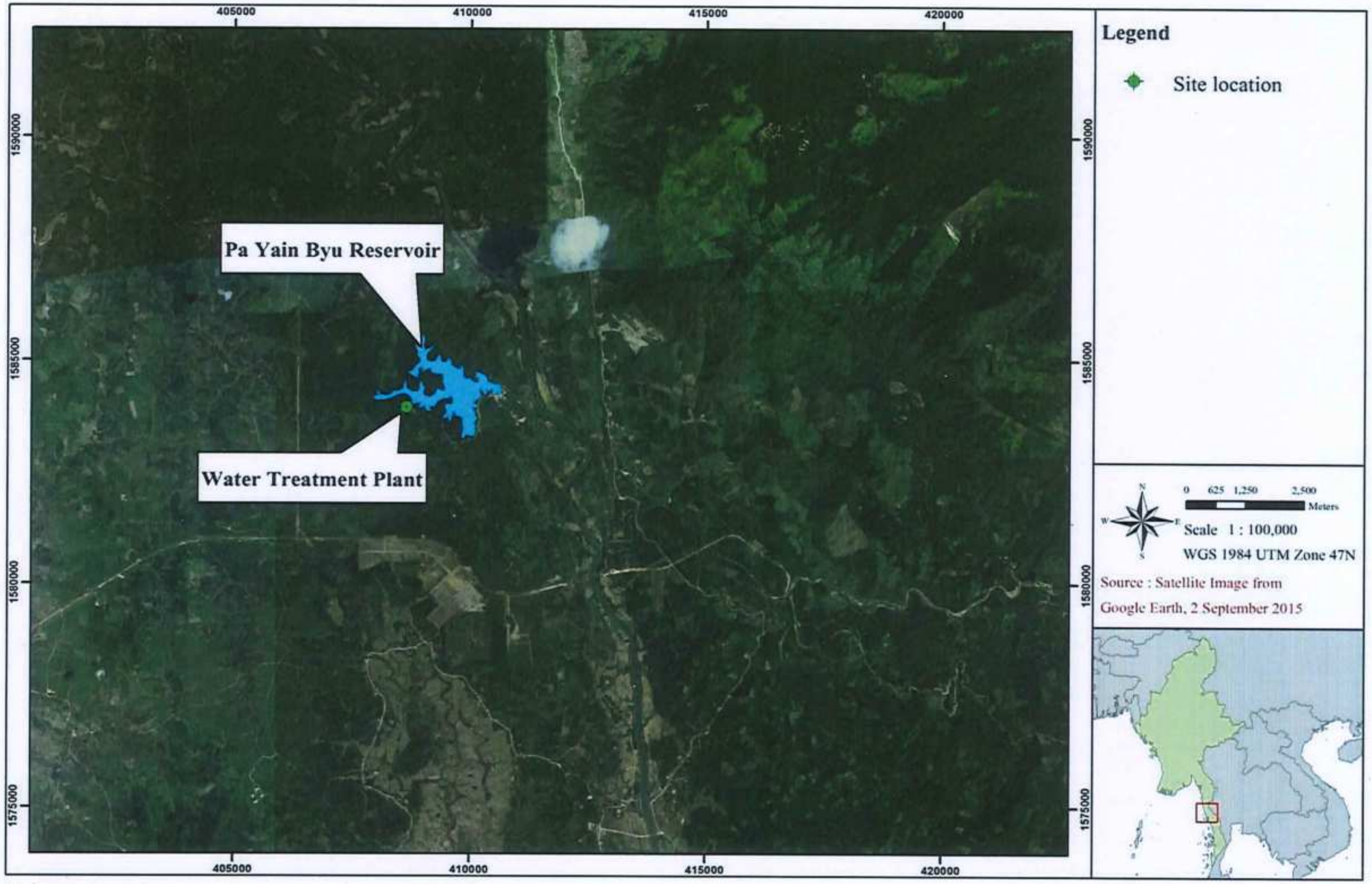


Land for the Initial Industrial Estate		Proposed Area Sq.km	Acre	Rai
Phase A	A1	1.01	249	630
	A2	3.20	791	2,001
	A3	2.79	689	1,744
Phase B	B1	2.78	687	1,738
	B2	1.83	452	1,143
	B3	2.39	591	1,495
Phase C	C1	1.24	305	773
	C2	1.92	475	1,201
	C3	1.92	475	1,201
	C4	1.92	475	1,201
Phase D	D1	3.48	861	2,178
	D2	2.52	623	1,577
Sub-total =		27.0	6,671	16,880

Land other than for the Initial Industrial Estate		Proposed Area Sq.km	Acre	Rai
1	Construction Support Facilities	1.67	412	1,044
2	IE-Main Road (Km. 0 to 18.5)	0.56	137	347
3	IE-North Road (Distance 4.167 km)	0.10	26	65
4	IE-South Road (Distance 1.723 km)	0.03	9	22
5	Small Power Plant	0.12	31	77
6	Power Transmission Lines	0.26	65	165
7	Storage Yard of Small Port	0.42	103	262
8	Coastal Road (Access to Small Port)	0.16	41	103
9	LNG Terminal and Regas Yard	1.12	277	701
10	Boil-off Gas Power Plant	0.14	34	86
11	Temporary Power Plant	0.02	4	9
12	Initial Township	1.37	337	853
13	Concrete Precast Yard	0.26	63	160
14	Two-Lane Road	6.94	1,635	4,138
15	Small Water Reservoir (Pa Yain Byu)	2.68	662	1,675
16	Ta Laing Gya Regulating Weir	1.00	247	624
17	Access Road to Regulating Weir	0.01	4	9
18	Raw Water Pipeline	0.21	53	134
	Total =	17.08	4,140	10,475

ပင်ရင်း - MIEH (2016)၊ (ERM က မွမ်းမံထားပါသည်)

ပုံ ၁.၄ စီမံကိန်း၏ အဆိုပြုတည်နေရာ



ပင်ရင်း - ERM (၂၀၁၆)

ပုံ ၁.၅ ဝက်ချောင်းကျေးရွာ (Wat Chaung Village) နှင့် ခမောင်းချောင်းကျေးရွာ (Khamaung Chaung Village) တည်နေရာပြမြေပုံ

ပင်ရင်း - ERM (၂၀၁၆)

အဆိုပြုစီမံကိန်းကို ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ ၏ ကနဦးစက်မှုလုပ်ငန်းနယ်မြေသို့ ရေထောက်ပံ့နိုင်ရန် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ရေကို ပယင်းရေလှောင်တမံမှ ရယူပြီး၊ နိုင်ငံတကာစံချိန်စံနှုန်းကိုပြည့်မီရန် သန့်စင်သွားမည် ဖြစ်ပါသည် (အသေးစိတ်ကို ***နောက်ဆက်တွဲ က*** တွင် ဖော်ပြထားပါသည်)။ စီမံကိန်းကို ***ဇယား ၁.၁*** တွင် ပြထားသည့်အတိုင်း အဆင့် ၈ ဆင့် ဖြင့် ပေါင်းစပ်သွားမည် ဖြစ်ပါသည်။ ရေသန့်စင်ရေးစက်ရုံ-WTP သည် ၂၀၂၃ ခုနှစ်၊ အဆင့် ၈ ဆင့် လုံးပြီးမြောက်သည့် ကာလတွင် တစ်ရက်လျှင် စုစုပေါင်း အဆိုပြုရေပမာဏ ၁၆၂,၀၀၀ ကုဗမီတာထိ တစ်ဆင့်ပြီးတစ်ဆင့် တိုးပွားကာ သန့်စင်ပေးသွားနိုင်မည် ဖြစ်ပါသည်။

ဇယား ၁.၁ ရေသန့်စင်ရေးစက်ရုံ ဆောင်ရွက်နိုင်မှုအခြေအနေ

ကနဦး စက်မှုလုပ်ငန်း နယ်မြေအဆင့်	အဆင့် A		အဆင့် B		အဆင့် C		အဆင့် D		
ခုနှစ်	၂၀၁၇	၂၀၁၈	၂၀၁၈	၂၀၂၀	၂၀၂၀	၂၀၂၁	၂၀၂၂	၂၀၂၃	၂၀၂၄
စီမံကိန်း အဆင့်	အဆင့် ၁	အဆင့် ၂	အဆင့် ၃	အဆင့် ၄	အဆင့် ၅	အဆင့် ၆	အဆင့် ၇	အဆင့် ၈	-
ဆောင်ရွက်နိုင်မှု (ကုဗမီတာ/ရက်)	၁၈,၀၀၀	၁၈,၀၀၀	၁၈,၀၀၀	၁၈,၀၀၀	၁၈,၀၀၀	၁၈,၀၀၀	၃၆,၀၀၀	၁၈,၀၀၀	-
ဆက်စပ် ဆောင်ရွက်နိုင်မှု (ကုဗမီတာ/ရက်)	၁၈,၀၀၀	၃၆,၀၀၀	၅၄,၀၀၀	၇၂,၀၀၀	၉၀,၀၀၀	၁၀၈,၀၀၀	၁၄၄,၀၀၀	၁၆၂,၀၀၀	၁၆၂,၀၀၀
စက်ရုံဆောင်ရွက်နိုင်မှု အတွက် လိုအပ်သောအချိုး (%)	၃၇.၇၂	၄၈.၈၂	၅၁.၀၃	၆၁.၅၅	၇၅.၁၈	၇၇.၀၂	၇၁.၆၇	၇၈.၄၇	၈၆.၄၂

စုစုပေါင်းရေလိုအပ်ချက်အတွက် စုစုပေါင်းစက်ရုံဆောင်ရွက်နိုင်မှု၏ ၇၀% ကို ရောက်ရှိသောအခါ၊ စီမံကိန်းလုပ်ငန်းနေရာ၏ အရှေ့တောင်ဘက် ၁၁ ကီလိုမီတာခန့်အကွာတွင် တည်ရှိသည့် တလိုင်းဂျ (Ta Liang Gya) ဆည်/တမံ ဖွံ့ဖြိုးရေးလုပ်ငန်းပါဝင်သော ရေထောက်ပံ့ရေးစနစ် တို့ အပါအဝင် ရေသန့်စင်ရေးစက်ရုံ-WTP ၏ ထွင်မှုကို ဆောင်ရွက် သွားရန် စီစဉ်ထားပါသည်။ တလိုင်းဂျ (Liang Gya) ဆည်/တမံ ဖွံ့ဖြိုးရေးလုပ်ငန်း နှင့် ရေထောက်ပံ့ရေးပိုက်လိုင်းအပါအဝင် ၎င်း၏ အင်္ဂါရပ်များသည် ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE လေ့လာချက်၏ နယ်ပယ်အတိုင်းအတာ သတ်မှတ်ခြင်းအတွင်း ပါဝင်မှုမရှိကြောင်း မှတ်ယူရမည် ဖြစ်ပါသည်။

စီမံကိန်း၏ အဓိကအစိတ်အပိုင်းများတွင် အောက်ပါတို့ပါဝင် ပါသည် -

- ***ရေသန့်စင်ရေးစက်ရုံ (WTP)*** တွင် အောက်ပါအစိတ်အပိုင်းတို့ ပါဝင်သွားမည် ဖြစ်ပါသည် -
  - ရေပိုလွှဲ ပုံး/တိုင်ကီများ(Flow Splitting Box/Tanks)၊
  - သန့်စင်ရေးကိရိယာတိုင်ကီများ (Clarifiers)၊
  - ရေစုဆောင်းရေးတိုင်ကီများ (Collecting Tanks)၊
  - ကြားခံ ရေစစ်များ (Single-Media Filters)၊
  - ရွှံ့နှစ်သန့်စင်ရေးဘေစင် နှင့် စွန့်ထုတ်ဆေးကြောရေ လေစင် (Sludge Basin and Waste Wash Water Basin)၊
  - သန့်စင်ပြီးရေ သိုလှောင်ရေးတိုင်ကီ (Treated Water Storage Tank)၊

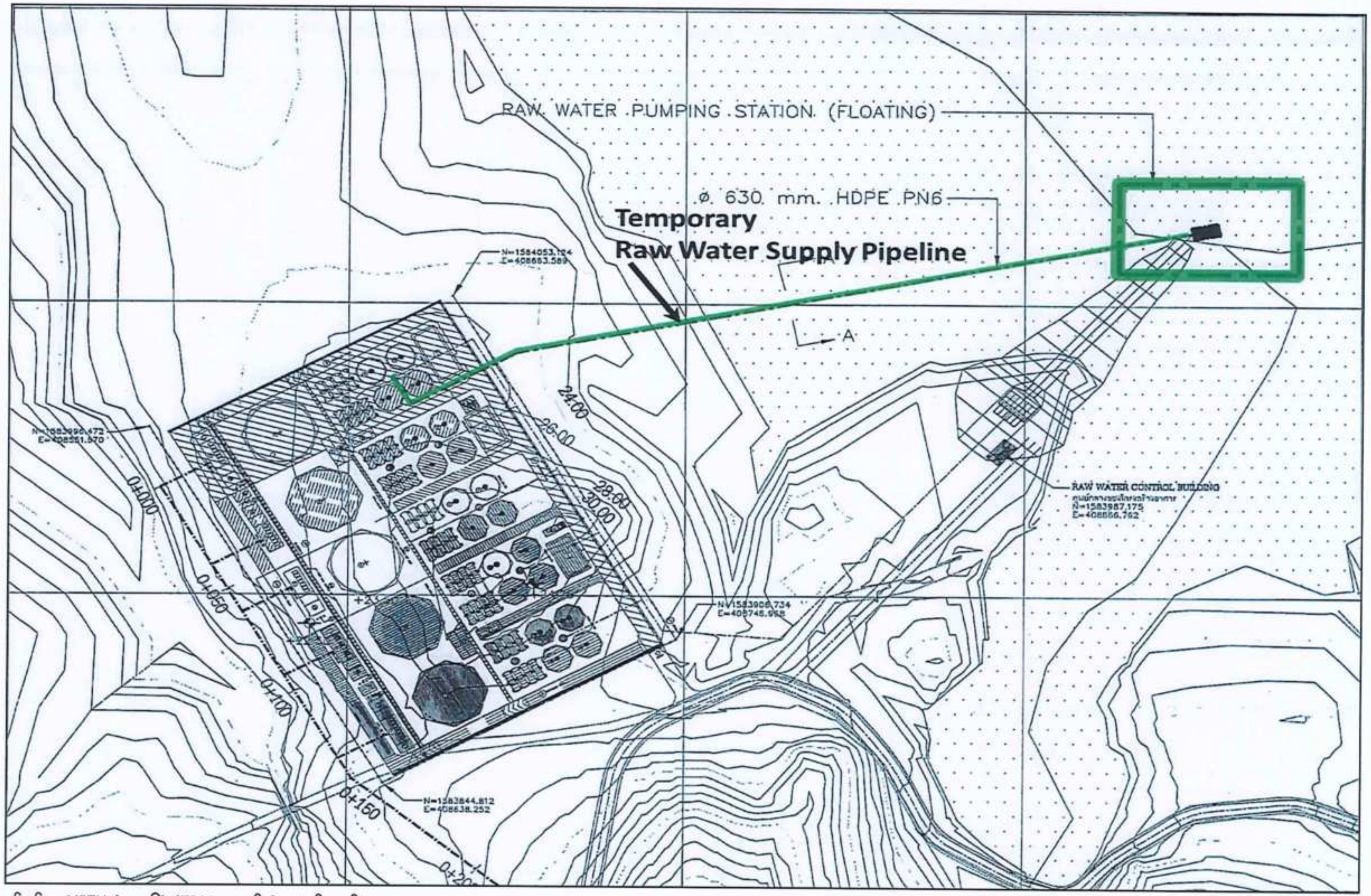
ဝ ဓာတုပမာဏဖယ်ရှားရေပို့ နှင့် အဆောက်အအုံများ (Chemical Dosing Pump and Facilities)၊ နှင့်

ဝ လေမှုတ်စက် နှင့် ရေထိုးဆေးကြောရေပို့ (Air Blower and Backwash Pump)။

- ***မသန့်စင်ရသေးသောရေ ပို့စက်နေရာ (RWPS)*** တွင် စီမံကိန်း၏ အဆင့် ၁ အတွက် ယာယီ ပို့နေရာအဖြစ် ပယင်းဖြူရေလှောင်တမံပေါ်၌ အသင့် အရှင်ထားနိုင်သောဆိပ်ခံဖော (floating pontoon) တစ်ခုပါဝင်မည် ဖြစ်ပါသည် (***ပုံ ၁.၆***)။ ပယင်းရေလှောင်တမံ ကမ်းပါးတွင် အမြဲတမ်း ရေပို့စက် နေရာ-RWPS တစ်ခုကို စီမံကိန်း၏ အဆင့် ၂ ကာလ မှ အဆင့် ၈ ကာလအထိ တပ်ဆင်သွားမည် ဖြစ်ပါသည် (***ပုံ ၁.၇***)။
- ***ရေထောက်ပို့ရေးပိုက်လိုင်း(မသန့်စင်ရသေးသောရေ ပို့စက်နေရာ-RWPS မှ ရေသန့်စင်ရေးစက်ရုံ-WTP သို့) တွင် စီမံကိန်း၏ အဆင့် ၁ ကာလအတွက် ယာယီရေထောက်ပို့ရေးပိုက်လိုင်း တစ်ခု ပါဝင်သွားမည် ဖြစ်ပါသည်။*** ယာယီရေထောက်ပို့ရေးပိုက်လိုင်းသည် ယာယီ ရေပို့စက်နေရာ-RWPS မှ ရေသန့်စင်ရေးစက်ရုံ-WTP ကို အရှင်ထားနိုင်သောဆိပ်ခံဖော (floating pontoon) ဖြင့် ချိတ်ဆက်ထားမည် ဖြစ်ပါသည် (***ပုံ ၁.၆***)။ အမြဲတမ်း ရေထောက်ပို့ရေးပိုက်လိုင်းသည် မြေအောက်ပိုက်လိုင်းတစ်ခုဖြစ်မည် ဖြစ်ပါသည်။ ၎င်းကို အမြဲတမ်း ရေပို့စက် နေရာ-RWPS မှ ရေသန့်စင်ရေးစက်ရုံ-WTP သို့ ချိတ်ဆက်ရန် အဆင့် ၂ ကာလ မှ အဆင့် ၈ ကာလ အထိ တပ်ဆင်သွားမည်ဖြစ် ဖြစ်ပါသည် (***ပုံ ၁.၇***)။

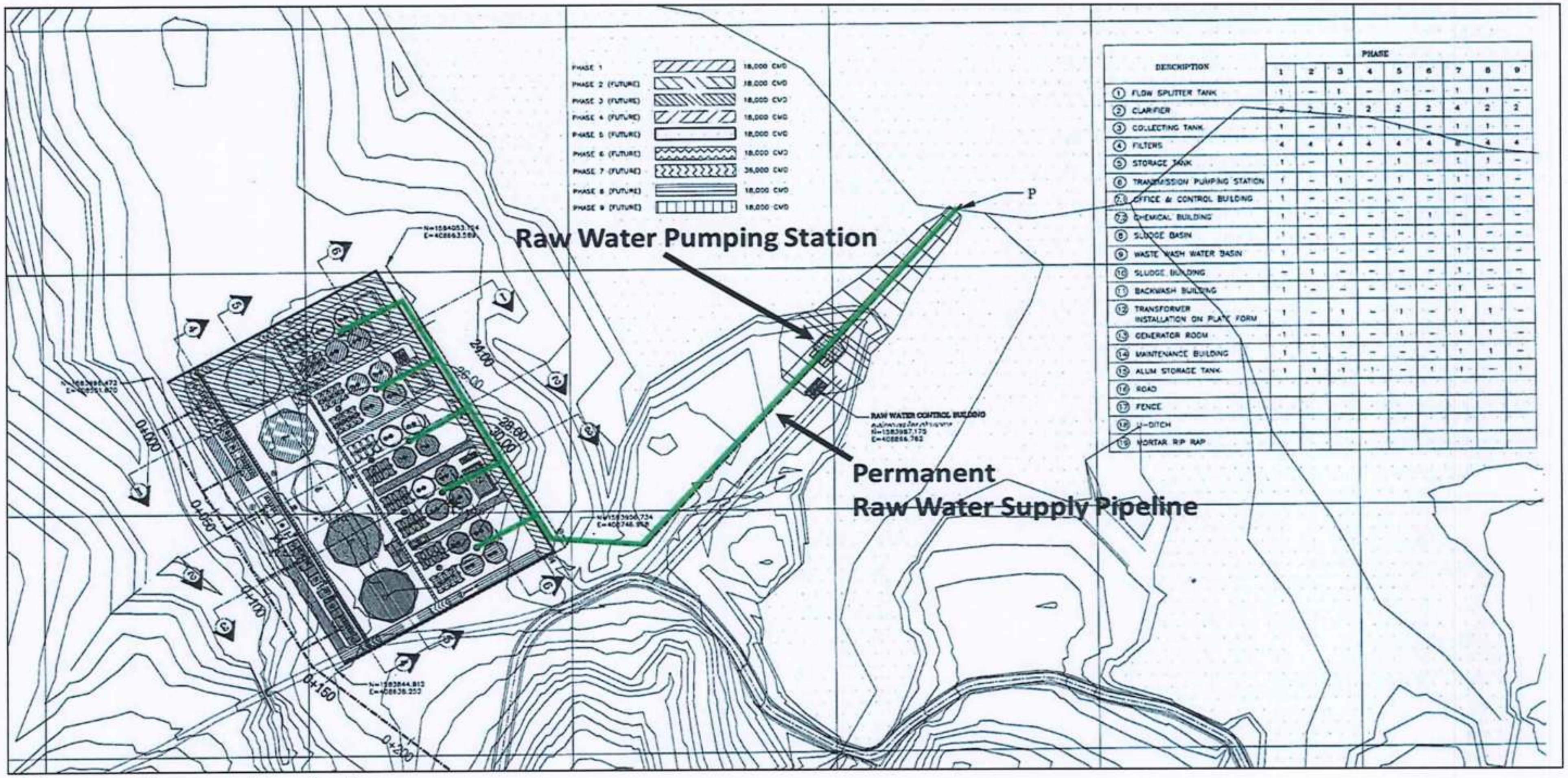
သန့်စင်ပြီးရေများကို သန့်စင်ပြီးရေတစ်ဆင့်ပို့ပေးရေး နှင့် ဖြန့်ဝေရေးပိုက်လိုင်းစနစ်မှ တစ်ဆင့် ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ သို့ ဖြန့်ဝေသွားမည် ဖြစ်ပါသည်။

ပုံ ၁.၆ အဆင့် ၁ ကာလ အတွက် ယာယီ ရေပံ့စက်နေရာ-RWPS နှင့် ယာယီ ရေထောက်ပို့ရေးပိုက်လိုင်းပြမြေပုံ



ပင်ရင်း - MIEH (၂၀၁၆) (ERM က မွမ်းမံထားပါသည်)

ပုံ ၁.၇ အဆင့် ၂ နှင့် ၈ ကာလ အတွက် အမြဲတမ်း ရေပံ့စက်နေရာ-RWPS နှင့် အမြဲတမ်း ရေထောက်ပံ့ရေးပိုက်လိုင်းပြမြေပုံ



ပင်ရင်း - MIEH (၂၀၁၆) (ERM က မွမ်းမံထားပါသည်)

1.4.2 အခြားနည်းရွေးချယ်ခြင်း

စီမံကိန်းလုပ်ငန်းတည်နေရာအတွက် အခြားနည်းလမ်းများရွေးချယ်ခြင်းကို ထည့်သွင်းစဉ်းစားမှု မပြုလုပ်ပါ။ ရေလှောင်တမံသည် ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ ၏ ကနဦးစက်မှုလုပ်ငန်း နယ်မြေနှင့် ကပ်လျှက်တည်ရှိနေခြင်းကြောင့် ပယင်းဖြူရေလှောင်တမံရှိ စီမံကိန်းတည်နေရာကို ရွေးချယ်ခဲ့ခြင်းဖြစ်ပြီး၊ လေလှောင်တမံသည် ရေသန့်စင်ရေးစက်ရုံ-WTP တွင် သန့်စင်ရေးအတွက် ရေလိုအပ်ချက်ကို ထောက်ပံ့ပေးနိုင်မည် ဖြစ်ပါသည်။

ပင်မနည်းပညာ (main technology) အတွက် လက်တွေ့ဆောင်ရွက်နိုင်မည့် အခြားနည်း ရွေးချယ်စရာ မရှိသော်လည်း၊ ကြိုတင်ပြင်ဆင်သန့်ရှင်းရေး (pre-oxidation) လုပ်ငန်းစဉ်တွင် အသုံးပြုနိုင်မည့် ဓာတုပစ္စည်းများအတွက် အခြားနည်းရွေးချယ်စရာ ရှိပါသည်။ အတွက် ကလိုရင်း (chlorine) နှင့် အိုဇုန်း (ozone) ကို အသုံးပြုနိုင်ပါသည်။ အိုဇုန်း (ozone) ကို အသုံးပြုမှုနှင့် နှိုင်းယှဉ်လျှင် ကလိုရင်း (chlorine) ကို အသုံးပြုရာတွင် စီပွားရေးအရတွက်ခြေအကိုက်ဆုံးဖြစ်ပြီး၊ ပြုပြင်ထိန်းသိမ်းရေး နှင့် လည်ပတ်ရေး စရိတ်များအတွက် ရင်းနှီးမြှုပ်နှံမှုနည်းသောကြောင့် ကလိုရင်း (chlorine) ကို ရွေးချယ်ထားပါသည်။

ထို့အပြင်၊ ဤစီမံကိန်းကိုအောင်မြင်ရန်ရည်ရွယ်ဆောင်ရွက်ရာတွင်၊ ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ ၏ ကနဦးစက်မှုလုပ်ငန်းနယ်မြေ သို့ ရေရှည်အကျိုးပြုပြီး၊ ယုံကြည်အားထားရသော ရေထောက်ပံ့ရေးပြုလုပ်နိုင်ရန်အတွက် စီမံကိန်းကို လိုအပ်သောကြောင့် စီမံကိန်းကိုဆက်မလုပ်တော့သည့် ရွေးချယ်မှုသည် ဖြစ်နိုင်သည် မဟုတ်ပါ။

1.5 ပတ်ဝန်းကျင်အကြောင်းအရာဖော်ပြချက်

အခြေခံအချက်အလက်များတွင် စီမံကိန်းလုပ်ငန်းနေရာ (စီမံကိန်းလေ့လာမှုဧရိယာ) ၏ ၃ ကီလိုမီတာ အချင်းဝက်ပတ်လည်အတွင်း မူလအချက်အလက်များ (primary data) နှင့် တစ်ဆင့်ခံအချက်အလက်များ (secondary data) ကောက်ယူစုဆောင်းခြင်းတို့ ပါဝင်ပါသည်။ မူလအချက်အလက်များကောက်ယူရာတွင် စီမံကိန်းလေ့လာမှုဧရိယာအတွင်း ကွင်းဆင်းစစ်တမ်း ကောက်ယူမှုများပါဝင်ပြီး၊ တစ်ဆင့်ခံအချက်အလက်များကောက်ယူရာတွင် ရှိနေပြီးသော အရင်း အမြစ်များ (existing sources) မှ အချက်အလက်များကောက်ယူမှုများ ပါဝင်ပါသည်။

1.5.1 ရူပပတ်ဝန်းကျင်ဆိုင်ရာအကြောင်းအချက်များ

1.5.1.1 မြေမျက်နှာသွင်ပြင် နှင့် သဘာဝရှုခင်း

စီမံကိန်းလုပ်ငန်းနေရာသည် မြန်မာနိုင်ငံ တောင်ဘက်၏ တန်သာရီတိုင်းဒေသကြီးရှိ ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ တွင် တည်ရှိ ပါသည်။ တန်သာရီတိုင်းဒေသကြီးတွင် အမြင့် ၉၁၄ မီတာ (၃,၀၀၀ ပေ) ရှိ တောင်တန်းကြီးများသည် အနောက်မြောက်ဘက်မှ အရှေ့တောင်ဘက်သို့ သွယ်တန်းလျှက် ရှိပါသည်။ အချို့တောင်တန်းများမှာ ပင်လယ်ဘက်သို့ သွယ်တန်းသွားကာ ပင်လယ်ကမ်းခြေတစ်လျှောက် ကျွန်းများအဖြစ် ပြန်လည် ဖြစ်ပေါ်လျှက် ရှိပါသည်။ ရှည်လျားပြီး

ကျဉ်းမြောင်းသောမြေညီပြင်များကို မြစ်များ နှင့် ပင်လယ်ကမ်းခြေဒေသများတစ်လျှောက် တွေ့မြင်နိုင်ပါသည်[1]။

1.5.1.2 *လေထုအရည်အသွေး*

လေထုဝန်းကျင်အရည်အသွေးကို ဝက်ချောင်းကျေးရွာ (Wat Chaung Village) တွင် ၂၀၁၆ ခုနှစ် ဇန်နဝါရီလတွင် ၃ ရက်ဆက်တိုက်ကာလအကြာ တိုင်းတာမှတ်သားခဲ့ပါသည်။ အောက်ပါ သတ်မှတ်ချက်များကို မှတ်တမ်းတင်ယူခဲ့ပါသည် -

- နိုက်ထရိုဂျင် ဒိုင်အောက်ဆိုက် (NO_2)၊
- ကာဗွန်မိုနိုအောက်ဆိုက် (CO)၊
- ပါတီကူလိတ် မက်တာ (PM_{10})၊
- ပါတီကူလိတ် မက်တာ ($PM_{2.5}$)၊ နှင့်
- ဆာလဖာ ဒိုင်အောက်ဆိုက် (SO_2)။

နိုက်ထရိုဂျင် ဒိုင်အောက်ဆိုက်-NO_2၊ ပါတီကူလိတ် မက်တာ-PM_{10}၊ ပါတီကူလိတ် မက်တာ-$PM_{2.5}$ နှင့် ဆာလဖာ ဒိုင်အောက်ဆိုက်-SO_2 အတွက် လေထုဝန်းကျင်အရည်အသွေးရလဒ်များသည် မြန်မာ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ [2] နှင့်ကိုက်ညီမှု ရှိကြောင်း တွေ့ရှိ ရပါသည်။ ကာဗွန်မိုနိုအောက်ဆိုက်-CO အတွက် မြန်မာလမ်းညွှန်ချက်တန်ဖိုးများ မရှိသောကြောင့်၊ WHO ၏ ဥရောပ အတွက် လေထုအရည်အသွေးလမ်းညွှန်ချက်များ (WHO's Air Quality Guidelines) [3] ကို အသုံးပြု တိုင်းတာရာတွင်၊ CO အတွက် လေထုဝန်းကျင်အရည်အသွေး ရလဒ်များ လမ်းညွှန်ချက်များ နှင့် ကိုက်ညီမှုရှိကြောင်း တွေ့ရှိရပါသည်။

1.5.1.3 *ဖန်လုံအိမ်ဓာတ်ငွေ့*

ကမ္ဘာ့ဘဏ်၏ တိုင်းပြည်လုံးဆိုင်ရာအချက်အလက်များ[4] တွင် ဖော်ပြထားသည့် ကာဗွန်ဒိုင် အောက်ဆိုက် (CO_2) ထုတ်လွှတ်မှုအရ၊ ၂၀၁၀ ပြည့်နှစ်တွင် မြန်မာနိုင်ငံရှိ ကာဗွန်ဒိုင်အောက်ဆိုက် (CO_2) ထုတ်လွှတ်မှုများမှာ သန်း ၃၁.၂၈ တန် ရှိပါသည်။ ကာဗွန်ဒိုင်အောက်ဆိုက်-CO_2 ထုတ်လွှတ်မှု တို့သည် ရေနံရုပ်ကြွင်းလောင်စာများလောင်ကျွမ်းမှု နှင့် ဘိလပ်မြေထုတ်လုပ်မှု တို့မှ အဓိကထွက်ပေါ်လာ သောထုတ်လွှတ်မှုများဖြစ်ကြ ပါသည်။

1.5.1.4 *ဆူညံမှု*

ဆူညံမှုကို ဝက်ချောင်းကျေးရွာ (Wat Chaung Village) တွင် ၂၀၁၆ ခုနှစ် ဇန်နဝါရီလတွင် ၂ ရက်ဆက်တိုက်ကာလအကြာ တိုင်းတာမှတ်သားခဲ့ပါသည်။

[1] http://www.modins.net/myanmarinfo/state_division/taninthayi.htm

[2] MOECAF၊ နောက်ဆက်တွဲ ၁ - အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ၊ ၂၀၁၅ ခုနှစ် ဒီဇင်ဘာလ ၂၉ ရက်။

[3] ဥရောပအတွက် လေအရည်အသွေးလမ်းညွှန်ချက်များ။ 1997။ WHO ဒေသဆိုင်ရာပုံနှိပ်ထုတ်ဝေခြင်း၊ ဥရောပဆိုင်ရာစာစဉ် အမှတ် ၂၃။ ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့။

[4] https://www.quandl.com/data/WORLDBANK/MMR_EN_ATM_CO2E_KT-Myanmar-CO2-emissions-kt ၂၀၁၅ ခုနှစ် မတ်လ ၃၀ ရက်နေ့တွင်နောက်ဆုံး ဝင်ကြည့်ထားပါသည်။

နေ့အချိန်တွင်၊ တိုင်းတာမှုပြုလုပ်သောဆူညံမှုအဆင့်များသည် မြန်မာ အမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာအရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များ (၂၀၁၅) ရှိ တန်ဖိုးများအောက် နိမ့်ပါးနေကြောင်း တွေ့ရှိရပါသည်။ သို့ရာတွင် ညဘက်အချိန်တွင် တိုင်းတာမှုပြုလုပ်သော ဆူညံမှုအဆင့်သည် လမ်းညွှန်ချက်များကို သိသိသာသာကျော်လွန်သွားကြောင်း တွေ့ရှိရပါသည်။ အဓိကဖြစ်ပေါ်လာ သည့် ဆူညံမှုအရင်းအမြစ်များတွင် ကျေးရွာမှ ဆူညံမှုမျိုးစုံ (ဥပမာ - စကားပြောဆိုသံ၊ ယာဉ်ငယ် များ၏အသံ၊ ချက်ပြုတ်ခြင်းမှ ထွက်လာသောအသံ၊ စသည်ဖြင့်) နှင့် လေတိုက်ခတ်မှုအခြေ အနေ များလည်း ပါဝင်ပါသည်။ ညဘက်အချိန်တွင် တိုးပွားလာသောဆူညံမှုအဆင့်များသည် ဆူညံမှု ဆိုင် ရာ စစ်တမ်းကောက်ယူမှုအတွင်းလေ့လာတွေ့ရှိခဲ့ရသော ဒီဇယ်သုံးစက်များကို အသုံးပြုရ သော ကြောင့် ဖြစ်ပါသည်

1.5.1.5 *မြေပေါ်ရေ*

စီမံကိန်းလုပ်ငန်းနေရာသည် အရှေ့ဘက်နယ်နိမိတ်ဒေသတစ်လျှောက် တောင်တန်းများမှ စီးဆင်းလာသောမြစ်များ နှင့် ချောင်းငယ်များရှိနေသည့် တနင်္သာရီတိုင်းဒေသကြီးတွင် တည်ရှိ ပါသည်။

မြေပေါ်ရေအရည်အသွေး နမူနာကို ပယင်းဖြူရေလှောင်တမံ၊ ထားဝယ်မြစ် နှင့် (တလိုင်းဂျတမံ၏ ရေစုန်နှင့်ရေဆန်ဖြစ်ပေါ်သည့်) တလိုင်းယမြစ် (Ta Lai Ya) ပေါ်ရှိ နေရာနှစ်ခု တို့ ဖြစ်သည့် နေရာ ၄ နေရာ၌ ကောက်ယူခဲ့ပါသည်။ နမူနာသည် စီမံကိန်းလုပ်ငန်းနှင့် သက်ဆိုင်သည့် သို့မဟုတ် စီမံကိန်းလုပ်ငန်းကြောင့် သက်ရောက်နိုင်သည့် ပါရာမီတာများအပေါ် အခြေခံပါသည်။ ဥပမာ - အစိုင်အခဲပါဝင်မှု (TSS)၊ ဇီဝဓာတုအောက်ဆီဂျင်ပါဝင်မှု (BOD)၊ အောက်ဆီဂျင်ပျော်ဝင်ပါဝင်မှု (DO) နှင့် ဗက်တီးရီးယားပိုးပါဝင်မှု တို့ဖြစ်ပါသည်။ မြေပေါ်ရေအရည်အသွေးတွက် မြန်မာ သို့မဟုတ် ကမ္ဘာ့ကျန်းမာရေးအဖွဲ့-WHO လမ်းညွှန်ချက်များမရှိသောကြောင့်၊ မြေပေါ်ရေ အရည်အသွေးရလဒ်များကို ထိုင်းနိုင်ငံ၏ မြေပေါ်ရေ အရည်အသွေးစံနှုန်းများ[1] နှင့် နှိုင်းယှဉ်ခဲ့ ပါသည်။

ပယင်းဖြူရေလှောင်တမံ၊ ထားဝယ်မြစ် တလိုင်းယမြစ် (တလိုင်းဂျတမံ၏ ရေစုန်ချိန်) တို့တွင် သတ်မှတ်ထားသည်ထက်ကျော်လွန်သွားသည့် ဇီဝဓာတုအောက်ဆီဂျင်ပါဝင်မှု-BOD မှလွဲ၍၊ ပါရာမီတာများအားလုံးသည် "အလယ်အလတ်ဖြစ်သော သန့်ရှင်းသော ရေချိုဖြစ်သော ရေအရင်းအမြစ်များ (Medium clean fresh surface water resource)" အတွက် နှိုင်းယှဉ်ထားသော စံနှုန်းအတွင်းတွင်ရှိပါသည်။ ဇီဝဓာတုအောက်ဆီဂျင်ပါဝင်မှု-BOD မြင့်မားခြင်းသည် ကြွင်းကျန်မြေဆီလွှာပါဝင်မှု (organic matter) ရှိနေကြောင်းညွှန်ပြ ပါသည်။ ဤသို့ဖြစ်ရသည်မှာ ရေဆန်တွင် စွန့်ထုတ်ထားသောအညစ်အကြေးများကြောင့် ဖြစ်နိုင်သော်လည်း၊ သေဆုံးသွားသောသစ်ပင်များ၊ ရေညှိပင်များ၊ သို့မဟုတ် တိရစ္ဆာန်များစွန့်ထုတ်သည့် မစင်များပါရှိနေခြင်းကြောင့် လည်း ဖြစ်နိုင်ပါသည်။

1.5.1.6 *မြေဆီလွှာများ နှင့် မြေအောက်ရေ*

စီမံကိန်းနေရာသည် အဓိကအားဖြင့် နန်းဆန်သောမြေ၊ နီညိုသောသစ်တောမြေ နှင့် နမ်းဖတ်ကျောက် နေရာတွင် တည်ရှိပါသည်။ နမ်းဖတ်ကျောက်မှာ၊ သဲကျောက် နှင့် သဲကျောက်စရစ်ခဲကြီးများ ရှိနေသည့် မြေလွှာအောက်မှကျောက်သားကို တလိုင်းယမြစ်၏ ကမ်းနှစ်ဘက်တစ်လျှောက်လုံး

[1] အမျိုးသားပတ်ဝန်းကျင်ဘုတ်အဖွဲ့၏ အမိန့်ကြော်ငြာစာမှ မြေပေါ်ရေအရည်အသွေးစံနှုန်းများ၊ နံပါတ် (၈)၊ B.E. 2537 (၁၉၉၄)၊ အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေး မြှင့်တင်ရေးနှင့် ထိန်းသိမ်းရေးအက်ဥပဒေ B.E.2535 (၁၉၉၂) အရ၊ Royal Government Gazette တွင်ထုတ်ဝေသည်၊ Vol. 111၊ အပိုင်း ၁၆၊ ဖေဖော်ဝါရီ ၂၄ ရက်၊ B.E.2537 (၁၉၉၄)။

ကောင်းစွာမြင်တွေ့နိုင်ပါသည်။ အပေါ်ယံမြေဆီလွှာသည် ၁ မီတာ သို့မဟုတ် ၁ မီတာအောက် အထူရှိသည့် နုန်းဆန်မြေ နှင့် ကြွင်းကျန်ပစ္စည်းများ (organic materials)[1] ဖြင့် အဓိက ပေါင်းစပ်ဖွဲ့စည်း ထားပါသည်။

မြန်မာနိုင်ငံရှိ ရေအသုံးပြုမှုသည် တိုးပွားလျှက်ရှိပါသည်။ အထူးသဖြင့် စိုက်ပျိုးရေး နှင့် စက်မှုလုပ်ငန်းကဏ္ဍများတွင် ဖြစ် ပါသည်။ ၈၉% ရေပမာဏအသုံးပြုမှုကို ပိုက်လိုင်းရေသွယ် စနစ်ဖြင့် အသုံးပြုကြပြီး၊ ၈% ခန့်မှာ အိမ်သုံးအတွက်ဖြစ်ကာ၊ ၃% မှာ စက်မှုလုပ်ငန်းအတွက် ဖြစ်ပါသည်[2]။

ဤစီမံကိန်းအတွက် စီမံကိန်းဧရိယာအနီး အခြေခံမြေအောက်အရည်သွေးဆိုင်ရာ ယခင်လေ့လာချက် တော်တော်များများကို ပြန်လည်သုံးသတ်မှုများ ပြုလုပ်ခဲ့ပါသည်။ pH ရလဒ်များမှ ဤဧရိယာရှိ မြေအောက်ရေများသည် အက်စစ်ပါဝင်မှုရှိကြောင်း ညွှန်ပြနေပါသည်။ ထို့အပြင် အစိုင်အခဲ၊ ခဲ၊ ပြဒါး၊ ဗက်တီးရီးယားပိုးများ နှင့် E.Coli ပိုးများ ပါဝင်မှုအဆင့်မြင့်မားမှုကို စီမံကိန်းဧရိယာရှိ အချို့မြေအောက်ရေ တည်နေရာများတွင် တွေ့ရှိရ ပါသည်။

1.5.2 *လူမှုပတ်ဝန်းကျင်ဆိုင်ရာ အကြောင်းအရာချက်များ*

1.5.2.1 *မြေအသုံးပြုမှု*

စီမံကိန်းသည် ခန့်မှန်းခြေ ၈.၈၂ စတုရန်းကီလိုမီတာ(၄.၁၃ ဧက) ဧရိယာခန့် ရှိပါသည်။ ပြုလုပ်ဆောင်ရွက် မည့် နေရာအများစုတွင် ဆီအုန်းပင်စိုက်ခင်းများရှိသော်လည်း၊ ဧရိယာငယ်တစ်ကို ခြုံခတ်ကာ၊ သစ်ပင်ပေါက်တောများကို ဖယ်ရှားထား ပြီးဖြစ်ပါသည်။

စီမံကိန်းလေ့လာမှုဧရိယာအတွင်း မြေအများစုမှာ ဒေသခံကျေးရွာသားများမှ စိုက်ပျိုးရေးအတွက် အသုံးပြုကြ ပါသည်။ အဓိကသီးနှံများမှာ သီဟိုဠ်သရက်၊ ရာဘာ၊ ကွမ်းသီး နှင့် ကွမ်းပင်၊ ဆီအုန်း နှင့် ငရုတ်ကောင်း တို့ ဖြစ်ကြ ပါသည်။

1.5.2.2 *မြစ်အသုံးပြုမှု*

ထားဝယ်မြစ်သည် စီမံကိန်းလုပ်ငန်းနေရာ၏ အရှေ့ဘက်သို့ ၃ ကီလိုမီတာခန့် အကွာတွင် တည်ရှိနေပြီး၊ တလိုင်းယမြစ်သည် စီမံကိန်းလုပ်ငန်းနေရာ၏ အရှေ့တောင်ဘက်သို့ ၁၁ ကီလိုမီတာခန့် အကွာ တွင် တည်ရှိနေပါသည်။ဝက်ချောင်းကျေးရွာ နှင့် ခမောင်းချောင်းကျေးရွာမှ ရွာသားများသည် အဓိကအားဖြင့် မိသားစုစားသုံးမှုအတွက် ရံဖန်ရံခါ ထားဝယ်မြစ် နှင့် တလိုင်းယမြစ်များတွင် ငါးဖမ်းကြ ပါသည်။

1.5.2.3 *လူဦးရေစာရင်းအချက်အလက်*

စီမံကိန်းဧရိယာရှိ ကျေးရွာတည်ရှိမှုအရ၊ လူဦးရေ ၁,၄၅၇ ဦးခန့် ရှိသော ခမောင်းချောင်းကျေးရွာသည် လူဦးရေ ၄၆၀ ဦးရှိသော ဝက်ချောင်းကျေးရွာထက် ပိုကြီးပါသည်။ ကျေးရွာများ၏ လူမျိုး၊ ဘာသာစကား နှင့် ကိုးကွယ်သောဘာသာ တို့သည် မြန်မာလူဦးရေနယ်နိမိတ် (ဥပမာ - မြန်မာစကားပြောသော ဗုဒ္ဓဘာသာ ဗမာလူမျိုးများ) နှင့် ဆက်စပ်မှုရှိပါသည်။

[1] Phisut Technology Co., Ltd (၂၀၁၅)။ ပြည်ထောင်စုသမ္မတ မြန်မာနိုင်ငံ၊ ထားဝယ်ခရိုင်ရှိ ရေလှောင်တမံငယ်စီမံကိန်းအတွက် ပယင်းဖြူရေလှောင်တမံဆိုင်ရာ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း။

[2] လယ်ယာစိုက်ပျိုးရေး နှင့် ဆည်မြောင်းဝန်ကြီးဌာန၊ ကဏ္ဍအသီးသီးမှ ရေအသုံးပြုမှု – ၂၀၀၈ မှ ၂၀၀၉။

1.5.2.4 *စီပွားရေး နှင့် အသက်မွေးဝမ်းကျောင်း*

စိုက်ပျိုးရေးလုပ်ငန်း

စီမံကိန်းဧရိယာရှိ သီးနှံများတွင် ရာဘာ၊ သီဟိုဠ်သရက်၊ ကွမ်းသီး နှင့် ကွမ်းပင်၊ ငရုတ်ကောင်း နှင့် ဆီအုန်းတို့ ကို စိုက်ပျိုးကြပါသည်။ မြန်မာနိုင်ငံတွင် တွေ့ရအများဆုံးဖြစ်သည့် နှံစားပင် ကို စီမံကိန်းဧရိယာ တွင် စိုက်ပျိုးထားသည် ကို မတွေ့ရပါ။

ခြံမွေးတိရစ္ဆာန်များ မွေးမြူရေး

စီမံကိန်းဧရိယာရှိ ကျေးရွာသားများသည် ကြက်၊ဘဲ၊ ကျွဲ၊ နွား၊ ဆိတ် တို့အပါအဝင် အမျိုးမျိုးသော ခြံမွေး တိရစ္ဆာန် တို့ကို မွေးမြူကြပါသည်။ သို့ရာတွင် အိမ်ထောင်စုအများစုသည် တိရစ္ဆာန်မွေးမြူရေး ထက် သီးနှံထုတ်လုပ်မှုကို ပိုမို လုပ်ကိုင် ကြပါသည်။

ကျွဲ၊ နွား တိရစ္ဆာန်မှလွဲ၍၊ ခြံမွေးတိရစ္ဆာန်အများကို ရောင်းချရန် မွေးမြူခြင်းထက် အိမ်တွင်းစားသုံး ရန် မွေးမြူကြသည်က များပါသည်။ ကျွဲ၊ နွား များကို လယ်ယာလုပ်ငန်းအတွက် (ဥပမာ-လယ်ထွန် ယက်ရာတွင်) အသုံးပြု ကြပြီး၊ ၎င်းတို့ မှ နို့ များကို ဈေးတွင် မကြာခဏ ရောင်းချလေ့ ရှိပါသည်။

ရေလုပ်ငန်းများ၊ ငါးမွေးမြူရေး နှင့် သစ်တောလုပ်ငန်း

စီမံကိန်းဧရိယာရှိ ခမောင်းချောင်းကျေးရွာမှ ရွာသားအချို့သည် ကုန်းတွင်းပိုင်း ငါးလုပ်ငန်း ကဏ္ဍ တွင် ပါဝင်လုပ်ကိုင်ကြပါသည်။ သူတို့သည် ကျေးရွာရေကန်များရှိ ငါးများကို ဇန်နဝါရီလမှ ဧပြီလ (ရေကန်များတွင်ရေပြည့်နေသည့်ကာလ) တို့တွင် အဓိကဖမ်းဆီးဆောင်ရွက်ကြပါသည်။ ခမောင်း ချောင်းကျေးရွာနည်းတူ၊ ဝက်ချောင်းကျေးရွာရှိ ရွာသားအချို့သည် ငါးဖမ်းလုပ်ငန်း လုပ်ကိုက်ကြ ပါသည်။ သို့ရာတွင် ငါးဖမ်းမှုအများစုမှာ အိမ်တွင်းစားသုံးရန်အတွက် ဖြစ်ပါသည်။ သူတို့သည် ပယင်းဖြူရေတမံတွင် အဓိက ဖမ်းဆီးကြပါသည်။

သယ်ယူပို့ဆောင်ရေး

စီမံကိန်းဧရိယာအတွင်း၊ အသုံးပြုသောလမ်းများမှာ အရည်အသွေးမကောင်းသည့် မြေသားလမ်းများ ဖြစ်ပြီး၊ စိုစွတ်ရာသီတွင် မြေတိုက်စားမှုများဖြစ်ပေါ်စေပါသည်။

ပညာရေး နှင့် စာသင်ကျောင်းများ

ဝက်ချောင်းကျေးရွာတွင် မူလတန်းကျောင်းတစ်ကျောင်းရှိပြီး၊ ခမောင်းချောင်းကျေးရွာတွင် မူလ တန်းကျောင်းနှင့်အလယ်တန်းကျောင်းရှိပါသည်။ ကျေးရွာများရှိ ၇၀% နီးပါးခန့် လူငယ်များသည် အလယ်တန်းအဆင့်ပညာရေးကို ရရှိကြပြီး၊ ၁၀ % ခန့်မှာ အထက်တန်းအဆင့် ပညာရေးကို ရရှိကြပါသည်။

1.5.2.5 *အခြေခံအဆောက်အအုံ နှင့် အသုံးပြုမှုများ*

စီမံကိန်းဧရိယာရှိ ကျေးရွာသားများသည် ချက်ပြုတ်ရန်အတွက် ထင်းကို အဓိကအသုံးပြုကြပြီး၊ ရေနံဆီ (LPG) ကိုလည်း အသုံးပြုကြပါသည်။ မီးလင်းရန်အတွက် ဒေသ မီးစက်များ၊ ဆိုလာ စနစ်များ၊ ရေနံဆီများ နှင့် ဖယောင်းတိုင်းများကို အသုံးပြုကြပါသည်။ မိသားစုအနည်းအကျဉ်းသာ လျှပ်စစ်မီးရရှိကြပါသည်။

1.5.2.6 စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှု

စီမံကိန်းလေ့လာမှုဧရိယာတွင် စွန့်ပစ်ရေများ (ဥပမာ - ဆေးကြောရေများ နှင့် သုံးရေများ) ကို အဓိကအားဖြင့် မြေကြီးပေါ်သို့ စွန့်ပစ်ကြပါသည်။ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းစွန့်ထုတ်ခြင်းကို မိသားစုတစ်စုချင်းစီမှတာဝန်ယူဆောင်ရွက်ကြပါသည်။ အိမ်ထောင်စုအများစုသည် သူတို့၏ စွန့်ပစ်ပစ္စည်းများကို မီးလောင်ကျွမ်းစေခြင်း သို့မဟုတ် အနီးအနားမြေပေါ်တွင် စွန့်ထုတ်ခြင်းတို့ကို ပြုလုပ်ကြပြီး၊ ထိန်းညှိခြင်းများ သို့မဟုတ် ထိန်းချုပ်ခြင်းများပြုလုပ်ခြင်း မရှိပါ။ ခမောင်းချောင်းကျေးရွာတွင် အများပြည်သူသုံးအမှိုက်ပုံး ရှိပါသည်။ သို့ရာတွင်၊ စွန့်ပစ်ပစ္စည်းများကို ကျေးရွာနယ်နိမိတ်အပြင်ရှိ ကျေးရွာ၏သင်္ချိုင်းအနီးရှိ မြေပေါ်တွင် စွန့်ပစ်ကြပါသည်။

1.5.2.7 ရေအသုံးပြုမှု

စီမံကိန်းဧရိယာရှိ ကျေးရွာများသည် သောက်ရေအတွက် မြေအောက်ရေအပေါ် အဓိကမှီခို သောက်သုံး ကြပါသည်။ သို့ရာတွင် အခြားအရင်းအမြစ်များမှလည်း သောက်သုံးရေးရရှိကြပါသည်။ အချို့ရွာသားများသည် အိမ်တွင်းအသုံးပြုရန်အတွက် မိုးရေကို (ဥပမာ - မြန်မာ့ရေအိုးတို့ဖြင့်) စုဆောင်းကြပြီး၊ အခြားသူတို့မှာ သောက်သုံးရေပုလင်းများကို ဝယ်ယူသောက်သုံးကြပါသည်။

1.5.2.8 အများပြည်သူ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး

စီမံကိန်းလေ့လာမှုဧရိယာရှိ တည်ရှိနေသည့် ကျေးရွာများတွင် လူသေဆုံးမှုမှာ ကူးစက် ရောဂါ နှင့် မကူးစက်သောရောဂါတို့ကြောင့် ဖြစ်ပါသည်။ စီမံကိန်းလေ့လာမှုဧရိယာရှိ ကျေးရွာများတွင် သူတို့ကိုယ်ပိုင် ကျန်းမာရေးအဆောက်အအုံများ မရှိပါ။ သို့ရာတွင်၊ ကျေးရွာများသို့ ကျန်းမာရေးဆိုင်ရာ ပညာရှင်များမှ လစဉ်လာရောက် စစ်ဆေးမှုများရှိပါသည်။ ရွာသားများသည် ပုံမှန်အားဖြင့် ကျန်းမာရေး စစ်ဆေးမှုများအတွက် အနီးအနားရှိကျန်းမာရေးစောက်ရှောက်မှုဆိုင်ရာ ဆေးပေးခန်းနေရာသို့ သွားရောက် ပြသကြလေ့ ရှိပါသည်။

1.5.2.9 ယဉ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်များ

စီမံကိန်းလုပ်ငန်းနေရာနှင့် အနီးဆုံးရှေးဟောင်းသုတေသနဆိုင်ရာနေရာသည် ထားဝယ်မြို့ မြောက်ဘက်သို့ ၁၁ ကီလိုမီတာခန့် အကွာ နှင့် ထားဝယ်အထူးစီးပွားရေးဇုန်-DSEZ ၏ နယ်နိမိတ်မှ ၁.၅ ကီလိုမီတာအကွာ တွင် တည်ရှိသော သာဂရ (Thagara) နေရာဖြစ်ပါသည်။ ထို့အပြင်၊ စီမံကိန်းလေ့လာမှုဧရိယာတွင် ဗုဒ္ဓဘာသာအမွေအနှစ်နေရာများလည်း ရှိပါသည်။

1.5.3 ဇီဝဆိုင်ရာ အကြောင်းအရာများ

စီမံကိန်းလေ့လာမှုဧရိယာသည် မြန်မာနိုင်ငံကမ်းရိုးတမ်းမိုးသစ်တော (IM0132) ဂေဟဒေသ [1] အတွင်း တည်ရှိပါသည်။ ဤဂေဟဒေသ သည် မြန်မာနိုင်ငံ အနောက်ဘက်ကမ်းတစ်လျှောက်ရှိ ရခိုင်ရိုးမ နှင့် တနင်္သာရီ တို့၏ အနောက်ဘက်ခြမ်း မြေနိမ့်အမြဲစိမ်း နှင့် ဆက်မီအမြဲစိမ်း (semi-evergreen) မိုးသစ်တော တို့ကို ကိုယ်စားပြုပါသည်။

[1] WWF အရှေ့တောင်အာရှ ဂေဟဒေသများ - မြန်မာနိုင်ငံအနောက်ဘက်မှ ဘင်္ဂလားဒေ့ရှ်နိုင်ငံသို့၊ မြန်မာနိုင်ငံကမ်းရိုးတမ်းမိုးသစ်တောများ (IMO132) http://www.worldwildlife.org/ecoregions/im0132၊ ၂၀၁၆။

စီမံကိန်းလေ့လာမှုဧရိယာ၏ ၁၀၀ ကီလိုမီတာ အတွင်း အရေးကြီးငှက်ဧရိယာများ (IBA)၊ မျိုးသုဉ်းမှု ပပျောက်ရေးမဟာမိတ် (AZE)၊ အရေးကြီးအပင်ဧရိယာများ (IPA) နှင့် ရေချိုဇီဝမျိုးစုံမျိုးကွဲအတွက် အရေးကြီးနေရာများ ရှိမနေပါ။

စီမံကိန်းလေ့လာမှုဧရိယာ၏ ၁၀၀ ကီလိုမီတာ အတွင်း ထိန်းသိမ်းကာကွယ်ထားသောဧရိယာတစ်ခု ရှိပါသည်။ တနင်္သာရီသဘာဝထိန်းသိမ်းရေး (Tanintharyi Nature Reserve) သည် စီမံကိန်း လုပ်ငန်းနေရာ၏ အရှေ့မြောက်ဘက်သို့ ၃၄ ကီလိုမီတာခန့် အကွာတွင် တည်ရှိပါသည်။ ထိန်းသိမ်း ရေးနေရာသည် တောရိုင်းတိရစ္ဆာန်နှင့် သဘာဝအပင်များအတွက်နေရာဖြစ်ပြီး၊ ခြိမ်းခြောက်ခံ မျိုးစိတ်များအတွက် နေရာများ (habitats) ဖြစ်ပါသည်။ ထိန်းသိမ်းရေး နေရာသည် အဓိက အားဖြင့် အပူပိုင်းအမြဲစိမ်းသစ်တောဖြစ်ပြီး၊ ဝါးတောများ နှင့် မြက်တောများဖြင့် ရောနေသည့် ရွက်ပြတ်တော ဖြစ်ပါသည်။

စီမံကိန်းအတွက် ဇီဝမျိုးစုံမျိုးကွဲစစ်တမ်းကို ၂၀၁၆ ခုနှစ် ဇန်နဝါရီလတွင် ကောက်ယူခဲ့ပါသည်။ လေ့လာခဲ့သောမြေပြင်နေရာများသည် အဓိကအားဖြင့် ထုတ်လုပ်ရန် ရှင်းလင်းထားသော လယ်ယာ မြေ သို့မဟုတ် ပလပ်မြေ နှင့် ဆီအုန်းစိုက်ခင်း တို့ဖြစ်ကြ ပါသည်။ သဘာဝမြေနေရာများ (Natural Habitats) တွင် အမြဲစိမ်းတော နှင့် ရွက်ပြတ်တောများပါဝင်ခဲ့ပါသည်။ စီမံကိန်းလေ့လာမှု ဧရိယာ အတွင်း သဘာဝမြေနေရာများကို မတွေ့ရှိရပါ။

ပြုပြင်ထားသောမြေနေရာများတွင် သစ်ပင်စိုက်ပျိုးခင်းများ၊ ရာဘာစိုက်ပျိုးခင်းများ၊ ဆီအုန်းစိုက်ပျိုး ခင်းများ၊ စပါးစိုက်ပျိုးခင်းများ၊ သစ်သီး နှင့် အခွံမာသီးအပင်စိုက်ပျိုးခင်းများ နှင့် ပလပ်မြေ လယ်ယာ မြေ တို့ပါဝင် ပါသည်။ ဤစိုက်ပျိုးမြေဧရိယာများသည် အဓိကအားဖြင့် စီမံကိန်းလေ့လာမှုဧရိယာ၏ တောင်ဘက်တွင် ရှိနေပါသည်။ ဤဧရိယာတွင် ဆီအုန်းစိုက်ပျိုးခင်းများလွှမ်းမိုးထားပါသည်။ စီမံ ကိန်း လေ့လာမှု ဧရိယာအတွင်း ထိန်းသိမ်းရန်အရေးပါသည့် သဘာဝအပင်မျိုးစိတ်များကို မတွေ့ ရှိရပါ။

လေ့လာခဲ့သည့်ရေအောက်နေရာများတွင် စီမံကိန်းလေ့လာမှုဧရိယာ အရှေ့ဘက်ရှိ ထားဝယ်မြစ် ကမ်းဘေးရေအောက်နေရာများ နှင့် မြစ်နှင့်ဆက်နွယ်သည့်စိုစွပ်နေရာ တို့ပါဝင်ပါသည်။ ကွင်းဆင်း လေ့လာမှု အတွင်း ရေသတ္တဝါများ နှင့် သဘာဝအပင်များကို တိုက်ရိုက်လေ့လာမှု မပြုလုပ်ခဲ့ပါ၊ ပယင်းဖြူရေလှောင်တမံအတွက် ဆောင်ရွက်ခဲ့သည့် ယခင်လေ့လာမှုများမှ ထားဝယ်မြစ်အတွင်း ငါးတန်များ (common catfish) ရှိကြောင်း ညွှန်ပြနေပါသည်။

1.6 ပတ်ဝန်းကျင် နှင့် လူမှု ထိခိုက်မှုများ

1.6.1 လေထုအရည်အသွေး

1.6.1.1 တည်ဆောက်ရေးကာလ

အဆိုပြုစီမံကိန်းနှင့်စပ်လျဉ်းသည့် ဆောက်လုပ်ရေးလုပ်ငန်းများသည် လေထုအရည်အသွေးအပေါ် ကန့်သတ်ယာယီသက်ရောက်မှုသာဖြစ်ပေါ်မည် ဖြစ်ပါသည်။ ဆောက်လုပ်ရေးလုပ်ငန်းများမှ ဖုန်မှုန့် ထွက်ရှိမှုသည် တည်ဆောက်ရေးကာလအတွင်း လေအရည်အသွေးအပေါ် သက်ရောက်မှု၏ အဓိက ကြောင်းအရင်းဖြစ်ပါသည်။ ဆောက်လုပ်ရေးလုပ်သားယာဉ်များနှင့် ဆောက်လုပ်ရေး ကိရိယာများ မှ ထုတ်လွှတ်မှုများမှာ အနည်းငယ်ယာယီသက်ရောက်မှုသာ ရှိမည် ဖြစ်ပါသည်။

1.6.1.2 လုပ်ငန်းလည်ပတ်ရေးကာလ

လုပ်ငန်းလည်ပတ်ရေးကာလအတွင်း ဓာတ်ငွေ့နောသောထုတ်လွှတ်မှုများ ထွက်ရှိမည် မဟုတ်ပါ။ သို့ရာတွင်၊ လုပ်သားယာဉ်များ နှင့် ဓာတုပစ္စည်းသယ်ယူပို့ဆောင်ခြင်း တို့မှ ထုတ်လွှတ်မှုများ ထွက်ပေါ်လာရန် အလားအလာရှိပါသည်။ စီမံကိန်းသည် ကြေထားသောကျောက်သုံးရေနံ ကတ္တရာလမ်းကို စီမံကိန်းနေရာသို့ တည်ဆောက်သွားမည်ဖြစ်သဖြင့်၊ မြေသားလမ်းကြောင့် သယ်ယူပို့ဆောင်ခြင်းမှ ဖုန်မှုန့်ထုတ်လွှတ်မှု ထွက်ပေါ်လာမည် မဟုတ်ပါ။

လုပ်ငန်းလည်ပတ်ရေးကာလအတွင်း ဖြစ်ပေါ်လာနိုင်သည့် နောက်ထပ်ထုတ်လွှတ်မှုတစ်ခုမှာ အနံ့ဆိုး ထွက်ပေါ်လာနိုင်ခြင်းဖြစ်ပါသည်။ ယင်းကဲ့သို့အနံ့ထွက်ရှိလာနိုင်မည့် ဖြစ်နိုင်အခြေအများဆုံးနေရာ မှာ ရေသန့်စင်ရေးလုပ်ငန်းစဉ်မှ လေမှုပြီးနောက်ထွက်ပေါ်လာသည့် အနည်အနစ်ကြောင့်ဖြစ် ပါသည်။ ထွက်ရှိလာသည့် အနည်အနစ်သည် အဓိကအားဖြင့် သဘာဝအရဓာတုပါဝင်ပြီး၊ အနံ့ထုတ်လွှတ်မှုကို အကန့်အသတ်နှင့် ဖြစ်ပေါ်စေမည် ဖြစ်ပါသည်။

1.6.2 ဖန်လုံအိမ်ဓာတ်ငွေ့

1.6.2.1 တည်ဆောက်ရေးကာလ

တည်ဆောက်ရေးကာတွင် ဆောက်လုပ်ရေးဇရိယာများရှိ ကရိန်း၊ ကုန်တင်ကားများ စသည့်ကိရိယာများ ကို ရွှေ့ပြောင်းမှုများ ရှိမည် ဖြစ်ပြီး၊ ၎င်းတို့မှ လောင်စာလောင်ကျွမ်းသုံးစွဲမှုကြောင့် ဖန်လုံအိမ်ဓာတ်ငွေ့ (GHG) ကို ဖြစ်ပေါ်စေနိုင်ပါသည်။ ဆောက်လုပ်ရေးလုပ်ငန်းများမှ ဖန်လုံအိမ်ဓာတ်ငွေ့ (GHG) ထုတ်လွှတ်မှုများသည် အခြားသောဆောက်လုပ်ရေးအမျိုးအစားနေရာများမှ ထုတ်လွှတ်မှုများနှင့်ဆင်တူပြီး၊ အရေးပါသည်ဟု မသတ်မှတ်ပါ။

1.6.2.2 လုပ်ငန်းလည်ပတ်ရေးကာလ

လုပ်ငန်းလည်ပတ်ရေးကာလတွင် ဖန်လုံအိမ်ဓာတ်ငွေ့ (GHG) ထုတ်လွှတ်မှုများဖြစ်ပေါ်လာနိုင်မည့် အဓိကလောင်စာလောင်ကျွမ်းသုံးစွဲမှုနေရာများရှိမည် မဟုတ်ပါ။ ယာဉ်ဖြင့်သယ်ယူပို့ဆောင်ရေး ခရီးစဉ်အနည်းအကျဉ်းမှ ဖန်လုံအိမ်ဓာတ်ငွေ့ (GHG) ထုတ်လွှတ်မှုများကို ထွက်ပေါ်စေနိုင်ပါသည်။ ထို့အပြင်၊ လျှပ်စစ်သုံးစွဲမှုအတွက် မြန်မာနိုင်ငံရှိ ပြင်ပလျှပ်စစ်ထောက်ပံ့ပေးသူမှ ဖြစ်ပေါ်လာနိုင်သည့် ဖန်လုံအိမ်ဓာတ်ငွေ့ (GHG) ထုတ်လွှတ်မှုများ ရှိနိုင်ပါသည်။

1.6.3 ဆူညံမှု

1.6.3.1 တည်ဆောက်ရေးကာလ

တည်ဆောက်ရေးကာလတွင်၊ အဓိကဆူညံမှုအမြင့်ဆုံးအဆင့်ကို စီမံကိန်းအသုံးပြုယာဉ်များ နှင့် မြေရှင်းလင်းရေးလုပ်ငန်းများ၊ မြေညှိခြင်း နှင့် တူးဖော်ခြင်းအလုပ်များအသုံးပြုသည့် အမျိုးအမျိုးသော ဆောက်လုပ်ရေးကိရိယာ (ဥပမာ - စက်များ၊ ရွှေ့ပြောင်းလွယ်သောကိရိယာ) များ လည်ပတ်ခြင်းမှ အဓိကဖြစ်ပေါ်မည် ဖြစ်ပါသည်။ စက်ရုံအဆောက်အအုံများဆောက်လုပ်ခြင်းကာလ နှင့် ပစ္စည်းများတပ်ဆင်ခြင်းကာလအတွင်းတွင် ဆူညံမှုထုတ်လွှတ်မှုများ သိသိသာသာနည်းပါးမည် ဖြစ်ပါသည်။ အဆင့် ၁ အတွက် နေ့အချိန်တွင် တစ်ရက်လျှင် ၁၀ နာရီ နှင့် တစ်ပတ်လျှင် ၆ ရက် ဖြင့် ဆောင်ရွက်မည်ဖြစ်ပြီး၊ ၁၈ လ ကြာမြင့်မည် ဖြစ်ပါသည်။ အနီးဆုံးထိခိုက်လွယ် ဇီဝပတ်ဝန်းကျင် (ဝက်ချောင်းကျေးရွာ) အပေါ် ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် ထွက်ရှိလာမည့် ဆူညံမှု

အဆင့်သည် မြန်မာ့ အမျိုးသားပတ်ဝန်းကျင်အရည်အသွေးဆိုင်ရာထုတ်လွှန်မှုလမ်းညွှန်ချက်များ၏ သတ်မှတ်ချက်များအောက် လျော့နိမ့်မည်ဖြစ်ကြောင်း တွက်ချက်ထားပါသည်။

1.6.3.2 လုပ်ငန်းလည်ပတ်ရေးကာလ

လုပ်ငန်းလည်ပတ်ရေးကာလတွင်၊ စီမံကိန်းမှ မည်သည့် အရေးပါသောဆူညံမှုထုတ်လွှတ်မှု အရင်း အမြစ်အနေရာများရှိမည် မဟုတ်ပါ။ ကိရိယာများအားလုံးကို အဆောက်အအုံများအတွင်းတွင် သိမ်းဆည်းထားမည် ဖြစ်ပါသည်။ ပွဲနေရာလည်ပတ်ခြင်းကြောင့် အရေးမပါသော ဆူညံမှု ဖြစ်ပေါ် မည် ဖြစ်ပါသည်။ လုပ်ငန်းခွင်နေရာသို့ ပစ္စည်းကိရိယာများသယ်ယူခြင်း/အမှုထမ်းများ သယ်ယူ ပို့ဆောင်ခြင်း နှင့်စပ်လျဉ်းသည့် ယာဉ်အသွားအလာဆိုင်ရာ အရေမပါသောဆူညံမှုများ ထွက်ပေါ် နိုင်သော်လည်း၊ ၎င်းဆူညံမှုများကို စီမံကိန်းဧရိယာရှိ ပုံမှန်နောက်ခံဆူညံမှုအဖြစ် သတ်မှတ်ပါသည်။

1.6.4 မြေပေါ်ရေ

1.6.4.1 တည်ဆောက်ရေးကာလ

တည်ဆောက်ရေးကာလတွင် အောက်ပါလုပ်ငန်းများကြောင့် အနီးရှိမြေပေါ်ရေအပေါ် ညစ်ညမ်း စေနိုင်ပါသည် -

- အနစ်အနစ်များဖြစ်ပေါ်ရန်အလားအလာရှိသည့် လုပ်ငန်းခွင်ရှင်းလင်းရေးလုပ်ငန်းများအပါအဝင် လုပ်ငန်းခွင်ပြင်ဆင်ခြင်း၊
- သန့်စင်ခန်းအဆောက်အအုံများနှင့် အလုပ်သမားများနေထိုင်ဆောင်များမှ မိလ္လာစွန့်ပစ်ရေ ထွက် ရှိခြင်း၊ နှင့်
- စွန့်ပစ်ပစ္စည်းသိုလှောင်ခြင်း နှင့် စွန့်ပစ်ခြင်း။

ထို့အပြင်၊ ဓာတုပစ္စည်းများ မတော်တဆယိုဖိတ်မှု နှင့် ယိုစိမ့်မှုများကြောင့် မြေပေါ်ရေညစ်ညမ်းမှု ဖြစ်ပေါ်စေရန် အလားအလာရှိပါသည်။ ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် မြေပေါ်ရေညစ်ညမ်းမှု မဖြစ်ပေါ်စေရန်၊ သင့်လျော်သောစီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည်ဖော်ဆောင်ရွက်ပြီး၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည် ဖြစ်ပါသည်။

1.6.4.2 လုပ်ငန်းလည်ပတ်ရေးကာလ

လုပ်ငန်းလည်ပတ်ရေးကာလတွင် အောက်ပါလုပ်ငန်းများကြောင့် အနီးရှိမြေပေါ်ရေအပေါ် ညစ်ညမ်း စေနိုင်ပါသည် -

- ရေသန့်စင်ရေးလုပ်ငန်းစဉ်မှ စွန့်ထုတ်ရေများ၊
- သန့်စင်ခန်းအဆောက်အအုံများနှင့် အလုပ်သမားများနေထိုင်ဆောင်များမှ မိလ္လာစွန့်ပစ်ရေ ထွက် ရှိခြင်း၊
- စွန့်ပစ်ပစ္စည်းသိုလှောင်ခြင်း နှင့် စွန့်ပစ်ခြင်း၊ နှင့်
- ရေဆိုးများစွန့်ပစ်ခြင်း။

ထို့အပြင်၊ ဓာတုပစ္စည်းများ မတော်တဆယိုဖိတ်မှု နှင့် ယိုစိမ့်မှုများကြောင့် မြေပေါ်ရေညစ်ညမ်းမှု ဖြစ်ပေါ်စေရန် အလားအလာရှိပါသည်။ လုပ်ငန်းလည်ပတ်ရေးလုပ်ငန်းများကြောင့် မြေပေါ်ရေ

ညစ်ညမ်းမှု မဖြစ်ပေါ်စေရန်၊ သင့်လျော်သောစီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည် ဖော်ဆောင်ရွက်ပြီး၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည် ဖြစ်ပါသည်။

1.6.5 မြေဆီလွှာများ နှင့် မြေအောက်ရေ

1.6.5.1 တည်ဆောက်ရေးကာလ

တည်ဆောက်ရေးကာလတွင် ဖြစ်ပေါ်လာနိုင်သည့် မြေဆီလွှာ နှင့် မြေအောက်ရေ သက်ရောက်မှုများမှာ အောက်ပါတို့နှင့် ဆက်စပ်နေပါသည် -

- လုပ်ငန်းခွင်ရှင်းလင်းရေးလုပ်ငန်းများတွင် စနစ်မကျသောစီမံခန့်ခွဲခြင်းကြောင့် မြေဆီလွှာဖွဲ့စည်းပုံ အရည်အတွက်အရေအ၊ အရည်အသွေးအရပါ ဆုံးရှုံးခြင်း။
- (လိုအပ်လျှင်)ရေထုတ်ယူခြင်း/ရေဖယ်ရှားခြင်းကြောင့် ဖွံ့ဖြိုးရေးကာလအတွင်း မြေအောက်ရေအဆင့်များကို အပြောင်းအလဲဖြစ်ပေါ်စေခြင်း၊
- စနစ်မကျသောဆောက်လုပ်ရေးစွန့်ပစ်ပစ္စည်းများသိုလှောင်ခြင်း နှင့် စွန့်ထုတ်ခြင်းများကြောင့် မြေဆီ လွှာ နှင့် မြေအောက် ရေအပေါ် ညစ်ညစ်စေခြင်း၊
- စွန့်ထုတ်ရေများနှင့် ရေစီးကျမှုများကို စနစ်မကျစွာစွန့်ထုတ်မှုကြောင့် မြေဆီလွှာ နှင့် မြေအောက်ရေအပေါ် ညစ်ညစ်စေခြင်း၊ နှင့်
- ဖြစ်ပေါ်လာနိုင်သည့် ယိုစိမ့်မှုများ၊ ယိုဖိတ်မှုများ နှင့် ညစ်ညမ်းနေသောပစ္စည်းများကြောင့် မြေဆီလွှာ နှင့် မြေအောက် ရေအပေါ် ညစ်ညစ်စေခြင်း။

ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် ဖြစ်ပေါ်လာနိုင်သည့်သက်ရောက်မှုများကို ဖြစ်နိုင်သမျှ လျှော့ချနိုင်ရန် နှင့် ကာကွယ်နိုင်ရန် သင့်လျော်သောစီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည်ဖော်ဆောင်ရွက်ပြီး၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှုများ ပြုလုပ်သွားမည် ဖြစ်ပါသည်။

1.6.5.2 လုပ်ငန်းလည်ပတ်ရေးကာလ

လုပ်ငန်းလည်ပတ်ရေးကာလတွင် ဖြစ်ပေါ်လာနိုင်သည့် မြေဆီလွှာ နှင့် မြေအောက်ရေ သက်ရောက်မှု များမှာ အောက်ပါတို့နှင့် ဆက်စပ်နေပါသည် -

- ဖြစ်ပေါ်လာနိုင်သည့် တိုက်စားမှုများကြောင့် မြေဆီလွှာဆုံးရှုံးခြင်း၊
- စနစ်မကျသော လုပ်ငန်းလည်ပတ်ရေးစွန့်ပစ်ပစ္စည်းများသိုလှောင်ခြင်း နှင့် စွန့်ထုတ်ခြင်းများကြောင့် မြေဆီ လွှာ နှင့် မြေအောက် ရေအပေါ် ညစ်ညစ်စေခြင်း၊
- စွန့်ထုတ်ရေများနှင့် ရေစီးကျမှုများကို စနစ်မကျစွာစွန့်ထုတ်မှုကြောင့် မြေဆီလွှာ နှင့် မြေအောက်ရေအပေါ် ညစ်ညစ်စေခြင်း၊ နှင့်
- ဖြစ်ပေါ်လာနိုင်သည့် ယိုစိမ့်မှုများ နှင့် ယိုဖိတ်မှုများ တို့ ကြောင့် မြေဆီ လွှာ နှင့် မြေအောက်ရေအပေါ် ညစ်ညစ်စေခြင်း။

ဆောက်လုပ်ရေးလုပ်ငန်းများကြောင့် ဖြစ်ပေါ်လာနိုင်သည့်သက်ရောက်မှုများကို ဖြစ်နိုင်သမျှ လျှော့ချနိုင်ရန် နှင့် ကာကွယ်နိုင်ရန် သင့်လျော်သောစီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည်ဖော်ဆောင်ရွက်ပြီး၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးမှုများ ပြုလုပ်သွားမည် ဖြစ်ပါသည်။

1.6.6 ကုန်းနေ နှင့် ရေနေ ဇီဝမျိုးစုံမျိုးကွဲ

1.6.6.1 တည်ဆောက်ရေးကာလ

လုပ်ငန်းခွင်နေရာရှင်းလင်းခြင်းကဲ့သို့သော ဆောက်လုပ်ရေးဆိုင်ရာလုပ်ငန်းကာလအတွင်း ပြုပြင်ထားသည့် နေရာ နှင့် သဘာဝ နေရာ ဇရိယာများဖြစ်သည့် ပင်ရင်းနေရာ (habitat) တွင် အနှောင့်အယှက်ဖြစ်ပေါ်စေခြင်းကြောင့် ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သက်ရောက်မှုရှိနိုင်သည့် အလားအလာရှိပါသည်။ ဇီဝမျိုးစုံမျိုးကွဲအပေါ် သိသာထင်ရှားသည့်သက်ရောက်မှုများ မဖြစ်ပေါ်စေရေး သို့မဟုတ် သက်ရောက်မှုများကို လျှော့ချနိုင်ရန် တည်ဆောက်ရေးကာလတွင် အနှောင့်အယှက်ဖြစ်မှုကို စီမံခန့်ခွဲနိုင်ရန် လျှော့ချရေးအစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

1.6.6.2 လုပ်ငန်းလည်ပတ်ရေးကာလ

လည်ပတ်ရေးလုပ်ငန်းများတွင် ဒေသတောရိုင်းတိရစ္ဆာန်များကို အနှောင့်အယှက်ဖြစ်ပေါ်စေနိုင်သည့် လုပ်ငန်းမှာ ညအချိန်မီးအသုံးပြုမှု ဖြစ်ပါသည်။ လုပ်ငန်းလည်ပတ်ရေးနှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး အတွက်လိုအပ်သည့်မီးအသုံးပြုမှုသည် နေ့ဘက်ပုံမှန်အစာထွက်စားသည့်အလေ့အထအပေါ် သက်ရောက်မှုရှိနိုင်ပြီး၊ အချို့မျိုးစိတ်များ၏ အိပ်ချိန်အလေ့အထကို အနှောင့်အယှက်ဖြစ်ပေါ်စေ နိုင်ပါသည်။ ထို့အပြင်၊ ယာဉ် သို့မဟုတ် စက်ပစ္စည်းဖြင့်တိုက်မိခြင်း သို့မဟုတ် ကျိုးပဲ့ကျခြင်းကြောင့် တောရိုင်းတိရိစ္ဆာန်တစ်ကောင်ချင်း၏ သေဆုံးမှုအတွက်လည်း အလားအလာရှိပါသည်။ သို့ရာတွင်၊ သက်ရောက်မှု၏အရေးပါမှုမှာ မပြောပလောက်သောအဆင့်အဖြစ် သတ်မှတ်ထားပါသည်။

1.6.7 စွန့်ပစ်ပစ္စည်း စီမံခန့်ခွဲမှု

1.6.7.1 တည်ဆောက်ရေးကာလ

တည်ဆောက်ရေးအဆင့်ကာလတွင်၊ နေ့စဉ်ဆောက်လုပ်ရေးလုပ်ငန်းများမှ စွန့်ပစ်ပစ္စည်းများ (ဥပမာ- ဆွေးလွယ်သောစွန့်ပစ်ပစ္စည်းများ) နှင့် အထွေထွေဆောက်လုပ်ရေးစွန့်ပစ်ပစ္စည်းများ ထွက်ပေါ်လာမည် ဖြစ်ပါသည်။

စွန့်ပစ်ပစ္စည်းအများစုမှာ အန္တရာယ်မရှိသည့်သောစွန့်ပစ်ပစ္စည်းများဖြစ်သော်လည်း၊ အသုံးပြုပြီးသော သုတ်ဆေးရည်၊ စက်ဆီများ၊ ဖိအားများအရည်များ၊ အသုံးပြုပြီးပျော်ဝင်လွယ်သောအရည်များ၊ အသုံးပြုပြီးဘက်ထရီများစသည့် အချို့သောပစ္စည်းများမှာ အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်းများ ဖြစ်ပါသည်။ စနစ်မကျသောစွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုကြောင့် ရပ်ရွာများနှင့် အလုပ်သမားများ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး အပေါ် သောက်ရေများ သို့မဟုတ် အစားအစာများမှတစ်ဆင့် သွယ်ဝိုက်သက်ရောက်မှုများ ဖြစ်ပေါ်နိုင်ပါသည်။ ထို့အပြင်၊ မြေပေါ်ရေနှင့်နှင့် မြေဆီလွှာအပေါ် ညစ်ညမ်းစေနိုင်မည့် ယိုစိမ့်မှုများ သို့မဟုတ် ဆီ၊လောင်စာဆီ ယိုဖိတ်မှုများ သို့မဟုတ် အခြားအန္တရာယ်ရှိသည့် ပစ္စည်းများ ဆိုင်ရာ မတော်တဆမှုများ ဖြစ်ပေါ်လာနိုင်ပါသည်။ စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ် (အန္တရာယ်ရှိသောစွန့်ပစ်ပစ္စည်း နှင့် အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းအတွက်) အပါအဝင် သင့်လျော်သည့်လျှော့ချရေးအစီအမံများအကောင်အထည်ခြင်းဖြင့် သက်ရောက်မှုများကို လျှော့ချသွားနိုင်မည် ဖြစ်ပါသည်။

ထို့အပြင်၊ ဧရိယာအတွင်း မြို့တော်စည်ပင်သာယာရေး စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုကွန်ယက်မှာ အကန့်အသတ်ရှိ ပါသည်။ ထို့ကြောင့်၊ အန္တရာယ်မရှိသောစွန့်ပစ်ပစ္စည်းများကို ထားဝယ်အထူး စီးပွားရေးဇုန် -DSEZ ၏ စက်မှုလုပ်ငန်းနယ်မြေအတွင်း ဖြစ်ပေါ်လာနိုင်ဖွယ်ရှိသော ဒီဇိုင်းပြုလုပ်ထား သည့်

လုပ်ငန်းခွင်ပြင်ပရှိ ဖို့မြေနေရာတွင် နေ့စဉ် စွန့်ပစ်သွားမည် ဖြစ်ပါသည်။ အန္တရာယ်ရှိသော စွန့်ပစ်ပစ္စည်းများကို လုပ်ငန်းခွင်နေရာတွင် ကနဦးစုဆောင်းသိုလှောင်ထားမည်ဖြစ်ပြီး၊ ၎င်းနောက် လွှဲယူရေးစခန်းသို့ သယ်ယူမည် ဖြစ်ပါသည်။ လွှဲယူရေးစခန်းမှ၊ ရန်ကုန်ရှိ သီလဝါအထူးစီးပွားရေးဇုန်ရှိ စွန့်ပစ်ပစ္စည်းပြုပြင်ထိန်းသိမ်းရေးအဆောက်အအုံများသို့ ပို့ဆောင်သွားမည် ဖြစ်ပါသည်။

1.6.7.2 *လုပ်ငန်းလည်ပတ်ရေးကာလ*

လုပ်ငန်းလည်ပတ်ရေးအဆင့်တွင် ထွက်ရှိလာသည့် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများသည် ရေသန့်စင်ရေး လုပ်ငန်းစဉ်မှ လေမှုတ်ပြီးနောက်ထွက်လာသည့် အနည်အနှစ်များ အဓိကပေါင်းစပ်ပါဝင်မည် ဖြစ်ပါသည်။ ပြုပြင်ထားသည့် အနည်အနှစ်များ (ကိတ်မုန့်ပုံစံအနည်အနှစ်များ) ကို DSEZ ၏ စက်မှုလုပ်ငန်းနယ်မြေအတွင်း မြေမျက်နှာပြင်အရည်အသွေးထိန်းသိမ်းပြုရေးလုပ်ငန်းများတွင် အသုံးပြုသွားမည် ဖြစ်ပါသည်။

ထို့အပြင်၊ အိမ်တွင်းထွက် အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို ပြန်လည်ပြုပြင်အသုံးပြုနိုင်သော စွန့်ပစ်ပစ္စည်းများနှင့် ပြန်လည်ပြုပြင်အသုံးမပြုနိုင်သော စွန့်ပစ်ပစ္စည်းများ (ဥပမာ- စက္ကူများ၊ ပလစတစ်များ) ကို ခွဲယူ စုဆောင်းမည် ဖြစ်ပါသည်။ အစိုင်အခဲစွန့်ပစ်ပစ္စည်းများကို ထားဝယ်အထူး စီးပွားရေးဇုန်-DSEZ ၏ စက်မှုလုပ်ငန်းနယ်မြေအတွင်း အဆိုပြုဖို့မြေနေရာတွင် စွန့်ပစ်သွားမည် ဖြစ်ပါသည်။

အန္တရာယ်ရှိသော စွန့်ပစ် ပစ္စည်းများကို လုပ်ငန်းခွင်နေရာတွင် ကနဦးစုဆောင်းသိုလှောင်ထားမည် ဖြစ်ပြီး၊ ၎င်းနောက် လွှဲယူ ရေးစခန်းသို့ သယ်ယူမည် ဖြစ်ပါသည်။ လွှဲယူရေးစခန်းမှ၊ ရန်ကုန်ရှိ သီလဝါအထူးစီးပွားရေးဇုန်ရှိ စွန့်ပစ်ပစ္စည်းပြုပြင်ထိန်းသိမ်းရေးအဆောက်အအုံများသို့ ပို့ဆောင်သွားမည် ဖြစ်ပါသည်။

စွန့်ပစ်ပစ္စည်းစီမံခန့်ခွဲမှုအစီအစဉ်ကို ပြင်ဆင်ရေးသား သွားမည်ဖြစ်ပြီး၊ ၎င်းတွင် လုပ်ငန်းလည်ပတ်ရေးကာလ၌ သတ်မှတ်ထားသောစွန့်ပစ်ပစ္စည်းအမျိုးအစားများအားလုံးအတွက် စီမံခန့်ခွဲရန်၊ ကာကွယ်တားဆီးရန်၊ လျှော့ချရန် နှင့် ပြန်လည်အသုံးပြုရန် အသေးစိတ်သတ်မှတ်ချက်များပါဝင်မည် ဖြစ်ပါသည်။

1.6.8 *လူမှု ထိခိုက်မှုများ*

1.6.8.1 *တည်ဆောက်ရေးကာလ*

<u>စီးပွားရေးနှင့် အသက်မွေးဝမ်းကျောင်း</u>

ဆောက်လုပ်ရေးကာလတွင်၊ အလုပ်အကိုင်အခွင့်အလမ်းပေါင်း ၁၇၇ ခန့်ရှိမည် ဖြစ်သောကြောင့်၊ ဒေသခံပြည်သူများတွက် အလုပ်အကိုင်အခွင့်အလမ်းများရှိပြီး၊ ဝင်ငွေတိုးလာနိုင်မည့် အလားအလာ ရှိပါသည်။ ဒေသခံအလုပ်သမားများနှင့် ဒေသခံမဟုတ်သည့် အလုပ်သမားများ၏ အချိုးမှာ ဒေသခံ အလုပ်သမား ၈ ဦးလျှင်၊ ဒေသခံမဟုတ်သူ ၁ ဦး ရှိမည် ဖြစ်ပါသည်။

ငါးလုပ်ငန်းအတွက် ဝက်ချောင်းကျေးရွာမှ ကျေးရွာသားအနည်းအကျဉ်းမှ ပယင်းဖြူရေလှောင်တမံကို အသုံးပြုလျက်ရှိကြ ပါသည်။ စီမံကိန်းလုပ်ငန်းနေရာကို ခြံခတ်သွားမည်ဖြစ်သောကြောင့်၊ ၎င်းငါးလုပ်ငန်းများကို ဆက်လက်လုပ်ကိုင်နိုင်မဟုတ်ပါ။ ဘေးအန္တရာယ်ကင်းရှင်းရေးအတွက် ဝင်ရောက်ငါးဖမ်းဆီးမှု များကိုလည်း ခွင့်ပြုတော့မည် မဟုတ်ပါ။ သို့ရာတွင်၊ အနီးအနား ဧရိယာများဖြစ်သည့် ဝက်ချောင်းကျေးရွာ၏ ချောင်း နှင့် ခမောင်းချောင်းကျေးရွာ ရေကန် တွင် ဒေသခံများ ငါးဖမ်းလုပ်ငန်းကို ဆက်လက်လုပ်ကိုင်သွား နိုင်မည် ဖြစ်ပါသည်။

ရေအသုံးပြုမှု

ဆောက်လုပ်ရေးလုပ်ငန်းများ နှင့် အလုပ်သမားများအတွက် ရေအရင်းအမြစ်ကို ပယင်းဖြူ ရေလှောင်တမံမှ ရယူမည် ဖြစ်ပါသည်။ သောက်ရေအဖြစ်အသုံးပြုရန် အတွက် သက်ဆိုင်ရာ သောက်သုံးရေစံနှုန်းနှင့်ကိုက်ညီရန် ရေကိုလုပ်ငန်းခွင်နေရာတွင် သန့်စင်မည်ဖြစ်ပါသည်။ စီမံကိန်းအတွက် ရေထုတ်ယူအသုံးပြုမှုအတွက် ရေလုံလောက်မှုရှိမည် ဖြစ်ပြီး၊ စီမံကိန်း၏ ရေအသုံးပြုခြင်းမှ လက်ရှိရေအသုံးပြုလျှက်ရှိသောသူများအပေါ် သိသာထင်ရှားစွာ သက်ရောက်မှု ရှိနိုင်မဟုတ်ပါ။

အများပြည်သူ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး

ယာဉ်အသွားအလာတိုးပွားလာမှု၊ လုပ်ငန်းခွင်အခြေခံဆောက်အအုံတည်ဆောက်ခြင်းနှင့် အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းများစီခန့်ခွဲမှုမှာ အများပြည်သူ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်း ရှင်းရေးအပေါ် သက်ရောက်မှုရှိနိုင်ပါသည်။ *ခန့်အပ်ရန်လိုအပ်သောလုံခြုံရေးဝန်ထမ်းအနည်းငယ် ရှိနေခြင်း ကြောင့် အများပြည်သူအပေါ် အတိုင်းအတာအနည်းငယ် အန္တရာယ် ဖြစ်ပေါ်စေနိုင်ပါသည်။ ယာဉ်အသွားအလာ* နှင့် အန္တရာယ်ရှိစွန့်ပစ်ပစ္စည်းများတွက် သင့်လျော်သော စီမံခန့်ခွဲမှုအစီအမံများ ကို အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပြီး၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည် ဖြစ် ပါသည်။ ထို့အပြင်၊ စီမံကိန်းလုပ်ငန်းခွင်နေရာကို ခြံခတ်သွားမည် ဖြစ်ပြီး၊ အဓိကစီမံကိန်း လုပ်ငန်း ခွင် ပြင်ပရှိလုပ်ငန်းများအတွက် သင့်လျော်သော အမှတ်အသားများကို ပြုလုပ်သွားမည် ဖြစ် ပါသည်။

ထို့အပြင်၊ ဤနေရာသို့ (ကူးစက်ရောဂါများသယ်ဆောင်လာသည့်) အလုပ်သမားများရောက်ရှိလာခြင်း ကြောင့် ကူးစက်ပြန့်ပွားတတ်သောရောဂါများဖြစ်ပေါ်နိုင် ပါသည်။ ကူးစက်ရောဂါများကို တားဆီးနိုင်ရန် စီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ထို့အပြင်၊ အလုပ်သမားများ နှင့် ဒေသခံများအတွက် ကျန်းမာရေးစောင့်ရှောက်မှုအဆောက်အအုံကို တည်ဆောက်ထားပြီးဖြစ်၍၊ ကျန်းမာရေးဆိုင်ရာကိစ္စရပ်များအတွက်အသုံးပြုနိုင်မည် ဖြစ်ပါသည်။

လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး

တည်ဆောက်ရေးကာလတွင်၊ အဓိကအချက်များဖြစ်သည့် ဆူညံမှု၊ ဖုန်မှုန့် နှင့် ရာသီဥတု တို့အားလုံးသည် အလုပ်သမားများအတွက် ကျန်းမာရေးအန္တရာယ်ကို ဖြစ်ပေါ်စေနိုင်ပါသည်။ ဝန်ထမ်းများအားလုံးသည် သင့်လျော်သော PPE ကို တစ်ချိန်လုံးဝတ်ဆင်ထားခြင်းဖြင့်၊ ဆူညံမှု နှင့် ဖုတ်မှုန့်နှင့်ဆက်စပ်သည့် ကျန်းမာရေးဆိုင်ရာအန္တရာယ်ဖြစ်နိုင်ဖွယ်မှာ နည်းပါးပြီး၊ ဖုန်မှုန့် ထိန်းချုပ်ရေး အစီအမံများကို လုပ်ငန်းခွင်တွင် အသုံးပြုသွားမည် ဖြစ်ပါသည်။

1.6.8.2 *လုပ်ငန်းလည်ပတ်ရေးကာလ*

စီးပွားရေး နှင့် အသက်မွေးလမ်းကျောင်း

လုပ်ငန်းလည်ပတ်ရေးအဆင့်ကာလတွင် တိုက်ရိုက် အလုပ်အကိုင်အခွင့်အလမ်း ၆၈ ခုကို ဖန်တီးပေးသွားမည် ဖြစ်ပါသည်။

မြန်မာဥပဒေ[1] အရ၊ လုပ်ငန်းလည်ပတ်ရေး ပထမ ၂ နှစ်အတွင်း အနည်းဆုံး ၂၅% သော အလုပ်သမားများသည် မြန်မာနိုင်ငံသားများဖြစ်ရမည် ဖြစ်ပါသည်။ ထို့အပြင်၊ ၂ နှစ်မှ ၄ နှစ် အတွင်း

[1] နိုင်ငံခြားရင်းနှီးမြှုပ်နှံမှုဥပဒေ သစ် (၂၀၁၂)။

အနည်းဆုံး ၅၀% သောအလုပ်သမားများသည် မြန်မာနိုင်ငံသားများဖြစ်ပြီး၊ ၅ နှစ်ကြာပြီးနောက် အနည်းဆုံး ၇၅% သောအလုပ်သမားများသည် မြန်မာနိုင်ငံသားများဖြစ်ရမည် ဖြစ်ပါသည်။

ရေအသုံးပြုမှု

လုပ်ငန်းလည်ပတ်ရေးကာလတွင် ဝန်ထမ်းများအတွက် သောက်သုံးရေကို သန့်စင်ထားသော ရေတိုင်ကီမှ ရယူမည် ဖြစ်ပါသည်။ ဓာတုဆိုင်ရာပြင်ဆင်ခြင်းအတွက် ရေထောက်ပံ့ရေးကို သန့်စင်ထားသောရေတိုင်ကီမှ ရေပုံ့ကိုအသုံးပြုလျှက် ရယူမည် ဖြစ်ပါသည်။ လုပ်ငန်းလည်ပတ်ရေးကာလအတွင်း စီမံကိန်းလုပ်ငန်းမှ ရေလှောင်တမံ သို့မဟုတ် ထားဝယ်မြစ် ၏ လက်ရှိရေအသုံးပြုသူများ (ဥပမာ - ငါးဖမ်းရန်ဧရိယာသို့လာရောက်သူများ)အပေါ် သိသာထင်ရှားသောသက်ရောက်မှု ရှိနိုင်မည် မဟုတ်ပါ။

အများပြည်သူ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေး

လုပ်ငန်းလည်ပတ်ရေးကာလအတွက် အများပြည်သူ ကျန်းမာရေး နှင့် ဘေးအန္တရာယ်ကင်းရှင်းရေးဆိုင်ရာ သက်ရောက်မှုများသည် အထက်တွင် ဆောက်လုပ်ရေးကာလအတွက်ဖော်ပြခဲ့သည့် အချက်များ နှင့် ဆင်တူပါသည်။

လုပ်ငန်းခွင် ကျန်းမာရေးနှင့် ဘေးအန္တရာယ် ကင်းရှင်းရေး

လည်ပတ်ရေးကာလအဆင့်တွင် ဖြစ်ပေါ်လာနိုင်သည့် ဓာတုပစ္စည်းများထိတွေ့မှုသည် အလုပ်သမားများအတွက် အန္တရာယ်ဖြစ်စေ နိုင်ပါသည်။ လုပ်ငန်းခွင်ရှိသင့်လျော်သော သိုလှောင်ရေးအဆောက်အအုံများ နှင့် ဖြေရှင်းရေးလုပ်ထုံးလုပ်နည်းများ အပါအဝင် သင့်လျော်သော စီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ ထို့အပြင်၊ မတော်တဆမှုများအတွက် သင့်လျော်သော အရေးပေါ်စီမံခန့်ခွဲမှုလုပ်ထုံးလုပ်နည်းကို တည်ဆောက်ရန် လိုအပ်မည် ဖြစ်ပါသည်။

1.6.9 *ယာဉ်အသွားအလာ*

1.6.9.1 *တည်ဆောက်ရေးကာလ*

တည်ဆောက်ရေးကာလတွင် လမ်းတွင်ယာဉ်အသွားအလာများပြားလာမှုကြောင့်၊ ယာဉ်ပြည့်ကျပ်မှု နှင့် ယာဉ်မတော်တဆမှုများနှင့်စပ်လျဉ်းသည့် ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုများရှိမည် ဖြစ်ပါသည်။ စီမံကိန်း၏ တည်ဆောက်ရေးကာလအဆင့်တွင် စီမံကိန်းလုပ်ငန်းခွင်ဝန်းကျင်ဧရိယာများ နှင့် ဆောက်လုပ်ရေးလုပ်သားများ၊ ကြီးမားသောကုန်ပစ္စည်းများ နှင့် ဆောက်လုပ်ရေးဆိုင်ရာ စွန့်ပစ်ပစ္စည်းများ အတွက် အဆိုပြု သယ်ယူပို့ဆောင်ရေးလမ်းကြောင်းများပေါ်တွင် ယာဉ်အသွားအလာများ တိုးပွားလာမည် ဖြစ်ပါသည်။

ထိခိုက်လွယ်ဆုံးဖြစ်မည့်သယ်ယူပို့ဆောင်ရေးလမ်းကြောင်းမှာ ထားဝယ်မြို့ရှိ ထားဝယ်ဆိပ်ကမ်းမှ ကြီးမားသောကုန်ပစ္စည်းများအတွက်အသုံးပြုမည့် စီမံကိန်းလုပ်ငန်းခွင်နေရာသို့သယ်ယူရေး လမ်းကြောင်း နှင့် ဆောက်လုပ်ရေးပစ္စည်းများနှင့် အလုပ်သမားအချို့အတွက် ထိုင်းနိုင်ငံ၊ ကန်ချမ်နာဘူရီ တိုင်း (Kanchanaburi Province)ရှိ ဘန်းဖူနမ့်ရွန် (Baan Phu Nam Ron) နယ်စပ်မှ စီမံကိန်းလုပ်ငန်းခွင်နေရာသို့သယ်ယူရေးလမ်းကြောင်း တို့ဖြစ်ကြပါသည်။

ဆောက်လုပ်ရေးလုပ်သားများ၊ စွန့်ပစ်ပစ္စည်းစွန့်ပစ်မှု နှင့် ဆောက်လုပ်ရေးပစ္စည်းများ အတွက် အသုံးပြုမည့် အဆိုပြုသယ်ယူရေးလမ်းကြောင်းများ အတွက် သွားလာရေးခရီးစီမံခန့်ခွဲမှုအစီအစဉ် (Journey Management Plan) အပါအဝင်၊ လမ်းပေါ်ယာဉ်အသွားအလာဆိုင်ရာစီမံခန့်ခွဲမှုအစဉ် (Road Traffic Management Plan) ကို စီမံကိန်းမှ ပြင်ဆင်ရေးသားပြီး၊ အကောင်အထည် ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ စီမံခန့်ခွဲမှုအစီအစဉ်များသည် တိုးပွားလာ မည့် ယာဉ်အသွားအလာများ ၏ ပတ်ဝန်းကျင်၊ လူမှုရေး နှင့် ကျန်းမာရေးသက်ရောက်မှုများကို အနိမ့်ဆုံးလျှော့ချနိုင်ရန် အသေးစိတ်အစီအမံများကို အကြံပြုသွားမည် ဖြစ်ပြီး၊ ဒေသ နှင့် တိုင်း ဒေသကြီးဆိုင်ရာ ယာဉ်အသွားအလာလမ်းကြောင်းများကို စနစ်တကျစီစဉ်လျှက် သင့်လျော်သော စည်းမျဉ်းများနှင့် အညီ စီမံခန့်ခွဲသွားမည် ဖြစ်ပါသည်။

1.6.9.2 *လုပ်ငန်းလည်ပတ်ရေးကာလ*

လုပ်ငန်းလည်ပတ်ရေးကာလတွင် လမ်းပေါ်ယာဉ်အသွားအလာများကြောင့် လမ်းပိတ်ဆို့မှု နှင့် ယာဉ်အသွားအလာဆိုင်ရာ မတော်တဆမှုများနှင့်စပ်လျဉ်းသည့် သက်ရောက်မှုများ ဖြစ်ပေါ်လာနိုင်ပါသည်။ စီမံကိန်းလုပ်ငန်းခွင်အနီးဧရိယာများအားလုံး နှင့် အဆိုပြု သယ်ယူရေးဆိုင်ရာလမ်းကြောင်းတို့တွင် လုပ်ငန်းလည်ပတ်ရေးကာလ လမ်းပေါ်ယာဉ်အသွားအလာများသည် ဆောက်လုပ်ရေးကာလ ယာဉ်အသွားအလာများထက် နည်းပါးမည် ဖြစ်ပါသည်။ ဖြစ်ပေါ်လာနိုင်သည့် လမ်းပေါ်ယာဉ်အသွားအလာအရင်းအမြစ်မှာ အလုပ်သမားများ၊ လည်ပတ်ရေးစွန့်ပစ်ပစ္စည်း နှင့် လည်ပတ်ရေးကုန်ပစ္စည်းများ သယ်ယူပို့ဆောင်ခြင်းကြောင့် ဖြစ်ပါသည်။

လုပ်ငန်းလည်ပတ်ရေးကာလအဆင့်အတွက် သွားလာရေးခရီးစီမံခန့်ခွဲမှုအစီအစဉ် (Journey Management Plan) အပါအဝင်၊ လမ်းပေါ်ယာဉ်အသွားအလာဆိုင်ရာစီမံခန့်ခွဲမှုအစဉ် (Road Traffic Management Plan) ကို စီမံကိန်းမှ ပြင်ဆင်ရေးသားပြီး၊ အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

1.6.10 ***ယဉ်ကျေးမှုဆိုင်ရာ အမွေအနှစ်***

1.6.10.1 *တည်ဆောက်ရေးကာလ*

တည်ဆောက်ရေးကာလတွင်၊ စီမံကိန်းသည် မြေဆီလွှာများကို တူးဖော်ခြင်းများပြုလုပ်သွားမည် ဖြစ်ပါသည်။ တူးဖော်ခြင်းလုပ်ငန်းများသည် ရှေးဟောင်းသုတေသနဆိုင်ရာပစ္စည်းများကို ပျက်စီးတတ်ကြောင်း လူသိများ ပါသည်။ အထူးသဖြင့် မြုပ်နှံထားခဲ့သော သို့မဟုတ် မြေအောက်တွင် ရှိသည်ဟု မသိသော ရှေးဟောင်းပစ္စည်းများရှိသည့် နေရာများတွင် ဖြစ်ပါသည်။ စီမံကိန်းဧရိယာအတွင်း ရှေးဟောင်းသုတေသနဆိုင်ရာပစ္စည်းများရှိသည်ဟု မှတ်တမ်းတင်ထားသည့် မှတ်တမ်းမှတ်ရာများ ရှိ မနေသော်လည်း၊ မှတ်တမ်းတင်မထားသည့် ရှေးဟောင်းပစ္စည်းများ တည်ရှိနေကြောင်း တည်ရှိနေနိုင်ပါသည်။ မှတ်တမ်းတင်မထားသည့် ရှေးဟောင်းသုတေသနဆိုင်ရာ နေရာများအပေါ်သက်ရောက်မှုများကို လျှော့ချသွားရန် မတော်တဆတွေ့ရှိမှုဆိုင်ရာလုပ်ထုံးလုပ်နည်း (A Chance Find Procedure)[1] ကို ပြင်ဆင်ရေးသားပြီး၊ အကောင်အထည်ဖော်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

[1] မတော်တဆတွေ့ရှိမှုဆိုင်ရာလုပ်ထုံးလုပ်နည်း (A chance find procedure) သည် မှတ်တမ်းမရှိသည့် ယဉ်ကျေးမှုဆိုင်ရာအမွေအနှစ်များ တွေ့ရှိလျှင်၊ မည်ကဲ့သို့ဆောင်ရွက်ရမည်ကို ဖော်ပြထားသည့် စီမံကိန်းအသေးစိတ်လုပ်ထုံးလုပ်နည်းတစ်ခု ဖြစ်ပါသည်။ ယင်းလုပ်ထုံးလုပ်နည်း တွင် တွေ့ရှိသည့်အမွေအနှစ်ပစ္စည်းကို စစ်ဆေးခြင်း၊ စိတ်ဝင်စားမည့်အဖွဲ့အစည်းများကို သတ်မှတ်ခြင်း၊ အမွေအနှစ်ပစ္စည်းကို

1.6.10.2 *လုပ်ငန်းလည်ပတ်ရေးကာလ*

ကြီးမားသောကုန်ပစ္စည်းများ နှင့် အလုပ်သမားများကို စီမံကိန်းလုပ်ငန်းခွင်သို့ သယ်ယူပို့ရေးသည် ဖုန်မှုန့်များထွက်ရှိစေပြီး၊ ယဉ်ကျေးမှုဆိုင်ရာနေရာများ၏ တန်ဖိုးများ ကို အနှောင့်အယှက် သို့မဟုတ် လျော့နည်းစေနိုင်ပါသည်။ ဥပမာ - စီမံကိန်းမှအသုံးပြုမည့် ရှိနေပြီးသောလမ်းမများအနီး တည်ရှိနေသာ ဝက်ချောင်းကျေးရွာရှိ နေရာများ ကဲ့သို့သော နေရာများဖြစ်ပါသည်။ သို့ရာတွင်၊ ဖုန်မှုန့်များကို စီမံခန့်ခွဲမှုအစီအမံများဖြင့် လျော့နည်းစေသောကြောင့် ဖြစ်ပေါ်လာနိုင်သည့် သက်ရောက်မှုမှာ ပပြောပလောက်သောအဆင့်သာ ဖြစ်ပေါ်မည် ဖြစ်ပါသည်။

1.6.11 ***စီစဉ်မထားသည့် ဖြစ်စဉ်ဖြစ်ရပ်များနှင့် မတော်တဆမှုများ***

1.6.11.1 *တည်ဆောက်ရေးကာလ*

တည်ဆောက်ရေးကာလတွင်၊ လေးလံကြီးမားသောကုန်ပစ္စည်းများကို ထိုင်းနိုင်ငံရှိ ဆိပ်ကမ်းမှ ထားဝယ်မြို့တွင်ရှိသည့် ထားဝယ်ဆိပ်ကမ်းသို့ ဝမ်းပြားရေယာဉ်ဖြင့် ပို့ဆောင်သယ်ယူမည် ဖြစ်ပါသည်။ ဆိပ်ကမ်းအဝင်အထွက်သွားလာမှုပြရေကြောင်းလမ်းညွှန်သည် ရေယာဉ်အရေ အတွက် တိုးပွားလာမှုကြောင့် ရေယာဉ်များ တိုက်မိနိုင်ခြင်း သို့မဟုတ် ရေကြောင်းသွားလာရေး မတော်တဆမှုဆိုင်ရာ အန္တရာယ် တိုးပွားစေနိုင်ပါသည်။ စီမံကိန်းသည် ရေယာဉ်ပေါ်တွင် သင့်လျော်သလို ရေကြောင်းပြမီးများ သို့မဟုတ် အချက်ပြသင်္ကေတများ တပ်ဆင်သွားမည် ဖြစ်ပါသည်။ ထို့အပြင်၊ စီမံကိန်းဆိုင်ရာကုန်ပစ္စည်းများသယ်ယူပို့ဆောင်ရေးအတွက် အသုံးပြုသော ဝမ်းပြားရေယာဉ်သည် စီမံကိန်း EHS စီမံခန့်ခွဲရေးအဖွဲ့မှ လွတ်လပ်စွာ စစ်ဆေးလေ့လာသွားမည် ဖြစ်ပါသည်။

တည်ဆောက်ရေးကာလအဆင့်တွင် ကြီးလေးသော ကိရိယာများ နှင့် စနစ်မကျသော ဓာတု/လောင်စာဆီ သိုလှောင်မှုများမှ ဆီများ၊ ချောဆီများ သို့မဟုတ် လောင်စာဆီများကဲ့သို့သော ဓာတုပစ္စည်းများ သို့မဟုတ် အန္တရာယ်ရှိသော ပစ္စည်းများ မတော်တဆယိုစိမ့်မှုများ သို့မဟုတ် ယိုဖိတ်မှုတို့ ဖြစ်ပေါ် နိုင်ပါသည်။ ဓာတုပစ္စည်းများ နှင့် အန္တရာယ်ရှိသောပစ္စည်းများကို သင့်လျော်သော သိုလှောင်မှု ဖြစ်စေရန် လျှော့ချရေး နှင့် စီမံခန့်ခွဲရေးအစီအမံများကို အကောင်အထည်ဖော်ဆောင်ရွက်ပြီး၊ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးသွားမည် ဖြစ်ပါသည်။

1.6.11.2 *လုပ်ငန်းလည်ပတ်ရေးကာလ*

သန့်စင်ထားသောရေသိုလှောင်ရေးတိုင်ကီကို ဖြန့်ဖြူးရေးပံ့နေရာသို့မပို့ဆောင်မီ သန့်စင်ထားသောရေကို သိုလှောင်ရန် အသုံးပြုပါသည်။ အကယ်၍ သန့်စင်ထားသောရေသိုလှောင်ရေးတိုင်ကီကို စနစ်တကျထိန်းသိမ်းမှုမပြုလုပ်လျှင်၊ မြောက်မြားစွာသောရေပမာဏကို အနီးပတ်ဝန်းကျင်သို့ စွန့်ထုတ်သွား နိုင်ပါသည်။ ၎င်းကိုကြိုတင်ကာကွယ်ရန်၊ ၁၁၀% ပမာဏကို သိုလှောင်နိုင်မည့် ကြံ့ခိုင်နိုင်ပြီး၊ စိမ့်မဝင်နိုင်သောကြမ်းပြင်ပါရှိသည့် တိုင်ကီဖြင့် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

အန္တရာယ်ရှိသောဓာတုပစ္စည်းများကို စနစ်တကျမကိုင်တွယ်ခြင်းနှင့်စပ်လျဉ်းသည် မထိန်းချုပ်နိုင်သော ပေါက်ကွဲမှုများ ဖြစ်ပေါ်စေနိုင်ပါသည်။ **မီး နှင့် ပေါက်ကွဲမှုများ အတွက် စီမံခန့်ခွဲမှုအစီအမံများ ပါဝင်မည့် အရေးပေါ်တုန့်ပြန်ရေးအစီအစဉ်ပြင်ဆင်လျှက်၊ စီမံခန့်ခွဲမှုအစီအမံများကို အကောင်အထည်ဖော် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။**

ပြန်လည်နေရာချထားခြင်း၊ စသည် တို့ကို ပြုလုပ်နိုင်မည့် အရည်အချင်းရှိသည် ရှေးဟောင်းသုတေသနပညာရှင်ထံသို့ တွေ့ရှိကြောင်း အသိပေးခြင်း တို့ ပါဝင်နိုင်ပါသည်။

1.6.12 ဆက်စပ်ထိခိုက်မှုဆန်းစစ်ခြင်း

ဆက်စပ်ထိခိုက်မှုများသည် စီမံကိန်းအနီးဝန်းကျင်ရှိ အခြားဖွံ့ဖြိုးဆောင်ရွက်မှုများ သို့မဟုတ် လုပ်ငန်းများမှ ဖြစ်ပေါ်လာနိုင်သည့် နောက်ထပ်သက်ရောက်မှုများဖြစ်ပါသည်။ အဆိုပြုစီမံကိန်း၏ ထိခိုက်မှုများကို အခြားစီမံကိန်း၏ ထိခိုက်မှုများပေါင်းစပ်သွားသောကြောင့် ပိုမိုကြီးမားသည့် ထိခိုက်မှု ဖြစ်ပေါ်ခြင်း ဖြစ်ပါသည်။

ဤဆန်းစစ်ခြင်းအတွက်၊ ထားဝယ်အထူးစီးပွားရေးဇုန် ၏ ကနဦးဖွံ့ဖြိုးရေးအဆင့်တွင် စီမံကိန်းခွဲ ၉ ခု၏ ယေဘုယျ အရည်အသွေးဆိုင်ရာ ဆက်စပ်ထိခိုက်မှုဆန်းစစ်ခြင်း ကို ဆောင်ရွက်ခဲ့ပါသည်။ ဆက်စပ်ထိခိုက်မှုဆန်းစစ်ခြင်းပြုလုပ်ဆောင်ရွက်မှုမှ စီမံကိန်းအတွက် သတ်မှတ်ထားသော ၎င်း သတ်မှတ်ချက်များအတွက် နောက်ထပ်လျှော့ချရေး သို့မဟုတ် စီမံခန့်ခွဲရေး အစီအမံများ လိုအပ်သည်ဟု မသတ်မှတ်ပါ။

1.7 အများပြည်သူနှင့် တွေ့ဆုံညှိနှိုင်းခြင်း နှင့် ပါဝင်ပတ်သတ်မှု

ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE ဆောင်ရွက်စဉ်ကာလအတွင်း စီမံကိန်းသက်ဆိုင်သူများနှင့် နေရာအများအပြားတွင် တွေ့ဆုံဆွေးနွေးပွဲများ ပြုလုပ်ခဲ့ပြီး ဖြစ်ပါသည်။ ကနဦးပတ်ဝန်းကျင် ဆန်းစစ်ခြင်း-IEE ၏ အစိတ်အပိုင်းတစ်ရပ်အနေဖြင့်ဆောင်ရွက်ခဲ့သည့် သက်ဆိုင်သူများနှင့် တွေ့ဆုံ ညှိနှိုင်းပွဲများတွင် အစိုးရကိုယ်စားလှယ်များ၊ အစိုးရမဟုတ်သောအဖွဲ့အစည်းများ (NGOs) နှင့် အကြို တွေ့ဆုံညှိနှိုင်းပွဲများ၊ နှင့် ကျေးရွာခေါင်းဆောင်များ နှင့် ဝက်ချောင်းကျေးရွာ (Wat Chaung Village) နှင့် ခမောင်းချောင်းကျေးရွာ (Khamaung Chaung Village) တို့တွင် အများပြည်သူနှင့် တွေ့ဆုံပွဲများ ပါဝင်ခဲ့ပါသည်။

တွေ့ဆုံညှိနှိုင်းခြင်းလုပ်ငန်းများ၏ အဓိကဦးတည်ချက်များမှာ အောက်ပါအတိုင်းဖြစ်ပါသည် -

- စီမံကိန်း၏ ဒီဇိုင်းကို နောက်ထပ်မွမ်းမံမှုပြုလုပ်နေသောကြောင့်၊ စီမံကိန်းကို မိတ်ဆက်ပေးရန် နှင့် လက်ရှိဆောင်ရွက်ထားမှုအခြေအနေများကို တင်ပြရန်၊
- ကြုံတွေ့လာနိုင်ခြေရှိသော ထိခိုက်မှုများ နှင့် အဆိုပြု စီမံခန့်ခွဲမှုအစီအမံများ၏ခြုံငုံသုံးသပ်ချက် ကို တင်ပြရန်၊
- သတ်မှတ်ထားသော ထိခိုက်မှုများ နှင့် အဆိုပြု စီမံခန့်ခွဲမှုအစီအမံများအပေါ် သက်ဆိုင်သူများ ထံမှ သဘောထားမှတ်ချက်များအပါအဝင်၊ အမြင်များ နှင့် မေးခွန်းများ စုဆောင်းရန်၊ နှင့်
- သက်ဆိုင်သူများမှ တင်ပြလာသည့် အဓိကအကြောင်းအရာမေးခွန်းများကို တုန့်ပြန်ဖြေကြားရန်။

သက်ဆိုင်သူများမှတင်ပြလာသည့် အဓိကအကြောင်းအရာမေးခွန်းများမှာအောက်ပါတို့ဖြစ်ပါသည် -

- အလုပ်အကိုင်အခွင့်အလမ်း - ကျေးရွာသားအများစုသည် စီမံကိန်းအဆိုပြုသူများ၏လုပ်ငန်းများ မှ သူတို့ရရှိနေပြီးသော အကျိုးအမြတ်များထက်၊ စီမံကိန်းမှ ဖန်တီးလာမည့် အလုပ်အကိုင်အခွင့် အလမ်းဆိုင်ရာ အကျိုးအမြတ်ကို လိုလားကြကြောင်း ညွှန်ပြနေပါသည်။
- နေရာရွှေ့ပြောင်းမှု/ပြန်လည်နေရာချထားမှု - ကျေးရွာသားများသည် စီမံကိန်းတည်ဆောက်ရေး မှ သူတို့၏စိုက်ခင်းများအပေါ် မည်သို့ သက်ရောက်နိုင်ကြောင်း ပိုမိုသိလိုကြပါသည်။
- ရေအသုံးပြုမှု - ရေလှောင်တမံမှရေကိုအသုံးပြုမှုကြောင့် စီမံကိန်းတစ်ဝိုက်နှင့်အနီးအနား ကျေးရွာများအတွက် ရေပြတ်လပ်မှုဆိုင်ရာစိုးရိမ်မှုများ ရှိကြပါသည်။

တွေ့ဆုံဆွေးနွေးမှုလုပ်ငန်းများမှ ရရှိခဲ့သည့် မေးခွန်းများ နှင့် စိုးရိမ်မှုများကို ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE အစီရင်ခံစာ ပြုစုရေးသားရာတွင် ပေါင်းစပ်ထည့်သွင်းခဲ့ပြီးဖြစ်ပါသည်။ သတင်းအချက်အလက်များကို ထိခိုက်မှုများသတ်မှတ်ခြင်း၊ ဆန်းစစ်ခြင်းလုပ်ငန်းစဉ် နှင့် စီမံခန့်ခွဲမှု အစီအမံများ နှင့် စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်းလုပ်ငန်းများဆိုင်ရာ သတ်မှတ်ခြင်းများကို အသိပေးရန် အသုံးပြုခဲ့ပြီး ဖြစ်ပါသည်။

တွေ့ဆုံဆွေးနွေးမှုလုပ်ငန်းစဉ်များသည် စီမံကိန်း၏ တည်ဆောက်ရေးကာလ နှင့် လည်ပတ်ရေးကာလ တစ်လျှောက်လုံး ပြုလုပ်သွားမည် ဖြစ်ပါသည်။ ၎င်းကို သက်ဆိုင်သူများနှင့် ထိတွေ့ဆက်ဆံရေး အစီအစဉ် (SEP) ဖြင့် ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။ သက်ဆိုင်သူများနှင့်ထိတွေ့ ဆက်ဆံရေး အစီအစဉ် (SEP) ကို တည်ဆောက်ရေး နှင့် လည်ပတ်ရေး လုပ်ငန်းများ မစတင်မီ စီမံကိန်းအဆိုပြုသူမှ ရေးဆွဲသွားမည် ဖြစ်ပါသည်။

မွန္မာနိုငျငံ EIA ကိုစညျးမြငျး (2015) ၏အပိုဒျ 65 န□ုန္ုးအဖွရျ,ပွိုးပွညျစုံသဓာအစီရငျခံစာမ□ာရရ□ီနိုငျပါသညျး:

http://www.daweiindustrialestate.com/download.php?cid=110&EIA%20Report

1.8 ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်

1.8.1 လျော့ချရေးအစီအမံများ

စီမံကိန်း၏ တည်ဆောက်ရေးကာလအဆင့်အတွက်အကြံပြုထားသည့် လျော့ချရေးအစီအမံများတွင် ကောင်းမွန်သောဆောက်လုပ်ရေး နှင့် သန့်ရှင်းရေးအလေ့အကျင့်ကောင်းများနှင့်ချိတ်ဆက်ထားပြီး၊ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) လည်း ပါဝင်ပါသည်။

စီမံကိန်း၏ လည်ပတ်ရေးကာလအဆင့်အတွက် လျော့ချရေးအစီအမံများသည် ဒီဇိုင်း၏ အစိတ်အပိုင်း တစ်ခုဖြစ်ပြီး၊ စီမံကိန်းဒီဇိုင်းအသေးစိတ်များနှင့် ပေါင်းစပ်ပါဝင်သွားမည် ဖြစ်ပါသည်။

စီမံကိန်း၏ တည်ဆောက်ရေး နှင့် လည်ပတ်ရေး ကာလ အဆင့်များအတွက် သတ်မှတ်ထားသည့် လျော့ချရေးအစီအမံများ၏အကျဉ်းချုပ်ကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) တွင် တင်ပြထားပါသည်။ ၎င်းမှ လျော့ချရေးအစီအမံများ နှင့် အစီရင်ခံစာသတ်မှတ်ချက်များနှင့်အတူ ယင်း၏ အတည်ပြုစစ်ဆေးချက်များ အတွက် အဓိကတာဝန်းများ များကိုလည်းသတ်မှတ်ပေးပါသည်။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ် (EMP) တွင် ဖော်ပြထားသည့် လျော့ချရေးအစီအမံများကို စီမံကိန်း သက်တမ်းတစ်လျှောက်လုံး အကောင်အထည်ဖော်ဆောင်ရွက်သွားစေရန် စီမံကိန်း အဆိုပြုသူမှ သေချာအောင်ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

1.8.2 စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရေးအစီအစဉ်

ပတ်ဝန်းကျင် နှင့် လူမှု ထိခိုက်မှုများဆိုင်ရာ အကောင်အထည်ဖော်ဆောင်ခြင်း နှင့် စောင့်ကြပ်ကြည့်ရှု စစ်ဆေးခြင်းအတွက် စီမံကိန်းအဆိုပြုသူ၏ အဓိက အခန်းကဏ္ဍများ နှင့် တာဝန်ဝတ္တရားများကို သတ်မှတ်ပြီးဖြစ်ပါသည်။ ပတ်ဝန်းကျင်ဆိုင်ရာ စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးခြင်း၊ ရုပ်ပိုင်းဆိုင်ရာ၊ ဇီဝဆိုင်ရာ နှင့် လူမှုဆိုင်ရာ ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုဆိုင်ရာအထူးရေးပါမှုကို ဆောင်ရွက်ရမည့်အညွှန်းများအဖြစ် သတ်မှတ်ပြီး ဖြစ်ပါသည်။ ဆောင်ရွက်ရမည့် အညွှန်း တစ်ခု

ချင်းစီ အတွက် ဘက်စုံစောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရေးအစီအစဉ် ကို စီမံကိန်း၏ အဆင့်များ အားလုံး အတွက် ပြင်ဆင်ရေးသားပြီးဖြစ်ပါသည်။ ၎င်းတွင် အကောင်အထည်ဖော်ဆောင်ရွက်ရန် နှင့် ကြီးကြပ်ရန် အတွက် တိုင်းတာရမည့်ည် ညွှန်းကိန်းများ၊ အသုံးပြုမည့် နည်းလမ်းများ၊ တည်နေရာ နမူနာများ၊ တိုင်းတာရေးဆိုင်ရာကြိမ်နှုန်းများ၊ ကန့်သတ်မှုစစ်ဆေးမှုများ၊ ကုန်ကျစရိတ် နှင့် တာဝန် ဝတ္တရားများ တို့ပါဝင် ပါသည်။

1.9 နိဂုံး နှင့် အကြံပြုချက်များ

ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE အစီရင်ခံစာကိုစီမံကိန်းအဆိုပြုသူထံမှရရှိသည့် နည်းပညာ ဆိုင်ရာ သတင်းအချက်အလက်များ၊ စီမံကိန်းနှင့်သင့်လျော်သည့် ဆောင်ရွက်ခဲ့ပြီးသော လေ့လာ ချက်များ နှင့် အစီရင်ခံစာများ၊ ပတ်ဝန်းကျင်စောင့်ကြပ်ကြည့်ရှုစစ်ဆေးရေးအခြေခံ အချက်အလက် များ၊ နှင့် သက်ဆိုင်သူများနှင့်ဆွေးနွေးတိုင်ပင်ခြင်းတို့အပေါ် အခြေခံ၍ ပြင်ဆင်ရေးသားခဲ့ပါသည်။

စီမံကိန်း၏ ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း-IEE သည် စီမံကိန်းမှ သိသာထင်ရှားသော ပတ်ဝန်း ကျင် နှင့် လူမှု ထိခိုက်မှုများဖြစ်ပေါ်မည် မဟုတ်ကြောင်းသေချာစေပါသည်။ ထိခိုက်မှုအများသည် သဘာဝအရ စီမံကိန်းနေရာသာကွက်၍ဖြစ်ပေါ်ပြီး၊ ယာယီ သို့မဟုတ် ရေတို သာဖြစ်ပေါ်မည် ဖြစ် ပြီး၊ ထိခိုက်မှုများကို ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်-EMP တွင် အကြံပြုထားသည့် နောက်ထပ် လျှော့ချရေးအစီအမံများ နှင့် စီမံကိန်း၏ စက်မှုပညာဒီဇိုင်းကို အသုံးပြုလျှက် ခိုင်မာသော ထိန်းချုပ် ရေး အစီအမံများဖြင့် အသင့်ကိုင်တွယ်ဖြေရှင်းသွားနိုင်မည် ဖြစ်ပါသည်။

ပတ်ဝန်းကျင်စီမံခန့်ခွဲမှုအစီအစဉ်-EMP ၏ ထိရောက်သောအကောင်အထည်ဖော်ဆောင်ရွက်မှုများ နှင့် မြန်မာအမျိုးသားပတ်ဝန်းကျင်အရည်အသွေးဆိုင်ရာလမ်းညွှန်ချက်များအညီဆောင်ရွက်ခြင်းများ သည် ပတ်ဝန်းကျင် နှင့် လူမှုထိခိုက်မှုများကိုလက်ခံနိုင်သောအဆင့်ထိ လျှော့ချသွားနိုင်မည် ဖြစ် ကြောင်း တင်ပြအပ်ပါသည်။

1.10 ကတိကဝတ်

Myandawei Industrial Estate Co., Ltd., သည် ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်း အစီရင်ခံစာတွင် ဖော်ပြပါရှိသော ကတိကဝတ်များ၊ ထိခိုက်မှုလျှော့ချသည့်နည်းလမ်းများနှင့် ဆောင်ရွက်မည့် အစီအစဉ်များအား အစဉ်အမြဲ အပြည့်အဝလိုက်နာပါမည်။

စီမံကိန်းအဆိုပြုသူသည် စီမံကိန်းအတွက်ချမှတ်ထားသော ပတ်ဝန်းကျင်နှင့်လူမှုစီမံခန့်ခွဲမှု အစီအစဉ်များ၊ စီမံကိန်းဆိုင်ရာ ကတိကဝတ်များနှင့် အခြေအနေများအလုံးစုံ(အားလုံး)ကို ပြည့်စုံစွာ အကောင်ထည်ဖော် ဆောင်ရွက်မည်ဖြစ်ပြီး ကန်ထရိုက်တာနှင့် တဆင့်ခံကန်ထရိုက်တာများ အားလုံးမှလည်း လေးစားလိုက်နာရမည့် ဥပဒေများဖြစ်သော ပတ်ဝန်းကျင်ထိန်းသိမ်းရေးဥပဒေ (၂၀၁၂)၊ ပတ်ဝန်းကျင် ထိန်းသိမ်းရေး နည်းဥပဒေများနှင့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ လုပ်ထုံးလုပ်နည်းနှင့်တကွ စီမံကိန်းအတွက် ချမှတ်ထားသော သဘာဝပတ်ဝန်းကျင်နှင့်လူမှုရေး ဆိုင်ရာ စီမံခန့်ခွဲမှုအစီအစဉ်များ၊ စီမံကိန်းဆိုင်ရာ ကတိကဝတ်များနှင့် အခြေအနေများအားလုံးကို ဥပဒေအရ လိုက်နာဆောင်ရွက်ရန် တာဝန်ယူပါမည်။

စီမံကိန်းအဆိုပြုသူနှင့် ERM မှ အောက်ပါအချက်များကို အတည်ပြုပါသည်။

၁) ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာသည် ဤအစီရင်ခံစာပြင်ဆင်နေသော အချိန်ကာလအတွင်း ကျွန်ုပ်တို့၏အကောင်းမွန်ဆုံးသောဗဟုသုတကိုအခြေခံ၍ မှန်ကန် တိကျ ၊ ကျစ်လစ် ပြည့်စုံစွာ ပြင်ဆင်ထားပါသည်။

၂(ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာသည် ဆီလျော်သောဥပဒေများကို အခြေခံ၍ (၂၀၁၅) တွင်ပြဌာန်းထားသည့် ပတ်ဝန်းကျင်ထိခိုက်မှုဆန်းစစ်ခြင်းဆိုင်ရာ အစီရင်ခံစာ၏ လုပ်ထုံး လုပ်နည်းများနှင့်အညီ ရေးသားပြင်ဆင်ထားပါသည်။

၃) စီမံကိန်းအဆိုပြုသူသည် ဤကနဦးပတ်ဝန်းကျင်ဆန်းစစ်ခြင်းအစီရင်ခံစာတွင် ဖော်ပြထား သော အစီအစဉ်များ ၊ကတိကဝတ်များ နှင့်ထိခိုက်မှုလျှော့ချသည့် နည်းလမ်းများ အား ပြည့်စုံစွာလိုက်နာ ဆောင်ရွက်ပါမည်။

Dr. Somchet Thinaphong

Managing Director

Myandawei Industrial Estate Company Limited

1 EXECUTIVE SUMMARY

1.1 PROJECT BACKGROUND

Myandawei Industrial Estate Holding Pte. Ltd. through its subsidiary, namely Myandawei Industrial Estate Co., Ltd., as the Concessionaire (hereinafter referred to as "the Concessionaire" or "the Project Proponent"), has signed a Concession Agreement (CA) with the Dawei Special Economic Zone Management Committee (DSEZMC) for the Initial Development Phase of the Dawei Special Economic Zone (DSEZ) in Myanmar.

The Initial Development Phase consists of the following 9 sub-projects:

1. Two-Lane Road (connecting DSEZ with the Thailand border);
2. Small Port;
3. Initial Industrial Estate;
4. Initial Phase Power Plant;
5. Initial Township;
6. Small Water Reservoir;
7. Telecommunications Landline;
8. LNG Terminal; and
9. Boil-off Gas and Temporary Power Plants.

The Project Proponent is planning to develop a Water Treatment Plant (WTP), Raw Water Pumping Station (RWPS) and Raw Water Supply Pipeline from the RWPS to the WTP (hereinafter referred to as "the Project") to supply industrial water for the light and medium industries of the Initial Industrial Estate of DESZ.

The Project will utilise the raw water stored in Pa Yain Byu storage reservoir with a proposed total capacity of 162,000 m^3/day. The raw water will be treated to meet the relevant international standards such as World Health Organisation (WHO) Guidelines for potable water and/ or the Thailand's Metropolitan Water Works Authority's drinking water standards with trace of chlorine residual.

The treated water will be distributed to the Initial Industrial Estate area via the transmission and distribution system. The detailed information of the transmission and distribution system can be found in the Environmental and Social Impact Assessment (ESIA) Study of the Initial Industrial Estate of DSEZ (prepared by other consultants[1]).

1.2 INITIAL ENVIRONMENTAL EXAMINATION (IEE) SCOPE

This IEE report has been prepared to cover the proposed Terms of Reference (ToR) stated in the Project Scoping Study[2] and to ensure compliance with the IEE

[1] MIED, Environmental and Social Impact Assessment of Dawei SEZ Initial Industrial Estate Project, United Analyst and Engineering Consultant, December 2015.

[2] MIE Company Limited, Scoping Study for Water Treatment Plant Project, Initial Development Phase of Dawei Special Economic Zone (DSEZ), Myanmar, ERM, February 2016.

requirements detailed in the Myanmar Environmental Impact Assessment Procedure (December 29th, 2015)[1].

This IEE report identifies the potential environmental and social impacts that could be associated with the proposed Project activities including those of an indirect and cumulative nature.

The study area for IEE covers all Project operational areas, including where supporting activities take place.

1.3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

1.3.1 National Requirements

The IEE has been undertaken in accordance with the Myanmar Environmental Impact Assessment Procedure which was promulgated on December 29th, 2015, and provides legislation for environmental and social governance of economic development in Myanmar, under the Environmental Conservation Law 2012 and Environmental Conservation Rules 2014 of the National Environmental Policy for Myanmar 1994.

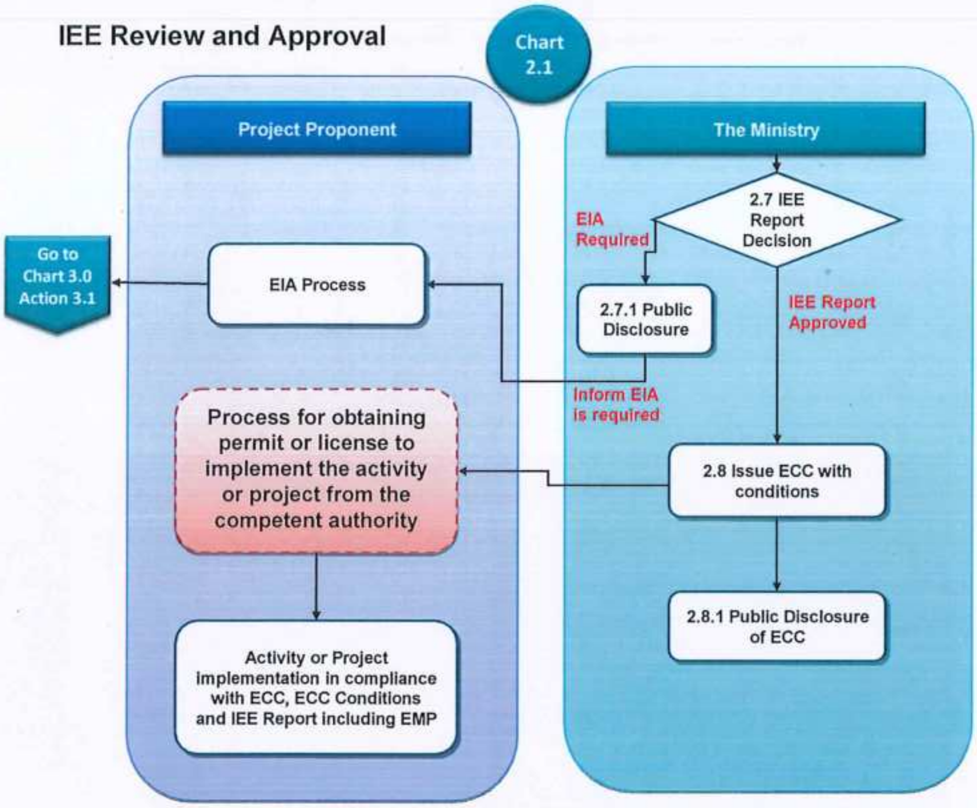
In addition, the IEE assessment was undertaken in accordance with Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines [2] which were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS) Guidelines, and provide the basis for regulation and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges.

An overview of the process (from the EIA Procedure) is shown in ***Figure 1.1***.

[1] MOECAF, Administrative Instruction of Environmental Impact Assessment Procedure, December 29th 2015.

[2] MOECAF, Annex 1 - National Environmental Quality (Emission) Guidelines, December 29th 2015.

Figure 1.1 *IEE Review and Approval Process (from EIA Procedures)*



1.4 PROJECT DESCRIPTION AND ALTERNATIVES

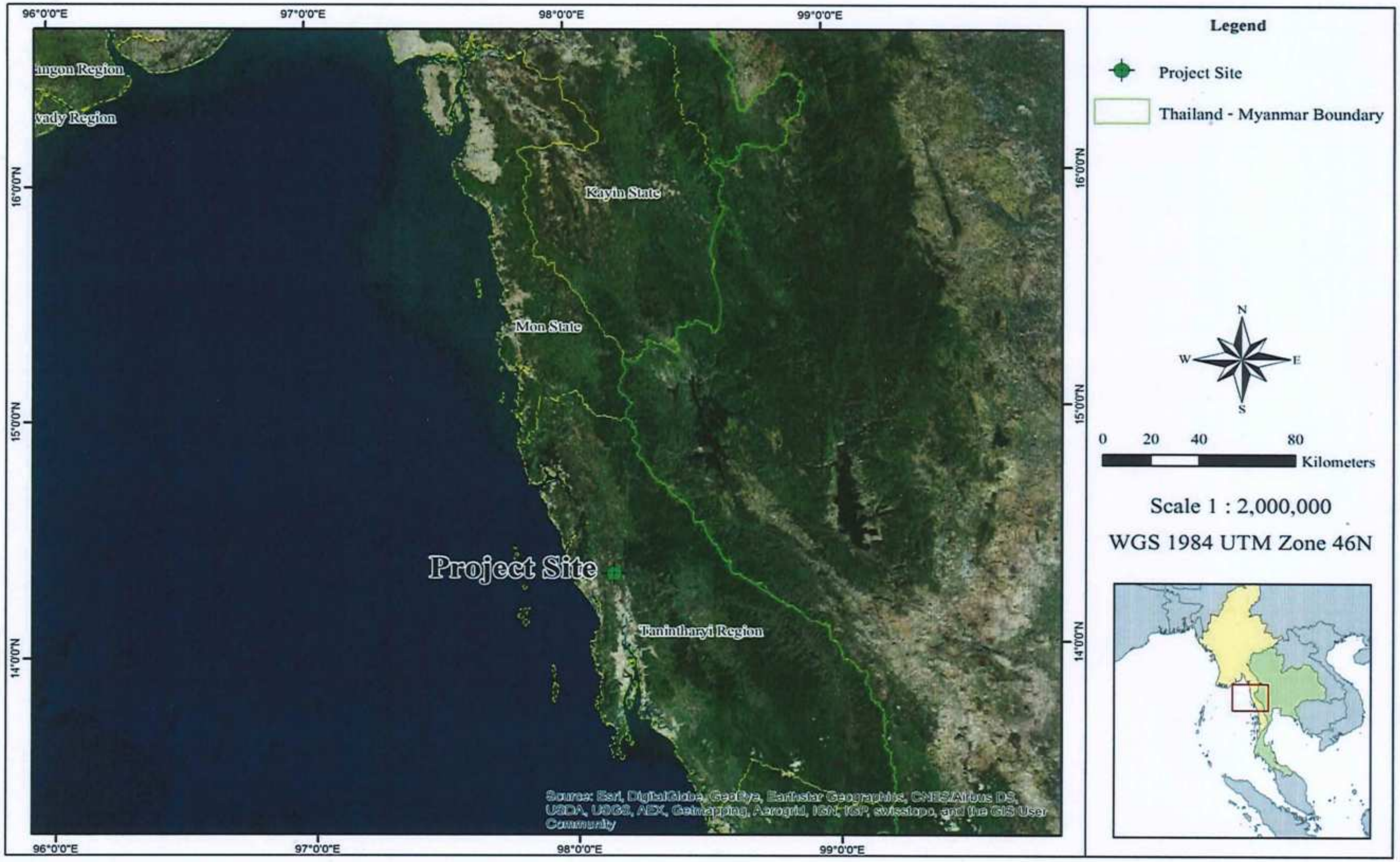
1.4.1 Project Description

The DSEZ is located in the northern part of Maungmagan Bay, on the Andaman coastline, approximately 28 km northwest of the Provincial City of Dawei, Tanintharyi Region, Myanmar (as shown in ***Figure 1.2***).

The proposed Project is located adjacent to the Pa Yain Byu Reservoir, approximately 1.5 km east of the Initial Industrial Estate of DSEZ, as shown in ***Figure 1.3*** and ***Figure 1.4***

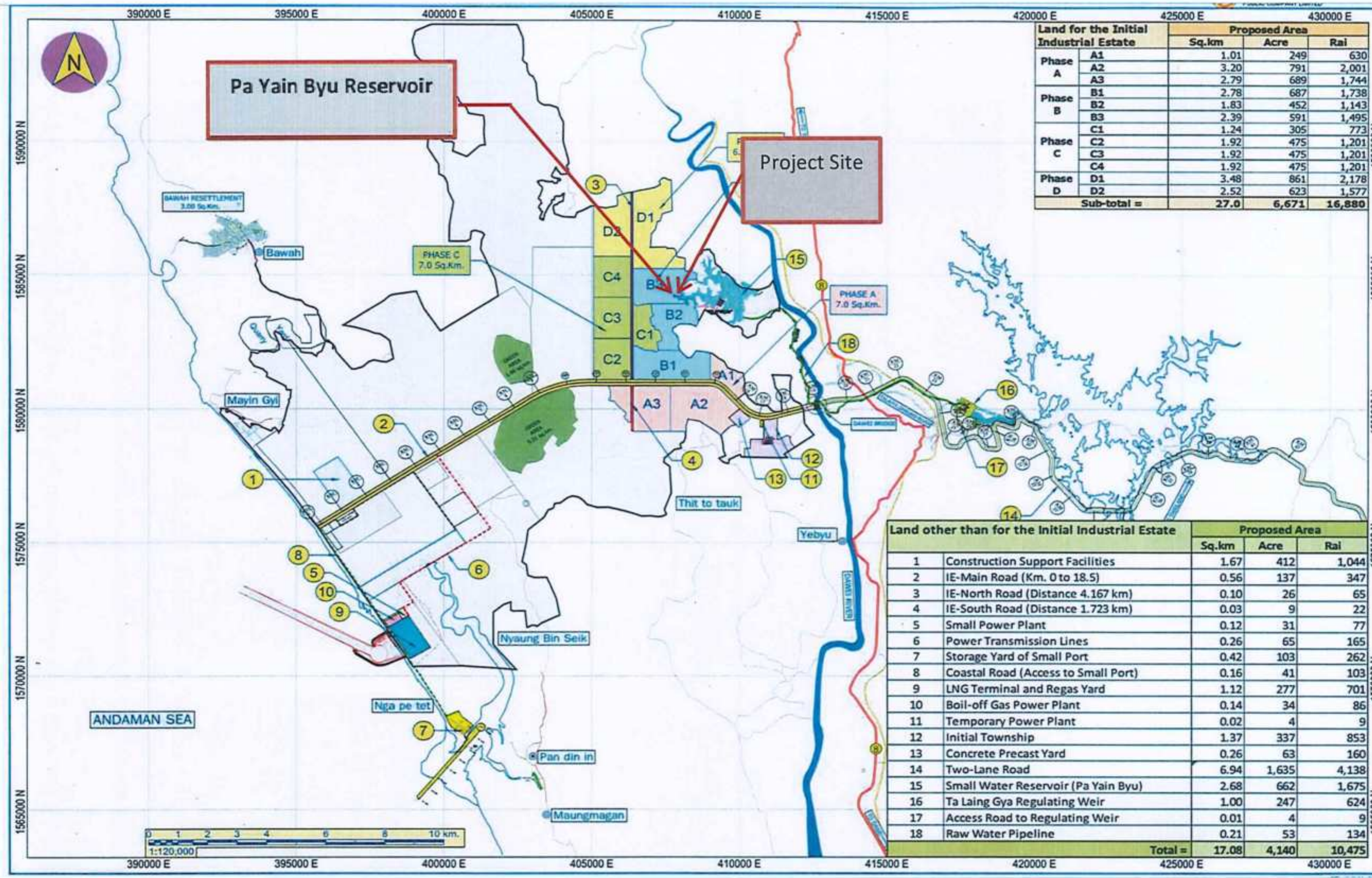
The nearest village to the Project site is Wat Chaung Village located approximately 1.8 km west of the Project site and Khamaung Chaung Village located approximately 3.5 km north-west of the Project site (as shown in ***Figure 1.5***).

Figure 1.2 Location of DSEZ within Myanmar



Source: ERM, 2016

Figure 1.3 Proposed Location of the Project in relation to DSEZ

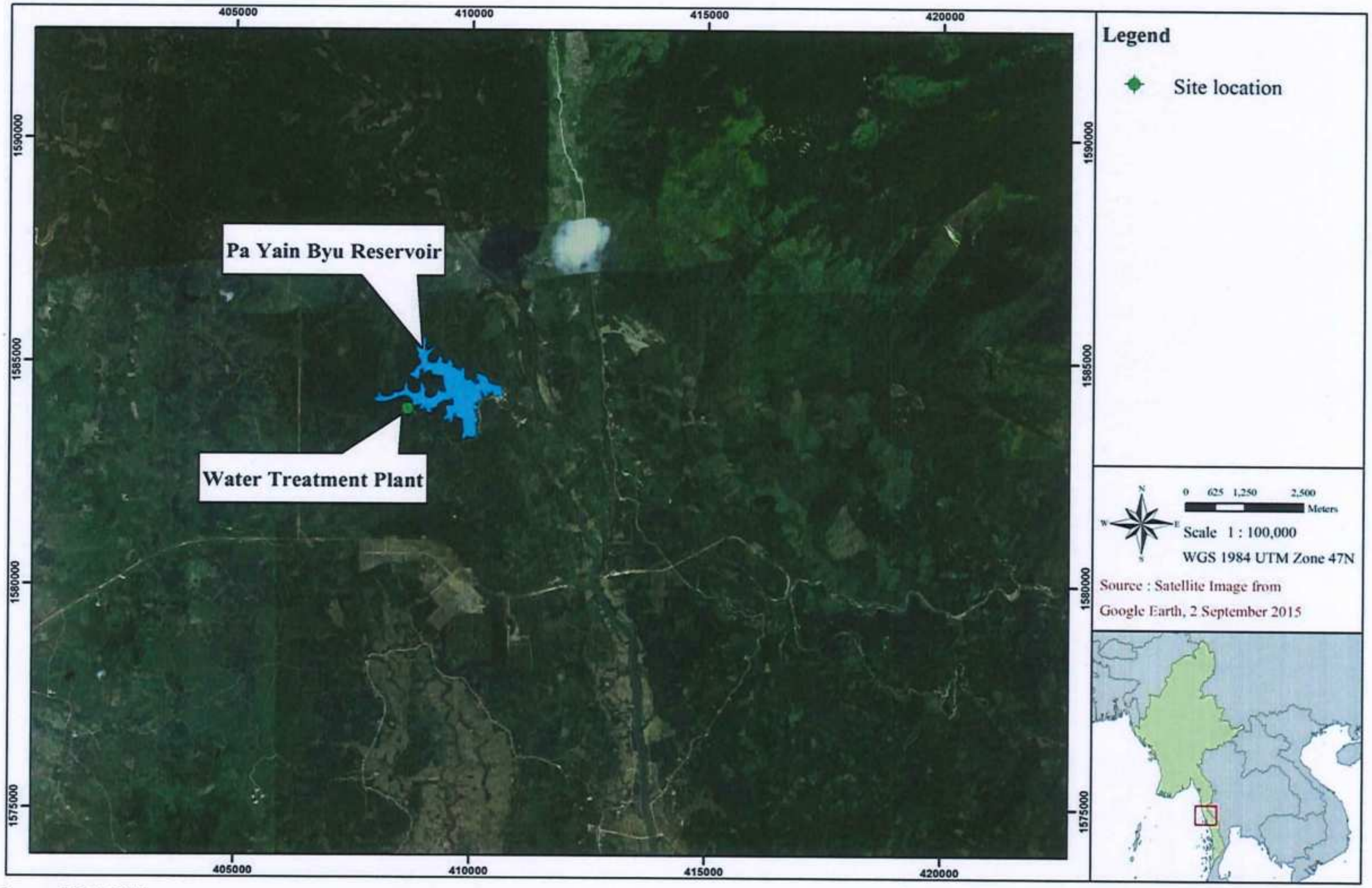


Land for the Initial Industrial Estate		Proposed Area Sq.km	Acre	Rai
Phase A	A1	1.01	249	630
	A2	3.20	791	2,001
	A3	2.79	689	1,744
Phase B	B1	2.78	687	1,738
	B2	1.83	452	1,143
	B3	2.39	591	1,495
Phase C	C1	1.24	305	773
	C2	1.92	475	1,201
	C3	1.92	475	1,201
	C4	1.92	475	1,201
Phase D	D1	3.48	861	2,178
	D2	2.52	623	1,577
	Sub-total =	27.0	6,671	16,880

Land other than for the Initial Industrial Estate		Proposed Area Sq.km	Acre	Rai
1	Construction Support Facilities	1.67	412	1,044
2	IE-Main Road (Km. 0 to 18.5)	0.56	137	347
3	IE-North Road (Distance 4.167 km)	0.10	26	65
4	IE-South Road (Distance 1.723 km)	0.03	9	22
5	Small Power Plant	0.12	31	77
6	Power Transmission Lines	0.26	65	165
7	Storage Yard of Small Port	0.42	103	262
8	Coastal Road (Access to Small Port)	0.16	41	103
9	LNG Terminal and Regas Yard	1.12	277	701
10	Boil-off Gas Power Plant	0.14	34	86
11	Temporary Power Plant	0.02	4	9
12	Initial Township	1.37	337	853
13	Concrete Precast Yard	0.26	63	160
14	Two-Lane Road	6.94	1,635	4,138
15	Small Water Reservoir (Pa Yain Byu)	2.68	662	1,675
16	Ta Laing Gya Regulating Weir	1.00	247	624
17	Access Road to Regulating Weir	0.01	4	9
18	Raw Water Pipeline	0.21	53	134
	Total =	17.08	4,140	10,475

Source: MIEH, 2016 (modified by ERM)

Figure 1.4 Proposed Location of the Project



Source: ERM, 2016

Figure 1.5 Location of Wat Chaung Village and Khamaung Chaung Village

Source: ERM, 2016

The proposed Project will be developed in order to provide the water supply to the Initial Industrial Estate of DSEZ. The raw water will be drawn from Pa Yain Byu Reservoir and will be treated to meet international standards, specified in ***Annex A***. The Project will comprise of the 8 phases as shown in ***Table 1.1***. The capacity of the WTP will be increased over the 8 phases with a total proposed capacity of 162,000 m3/ day by the completion of Phase 8 in 2024.

Table 1.1 Water Treatment Plant Capacity

Initial Industrial Estate Phase	Phase A		Phase B		Phase C		Phase D		
Tentative Year (COD)	2018	2020	2020	2021	2021	2022	2023	2024	2025
The Project Phase	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	-
Capacity (m^3/day)	18,000	18,000	18,000	18,000	18,000	18,000	36,000	18,000	-
Accumulated Capacity (m^3/day)	18,000	36,000	54,000	72,000	90,000	108,000	144,000	162,000	162,000
Ratio of Demand to Plant Capacity (%)	37.72	48.82	51.03	61.55	75.18	77.02	71.67	78.47	86.42

It is anticipated that once the total water demand reaches 70% of the total plant capacity, the expansion of WTP will be developed, together with the alternative raw water supply system which includes the development of Ta Laing Gya Regulating Weir/ Dam located approximately 11 km south east of the Project site. It should be noted that the development of Ta Laing Gya Regulating Weir/ Dam and its features, including additional water supply pipeline, are not included within the Scope of the IEE Study.

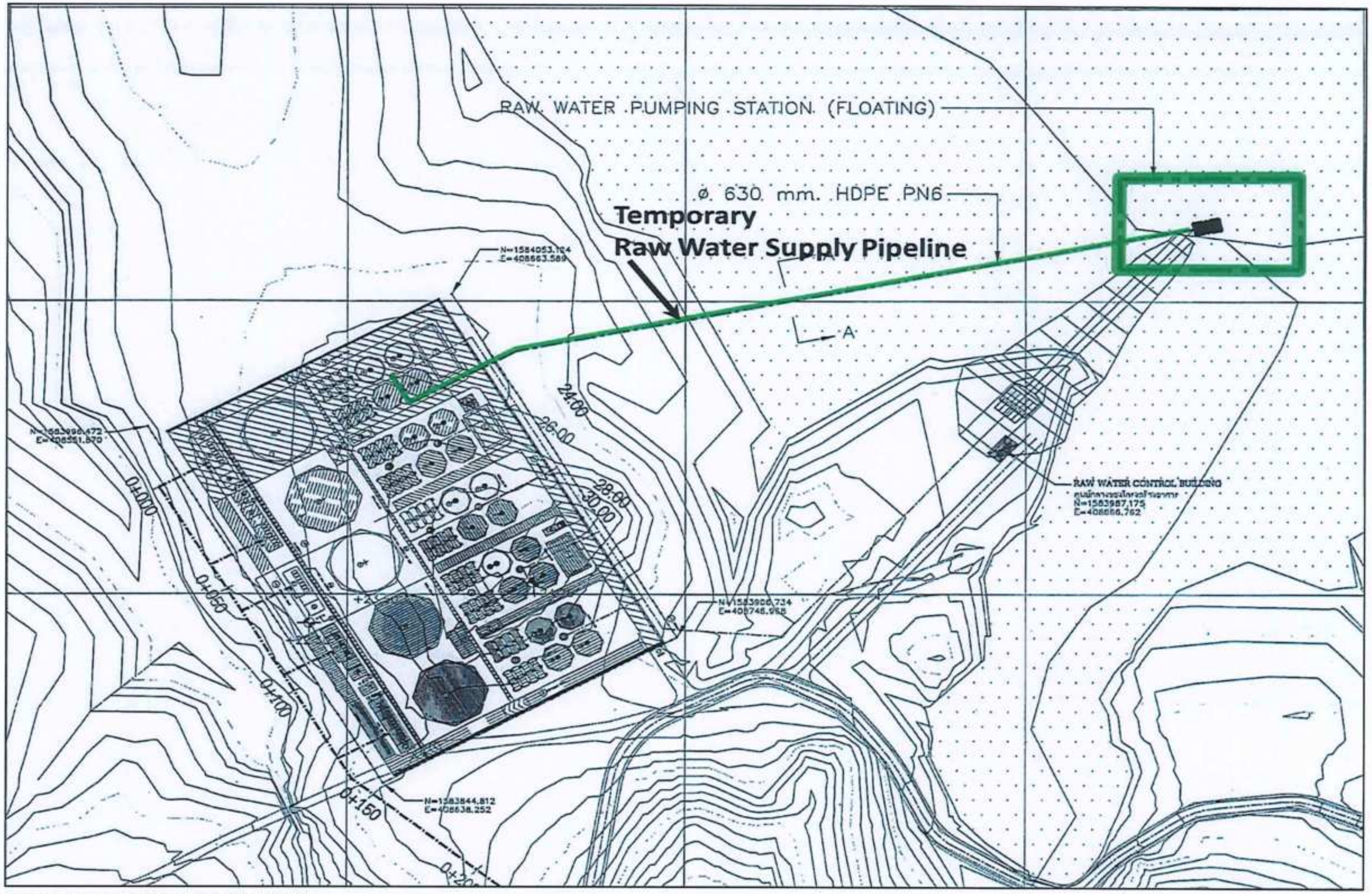
The Project consists of the following key components:

- ***The Water Treatment Plant (WTP)*** which will consist of the following main components:
  - Flow Splitting Box/Tanks;
  - Clarifiers;
  - Collecting Tanks;
  - Single-Media Filters;
  - Sludge Basin and Waste Wash Water Basin;
  - Treated Water Storage Tank;
  - Chemical Dosing Pump and Facilities; and
  - Air Blower and Backwash Pump.
- ***Raw Water Pumping Station (RWPS)*** which will comprise of a ready-made floating pontoon on the Pa Yain Byu reservoir as a temporary pumping station for Phase 1 of the Project (***Figure 1.6***). A permanent RWPS on the bank of Pa Yain Byu reservoir will be installed for Phases 2 to 8 of the Project (***Figure 1.7***).
- ***Water Supply Pipeline (from RWPS to WTP)*** will comprise of a temporary water supply pipeline for Phase 1 of the Project. The temporary water pipeline will

connect from the temporary RWPS to the WTP by a floating pontoon. (***Figure 1.6***) A permanent water supply pipeline will be installed for Phases 2 to 8 which will be an underground pipeline to connect the permanent RWPS to the WTP (***Figure 1.7***).

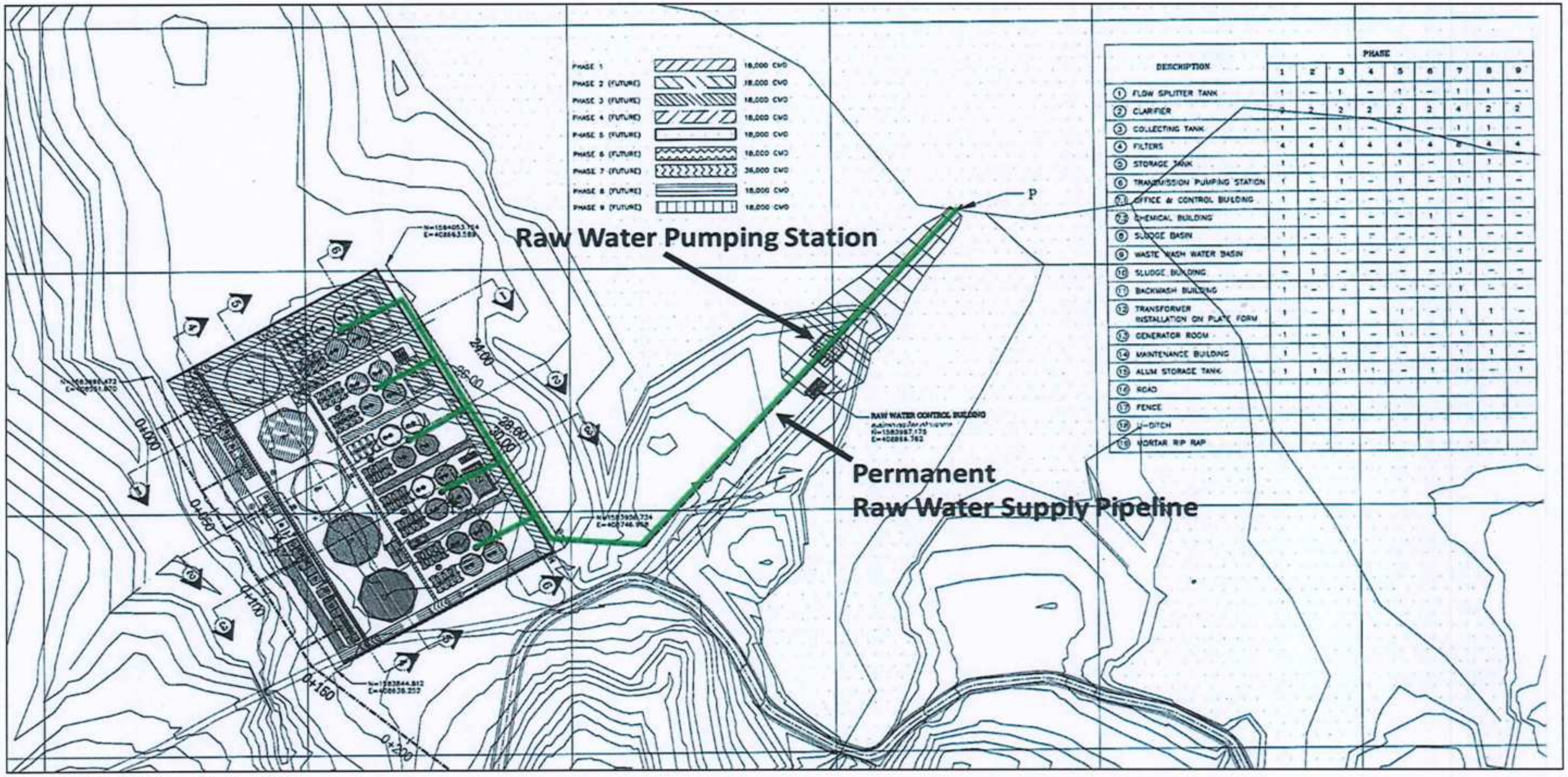
The treated water will be distributed to the Initial Industrial Estate area via the treated water transmission and distribution pipeline system.

Figure 1.6 Temporary RWPS and Temporary Water Supply Pipeline for Phase 1



Source: MIEH, 2016 (modified by ERM)

Figure 1.7 Permanent RWPS and Permanent Water Supply Pipeline for Phases 2 to 8



Source: MIEH, 2016 (modified by ERM)

1.4.2 *Project Alternatives*

No alternatives to the Project site location have been considered. The location of the Project at the Pa Yain Byu Reservoir has been selected due to the reservoirs proximity to the Initial Industrial Estate of DSEZ and the reservoir capacity to supply the water required for treatment in the WTP.

There are no practical alternatives to the main technology, however there are alternatives to the chemicals that could be used in the pre-oxidation process. Chlorine or ozone can be used for pre-oxidation; chlorine has been selected as it is the most commercially used, resulting in lowest investment, maintenance and operating costs compared with the use of ozone.

In addition, there is no feasible no-project option if this Project aim is to be achieved as the Project is required to provide a sustainable and reliable water supply to the Initial Industrial Estate of DSEZ.

1.5 *DESCRIPTION OF THE ENVIRONMENT*

The baseline conditions comprised of primary and secondary data collection within a 3 km radius of the Project site (the Project Study Area). The primary data collection involved field surveys within the Project Study Area while the secondary data collection involved collection of data from existing sources.

1.5.1 *Physical Components*

1.5.1.1 *Topography and Landscape*

The Project site is located in the DSEZ in Tanintharyi Region of southern Myanmar. Within the Tanintharyi Region, mountains approaching 914 m (3,000 feet) in height run from north-west to south-east. Some of the mountain ranges run into the sea and rise again as islands along the coast. Long and narrow plains can be found along the rivers and the coastal areas[1].

1.5.1.2 *Air Quality*

Ambient air quality was recorded at Wat Chaung Village for a period of 3 continuous days in January 2016. The following parameters were recorded:

- Nitrogen Dioxide (NO_2);
- Carbon Monoxide (CO);
- Particulate Matter (PM_{10});
- Particulate Matter ($PM_{2.5}$); and
- Sulphur Dioxide (SO_2).

The ambient air quality results for NO_2, PM_{10}, $PM_{2.5}$ and SO_2 were found to be in accordance with the Myanmar NEQ Guidelines (2015)[2]. There are no Myanmar

[1] http://www.modins.net/myanmarinfo/state_division/taninthayi.htm

[2] MOECAF, Annex 1 - National Environmental Quality (Emission) Guidelines, December 29th 2015.

guideline values for CO, therefore the WHO's Air Quality Guidelines[1] for Europe have been used and the ambient air quality results for CO were found to be in accordance with the guidelines.

1.5.1.3 *Greenhouse Gas*

According to the Carbon Dioxide (CO_2) emission provided in the Database of World Bank Cross Country Data[2], CO_2 emissions in Myanmar in 2010 were 31.28 million tonnes. The CO_2 emissions are those stemming from the burning of fossil fuels and the manufacture of cement.

1.5.1.4 *Noise*

Noise was recorded in Wat Chaung Village for a period of 2 continuous days in January 2016.

During daytime, the measured noise levels were found to be lower than the values in the Myanmar NEQ Guidelines (2015). However, during the night time, measured noise levels were found to significantly exceed the guidelines. The primary potential noise sources include general noises from the village (such as speech, small vehicles, cooking, etc.), as well as wind conditions. The increased noise levels in the evening are due to the use of diesel generators, which was observed during the noise survey.

1.5.1.5 *Surface Water*

The Project site is located in the Tanintharyi Region, which consists of several rivers and small streams originating from the mountains along the eastern border region.

Surface water quality sampling was undertaken at 4 locations: Pa Yain Byu Reservoir, Dawei River and two locations on Ta Laing Gya River (downstream and upstream of Ta Laing Gya Regulating Weir). The sampling focused on parameters that are likely to be relevant or impacted by Project operations, i.e. Total Suspended Solids (TSS), Biochemical Oygen Demand (BOD), Dissolved Oxygen (DO), and total coliform. There are no Myanmar or WHO guidelines available for surface water quality. Therefore, the surface water quality results were compared to Thailand's Surface Water Quality Standards[3].

All parameters were within the compared Standard for "Medium clean fresh surface water resource", with the exception of BOD, which was exceeded at Pa Yain Byu Reservoir, Dawei River Ta Laing Gya River (downstream of Ta Laing Gya Regulating Weir). High BOD levels indicate the presence of organic matter. Although this is most likely due to sewage discharged upstream, it could also be due to the presence of dead plant matter, algae, or animal droppings.

[1] Air quality guidelines for Europe. 1997. WHO regional publications, European series No. 23. World Health Organization.

[2] https://www.quandl.com/data/WORLDBANK/MMR_EN_ATM_CO2E_KT-Myanmar-CO2-emissions-kt, accessed 30 March 2015.

[3] Surface Water Quality Standards from the Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) , published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994).

1.5.1.6 *Soils and Groundwater*

The Project site is primarily located on alluvial soil, red brown forest soil, and granite. The bedrock, consisting of banded granite and sandstone and large pebbly sandstones, is well exposed along both banks of the Ta Laing Gya River. The topsoil is mainly composed of silty soil, with thickness 1 metre or less, and containing organic materials[1].

Water use in Myanmar has been on the increase, particularly in the agricultural and industrial sectors. As much as 89% of water use is tapped for irrigation purposes, while approximately 8% is for domestic consumption and 3% is for industry[2].

A number of previous studies on baseline groundwater quality near the Project area have been reviewed for this Project. The pH results show that groundwater in this area is acidic. In addition, elevated levels of suspended solids, lead, mercury, Total Coliform Bacteria (TCB) and E.Coli can be found in some groundwater locations in the Project area.

1.5.2 *Social Components*

1.5.2.1 *Land Use*

The Project will cover an area of approximately 0.02 km^2 (4.13 acres). Most of the area that will be developed is currently covered by oil palm plantations, however, a small area has been fenced, and all vegetation has been removed.

Most of the land within the Project Study Area is used by local villages for agriculture. The most common crops are cashew, rubber tree, betel nut and betel leaf, palm oil and pepper.

1.5.2.2 *River Use*

The Dawei River lies approximately 3 km to the east of the Project site and the Ta Laing Gya River is located approximately 11 km south-east of the Project site. The villagers in Wat Chaung Village and Khamaung Chaung Village occasionally fish in the Dawei River and the Ta Laing Gya River, predominately for household consumption.

1.5.2.3 *Demographic Profile*

In terms of the villages located in the Project area, Khamaung Chaung Village, with a population of approximately 1,457 people, is larger than Wat Chaung Village, with a population of approximately 460 people. The villages in terms of ethnicity, language and religion, reflect the broader Myanmar population – i.e. are Buddhist Burmans that speak Myanmar

1.5.2.4 *Economy and Livelihoods*

Agriculture

In terms of crops, a range of crops are grown in the Project area including rubber, cashew, betel nut and leaf, pepper, and palm oil. The most common crop in Myanmar – cereal crops – is not grown in the Project area.

1 Phisut Technology Co., Ltd, 2015, Initial Environmental Examination on Pa Yain Byu Reservoir for Small Reservoir Project in Dawei District, the Republic of the Union of Myanmar.

2 Ministry of Agriculture and Irrigation, Water Use by Different Sectors – 2008 to 2009.

Livestock Rearing

The villagers in the Project raise a variety of livestock, including poultry, cattle, goats However, more households are involved in crop production, than livestock rearing.

Instead of selling the livestock, in many instances the livestock are reared for personal consumption, with the exception of cattle. The milk from the cattle is often sold at the market, while the cattle themselves help around the farm (e.g. to till the land).

Fisheries and Aquaculture and Forestry

In the Project area, a small number of people in Khamaung Chaung Village are actively involved in the inland fishing sector. Those involved largely fish in village ponds from January to April (when the ponds are full with water). Similar to Khamaung Chaung Village, a small number of people in Wat Chaung Village indicated that they fish, but much of the fishing is for household consumption. Those involved largely fish at the Pa Yain Byu Reservoir.

Transportation

Within the Project area, most of the roads are dirt roads of poor quality due to heavy rains during the wet season (which causes erosion).

Education and Schools

There is a primary school in Wat Chaung Village, while there is a primary and middle school in Khamaung Chaung Village. Nearly 70% of youth in the villages obtain middle school level education, while approximately 10% obtain a high school level education.

1.5.2.5 Infrastructure and Utilities

The villages in the Project area largely use wood for cooking while some use liquefied petroleum gas (LPG). A range of lighting sources exist including local generators, solar systems, kerosene and candles. A small number of households have access to electricity.

1.5.2.6 Waste Management

In terms of waste in the Project study area, wastewater (e.g. greywater from sinks and baths) is largely directed back into the ground. Solid waste disposal is the responsibility of each household. Most households either burn their waste or dispose their waste on nearby land, neither of which is regulated or controlled. There is public waste bin in Khamaung Chaung village; however, the waste is disposed on nearby land near, outside the village boundaries not far from the village's graveyard.

1.5.2.7 Water Use

Villages in the Project area largely rely on groundwater as a source of drinking water; however, it is not the only source. Some villagers collect rainwater for domestic purposes (e.g. via Myanmar jars); while others buy bottled of drinking water.

1.5.2.8 *Community Health and Safety*

In terms of morbidity in the villages located in the Project Study Area, communicable and non-communicable diseases are present. The villages in the Project Study Area do not have their own health care facilities. However, the villages are visited by a health care professional on a monthly basis. Villagers typically visit one of a number of nearby health care facilities for health checks.

1.5.2.9 *Cultural Heritage*

The nearest archaeological site to the Project site is Thagara located approximately 11 km west of Dawei and 1.5 km from the boundary of the DSEZ. In addition, there are several additional Buddhist living heritage sites in the Project Study Area.

1.5.3 ***Biological Components***

The Project Study Area resides within the Myanmar Coastal Rain Forests (IM0132) EcoRegion[1]. This ecoregion represents the lowland evergreen and semi-evergreen rain forests of the western side of Arakan Yoma and Tenasserim ranges along the west coast of Myanmar.

No Important Bird Areas (IBA), Alliance for Zero Extinction (AZE), Important Plant Areas (IPA) and Important Sites for Freshwater Biodiversity are present within 100 km of the Project Study Area.

There is one protected area is within 100 km of the Project Study Area. The Tanintharyi Nature Reserve is located approximately 34 km north east of the Project site. The reserve plays host to a rich diversity of flora and fauna and contains habitats for threatened species. The reserve is primarily tropical evergreen forest and mixed deciduous forest with patches of bamboo and grassland.

A biodiversity survey was conducted for the Project in January 2016. The terrestrial habitats observed were primarily of cleared agricultural land in production or fallow and palm oil plantations. Natural Habitats consisted of evergreen and deciduous forests. No Natural Habitat was identified within the Project Study Area.

Modified Habitats consisted of timber plantations, rubber plantations, palm oil plantations, rice paddies, fruit and nut tree plantations and fallow agricultural land. These agricultural areas were located mainly to the south of the Project Study Area. Palm oil plantations dominate this area. No floral species of conservation significance were identified within the Project Study Area.

Aquatic habitats identified include riverine lotic habitats and riparian areas adjacent to the Dawei River to the east of the Project Study Area. No direct observations were made of aquatic flora and fauna during the field visit. Previous surveys for the Pa Yain Byu Reservoir indicate that common catfish are present within the Dawei River.

[1] WWF EcoRegions Southern Asia: Western Myanmar into Bangladesh. Myanmar Coastal Rain Forests (IMO132) http://www.worldwildlife.org/ecoregions/im0132, 2016.

1.6 ENVIRONMENTAL AND SOCIAL IMPACTS

1.6.1 Air Quality

1.6.1.1 Construction

Construction activities related to the proposed Project will result in limited short-term air quality impacts. Generation of dust from construction activities is the principle air quality impact of concern during construction. Emissions from construction worker vehicles and construction equipment are anticipated to have minimal short-term impacts.

1.6.1.2 Operation

No gaseous emissions are anticipated during operation. However, there are potential emissions from worker vehicles and chemical transportation. Given the Project will construct a crushed rock access road with prime coat to the Project site, fugitive dust emission from transportation over unpaved road is not anticipated.

A further potential air-quality impact during operation is the release of unpleasant odours. The most likely sources of such odours would be sludge from the water treatment process. The sludge produced is primarily chemical in nature and would cause limited odor emissions.

1.6.2 Greenhouse Gas

1.6.2.1 Construction

During construction, there will be movement of equipment in the construction areas such as crane, trucks and etc., which will contribute to greenhouse gas (GHG) emissions from the combustion of fuel. The GHG emissions from the construction activities will be similar to other types of construction sites and is not considered significant.

1.6.2.2 Operation

It is anticipated that there will be no major combustion sources of GHG emissions during operation. There will be a small number of trips for vehicle transportation which will result in GHG emissions. In addition, a potential GHG source may also result from using electricity provided by an external provider in Myanmar.

1.6.3 Noise

1.6.3.1 Construction

During construction, highest noise levels will primarily be generated by Project vehicles and various construction equipment (e.g. engines and mobile equipment), used to carry out land clearing activities, levelling and excavation work. During construction of plant facilities and equipment installation, noise emissions will be considerably lower. The construction works will be undertaken during daytime (10 hours/day, 6 days/week), and will last for 10 months for Phase 1. The noise level generated from the construction activities at the closest sensitive receptor (Wat Chaung Village) is predicted to be below the Myanmar NEQ Guidelines.

1.6.3.2 *Operation*

During operation, there are not expected to be any significant sources of noise from the Project. All equipment will be accommodated inside buildings. There may be some minor noise emitted from the operation of pumping station, and there would also be very minor noise impacts due to traffic associated with material transfer/operation personnel accessing the site, but these would be comparable to typical background noises in the Project area.

1.6.4 *Surface Water*

1.6.4.1 *Construction*

The following activities during construction could result in contamination of nearby surface water bodies:

- Site preparation, including site clearance activities which has the potential to cause sedimentation;
- Sanitary wastewater from toilets facilities and workers accommodation; and
- Waste storage and disposal.

In addition, there is the potential for contamination of surface water bodies caused by accidental spill and leaks of chemicals. Appropriate management measures will be implemented and monitored to ensure contamination of surface water does not occur as a result of the construction activities.

1.6.4.2 *Operation*

The following activities during operation could result in contamination of nearby surface water bodies:

- Wastewater from the water treatment process;
- Sanitary wastewater from toilet facilities and workers accommodation;
- Waste storage and disposal; and
- Stormwater discharge.

In addition, contamination of surface water bodies could be caused by accidental spill and leaks of chemicals. Appropriate management measures will be implemented and monitored to ensure contamination of surface water does not occur as a result of the operational activities.

1.6.5 *Soils and Groundwater*

1.6.5.1 *Construction*

During construction, the potential soil and groundwater impacts are associated with the following:

- Loss of soil structure, quantity and quality due to improper management during site clearance activities;
- Changes to groundwater levels during development due to abstraction/dewatering (if necessary);

- Soil and groundwater contamination due to improper construction waste storage and disposal;
- Soil and groundwater contamination due to improper discharge of waste water discharges and runoff; and
- Soil and groundwater contamination due to potential leaks, spills and contaminated fill materials.

Appropriate management measures will be implemented and monitored to ensure the potential impacts from the construction activities are minimised or prevented where possible.

1.6.5.2 Operation

During operation, the potential soil and groundwater impacts are associated with the following:

- Loss of soil due to increased erosion potential;
- Soil and groundwater contamination due to improper construction waste storage and disposal;
- Soil and groundwater contamination due to improper discharge of waste water discharges and run-off; and
- Soil and groundwater contamination due to potential leaks, spills and leak.

Appropriate management measures will be implemented and monitored to ensure the potential impacts from the construction activities are minimised or prevented where possible.

1.6.6 Terrestrial and Marine Biodiversity

1.6.6.1 Construction

Disturbance to habitat in modified and natural habitat areas during construction activities such as site clearance has the potential to impact biodiversity. Mitigation measures will be implemented to manage the disturbance during construction so that biodiversity is not significantly impacted or impacts are reduced.

1.6.6.2 Operation

Operational activities that have potential to disturb native fauna include the use of night lighting. Lighting required for operation and safety can influence nocturnal foraging behaviours as well as disrupt sleep patterns of certain species. In addition, there is the potential for mortality of individual fauna species as a result of vehicle or machinery strike or falling debris. However, the impact significance is considered to be negligible.

1.6.7 Waste Management

1.6.7.1 Construction

During the construction phase, a range of waste materials will be generated either due to daily construction activities (e.g. generation of putrescible waste) as well as a range of general construction waste

The majority of the waste will be non-hazardous, however some of these may be hazardous such as used paint, engine oils, hydraulic fluids, spent solvents, spent batteries etc. Inappropriate waste management may result in indirect impacts to community and worker health and safety due to contamination of drinking water or food. In addition, there is the potential for accidental leaks or spills of oil, fuel or other hazardous materials that could potentially pollute surface waters and soil Implementation of appropriate mitigation measures including a waste management plan (both non-hazardous and hazardous) will minimise the impacts.

In addition, the municipal waste management network within the area is limited. Therefore, non-hazardous waste will be disposed of offsite daily, potentially at the designated landfill within the Industrial Estate of DSEZ. Hazardous waste will be collected and initially stored on site, after which it will be transported to a transfer station. From the transfer station, it will be transported to waste treatment facilities in Thilawa Special Economic Zone in Yangon.

1.6.7.2 Operation

The solid waste generated during the operation phase will predominately comprise of the sludge from the water treatment process. It is anticipated that the treated sludge (sludge cake) will be used for earth work within the Industrial Estate of the DSEZ.

In addition, there will be domestic solid waste, which will be collected and segregated for recyclable and non-recyclable waste (i.e. paper, plastic). It is anticipated that the solid waste will be disposed of in the proposed landfill within the Industrial Estate of the DSEZ.

The hazardous waste generated during operation will be collected and initially stored on site, after which it will be transported to a transfer station. From the transfer station, it will be transported to waste treatment facilities in Thilawa Special Economic Zone.

A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the operation phase for all of the waste streams identified.

1.6.8 Social Impacts

1.6.8.1 Construction

Economy and Livelihoods

During construction, it is expected that approximately 170 direct employment opportunities will exist, therefore there is the potential for employment opportunities and an increase in income for members of the local community. The approximate ratio of local workers to non-local workers is 8 local workers for every 1 non-local worker.

In terms of fishing, Pa Yain Byu Reservoir is currently used by a handful of villagers from Wat Chaung Village for fishing. This activity will no longer be able to occur as the Project site will be fenced, and for safety purposes access will no longer be allowed. However, nearby areas, such as Wat Chaung Village's creek and Khamaung Chaung Village's pond will still be accessible to the local communities.

Water Use

The source of water for construction activities, including workers, will be the Pa Yain Byu Reservoir. The water will be treated onsite to the relevant drinking water standards for use as drinking water. It is anticipated that there will be adequate water to support the Project's withdrawal, and, as such, the Project is not expected to have a significant impact on current water users.

Community Health and Safety

Impacts to community health and safety can result from an increase in traffic, the establishment of onsite infrastructure and the management of hazardous materials. To a lesser extent, given the small number of security personnel required, the presence of security forces could also present a risk to the community. Appropriate management measures will be implemented and monitored for traffic and hazardous materials. In addition, the Project site will be fenced, while any activities outside the main Project site will be appropriately signposted.

In addition, an increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area (who can carry with them communicable diseases). A number of management measures will be implemented for the prevention of communicable diseases. In addition, a health care facility has been constructed for the workers and the local villagers, are able to visit the facility to seek the facility for medical attention.

Occupational Health and Safety

During construction, the key issues include noise, dust, and weather, all of which can create health hazards for the workforce. The likelihood of the hazards associated with noise and dust occurring is low, considering all staff will be required to wear appropriate PPE at all times and dust suppression measures will be used onsite.

1.6.8.2 Operation

Economy and Livelihoods

It is anticipated that approximately 68 direct employment opportunities will be created during the operational phase.

In accordance with Myanmar law[1], at least 25% of the workers will be Myanmar nationals during the first 2 years of operation. In addition, during years 2 to 4 of operation at least 50% of the workers will be Myanmar nationals and after 5 years of operation a minimum of 75% will be Myanmar nationals

Water Use

A potable water demand for staff during operation is expected to be minimal and will be supplied from the treated water tank. Water supply for chemical preparation will be supplied from the treated water tank using a water pump. The Project is not

[1] The new foreign investment law of 2012.

expected to have a significant impact on current water users (i.e. those who access the area to fish) of either the reservoir or the Dawei River during operation.

Community Health and Safety

The impacts to community health and safety during operation are similar to those outlined for construction above.

Occupational Health and Safety

During the operation phase, the potential for exposure to chemicals can create a hazard for workers. Appropriate management measures will be implemented including appropriate onsite storage facilities and handling procedures. In addition, appropriate emergency management procedures will need to be established, in the event that an incident occurs.

1.6.9 *Traffic*

1.6.9.1 *Construction*

During construction, there are potential impacts associated with congestion and road traffic accidents due to an increase in road traffic. Road traffic will increase during the construction phase of the Project in areas surrounding the Project site and on the proposed transportation routes for construction workers, heavy cargo and construction waste.

It is anticipated that the most sensitive transportation routes will be from Dawei Port in Dawei City to the Project site to be used for heavy cargo and from Baan Phu Nam Ron border in Kanchanaburi Province, Thailand to the Project site to be used for construction materials and some workers.

The Project will prepare and implement a Road Traffic Management Plan, including a Journey Management Plan for the proposed transportation routes to be used for construction workers, waste disposal and construction materials. The Management Plans will recommend specific measures to ensure that the environmental, social and health impacts of increased traffic volumes are kept to a minimum and that local and regional traffic flows are well planned and managed in accordance with the appropriate regulations.

1.6.9.2 *Operation*

During operation, there are potential impacts associated with congestion and road traffic accidents due to road traffic. Road traffic volumes during operation will be less than the construction phase in all areas surrounding the Project site, as well as on the proposed transportation routes. The potential sources of road traffic are transportation of workers, operational waste and operational materials.

The Project will prepare and implement a Road Traffic Management Plan, including a Journey Management Plan for the operational phase.

1.6.10 *Cultural Heritage*

1.6.10.1 *Construction*

During construction, the Project will excavate soil. Excavation works have been known to cause damage to archaeological artefacts, particularly in instances where the artefacts are buried or unknown to exist. Although there are no documented archaeological sites within the Project area, there is potential for undocumented archaeological artefacts to exist. A Chance Find Procedure[1] will be developed and implemented in order to minimise impacts to undocumented archaeological sites.

1.6.10.2 *Operation*

Transport of heavy cargo and workers to the Project site can generate dust which has the potential to disturb or diminish the value of cultural heritage sites, such as the sites in Wat Chaung Village that are located near existing roads that will be used by the Project. However, it is anticipated that dust will be minimized through management measures and therefore the impact is anticipated to be negligible.

1.6.11 *Unplanned Events and Accidental Events*

1.6.11.1 *Construction*

During construction, heavy cargo will be transported by barge from the port in Thailand to the existing port Dawei Port located in Dawei City. The increasing number of vessels navigating in-out the ports could enhance the risk of vessel collision or maritime incident. The Project will install navigation light or warning sign on the vessel as appropriate. In addition, barges used for Project material transport will be independently inspected and audited by the Project EHS Management Team.

Accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants or fuel from heavy equipment, and improper chemical/fuel storage could occur during the construction phase. A range of mitigation and management measures will be implemented and monitored to ensure appropriate storage of chemical and hazardous materials.

1.6.11.2 *Operation*

The treated water storage tank is used to store treated water prior to transfer to the distribution pumping station. If the treated water tank is not maintained appropriately a large amount of water could be discharged into the surrounding environment. To prevent this, the tank will have an impermeable floor and containment, of capacity to accommodate 110% of the volume.

There are potential sources of uncontrolled explosions associated with inappropriate handling of the hazardous chemicals. A number of management measures will be implemented including preparation of an emergency response plan which will include management measures for fire and explosions.

[1] A chance find procedure is a project-specific procedure that outlines the actions to be taken if previously unknown cultural heritage is encountered. The procedure can include notification of findings to a qualified archaeologist who will inspect the exposed heritage, identification of interested parties, relocation of the heritage, etc.

1.6.12 *Cumulative Impact Assessment*

Cumulative impacts are additional impacts that may be generated by other developments or activities in the vicinity of the Project, that when added to the impacts of the proposed Project combine to cause a greater impact.

For the purposes of this assessment, a general qualitative cumulative impact assessment of the 9 sub-projects in the Initial Development Phase of the Dawei Special Economic Zone was conducted. No additional mitigation or management measures from those identified for the Project are considered to be necessary from the cumulative impact assessment undertaken.

1.7 *PUBLIC CONSULTATION AND PARTICIPATION*

Project stakeholders have been engaged at a number of locations during development of the IEE. Stakeholder engagement activities that have been undertaken as part of the IEE included pre-engagement meetings with representatives from government, non-governmental organisations (NGOs), and village leaders, as well as public meetings in Wat Chaung Village and Khamaung Chaung Village.

The focus of the engagement activities has been to:

- Introduce the Project and provide ongoing updates as the design of the Project is further refined;
- Provide an overview of the likely impacts and proposed management measures;
- Gather stakeholder insights and input, including feedback on the identified impacts and proposed management measures; and
- Respond to key issues raised by stakeholders.

Key issues raised by stakeholders included:

- Employment. Most of the villages indicated that they would like to benefit from the employment opportunities that will be created by the Project, more than they are already benefiting from the Project Proponents activities in the area;
- Displacement / resettlement: Villagers would like to better understand how the Project construction may affect their plantations; and
- Water use: There is concern that use of water from the reservoir will create shortages around the Project site, including shortages for nearby villages.

The issues and concerns captured during the stakeholder engagement activities have been incorporated into development of the IEE. The information has been used to inform the impact identification and assessment process as well as the identification of management measures and monitoring activities.

Engagement will continue to occur throughout construction and operation of the Project. It will be guided by a stakeholder engagement plan (SEP). The SEP will be developed by the Project Proponent prior to commencing construction activities.

As per Paragraph 65 of the Myanmar EIA Procedure (2015), the complete report is available at:

http://www.daweiindustrialestate.com/download.php?cid=110&EIA%20Report

1.8 ENVIRONMENTAL MANAGEMENT PLAN

1.8.1 Mitigation Measures

Many of the mitigation measures suggested during the construction phase of the Project are associated with good construction and housekeeping practices and are included in the Environmental Management Plan (EMP).

Mitigation measures for the operation phase (such as those for noise generation and wastewater discharge) of the Project are part of the design and will be incorporated into the Project design specifications.

A summary of mitigation measures identified for the construction and operation phases of the Project is presented in the EMP. This also identifies lead responsibility for implementing the mitigation measures and its verification along with reporting requirements.

The Project Proponent will ensure that the mitigation measures stated in the EMP are implemented throughout the life span of the Project.

1.8.2 Monitoring Programme

Key roles and responsibilities of the Project Proponent have been defined for implementation and monitoring of environmental and social impacts. For environmental monitoring, physical, biological and social environmental management components of particular significance have been identified as performance indicators. A comprehensive monitoring plan for each performance indicator has been prepared for all phases of the Project which gives parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibilities for implementation and supervision.

1.9 CONCLUSIONS AND RECOMMENDATIONS

This IEE report has been prepared based on the technical information provided by the Project Proponent, existing studies and reports relevant to the Project, baseline environmental monitoring and the stakeholder engagement.

The IEE of the Project ascertains that the Project is unlikely to cause any significant environmental and social impacts. Many of the impacts are localised and short-term or temporary in nature and can be readily addressed by some embedded control measures in the engineering design of the Project as well as additional mitigation measures as suggested in the EMP.

The effective implementation of the EMP and adherence with the Myanmar NEQ guidelines will assist in minimising the environmental and social impacts to acceptable levels.

1.10 COMMITMENT

Myandawei Industrial Estate Co., Ltd., will at all times comply fully with the commitments, mitigation measures, and plans that have been presented in this IEE Report.

The Project Proponent shall fully implement the ESMP, all Project commitments, and conditions, and is liable to ensure that all contractors and subcontractors of the Project comply fully with all applicable Laws, including the Environmental Conservation Law (2012), Environmental Conservation Rules and Environmental Impact Assessment Procedure (2015), as well as the ESMP, Project commitments and conditions.

The Project Proponent and ERM hereby confirm that:

(1) The IEE Report is accurate, consolidated and complete to the best of our knowledge, at the time of preparing this Report;

(2) The IEE has been conducted in accordance with relevant laws, including the EIA Procedure (2015).

(3) The Project Proponent will fully follow the commitments, mitigation measures and plans set out in this IEE Report.

Dr. Somchet Thinaphong

Managing Director

Myandawei Industrial Estate Company Limited

2 INTRODUCTION

2.1 PURPOSE OF THIS REPORT

This Initial Environmental Examination Report (IEE) report presents an assessment of the potential environmental and social impacts associated with the development of a Water Treatment Plant (WTP) for the Initial Development Phase of Dawei Special Economic Zone (DSEZ).

This report has been prepared for **Myandawei Industrial Estate Co., Ltd.,** (hereinafter referred to as "the Concessionaire" or "the Project Proponent") by **Environmental Resources Management** (hereinafter referred to as 'ERM') and presents the objectives, methodology and outcomes of the IEE study in accordance with the requirements of the Myanmar Environmental Impact Assessment Procedure (December 29th, 2015).

2.2 PROJECT BACKGROUND AND OVERVIEW

The Project Proponent has signed a Concession Agreement (CA) with the Dawei Special Economic Zone Management Committee (DSEZMC) for the Initial Development Phase of the DSEZ in Myanmar.

The DSEZ is located in the northern part of Maungmagan Bay, on the Andaman coastline, approximately 28 km northwest of the Provincial City of Dawei, Tanintharyi Region, Myanmar.

The Initial Development Phase consists of the following 9 sub-projects:

1. Two-Lane Road (connecting DSEZ with the Thailand border);
2. Small Port;
3. Initial Industrial Estate;
4. Initial Phase Power Plant;
5. Initial Township;
6. Small Water Reservoir;
7. Telecommunications Landline;
8. LNG Terminal; and
9. Boil-off Gas and Temporary Power Plants.

The Project Proponent is planning to develop a WTP, Raw Water Pumping Station (RWPS) and Raw Water Supply Pipeline from the RWPS to the WTP (hereinafter referred to as "the Project") to supply industrial water for the light and medium industries of the Initial Industrial Estate of DSEZ.

The proposed Project is located adjacent to the Pa Yain Byu reservoir, approximately 1.5 km from the Initial Industrial Estate of DSEZ.

The nearest villages to the Project site is Wat Chaung Village, located approximately 1.8 km west of the Project site and Khamaung Chaung Village, located approximately 3.5 km northwest of the Project site.

The Project will utilise the raw water stored in Pa Yain Byu storage reservoir with proposed total capacity of 162,000 m^3/day. The raw water will be treated to meet the relevant international standards such as World Health Organisation (WHO) Guidelines for potable water and/ or the Thailand's Metropolitan Water Works Authority's drinking water standards with trace of chlorine residual.

The treated water will be distributed to the Initial Industrial Estate area via the transmission and distribution system. Detailed information of the transmission and distribution system can be found in the Environmental and Social Impact Assessment (ESIA) Study of the Initial Industrial Estate of DSEZ (prepared by other consultants[1]). However, it should be noted that the transmission and distribution system is outside the Scope of this IEE and therefore is not considered further.

2.3 PROJECT NEED

Myanmar Government's Implementation Plan for DSEZ development includes the development of the water supply facilities in order to support the growth of the industries within the Initial Industrial Estate of DSEZ. A sustainable and reliable water supply system is required as an essential component to the overall Initial Phase development of DSEZ.

The proposed Project will also minimise the potential fresh water shortage during the development of the Initial Industrial Estate and during the determination of additional water supply system for future expansion of DSEZ.

2.4 PROJECT PROPONENT

Details of the Project Proponent are as follows:

Name: Myandawei Industrial Estate Co., Ltd.

Address: 6th Floor
Salomon Business Centre
224/A
U Wlsara Road
Bahan Township, Yangon
Myanmar

Company Website: http://www.daweiindustrialestate.com/

Contact Details: Design / EIA / Engineering Consultant Manager
6th Floor, Salomon Business Centre
223/A, U Wlsara
Bahan Township, Yangon
Myanmar
Email: Sawan@itd.co.th
Tel: (951) 535 421
Fax: (951) 535421

[1] MIEH, Environmental and Social Impact Assessment of Dawei SEZ Initial Industrial Estate Project, United Analyst and Engineering Consultant, December 2015.

It shall be noted that the Project Proponent will be committed to implement the final-approved mitigation measures and monitoring programme stated in the IEE Report. The example of the commitment letter is shown in ***Figure 2.1*** below. However, such letter will be signed once the final mitigation measures and monitoring programme is approved by relevant authorities.

Figure 2.1 Example of Commitment Letter (to be signed by the Project Proponent)

MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

Ministry of Natural Resources and Environment Conservation (MONREC)

Building No.53, Oattara Thiri Township,

15011, Nay Phi Taw, Myanmar

Attn: Director General, Natural Resource

and Environmental Impact Assessment Division (NR-EIA),

ECD-MONREC

Re: Initial Environmental Examination Report in respect of the Water Treatment Plant (WTP) for the Initial Development Phase of Dawei Special Economic Zone (DSEZ) Project (the "IEE including EMP")

Dear Sir,

We refer to the captioned IEE, which was prepared and finalized by **Environmental Resources Management** in accordance with the **Environmental Conservation Law and Articles 52 and 53 of the Environmental Conservation Rules of the Republic of the Union of Myanmar** under the instructions of **Myandawei Industrial Estate Co., Ltd**, dated **28 July 2016** and formally submitted by **Myandawei Industrial Estate Co., Ltd**, to **Natural Resource and Environmental Impact Assessment Division (NR-EIA), ECD-MONREC** under letter dated Date, Month, Year.

Intending to be legally bound hereby and financially liable to **MONREC** hereunder, we:

a. Endorse and confirm to **MONREC** the accuracy and completeness of the IEE,

b. Confirm and undertake to **MONREC** that the IEE has been prepared in strict compliance with applicable Myanmar law, including EIA Procedure and with the Terms of Reference dated February 2016 as approved by the ECD, and

c. Confirm and undertaken to **MONREC** that the project company established by **Myandawei Industrial Estate Co., Ltd**, in respect of the **Water Treatment Plant (WTP) for the Initial Development Phase of Dawei Special Economic Zone (DSEZ) Project** shall at all times comply fully with: (i) any and all commitments and obligations as set forth in the IEE, and (ii) any and all plans and the various components thereof, including without limitation, impact avoidance, mitigation, and remediation measures, and with respect to both (i) and (ii), including but not limited to such commitments, obligations, plans and measures as relate to the development, construction, commissioning, operation and maintenance of the project, and any circumstance in which work done or to be done, or services performed or to be performed, in connection with the project's development, construction,

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MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

Yangon Office 6th Floor, ... U Wisara Road, Bahan Township, Yangon, Myanmar

Bangkok Office 43rd Floor, ... New Petchburi Road, Bangkapi, Huaykwang, Bangkok, Thailand

d. We acknowledge and agree that any failure to so comply shall subject us to liability for breach of this undertaking and that, in addition to making financial compensation to **MONREC** and payment of any applicable penalties under the law or under the project's concession agreement and its appendixes, **Myandawei Industrial Estate Co., Ltd,** shall be responsible to **MONREC** to carry out and bear all costs of the immediate and proper rectification of the event of non-compliance and any effects thereof.

e. We acknowledge and agree, further, that any failure to so comply may be treated by MONREC as a breach by the project company under the concession agreement, if not rectified in according with the terms and conditions of the concession agreement, may lead to termination or other due exercise by the GOVERNMENT OF MYANMAR of remedies available to it thereunder.

The issuance of this confirmation and undertaking has been duly authorized by all necessary corporate action and a copy of the resolution of the **[shareholders/Board of Directors]** authorizing it and the power of attorney explicitly granting signing authorization to the individual who has signed below are attached as schedules hereto.

[Myandawei Industrial Estate Co., Ltd,]

Name: Somchet Thinaphong

Title: Managing Director

Schedules attach

Source: MIE, 2017

2.5 *ENVIRONMENTAL AND SOCIAL EXPERTS*

ERM has been contracted by the Project Proponent to prepare an IEE report for the Project. This report presents the objectives, methodology and outcomes of the impact assessment.

ERM is a leading global provider of environmental, health, safety, risk, social consulting and sustainability related services. ERM have more than 5,000 people in over 40 countries and territories working out of more than 150 offices.

ERM is committed to providing a service that is consistent, professional and of the highest quality. ERM are approved by the Ministry of Natural Resources, Environment and Conservation (MONREC), and have recently registered our Company as a separate ERM Myanmar entity and opened an office in Yangon.

ERM has high international standing, and an unrivalled track record in preparing successful ESIAs for high profile and often controversial development projects. ERM has over 20 years' experience undertaking ESIA Studies for the power sector worldwide, including many high profile power projects.

The key personnel from ERM involved in the preparation of this ESIA Study are presented in ***Table 2.1***.

Table 2.1 ERM Key Personnel Involved in the Preparation of the IEE Report

Name	Project Role
Ms Kamonthip Ma-oon	Partner in Charge
Dr Robin Kennish	Project Technical Director
Mr Mark Wilson	Project Manager
Mr Chris Brown	Soil / Water Specialist
Mr Vincent Lecat	Stakeholder Engagement Specialist
Mr Yingsak Maleewat	Social Specialist
Mr David Nicholson	Biodiversity Specialist
Mr Edmund Taylor	Air Quality Specialist
Ms Sarinya Rangsipatcharayut	GHG Specialist
Ms Mandy To	Noise Specialist

For this Project, ERM has selected the qualified sub-consultant, **Sustainable Environment Myanmar Co., Ltd (SEM)**, who has experience in carrying out the baseline survey and public consultation meetings in the local context. Note that all the works provided by SEM are under ERM supervision.

SEM is a leading resource and environmental consultancy firm based in Myanmar, consisting of former and current university faculty members of various disciplines relating to environmental and social management.

Their experts have worked extensively across Myanmar undertaking Environmental Impact Assessment related works including terrestrial biodiversity surveys, habitat and land use mapping, health and social impact surveys and development of post project monitoring surveys.
SEM has been involved in all the field activities related to environmental baseline data collection, in particular the biodiversity study, air quality and noise data collection, surface / ground water and soil sampling. SEM also supported ERM in the socio-economic and cultural heritage data collection and the stakeholder engagement process leading the public participation meetings.

The key personnel from SEM involved in the Project are presented in ***Table 2.2.***

Table 2.2 SEM Key Personnel involved in Preparation of the ESIA Study (and Scoping Study)

Name	Project Role
Mr Zaw Naing Oo	SEM Managing Director
Mr Than Than Htay	Biodiversity Specialist
Ms Khi Ohnmar Htwe	Social and Public Consultation Specialist
Ms Myat Thitsar Naing	Health Specialist
Mr Chit Myo Lwin	Team Leader for Baseline Survey

2.6 IEE OBJECTIVES

The specific objectives of this IEE are as follows:

- Facilitate an understanding of the elements of the existing baseline conditions that are relevant to resources/receptors that could be potentially impacted by the Project;
- Identify the aspects of the Project that could potentially result in significant environmental and social impacts on resources/receptors;
- Document how stakeholders have been engaged during the IEE Process, and how stakeholder feedback has been considered in the IEE;
- Predict and evaluate the significance of the potential environmental and social impacts of the Project;
- Identify the aspects of the Project that need to be managed, and recommend appropriate and justified mitigation and enhancement measures;
- Determine the significance of residual impacts, taking into account the implementation of mitigation measures;
- Generate a plan for the management and monitoring of impacts; and
- Meet the IEE requirements detailed in the Myanmar Environmental Impact Assessment Procedure (December 29th, 2015).

2.7 IMPACT ASSESSMENT SCOPE

This report has been prepared to cover the proposed Terms of Reference (ToR) stated in the Project Scoping Study[1] and to ensure compliance with the IEE requirements detailed in the Myanmar Environmental Impact Assessment Procedure (December 29th, 2015).

The IEE identifies the potential environmental and social impacts that could be associated with the proposed Project activities including those of an indirect and cumulative nature.

The study area for environmental and social impact assessment covers all Project operational areas, including where supporting activities take place.

The scope of the impact assessment includes Project activities that may affect the existing environment and social setting. The Project location, Project overview and components, schedule, Project facilities and activities, construction and operational processes are described in ***Chapter 4***.

The scope does not provide an assessment for any other/future developments or activities, either at the site location or anywhere else within the Project site, unless these activities are specifically identified in ***Chapter 4*** of this report.

Should any further development be planned, either as result of this Project or other related work, additional planning and assessment must be carried out specifically in relation to that proposed development.

[1] MIE Company Limited, Scoping Study for Water Treatment Plant Project, Initial Development Phase of Dawei Special Economic Zone (DSEZ), Myanmar, ERM, February 2016.

ERM does not endorse or take responsibility for any use of this report outside of or inconsistent with the scope of the Project as defined in ***Chapter 4*** of this IEE report.

2.8 STRUCTURE OF THIS REPORT

An outline of the IEE report is provided in ***Table 2.3.***

Table 2.3 IEE Report Structure

Chapter Number	Contents Heading	Explanatory Note
Front Piece	-	Title page, acknowledgments, table of contents (including list of figures, tables and maps)
1	Executive Summary	Summary of the IEE Report
2	Introduction	This *Chapter* outlines the development and structure of the IEE report including the background, terms of reference, objectives, scope and declaration.
3	Policy, Legal and Institutional Framework	The policy, legal and institutional framework within which the IEE Study has been conducted is discussed in this *Chapter*. National regulations are reviewed and summarized.
4	Description of the Project and Alternatives.	This *Chapter* provides a concise description of the Project and its geographical and temporal context. It includes a site description, an overview of the Project design and details of Project inputs and outputs. This *Chapter* also includes discussion of the Project background, objectives, need for the Project, value of the Project, envisioned sustainability, alternatives considered (including no Project alternative), development options considered and site selection. The *Chapter* also includes a description of best available technologies.
5	Description of the Surrounding Environment	This *Chapter* summarizes the available baseline data on the environmental and social resources and receptors within the Project Study Area. It is based on both primary and secondary data sources and considers changes in the baseline condition without the development in place. It focuses on the description of the biological environment, physical environment, and human environment.
6	Impact Assessment and Mitigation Measures	This *Chapter* summarizes the predicted positive and negative impacts of the Project. Cumulative impacts will be assessed as appropriate. This *Chapter* includes a summary of the current socio-economic status and the identification of potential negative and positive impacts. This *Chapter* outlines general and specific mitigation measures to reduce, remove or avoid negative impacts to environmental and social receptors. Any residual impacts (post mitigation) are outlined.
7	Environmental Management Plan (EMP)	The EMP draws together the possible mitigation measures; group them logically into components with common themes; define the specific actions required and timetable for implementation; identifies training needs, institutional roles and responsibilities for implementation; develops a monitoring programme and estimates the costs of the measures.
8	Stakeholder Consultation and Disclosure	This *Chapter* presents the results of consultation undertaken as part of the IEE Study, plus plans for future consultation. It identifies key Project stakeholders and presents their feedback on the Project.

Chapter Number	Contents Heading	Explanatory Note
9	Conclusion and Recommendations	This *Chapter* summarizes conclusions that are made based on the assessment as well as outlining any further recommendations.
10	References	This includes all references which are used to form part of the IEE Study.
	Annexes	This includes all technical annexes with details of specific technical surveys

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 CORPORATE ENVIRONMENTAL POLICY

The Project Proponent is currently drafting an Environmental Policy, which will be implemented for all relevant operations for the Project. This Environmental Policy is expected to be completed before the Project commences.

3.2 POLICY AND LEGAL FRAMEWORK

This *Section* of the IEE report details the policy and legal framework for the Project, covering national requirements as well as applicable international treaties and conventions. The intent is to lay out the regulatory and non-regulatory performance requirements for all stages of the Project.

3.2.1 Overview of Myanmar Legislation

3.2.1.1 The Constitution

The latest enacted Constitution (May 2008) provides information on governing laws and regulations in Myanmar. The Constitution takes precedence over any other national legislation or international agreements. The general provisions of the Constitution that relate to the Project are the requirement for Myanmar citizens to assist in:

- Preservation and safeguarding of cultural heritage;
- Environmental conservation;
- Striving for development of human resources; and
- Protection and preservation of public property.

3.2.1.2 Administrative Divisions of Myanmar

Myanmar is divided into twenty-one (21) main administrative subdivisions, which include:

- Seven states;
- Seven regions (Note that regions were previously referred to as “divisions”, prior to August 2010);
- Five self-administered zones;
- One self-administered division; and
- One union territory.

The administrative subdivisions are detailed in ***Table 3.1***, and an administrative map is presented in ***Figure 3.1***.

Table 3.1 Administrative Regions of Myanmar

Name	Capital	Population	Area
Ayeyarwady Region	Pathein	6,663,000	35,138
Bago Region	Bago	5,099,000	39,404
Chin State	Hakha	480,000	36,019
Kachin State	Myitkyina	1,270,000	89,041
Kayah State	Loikaw	259,000	11,670
Kayin State	Pa-an	1,431,377	30,383
Magway Region	Magwe	4,464,000	44,819
Mandalay Region	Mandalay	7,627,000	37,021
Mon State	Mawlamyaing	2,466,000	12,155
Rakhine State	Sittwe	2,744,000	36,780
Sagaing Region	Sagaing	5,300,000	93,527
Shan State	Taunggyi	4,851,000	155,801
Tanintharyi Region	Dawei	1,356,000	43,328
Yangon Region	Yangon	5,560,000	10,170
Naypyidaw Union Territory	Naypyidaw	925,000	N/A
Danu Self-Administered Zone	Pindaya	N/A	N/A
Kokang Self-Administered Zone	Laukkai	N/A	N/A
Naga Self-Administered Zone	Lahe	N/A	N/A
Pa-O Self-Administered Zone	Hopong	N/A	N/A
Pa Laung Self-Administered Zone	Namhsan	N/A	N/A
Wa Self-Administered Division	Hopang	N/A	N/A

States and regions are divided into districts. Districts consist of townships, which are composed of towns, wards and village-tracts. Village-tracts are groups of adjacent villages. The administrative structure of the states, regions and self-administering bodies is defined in the Constitution.

Each region and state has a Regional/State Government, consisting of a Chief Minister, Ministers and an Advocate General. Legislative authority resides with the State/Regional "Hluttaw" (a parliament or legislative body), which are made up of elected civilian members and representatives of the military.

The Constitution states that Naypyidaw is a Union Territory under the direct administration of the President. The Naypyidaw Council, led by a Chairperson, carries out general functions on behalf of the President. The Chairpersons of the Naypyidaw Council are appointed by the President, and include civilians and representatives of the military.

Self-Administered Zones and Self-Administered Divisions are administered by a Leading Body, which is headed by a Chairperson, and has executive and legislative powers. The Leading Body consists of elected State/Regional Hlutttaw members and military personnel.

Figure 3.1   Myanmar States/Regions and Townships

Source: Myanmar Information Management Unit

3.2.1.4 *EIA and ESHIA Requirements in Myanmar*

Laws in Myanmar related to EIA and ESHIA requirements are as follows:

Environmental Policy, 1994, Myanmar Agenda 21, 1997, and National Sustainable Development Strategy, 2009

Myanmar issued an Environmental Policy in 1994, which was as follows:

"…. The wealth of the nation is its people, its cultural heritage, its environment and its natural resources. The objective of Myanmar's Environment Policy is aimed at achieving harmony and balance between these, through the integration of environmental considerations into the development process to enhance the quality of life of all its citizens. Every nation has the sovereign right to utilize its natural resources in accordance with its environmental policies, but great care must be taken not to exceed its jurisdiction or infringe upon the interests of other nations. It is the responsibility of the State and every citizen to preserve its natural resources in the interest of present and future generations. Environmental protection should always be the primary objective in seeking development".

With a view to implementing a National Environment Policy (NEP), the National Commission for Environmental Affairs (NCEA) formulated Myanmar Agenda 21 in 1997 under the guiding principles established at the United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992. The Agenda 21 provided the first framework for integrating environmental considerations into national development plans in Myanmar. The purpose of Agenda 21 is to mobilize and focus national efforts to achieve sustainable development, and is intended to have the following functions:

a) To define the choices, set the goals and targets, and establish the standards for sustainable development in Myanmar;

b) To illuminate the environmental and ethical dimensions underlying the choices to be made and goals to be achieved in sustainable development;

c) To analyze the ecological, economic and social issues in the country in a comprehensive and integrated fashion, clarifying the links between them, identifying the policy gaps, and showing how to reduce conflicts between environment and development;

d) To identify and evaluate options for addressing priority issues, problems and opportunities, including the identification of appropriate programmes for legal reform, development of economic instruments, institutional development, capacity-building and other measures;

e) To set out sectoral and cross-sectoral policies and plans which rationalize the responsibilities for sustainable development, reduce duplication, close gaps, prevent or reduce conflicts, and take advantage of compatibilities and synergies among sectors and interest groups;

f) To improve decision-making and policy formulation through better information and analytical techniques, and by enabling those most affected by decisions to participate in the decision-making process;

g) To develop understanding and build consensus so that decisions have strong support;

h) To identify, promote and support actions leading to sustainable development and to reduce, abate and put a stop to actions impeding sustainable development;

i) To identify and apply practices which sustain the resource base of the economy, achieve sustainable levels of resource use, restore degraded natural resources, make use of unused or under-used resource potential, improve the efficiency of existing resource use, and diversify the use or seek substitution of existing resources;

j) To determine priorities for action, evaluating costs and benefits and the trade-offs between the different concerns affecting all levels of society;

k) To provide a basis for the allocation and optimal use of limited resources;

l) To develop and strengthen institutions for sustainable development; and

m) To build up the capacity of institutions and the population of the country to handle complex and inter-related issues through frameworks which integrate environmental concerns with planning.

Subsequently in 2007, the NCEA developed the National Sustainable Development Strategy (NSDS) for Myanmar. It incorporated the aspirations of the Agenda 21 as well as Myanmar's Millennium Development Goals. The NSDS was approved in 2009 and served as the main guiding principal on environmental protection in the country.

Specific strategies are outlined under each goal. For example, the goal for Sustainable Management of Natural Resources suggests strategies for forest resource management, sustainable energy production and consumption, biodiversity conservation, sustainable freshwater resources management, sustainable management of land resources, sustainable management for mineral resources utilization, etc.

The aim of NSDS is to achieve sustainable development through three sectors, focused on natural resource management, economic development, and social development. Relevant government ministries are expected to institutionalize NSDS principles into their sectoral development through short-term, medium-term and long-term actions.

Although much of the NSDS guidelines are for adoption and integration into the government legislation and regulation body, some are targeted at the private sector, such as the polluter pay principle, and reduction of energy consumption and greenhouse gas emission from industries.

The Environmental Conservation Law, 2012

The legal mechanism for ESHIA has been put in place with the 2012 Environmental Conservation Law. The law was enacted on April 1, 2012, based on a draft written in 1998.

According to the text of The Environmental Conservation Law, the main objectives of the Law are as follows:

a) to enable to implement the Myanmar National Environmental Policy;
b) to enable to lay down the basic principles and give guidance for systematic integration of the matters of environmental conservation in the sustainable development process;
c) to enable to emerge a healthy and clean environment and to enable to conserve natural and cultural heritage for the benefit of present and future generations;
d) to reclaim ecosystems as may be possible which are starting to degenerate and disappear;
e) to enable to manage and implement for decrease and loss of natural resources and for enabling the sustainable use beneficially;
f) to enable to implement for promoting public awareness and cooperation in educational programmes for dissemination of environmental perception;
g) to enable to promote international, regional and bilateral cooperation in the matters of environmental conservation;
h) to enable to cooperate with Government departments, Government organizations, international organizations, non-government organizations and individuals in matters of environmental conservation.

The following articles are particularly relevant to ESHIA requirements and this project:

"7. The duties and powers relating to the environmental conservation of the Ministry are as follows:

…

(m) causing to lay down and carry out a system of environmental impact assessment and social impact assessment as to whether or not a project or activity to be undertaken by any Government department, organization or person may cause a significant impact on the environment;"

Also in this law, Article 14 and Article 15 are related with waste disposal in accordance with environmental standards:

"14. A person causing a point source of pollution shall treat, emit, discharge and deposit the substances which cause pollution in the environment in accordance with stipulated environmental quality standards.

15. The owner or occupier of any business, material or place which causes a point source of pollution shall install or use an on-site facility or controlling equipment in order to monitor, control, manage, reduce or eliminate environmental pollution. If it is *impracticable, it shall be arranged to dispose the wastes in accordance with environmentally sound methods."*

Article 19 is related to maintenance of cultural heritage:

"19. The Ministry shall cooperate with the relevant Government departments and Government organizations in the matters of environmental conservation for perpetual existence of cultural heritage sites and natural heritage sites, cultural monuments and natural areas stipulated under any existing law."

For violations of bylaws, regulations and directives issued under this law, punishment is not more than one year or fine (unspecified amount), or both, under Article 32.

Environmental Conservation Rules (2013)

The Environmental Conservation Rules were approved by cabinet in 2013, and The Ministry of Environmental Conservation and Forestry passed the Environmental Conservation Rules on 5 June 2014.

The Environmental Conservation Rules detail the environmental policy and implementation framework of the 2012 Environmental Conservation Law. According to the Rules, the Ministry of Environmental Conservation and Forestry (the "Ministry") with the approval of the Environmental Conservation Committee (the "Committee") is authorized to prescribe: (a) the amount of liability owing from a person or entity causing environmental damage; and (b) the amounts of contribution to be made to the Environmental Management Funds by persons or entities engaged in environmental services and extraction of natural resources.

The Ministry is also authorized to specify: (a) the projects, businesses, services, or investments for which environmental impact assessments ("EIA") must be conducted; and (b) the businesses, work sites, or factories that can potentially damage the environment for which prior permission from the Ministry must be sought. The second list must be approved by the Union Government and confirmed by the Committee. However, it is important to note that even if a project, business, service, or investment does not fall under those for which EIA must be conducted, the Ministry may still require an Initial Environmental Examination in order to determine whether an EIA is in fact necessary. Additionally, companies must seek the confirmation of the Ministry before appointing an EIA service provider.

In addition, the Environmental Conservation Rules stipulate the following relevant articles under Chapter (XI) Environmental Impact Assessment:

"54. The business, department, organization or person who would carry out categories of plan, business or activity stipulated under rule 52:

(a) shall carry out environmental impact assessment for his plan, business or activity;

(b) submit to the Ministry in advance by which organization or person, the environmental impact assessment is intended to be carried out;

(c) submit the environmental impact assessment report to the Ministry.

55. The plan, business or activity which is established before the issue of these rules and responsible to carry out the environmental impact assessment or initial environmental examination shall prepare the environmental management plan in accord with the environmental impact assessment procedure to be issued under the Law and submit to the Ministry. The Ministry shall scrutinize the environmental management plan for approving it. The person who carries out the project, business or activity shall implement the environmental management plan approved by the Ministry and matters stipulated by the Ministry within the time stipulated by the Ministry.

56. The person who carries out any project, business or activity shall arrange and carry out for conducting the environmental impact assessment for any project, business or activity by a qualified third person or organization accepted by the Ministry.

57. The Ministry shall, on submission to the Ministry in advance by which organization or person, the environmental impact assessment is intended to be carried out under sub-rule (b) of rule 54, determine and decide, after making scrutiny, whether or not it is suitable level of international organization or person to carry out the environmental impact assessment. The decision of the Ministry relating to such matter is final and conclusive.

58. The Ministry shall form the Environmental Impact Assessment Report Review Body with the experts from the relevant Government departments, Government organizations.

59. If the private persons are included in the Environmental Impact Assessment Report Review Body, honorariums, allowances and aids for them may be borne from the environmental management fund.

60. The Ministry may assign duty to the Department to scrutinize the report of environmental impact assessment prepared and submitted by a third person or organization relating to environment impact assessment and report through the Environmental Impact Assessment Report Review Body.

61. The Ministry may approve and reply on the environmental impact assessment report or environmental management plan with the approval of the Committee."

Foreign Investment Law, 2012, Foreign Investment Rules, 2013, and Notifications for Investment, 2013

Myanmar passed a new Foreign Investment Law on November 2, 2012, which replaced the Myanmar Foreign Investment Law of 1988. The recently enacted rules require ESIA for large projects according to the rules of the Ministry of Environmental Conservation and Forestry.

Although the law does not specifically define legislation for EIAs, Notification 1/2013 provides a categorization of the business activities in which foreigners will be allowed to engage. Under this, "Electrical power production" projects fall under "Category 3.3: activities allowed only following an Environmental Impact Assessment". Specifically, electrical power production projects "must conduct Environmental Impact Assessment and obtain and follow MOECAF's terms and conditions".

Environmental Impact Assessment Procedure

The Environmental Impact Assessment Procedure was promulgated on December 29th, 2015, and provides legislation for environmental and social governance of economic development in Myanmar, under the Environmental Conservation Law 2012 and Environmental Conservation Rules 2014 of the National Environmental Policy for Myanmar 1994. The Procedure states that:

"….all Projects and Project expansions undertaken by any ministry, government department, organization, corporation, board, development committee and organization, local government or authority, company, cooperative, institution, enterprise, firm, partnership or individual (and/or all Projects, field sites, factories and businesses including expansions of such Projects, field sites, factories and businesses identified by the Ministry, which may cause impact on environmental quality and are required to obtain Prior Permission in accordance with Section 21 of the Law, and Article 62 of the Rules) having the potential to cause Adverse Impacts, are required to undertake IEE or EIA or to develop an EMP, and to obtain an ECC in accordance with this Procedure."

According to the EIA Procedure, based on the criteria indicated in Annex 1 'Categorization of Economic Activities for Assessment Purposes', wastewater treatment plants usually require an EIA. However, for this project, MIEH has discussed and agreed with the relevant authorities that only an IEE Study is required for this Project.

IEE Investigation shall encompass the requirements of Article 31 through 43. Key points are as follows:

"34. The Project Proponent shall undertake the following public consultation process in regard to an IEE Type Project:

a) Immediately upon commencement of the IEE, disclose relevant information about the proposed Project to the public and civil society through the Project or Project Proponent's website(s) and local media, including by means of the prominent posting of legible sign boards at the Project site which are visible to the public, and comply with technical guidelines issued by the Ministry; and

b) arrange the required complement of consultation meetings as advised by the Ministry, with local communities, potential PAPs, local authorities, community based organizations, and civil society, and provide appropriate and timely explanations in press conferences and media interviews.

35. The Project Proponent shall issue a letter of endorsement in a format prescribed by the Ministry. Such letter shall be submitted to the Department together with the IEE Report prepared either in the Myanmar language, or in the English language with an accompanying, accurate summary in the Myanmar language, and confirming:

a) the accuracy and completeness of the IEE,

b) that the IEE has been prepared in strict compliance with applicable laws including this Procedure, and

c) that the Project will at all times comply fully with the commitments, mitigation measures, and plans in the IEE Report.

36. The IEE Report shall contain the following:

a) Project description in reasonable detail with description of the project size, installations, technology, infrastructure, production processes, use of materials and resources, generation of waste, emissions and disturbances together with overview maps and site layout maps (using aerial photos and satellite images in proper scale) for each Project phase and, where relevant, project alternatives for each Project phase;

b) identification of the Project Proponent including (where the Project Proponent is not a natural person but a company or other juridical entity) the identification of the owners, directors (if any) and day to day management and officers of the Project Proponent;

c) identification of the IEE experts, including which expert is responsible for which part of the IEE Report;

d) description of applicable laws, decrees, regulations, standards, guidelines and corporate policies related to environmental and social matters of the Project together with the relevant government agencies involved and their roles and responsibilities vis-à-vis the Project.

e) description of the surrounding environmental and social conditions of the Project including maps of all relevant physical, biological, social, socio-economic and cultural features;

f) identification and assessment of potential Environmental Impacts including assessment and description of Adverse Impacts and Residual Impacts with presentation of the spatial and temporal characteristics of the impacts using maps, images, aerial photos and satellite images;

g) results of the public consultation and public participation processes, recommendations received from the public, and the Project Proponent's written responses to comments received during that process;

h) the environmental protection measures of the Project which are intended to mitigate Adverse Impacts clearly presented together with applicable environmental and social requirements and any Residual Impacts;

i) the EMP; and

j) the persons, organizations and budgets needed for implementation of the EMP.

3.2.1.5 Myanmar Protected Areas

The first legal instrument related to protected areas, which designated a wildlife sanctuary in the environs of the Royal Mandalay City, was promulgated in 1859. The first piece of wildlife legislation to be enacted was the Wild Elephant Protection Act of 1879. The Forest Act of 1902 gave responsibility for wildlife management to the Forest Department. Legislation specific to wild animals followed in 1927, and broader legislation followed nine years later with the Wildlife Protection Act of 1936. This provided for designation of wildlife sanctuaries with species-specific conservation objectives. Legislation was revised in 1994 with issue of the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law. The 1994 Law, which was issued by the State Law and Order Restoration Council, provides for:

- A Committee for the Protection of Wildlife and Wild Plants and Conservation of Natural Areas, which is to serve as an advisory body to the Minister of Forestry; supervise implementation of the Law; give guidance in matters of research, conserving species in danger of extinction and international cooperation;
- Categories of ‘natural areas’ and zoological and botanical gardens, their declaration and uses;
- Categories of protected wild animals (almost the same as provided for under earlier law): completely protected, normally protected and seasonally protected;
- Hunting licences;
- Establishment of zoological and botanical gardens;
- Registration of ownership of completely protected animals or trophies thereof;
- Administrative actions;
- Appeals; and
- Offences and penalties.

The categories of so-called ‘natural areas’ are defined in the Law described above as:

- Scientific Nature Reserve;
- National Park;
- Marine National Park;
- Nature Reserve;
- Wildlife Sanctuary;
- Geo-Physically Significant Reserve; and
- Other Nature Reserve Determined by the Minister.

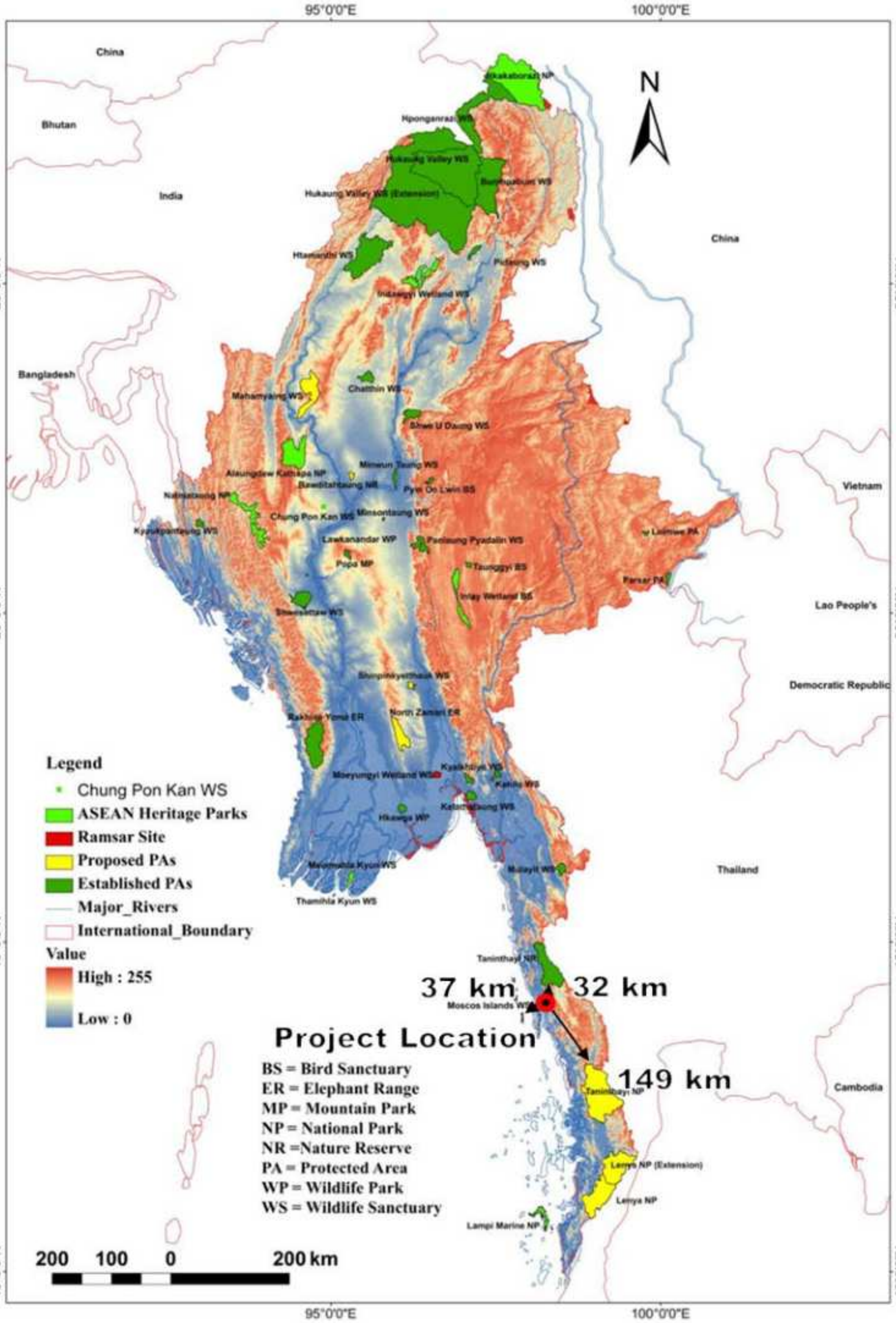
A total of 43 protected areas have been established or proposed in Myanmar, and are shown in ***Figure 3.2.*** The nearest protected areas to the Project are Moscos Island Wildlife Sanctuary (37 km from Project Site), Tanintharyi National Park (207 km from Project Site), and Tanintharyi Nature Reserve (32 km from Project Site), the details of which are shown in ***Table 3.2.***

Table 3.2 Protected Areas in Myanmar

No	Name	National Designation	Year Established	Location and Coordinates	Area (km^2)	Distance to Project (Km)	Key Species Protected
1	Moscos Island W.S	Wildlife Sanctuary	1927	Taninthayi Region, Yebyu and Launglon Townships, 14°04'N, 97°50'E	49	37	Barking Deer, Sambar Deer, Swiftlets
2	Tanintharyi N.P *	National Park	2002 (Proposed)	Tanintharyi Region, Tanintharyi Township, 12°41'N, 99° 04'E	2,072	149	Sambar Deer, Asian Elephant, Barking Deer, Serow, Red Goral, Leopard, Birds Spp.
3	Tanintharyi Nature Reserve *	Nature Reserve	2005	Tanintharyi Region, Yebyu and Tavoy Townships, 14°36'N, 98° 17'E	1,700	32	Gurney's Pitta, Elephant

Source: Myanmar Protected Areas: Context, Current Status and Challenges, 2011

Figure 3.2 Protected Areas in Myanmar and Project Location



Source: Fifth National Report to the United Nations Convention on Biological Diversity, Ministry of Environmental Convention and Forestry, March 2014

3.2.1.6 *Other Project-Relevant Legislation in Myanmar*

A number of other laws exist in Myanmar which, either directly or indirectly, relate to environmental and social management, however these laws are general in nature and refer primarily to good practice recommendations. ***Table 3.3*** provides a list of major environmental laws relevant to the Project, and key project-relevant legislation is discussed below.

Myanmar Special Economic Zone Law, 2014

The Dawei Special Economic Zone Law, officially known as The State Peace and Development Council Law No. 17, was passed on 27 January 2011. The law mostly relates to rules and regulations regarding investment, taxation and industrial development. However, it does stipulate the following with regards to environment, social and health:

"35. The investor shall not only abide by the environmental standards described in the Myanmar Environmental Conservation Law and international standards, but also carry out them in accordance with the existing laws in order not to have undesirable health and social impact."

Public Health Law

Section 3 of the Public Health Law includes a general provision that empowers the Government of the Union of Myanmar to "carry out measures" relating to environmental health, such as garbage disposal, use of water for drinking and other purposes, radioactivity, protection of air from pollution, sanitation works and food and drug safety. However, detailed provisions do not exist.

Union of Myanmar Marine Fisheries Law, 25 April 1990

There are several restrictions relating to marine fisheries contained within the Fisheries Law. Those found guilty of violating any of the prohibitions may be liable to heavy fines and/or imprisonment. The relevance of this law to the offshore component of the project is that it places a general restriction on pollution, as follows: *"No person shall dispose of living aquatic creatures or any polluting material into the Union of Myanmar Marine Fisheries"*.

Territorial Sea and Maritime Zones Law, 1977

The Union of Myanmar has exclusive jurisdiction for the construction, maintenance and operation of offshore terminals. It also has exclusive jurisdiction to preserve and protect the marine environment, and to prevent and control marine pollution.

The Underground Water Act, 1930

The Underground Water Act, 1930 provides measures for systematic and sustainable use of underground water.

Forest Law, 1992

The Forest Law, 1992 is one of the environmental related laws in the forestry sector. The offences for extracting, moving, keeping in possession unlawfully any forest produce, including fauna and flora are liable to be punished with fine or imprisonment, or for both. For offences relating to teak trees the punishment is heavier. The Courts are empowered to confiscate all forest produce, vehicles, vessels, animals, machinery, tool and equipment in addition to the punishment for the related offence. Forest Officers are also empowered to take administrative actions in respect of forest produce seized.

Penal Code, 1961 (and extended in Public Health Law, 1972)

The Penal Code has some relevance to public health. It is considered an offence to "voluntarily corrupt or foul the water of any public spring or reservoir so as to render it less fit for the purpose for which it is ordinarily used", or to pollute the atmosphere from smoke, fumes, noxious odours, dust particles, noise and radioactive substances.

Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law, 1994

Under the Protection of Wildlife and Wild Plants and Conservation of Natural Areas Law, 1994, the following are considered crimes: hunting without license, breeding protected animals without permission, causing water and air pollution, poisoning water, possessing, selling, transporting or transferring wildlife or any part thereof without permission.

Conservation of Water Resources and Rivers Law, 2006

The Conservation of Water Resources and Rivers Law (2006) prohibits carrying out any actions with the aim to ruin water resources, including rivers, and causing intentional water wastage, and pollution of water resources.

Antiquities Act, 1957 (Revised 1962)

The Antiquities Act is a law that governs movable and immovable cultural heritage that have archaeological and historical value.

The Antiquities section provides stipulations for the movement of antiquities inside and outside the country, the protection and management of antiquities, the protection and restoration obligation and the compulsory acquisition right of the Director of the Burma Archaeological Survey, and penalties for violations of the above.

The Protection and Preservation of Cultural Heritage Region Law, 1998 (Revised in 2009 and Supplemented in 2011)

The Protection and Preservation of Cultural Heritage Region Law mainly supplements the Antiquities Act with provisions that more widely cover cultural heritage. Relevant excerpts are as follows:

"20. No person shall carry out any of the following in the cultural heritage region:-

(a) destroying an ancient monument;

(b) willfully altering the original ancient form and structure or original ancient workmanship of an ancient monument;
(c) excavating to search for antiquities;
(d) exploring for petroleum, natural gas, precious stones or minerals.

21. No person shall, without prior permission granted under this Law, carry out any of the following in the cultural heritage region:-

(a) carry out renovation and maintenance work on an ancient monument;
(b) carrying out archaeological excavation;
(c) building road, constructing bridge, irrigation canal, embankment or extending the same;
(d) digging well, pond, fish-breeding pond or extending the same."

Table 3.3 Project-Relevant Legislation in Myanmar

Sector	Relevant Laws in Myanmar
Administrative	The Territorial Sea and Maritime Zones Law, 1977
	The Emergency Provisions Act, 1950
	The Essential Supplies and Services Act, 1947
	The Police Act, 1945
	The Poisons Act, 1919
	The Explosive Substances Act, 1908
	The Yangon Police Act, 1899
	The Explosives Act, 1887
	The Penal Code, 1861 of Offences Affecting the Public Health, Safety, Convenience, Decency and Morals
	Foreign Investment Law, 2012
	The Child Law (Law No. 9/93)
	Myanmar Maternal and Child Welfare Association Law (No. 21/90).
	Myanmar Investment Commission Notification (1994)
	The Private Industrial Enterprise Law - SLORC Law No. 22/90
Agriculture and Irrigation	The Fertilizer Law, 2002
	The Plant Pest Quarantine Law, 1993, and amended in 2011
	The Pesticide Law, 1990
	The Embankment Act, 1909
	Underground Water Act, 1930
	Farmland Rules - Notification No 62/2012 (English)
	Vacant, Fallow and Virgin Lands Management Rules - Notification No. 1/2012
	Vacant, Fallow and Virgin Land Management Act - Pyidaungsu Hluttaw Law No. 10/2012
Culture	The Protection and Preservation of Cultural Heritage Region law, 1998 (Revised in 2009 and Supplemented in 2011)
	Antiquities Act, 1957 (Revised 1962)
Forestry, Environment and Natural Resources	The Protection of Wild Life, Wild Plants and Conservation of Natural Areas Law, 1994
	The Forest Law, 1992
	The Conservation of Water Resources and Rivers Law, 2006
	Burma Wild Life Protection Rules, 1941
	The Forest Department Notification No. 583/94
	Environmental Impact Assessment Rules
	Environmental Conservation Law (March 2012)
	Myanmar Agenda 21
	National Environmental Policy (1994)
Public Health	The National Food Law, 1997
	The Traditional Drug Law, 1996
	The Prevention and Control of Communicable Disease Law, 1995
	The Narcotics Law, 1993
	The National Drug Law, 1992
	The Union of Myanmar Public Health Law, 1972
	Private Health Act, 2007
	The Penal Code of Offences Affecting the Public Health, Safety, Convenience, Decency and Morals (1861)
Occupational Health and Safety	Factory Act, 1951 (safe and healthy workplaces)
	Employment and Training Act 1950
Tourism	The Myanmar Hotel and Tourism Law, 1993

Sector	Relevant Laws in Myanmar
Industrial	Myanmar Special Economic Zone Law, 2011
	Dawei Special Economic Zone Law, 2011
	The Private Industrial Enterprise Law, 1990
	The Factories Act, 1951
	The Oilfield (Workers and Welfare) Act, 1951
	The Petroleum Act, 1934
	The Oilfield Act, 1918
	Employment Restriction Act (1959)
	Workmen's Compensation Act
	Shops and Establishment Act, 1951
	Leave and Holidays Act, 1951
	Minimum Wage Act 1949
	Payment of Wages Act 1936
	Social Security Act 1954
	Trade Dispute Act 1929
	Settlement of Labour Dispute Law (2012)
	Employment and Skill Development Law
	Employment Statistics Act (1948)
	Water Power Act (1927)
Fisheries, Aquaculture, and Water	The Freshwater Fisheries Law, 1991
	The Myanmar Marine Fisheries Law, 1990, amended in 1993
	The Law Relating to Aquaculture, 1989
	The Law Relating to the Fishing Rights of Foreign Fishing Vessels, 1989
	The Law Amending the Law Relating to the Fishing Rights of Foreign Fishing Vessels, 1993
	The Law Amending the Myanmar Marine Fisheries Law, 1993
	The Conservation of Water Resources and Rivers Law - SPDC Law No. 8/2006
	Territorial Sea and Maritime Zone Law-1977
	The Underground Water Act (1931)
Science and Technology	The Atomic Energy Law, 1998
	Science and Technology Development Law (Law No. 5/94, 1994)
Transportation	The Highways Law, 2000
	The Motor Vehicles Law, 1964
	The Law Amending the Motor Vehicles Law of 1964 enacted in 1989
	The Myanmar Aircraft Act, 1934
	The Inland Steam Vessels Act, 1917
	The Ports Act, 1907
	The Defile Traffic Act, 1908
	The Yangon Port Act, 1905
	The Canal Act, 1905
	The Obstruction in Fairways Act, 1881
Land Use	Land Acquisition Act, 1894
	The Towns Act, 1907
	The Village Act, 1907

3.2.2 International Conventions

Myanmar has ratified several international conventions. Highlights of key conventions are provided below.

3.2.2.1 The Kyoto Protocol on Climate Change (UNFCC)

Myanmar achieved full accession to the UNFCC in 2003. This obligates Myanmar to assure that future development in the country meets the conditions of the Convention. Relevant to this Project are the requirements associated with the potential generation of greenhouse gas from the operation of the coal fired power plant; further conditions of relevance include:

- Enhancement of energy efficiency in relevant sectors;
- Protection and enhancement of sinks and reservoirs of greenhouse gases;
- Promotion of sustainable forest management practices, afforestation and reforestation;
- Promotion of sustainable forms of agriculture;
- Implementation of measures to limit and/ or reduce emissions of greenhouse gases; and
- Limitation and/ or reduction in methane emissions.

3.2.2.2 The United Nations Convention on Biodiversity 1992

This Convention seeks to conserve biodiversity and promote its sustainable use. It requires the identification and monitoring of the biodiversity in an area and adopting the necessary conservation measure. Myanmar became party to this Convention in 1994.

3.2.2.3 The Basel Convention 1989

This was developed under the auspices of the United Nations Environmental Programme (UNEP) in response to the growing worldwide awareness of the problem of international traffic in hazardous waste. The *Basel Convention 1989* is the first and foremost global environmental treaty that strictly regulates the trans-boundary movement of hazardous wastes. It obligates parties to ensure environmentally sound management, especially during the disposal process.

The objectives of the Convention are to:

- Ensure that waste is disposed of as near as possible to the place or source of its generation;
- Reduce trans-boundary waste and where it cannot be avoided, to be disposed of in an environmentally sound and efficient manner; and
- Provide assistance to developing countries in the management of hazardous waste and the generation.

The Convention places a ban on the export of hazardous waste from Organization for Economic Cooperation and Development (OECD) countries to non-OECD countries.

A list of Project-relevant international treaties of which Myanmar is a signatory is provided in ***Table 3.4***.

Table 3.4 International Conventions Ratified by Myanmar

No.	Conventions	Year (Ratified/Acceded/Accepted)
Environment		
1	Plant Protection Agreement for the Southeast Asia and Pacific Region, Rome 1956	1959 (Ratified)
2	MARPOL: International Convention for the Prevention of Pollution from Ships 1973 and MARPOL Protocol of 1978	1988 (Accession)
3	ICAO: ANNEX 16 to the Convention on International Civil Aviation Environmental Protection Vol. I and II, Aircraft Noise and Aircraft Engine Emission	Accession
4	Agreement on the Networks of Aquaculture Centres in Asia and the Pacific, Bangkok 1988	1990 (Accession)
5	Vienna Convention for the Protection of the Ozone Layer, Vienna 1985	1993 (Ratification)
6	Montreal Protocol on Substances that Deplete the Ozone Layer, Montreal 1987	1993 (Ratification)
7	London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer, London 1990	1993 (Ratification)
8	United Nations Framework Convention on Climate Change (UNFCCC), New York 1992	1994 (Ratification)
9	Convention on Biological Diversity, Rio de Janeiro 1992	1994 (Ratification)
10	The Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris 1972	1994 (Acceptance)
11	International Tropical Timber Agreement (ITTA), Geneva 1994	1996 (Ratification)
12	United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought, Paris 1994	1997 (Accession)
13	Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Washington DC 1973; and as amended in Bonn, Germany 1979	1997 (Accession)
14	ASEAN Agreement on Conservation of Nature and Nature Resources, Kuala Lumpur, 1985	1997 (Signatory)
15	Kyoto Protocol to the Convention on Climate Change, Kyoto 1997	2003 (Accession)
16	ASEAN Agreement on Trans-boundary Haze Pollution	2003 (Ratification)
17	Stockholm Convention on Persistent Organic Pollutants (POPs), 2001	2004 (Accession)
18	Ramsar Convention on Wetlands of International Importance	2005 (Accession)
19	Establishment of ASEAN Regional Centre for Biodiversity	2005 (Signatory)
20	Declaration on ASEAN Heritage Parks	2003 (Signatory)
21	International Treaty on Plant Genetic Resources for Food and Agriculture, 2001	2004 (Ratification)
22	Catagena Protocol on Biosafety, Cartagena, 2000	2001 (Signatory)
23	Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas, Rome, 1973	1994 (Acceptance)
24	United Nations Convention on the Law of the Sea, Montego Bay, 1982	1996 (Ratified)
25	Agreement Relating to the Implementation of Part XI of the United Nations Convention on the Law of the Sea of 10 December 1982, New York, 1994	1996 (Accession)
26	Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and their Destruction, Paris, 1993	1993 (Signatory)

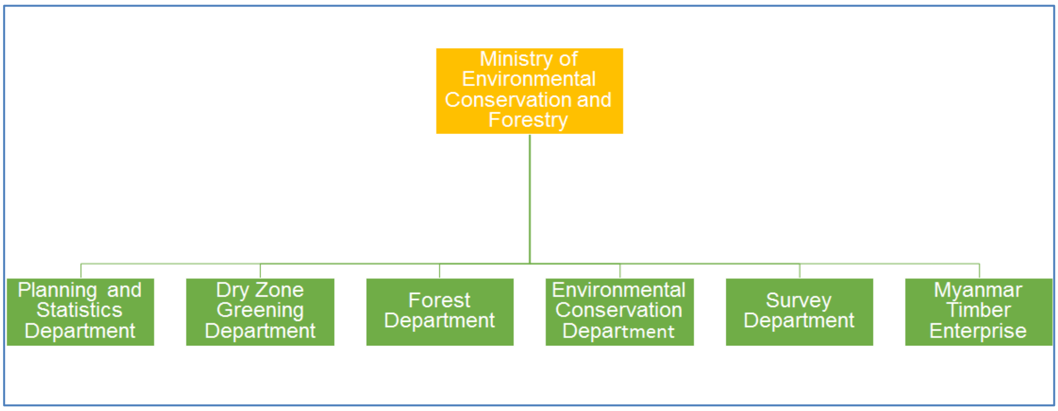
No.	Conventions	Year (Ratified/Acceded/Accepted)
27	Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Sea Bed and Ocean Floor and in the Subsoil there of, London, Moscow, Washington, 1971	1971 (Signatory)
Social, Labour and Health		
28	Universal Declaration of Human Rights (UNDHR)	signed
29	Convention on the Rights of the Child	1991 (acceded)
30	Convention on Elimination of All Forms of Discrimination against Women (CEDAW)	1997 (acceded)
31	Relevant ILO Conventions in force in Myanmar • C1 Hours of Work (Industry) • C14 Weekly Rest (Industry) • C17 Workmen's Compensation (Accidents) • C19 Equality of Treatment (Accident Compensation) • C26 Minimum Wage Fixing Machinery • C29 Forced Labour Convention • C42 Workmen's Compensation (Occupational Diseases) Revised 1934 • C52 Holidays with Pay • C87 Freedom of Association and Protection of the Right to Organize	

3.3 Institutional Framework

3.3.1.1 Central EIA Authority

The Ministry of Environmental Conservation and Forestry (MOECAF) is the authority that is responsible for implementing EIA. In 2011, MOECAF was upgraded as the coordinating agency responsible for the environmental management. An organizational chart of MOECAF is shown in ***Figure 3.3.***

Figure 3.3 MOECAF Organization



Source: Finnish Environment Institute, 2015

3.3.1.2 Other Governmental Parties Involved in EIA

MOECAF has assigned responsibilities with regards to EIA to the Environmental Conservation Department (ECD), which is one of the 6 departments of the MOECAF. The ECD was set up in October 2012 and is mainly responsible for implementing the National Environmental Policy, strategy, framework, planning and action plan for the integration of environmental consideration into the national sustainable development process.

In addition, an EIA Report Review Body, consisting of individual experts and/or experts from relevant government departments and organizations, may support MOECAF with the review process.

The Myanmar Investment Commission (MIC) has responsibility for making decisions regarding project approval. MIC is a government-appointed body under the Ministry of National Planning and Economic Development, formed in 1994, that appraises investment proposals in Myanmar.

3.3.1.3 *IEE Review and Approval Process*

Based on the EIA Procedure, articles relevant to the submission and approval of IEE Report are presented below. In addition, an overview of the process (from the EIA Procedure) is shown in ***Figure 3.4***.

Submission of IEE

37. After completing all investigations and public consultation and participation processes required for IEE Type Projects, the Project Proponent shall submit the IEE Report for the Project to the Department in both digital form and complete paper copies, together with the required service fee as prescribed by the Department.

38. Not later than fifteen (15) days after submission of the IEE Report to the Department, the Project Proponent shall disclose the IEE Report to civil society, PAPs, local communities and other concerned stakeholders: (i) posting on the Project or Project Proponent's website(s), (ii) by means of local media (i.e. newspapers); (iii) at public meeting places (e.g. libraries, community halls); and (iv) at the offices of the Project Proponent.

Review and Approval Process

39. Upon receipt of the IEE Report from the Project Proponent, the Department shall:

a) disclose the IEE Report to the public on the Ministry and/or Department website(s), and/or through other appropriate media;

b) invite comments and suggestions on the IEE Report from all relevant parties including relevant government organizations, institutions, civil society organizations, and PAPs, as appropriate;

c) arrange public consultation meetings at the local level, at which the Project Proponent shall present the IEE Report; and

d) collect and review all comments and recommendations received, and forward the same to the Ministry to enable it to make a final decision on approval of the IEE Report.

40. If it is determined by the Ministry that the IEE Report does not satisfy requirements, then the Project Proponent shall be called upon by the Department to *undertake necessary amendments and/or to provide supplementary information as directed by the Ministry.*

41. Upon completion of its review of the IEE Report, the Ministry shall;

a) approve the IEE Report, subject to any conditions it may prescribe, and issue an ECC; or

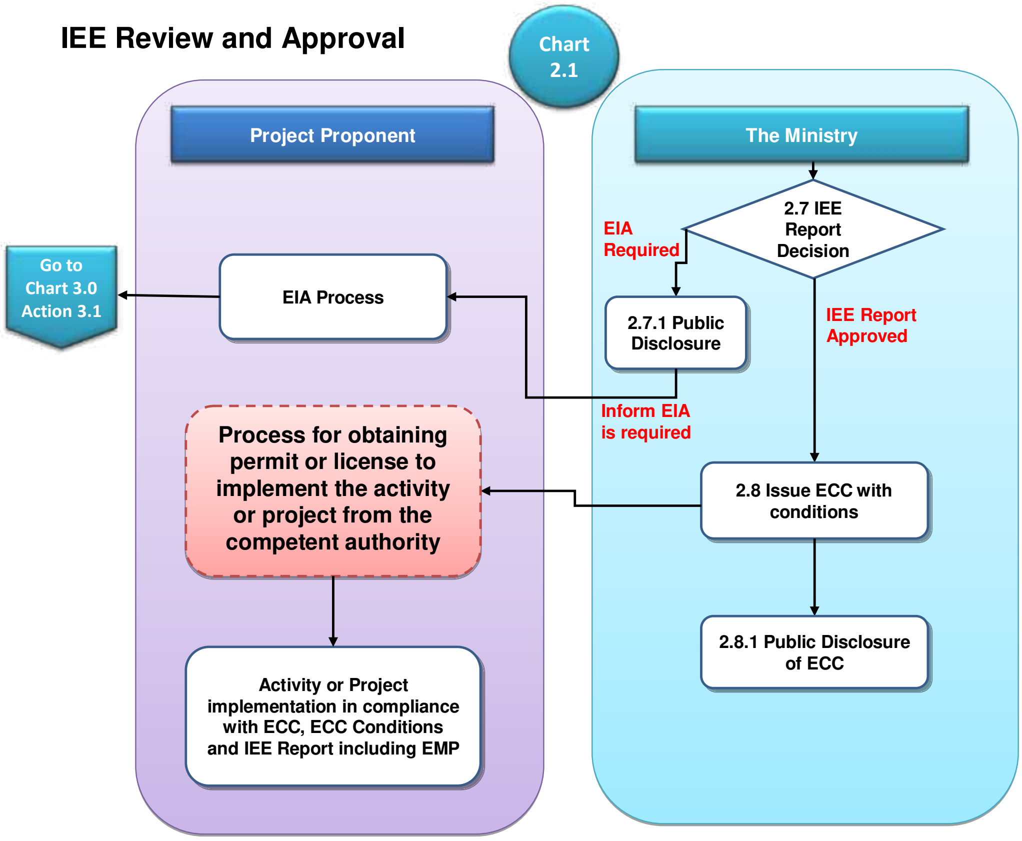
b) require that the Project carry out an EIA, citing the reasons for this decision and informing the Project Proponent of its decision; and, in either case

c) publicly disclose its decision.

42. The Department shall deliver the final decision of the Ministry within sixty (60) working days of receipt of an IEE Report. If the Ministry requires an IEE Report to be amended, then the due date for delivery of the Ministry's decision shall be extended accordingly.

43. All costs incurred in completing the IEE Report disclosure and review, including the public consultation process, shall be borne by the Project Proponent.

Figure 3.4 IEE Review and Approval Process (from EIA Procedures)



3.4 ENVIRONMENTAL AND/OR HEALTH STANDARDS

3.4.1 *Myanmar National Environmental Quality (Emission) Guidelines*

Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines were promulgated on December 29th, 2015. The Guidelines are largely based on International Finance Corporation (IFC) Environmental Health and Safety (EHS)

Guidelines, and provide the basis for regulation and control of various environmental parameters, including noise and vibration, air emissions, and effluent discharges, from various sources.

Relevant excerpts from the guidelines are as follows:

"*6. Provisions of the general and applicable industry-specific Guidelines shall be reflected in project EMP and ECC and together constitute a project's commitment to take necessary measures to avoid, minimize and control adverse impacts to human health, safety, and the environment through reducing the total amount of emissions generation; adopting process modifications, including waste minimization to lower the load of pollutants requiring treatment; and as necessary, application of treatment techniques to further reduce the load of contaminants prior to release or discharge.*

7. Further reference should be made by projects to applicable industry-specific IFC EHS guidelines for advice on means of achieving limit values specified in Annex 1.

8. These Guidelines supersede any existing national guideline or standard provision relating to regulation and control of noise, air, and water emissions from activities and projects subject to the EIA Procedure.

9. As specified in Article 56 of the EIA Procedure, all projects are obliged to use, comply with and refer to applicable national guidelines or standards or international standards adopted by the Ministry. These Guidelines will henceforth be applied by the Ministry in satisfying this requirement until otherwise modified or succeeded by other guidelines or standards.

…

12. As specified in Article 95 of the EIA Procedure, projects shall engage in continuous, proactive and comprehensive self monitoring of the project and comply with applicable guidelines and standards. For purposes of these Guidelines, projects shall be responsible for the monitoring of their compliance with general and applicable industry-specific Guidelines. Projects shall be responsible for ensuring compliance at the point of compliance specified in the applicable Guidelines.

13. To demonstrate compliance with these monitoring requirements as specified in articles 97 and 98 of the EIA Procedure, projects shall submit monitoring reports to the Ministry at least every six months or more frequently as provided in the EMP and ECC. Monitoring reports shall inter alia document compliance, difficulties encountered in complying with EMP and ECC conditions, number and type of non-compliance with EMP and ECC, and monitoring data of prescribed environmental parameters as detailed in the EMP and ECC. "

A summary of environmental standards that are relevant to the Project are shown below. These standards will be used for comparison of baseline data and predicted impacts in this ESHIA.

3.4.1.1 General Guidelines

Air Emissions

"Projects with significant sources of air emissions, and potential for significant impacts to ambient air quality, should prevent or minimize impacts by ensuring that: (i) emissions do not result in pollutant concentrations that reach or exceed ambient quality guidelines and standards, or in their absence the current World Health Organization (WHO) Air Quality Guidelines; and emissions do not contribute a significant portion to the attainment of relevant ambient air quality guidelines or standards (i.e. not exceeding 25 percent of the applicable air quality standards to allow additional, future sustainable development in the same airshed."

Table 3.5 WHO Ambient Air Quality Guidelines

Parameter	Averaging Period	Guideline Value (µg/m^3)
Nitrogen dioxide	1-year 1-hour	40 200
Ozone	8-hour daily maximum	100
Particulate matter PM10[a]	1-year 24-hour	20 50
Particulate matter PM2.5[b]	1-year 24-hour	10 25
Sulfur dioxide	24-hour 10-minute	20 500

[a] PM10 = Particulate matter 10 micrometers or less in diameter
[b] PM2.5 = Particulate matter 2.5 micrometers or less in diameter
Source: Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)

Wastewater

"Industry-specific guidelines apply during the operations phase of projects and cover direct or indirect discharge of wastewater to the environment. They are also applicable to industrial discharges to sanitary (domestic) sewers that discharge to the environment without any treatment. Wastewater generated from project operations includes process wastewater, wastewater from utility operations, runoff from process and storage areas, and miscellaneous activities including wastewater from laboratories, and equipment maintenance shops. Projects with the potential to generate process wastewater, sanitary sewage, or storm water should incorporate the necessary precautions to avoid, minimize, and control adverse impacts to human health, safety or the environment. Industry-specific guidelines summarized hereinafter shall be applied by all projects, where applicable, to ensure that effluent emissions conform to good industry practice.

For project types where industry-specific guidelines are not set out in these Guidelines, the general guideline values shown in ***Table 3.6****, or as stipulated on a case-by-case basis, apply during project operations.*

In addition to general and industry-specific wastewater guidelines applicable during project operations, the guideline values shown in apply during the construction phase of projects, covering storm water or surface water, and sanitary wastewater discharges from all project sites.

Table 3.6 Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (General Application)

Parameter	Unit	Guideline Value

Parameter	Unit	Guideline Value
5-day Biochemical Oxygen Demand	mg/L	50
Ammonia	mg/L	10
Arsenic	mg/L	0.1
Cadmium	mg/L	0.1
Chemical Oxygen Demand	mg/L	250
Chlorine (total residual)	mg/L	0.2
Chromium (hexavalent)	mg/L	0.1
Chromium (total)	mg/L	0.5
Copper	mg/L	0.5
Cyanide (free)	mg/L	0.1
Cyanide (total)	mg/L	1
Fluoride	mg/L	20
Heavy metals (total)	mg/L	10
Iron	mg/L	3.5
Lead	mg/L	0.1
Mercury	mg/L	0.01
Nickel	mg/L	0.5
Oil and grease	mg/L	10
pH	S.U.[a]	6-9
Phenols	mg/L	0.5
Selenium	mg/L	0.1
Silver	mg/L	0.5
Sulphide	mg/L	1
Temperature Increase	°C	<3[b]
Total Coliform Bacteria	100 mL	400
Total Phosphorus	mg/L	2
Total Suspended Solids	mg/L	50
Zinc	mg/L	2

Source: Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)

Table 3.7 Site Runoff and Wastewater Discharges (Construction Phase)

Parameter	Unit	Maximum Concentration
Biological Oxygen Demand	mg/L	30
Chemical Oxygen Demand	mg/L	125
Oil and Grease	mg/L	10
pH	S.U.[a]	6-9
Total Coliform Bacteria	100 mL	400
Total Nitrogen	mg/L	10
Total Phosphorus	mg/L	20
Total Suspended Solids	mg/L	50

Source: Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)

Noise Levels

General noise guidelines are presented in ***Table 3.8***. Noise impacts should not exceed these levels, or result in a maximum increase in background levels of 3 dBA at the nearest receptor location off-site.

Table 3.8 General Noise Level Standards

Receptor	One Hour LAeq (dBA)	
	Daytime (07:00 – 22:00)	Nighttime (22:00 – 07:00)
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Source: Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines (2015)

Odor

"Point and diffuse source odors from industries should be minimized using available prevention and control techniques as described in the IFC EHS industry-specific guidelines. Point source activities are those that involve stack emissions of odor and which generally can be controlled using waste reduction, waste minimization and cleaner production principles or conventional emission control equipment. Diffuse source activities are generally dominated by area or volume source emissions of odor (e.g. intensive agricultural activities) and which can be more difficult to control. Projects should control odors to ensure that odors that are offensive or unacceptable to neighbors do not occur. Generally, odor levels should not exceed five to ten odorant units at the edge of populated areas in the vicinity of a project. Projects with multiple odorous point or diffuse releases, or emitting complex odors should conduct an odor impact assessment to determine ground-level maximum concentrations taking into account site-specific factors including proximity to populated areas."

3.4.1.2 Industry-Specific Standards for Water Supply

Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines specify the following guidelines in relation to "Potable Water Treatment Facilities":

"This guideline applies to the operation of centralized potable water treatment facilities sourcing water from rivers, lakes, reservoir or groundwater aquifer and treating through water purification. Water quality of potable water supply systems should meet applicable national drinking water standards. Sludge from water purification should be evaluated on a case-by-case basis to establish whether if constitutes a harmful or non-harmful waste and managed accordingly. Sludge from water treatment facilities can be dewatered and disposed of to a landfill."

3.4.2 Other Relevant Guidelines/Standards

As stated in ***Chapter 2***, the Project will treat the water from the reservoir to meet relevant international standards such as World Health Organisation (WHO) Guidelines for potable water and/ or the Thailand's Metropolitan Water Works Authority's drinking water standards with trace of chlorine residual. These standards are presented in full in ***Annex A.***

4 PROJECT DESCRIPTION AND ALTERNATIVES

4.1 INTRODUCTION

This Chapter presents an overview of the Project description as relevant for the understanding and implications of potential impacts on the environmental and socio-economic components of the Study Area. This Chapter also provides an analysis of alternatives to the Project in ***Section 4.8***.

4.2 PROJECT BACKGROUND

A Concession Agreement (CA) has been signed between the Project Proponent and Dawei Special Economic Zone Management Committee (DSEZMC) for the Initial Development Phase of DSEZ.

The Project Proponent is planning to develop the Project, which consists of a Water Treatment Plant (WTP), Raw Water Pumping Station (RWPS) and Raw Water Supply Pipeline (from RWPS to WTP), to provide water supply to the Initial Industrial Estate of the DSEZ.

The Project will utilise the raw water stored in Pa Yain Byu storage reservoir with the proposed total capacity of 162,000 m^3/day. The raw water will be treated to meet the relevant international standards such as World Health Organisation (WHO) Guidelines for potable water and/ or the Thailand's Metropolitan Water Works Authority's drinking water standards with trace of chlorine residual. The treated water will be distributed to the Initial Industrial Estate area via the transmission and distribution system. The detailed information of the transmission and distribution system can be found in the ESIA Study of the Initial Industrial Estate of DSEZ (prepared by other consultants[1]). However, it should be noted that the transmission and distribution system is outside the Scope of this IEE Study and therefore is not considered further.

4.3 PROJECT NEED

Myanmar Government's Implementation Plan for DSEZ development includes the development of the water supply facilities in order to support the growth of the industries within the Initial Industrial Estate of DSEZ. A sustainable and reliable water supply system is required as an essential component to the overall Initial Phase development of DSEZ.

The proposed Project will also minimise the potential fresh water shortage during the development of the Initial Industrial Estate and during the determination of additional water supply system for future expansion of DSEZ.

[1] MIEH, Environmental and Social Impact Assessment of Dawei SEZ Initial Industrial Estate Project, United Analyst and Engineering Consultant, December 2015.

4.4 PROJECT LOCATION

The Dawei Special Economic Zone (DSEZ) is located in the northern part of Maungmagan Bay, on the Andaman coastline, approximately 28 km northwest of the Provincial City of Dawei, Tanintharyi Region, Myanmar (as shown in ***Figure 4.1***).

The proposed Project is located adjacent to the Pa Yain Byu reservoir, approximately 1.5 km from the Initial Industrial Estate of DSEZ, as shown in ***Figure 4.2*** and ***Figure 4.3***.

The nearest village to the Project site is Wat Chaung Village located approximately 1.8 km west of the Project site and Khamaung Chaung Village located approximately 3.5 km northwest of the Project site.

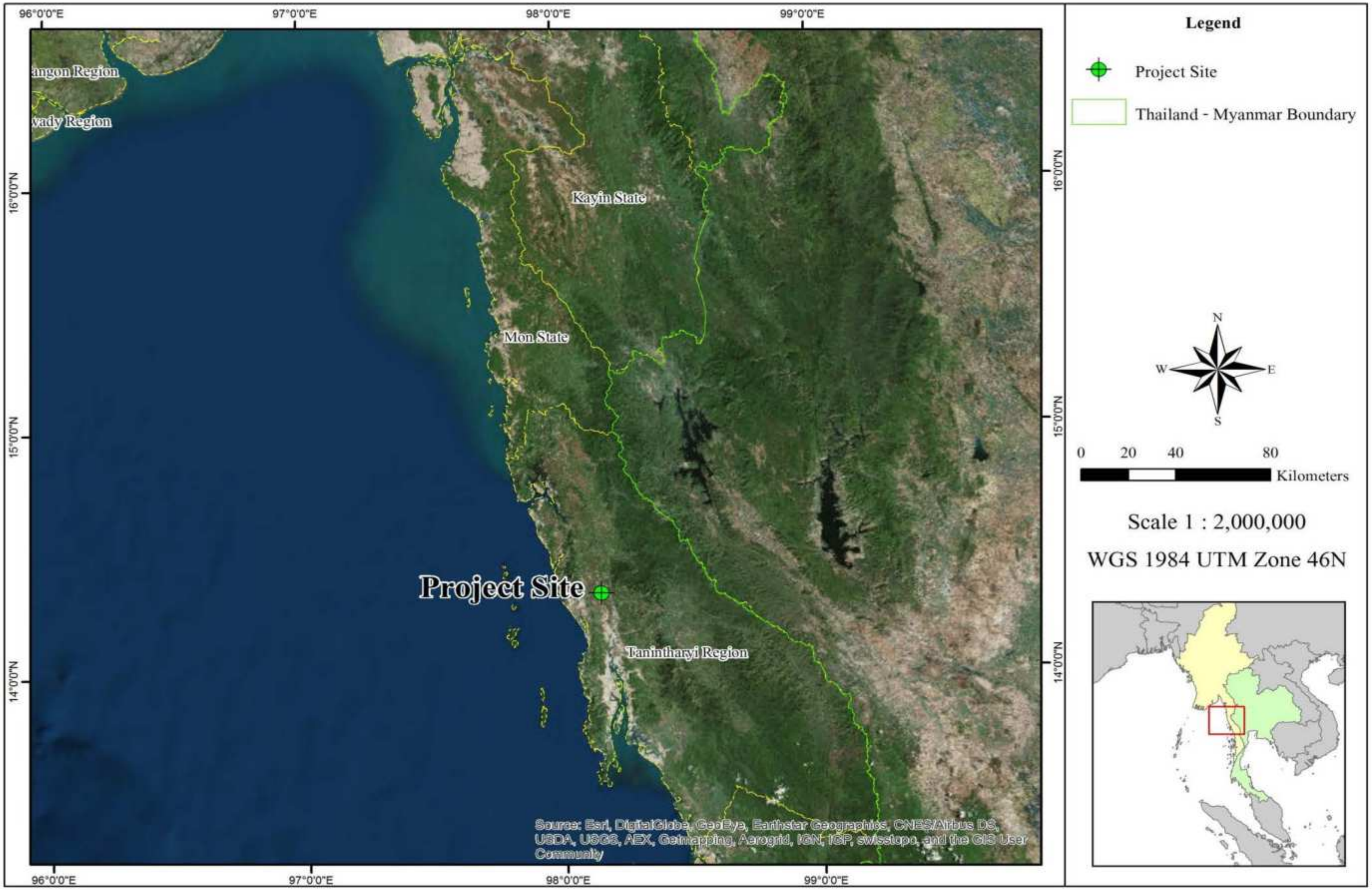
4.5 PROJECT STUDY AREA

The Project Study Area refers to the area that needs to be studied in order to adequately understand and describe the baseline conditions likely to be affected by the Project. At a minimum, the Project Study Area will encompass the Project Footprint and the Area of Influence (AoI), whereby the AoI includes the following:

- the primary Project site(s) and related facilities that the Project Proponent develops or controls;
- associated facilities that are not developed and funded as part of the Project but are essential for the Project and without which the Project cannot proceed;
- areas potentially affected by cumulative impacts resulting from other developments known at the time of the Impact Assessment (IA), further planned phases of the Project or any other existing circumstances; and
- areas potentially affected by impacts from predictable (but unplanned) developments as a result of the Project.

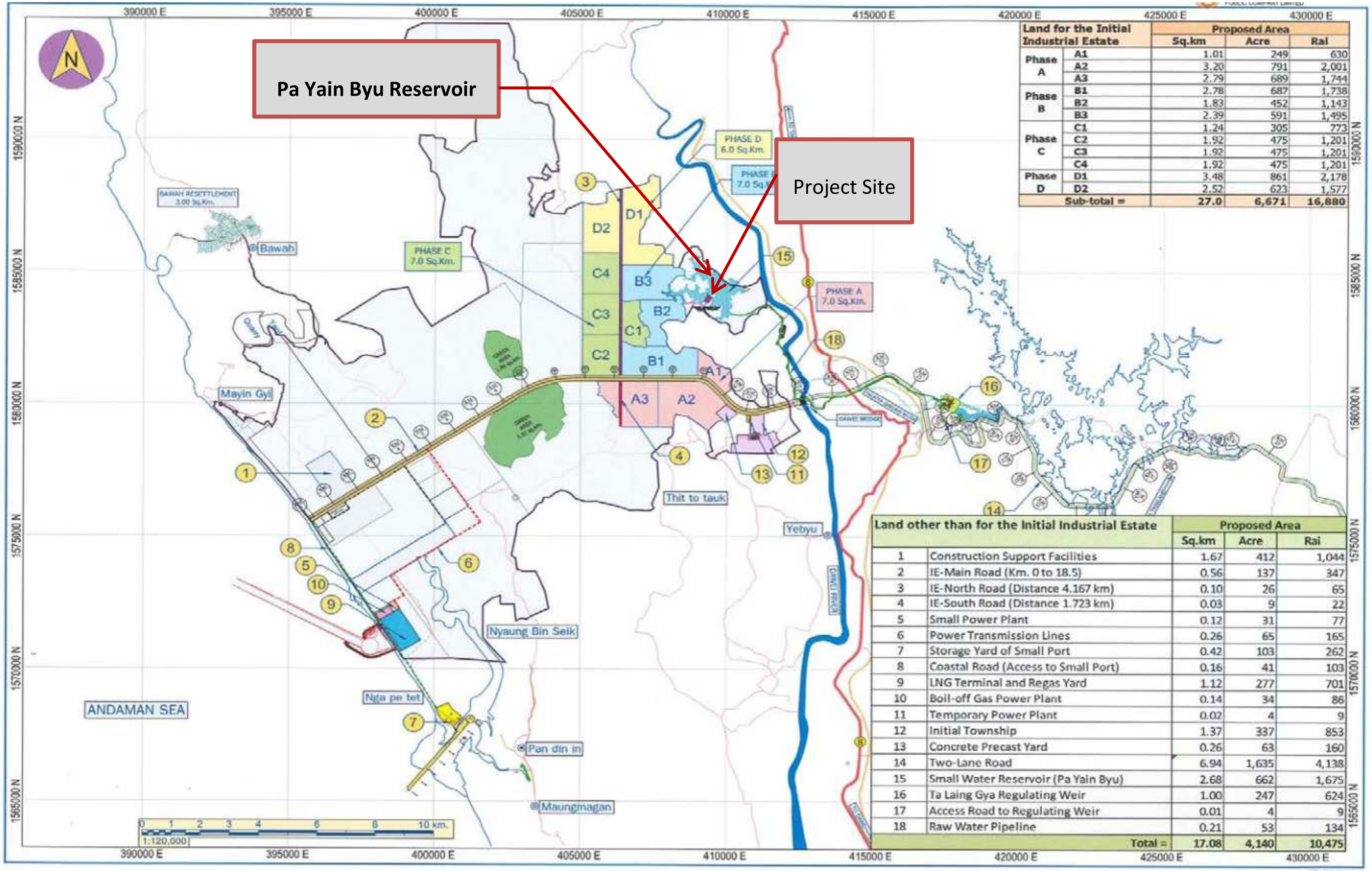
Based on the above, for this Project, the Project Study Area (see ***Figure 4.4***) comprises a 3 km radius of the Project site.

Figure 4.1 Location of DSEZ within Myanmar



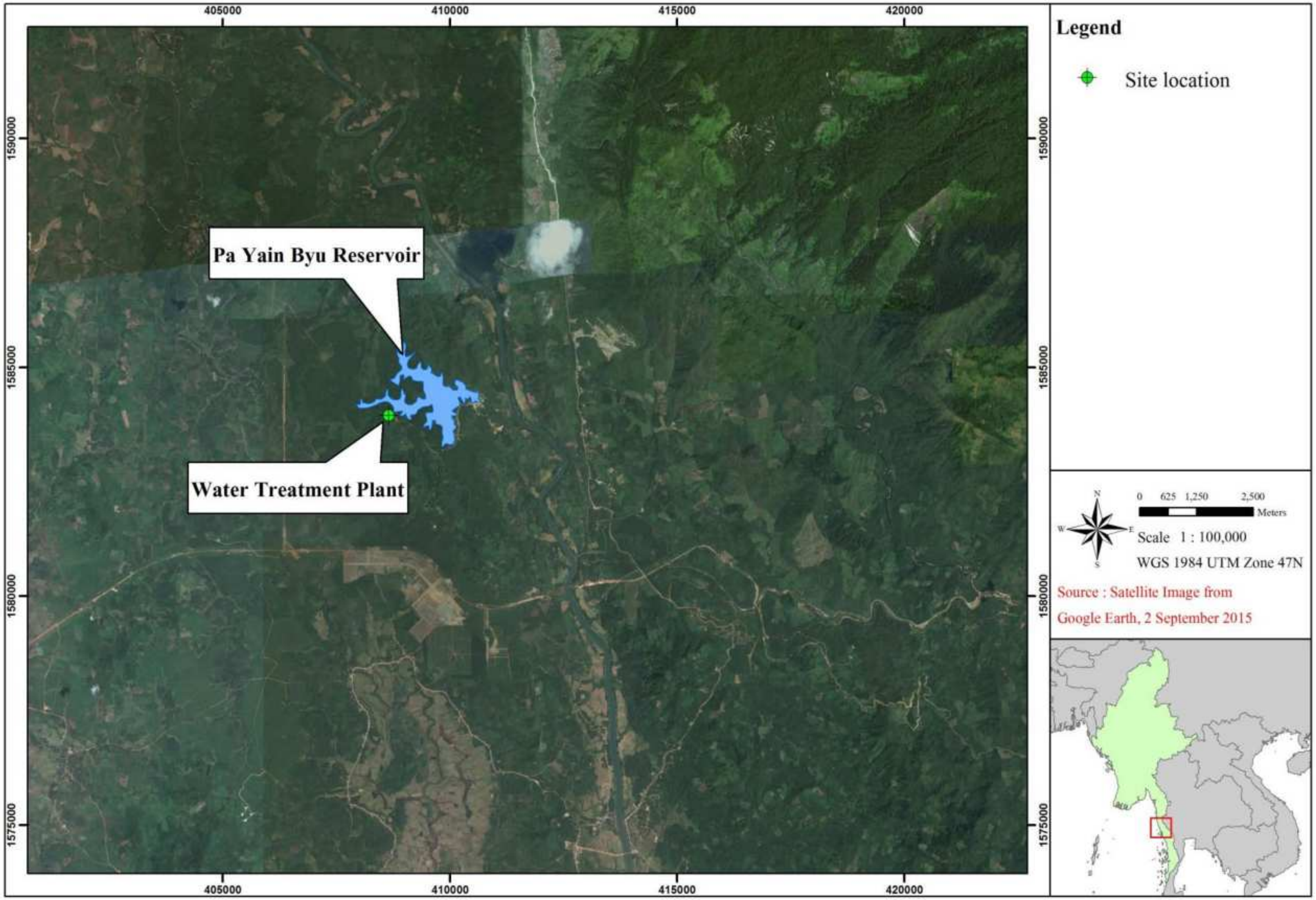
Source: ERM, 2016

Figure 4.2 Proposed Location of the Project in relation to DSEZ



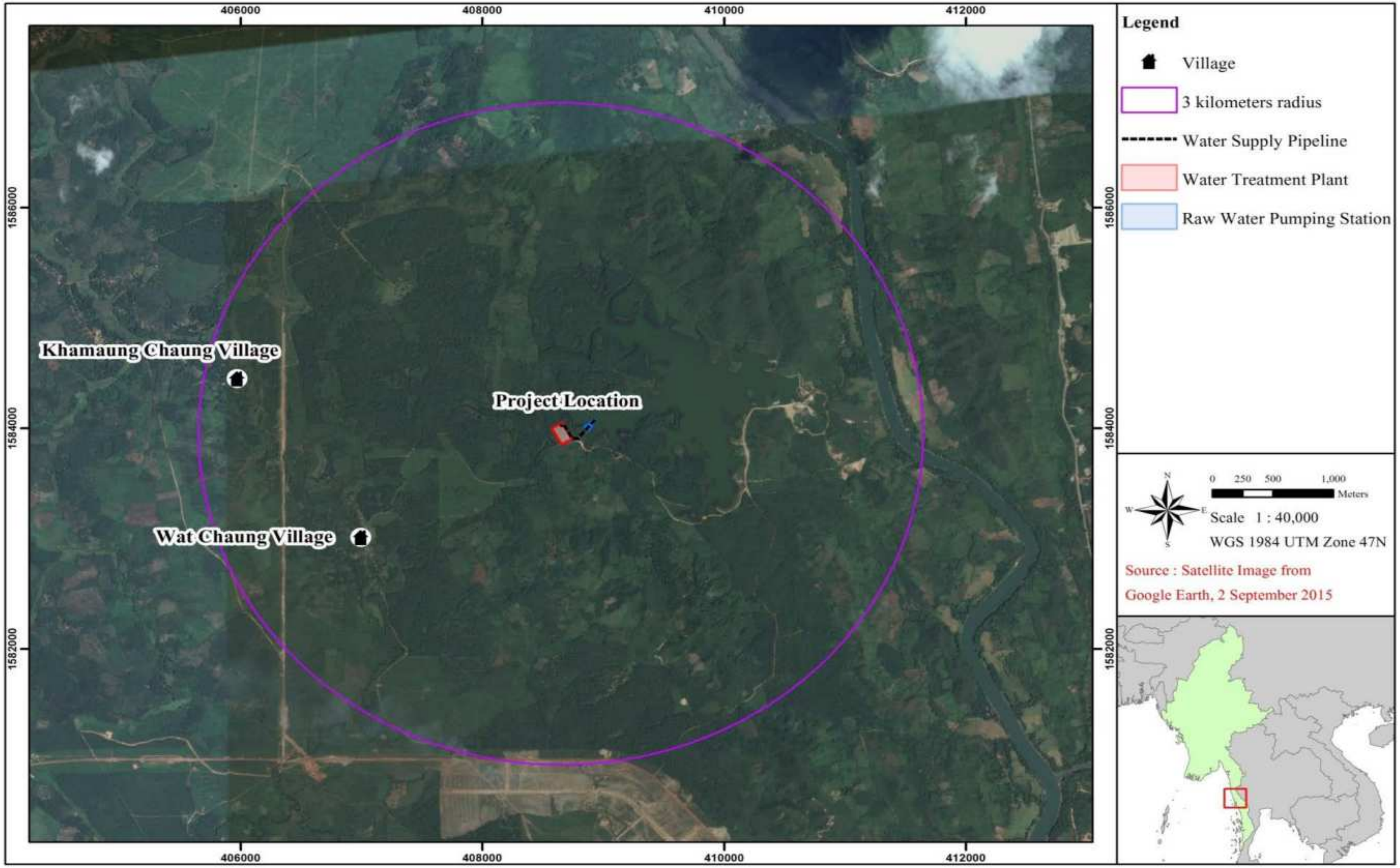
Source: MIEH, 2016 (modified by ERM)

Figure 4.3 Proposed Location of the Project



Source: ERM, 2016

Figure 4.4 Project Study Area



Source: ERM, 2016

4.6 PROJECT KEY COMPONENTS

The proposed Project will be developed in order to provide the water supply to the Initial Industrial Estate of DSEZ. The raw water will be drawn from Pa Yain Byu reservoir and will be treated to meet international standards such as those recommended by the World Health Organization (WHO) Guidelines for potable water and/or Thailand's Metropolitan Water Works Authority's drinking water standards with trace of chlorine residual. However, industrial water for specific industrial uses may require further advanced water treatment which will be under such individual industry responsibility.

The Project plans to provide the water supply to light and medium industries within the Initial Industrial Estate, during Phase A, B, C and D. The Project will comprise of the 8 phases as shown in ***Table 4.1***. The capacity of the WTP will be increased over the 8 phases, with a total proposed capacity of 162,000 m^3/ day by the completion of Phase 8 in 2024.

Table 4.1 WTP Treatment Plant Capacity

Initial Industrial Estate Phase	Phase A		Phase B		Phase C		Phase D		
Tentative Year (COD)	2018	2020	2020	2021	2021	2022	2023	2024	2025
The Project Phase	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8	-
Capacity (m^3/day)	18,000	18,000	18,000	18,000	18,000	18,000	36,000	18,000	-
Accumulated Capacity (m^3/day)	18,000	36,000	54,000	72,000	90,000	108,000	144,000	162,000	162,000
Ratio of Demand to Plant Capacity (%)	37.72	48.82	51.03	61.55	75.18	77.02	71.67	78.47	86.42

Source: MIEH, 2016

The Project consists of the following key components (see ***Figure 4.5*** for general layout plan):

- ***The Water Treatment Plant (WTP)*** which will consist of the following main components (see ***Figure 4.6***):
  - Flow Splitting Box/Tanks;
  - Clarifiers;
  - Collecting Tanks;
  - Single-Media Filters;
  - Sludge Basin and Waste Wash Water Basin;
  - Treated Water Storage Tank;
  - Chemical Dosing Pump and Facilities; and
  - Air Blower and Backwash Pump.

- ***Raw Water Pumping Station (RWPS)*** which will comprise of a ready-made floating pontoon on the Pa Yain Byu reservoir as a temporary pumping station for

Phase 1 of the Project (see ***Figure 4.7***). A permanent RWPS on the bank of Pa Yain Byu reservoir will be installed for Phases 2 to 8 of the Project (see ***Figure 4.8***).

- ***Water Supply Pipeline (from RWPS to WTP)*** will comprise of a temporary water supply pipeline for Phase 1 of the Project. The temporary water pipeline will connect from the temporary RWPS to the WTP by a floating pontoon (see ***Figure 4.7)***. A permanent water supply pipeline will be installed for Phases 2 to 8 which will be an underground pipeline to connect the permanent RWPS to the WTP. (see ***Figure 4.8***).

The details of Project key components and Process Flow Diagram are described in ***Section 4.7.2***.

It is anticipated that once the total water demand reaches 70% of the total plant capacity, the expansion of WTP will be developed, together with the alternative raw water supply system which includes the development of Ta Laing Gya Regulating Weir/ Dam and additional water supply pipeline from Ta Laing Gya Regulating Weir/ Dam to Pa Yain Byu reservoir.

Ta Laing Gya Regulating Weir/ Dam will be developed on the Ta Laing Gya River, located approximately 11 km south east of the Project site (see ***Figure 4.9***). The Ta Laing Gya Regulating Weir/ Dam will comprise of the following features:

- Dam Feature;
- Storage Pond;
- Spillway;
- Water Supply Pipeline from Ta Laing Gya Regulating Weir to Pa Yain Byu reservoir;
- Diversion Work;
- River Outlet; and
- Saddle Dike.

It is anticipated that the development of the Ta Laing Gya Regulating Weir/ Dam will be able to provide additional capacity to meet the total water demand of 162,000 m^3/day. It should be noted that the development of Ta Laing Gya Regulating Weir/ Dam and its features, including additional water supply pipeline, are not included within the scope of this IEE Study, and therefore will not be considered further in this IEE Study.

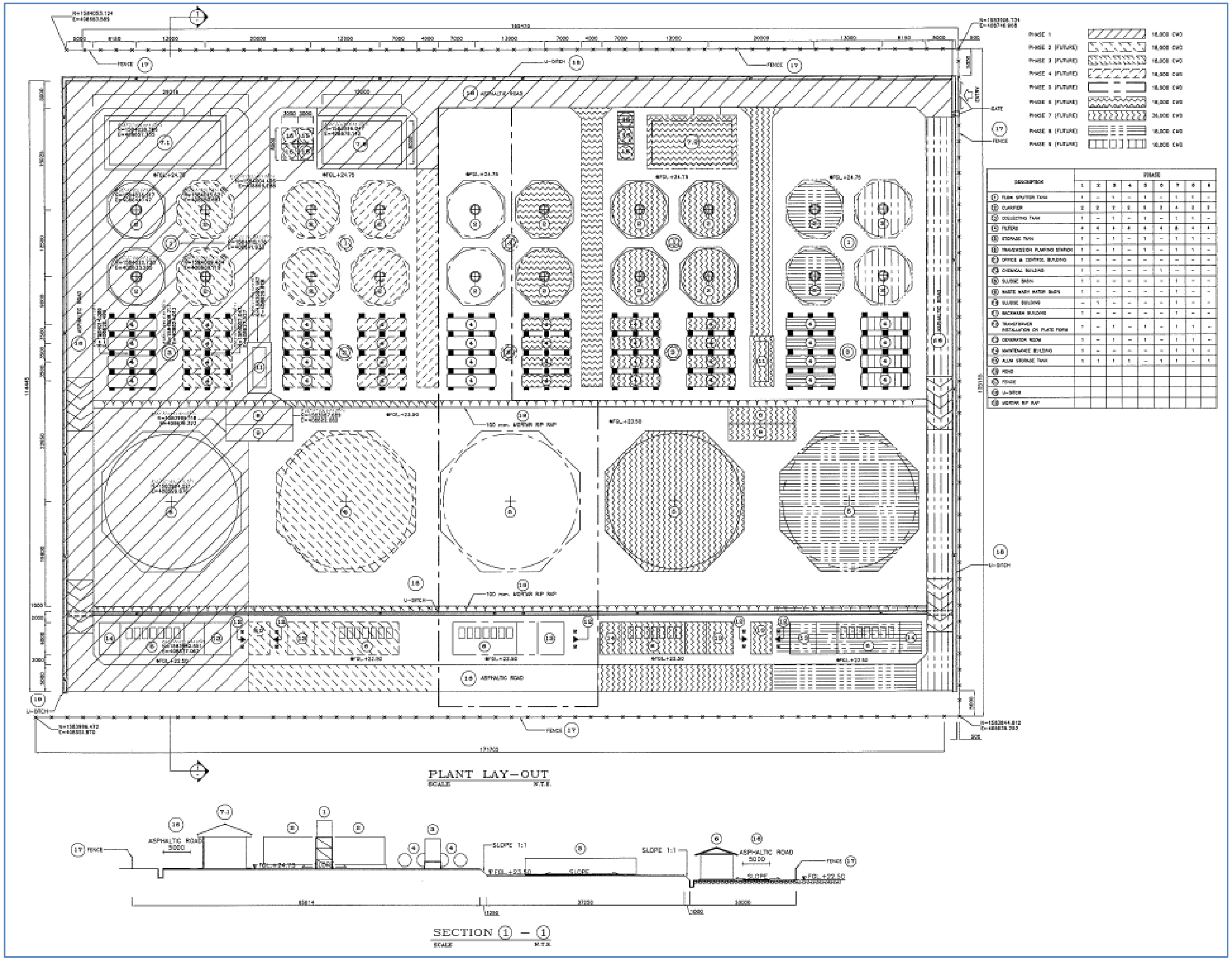
It is to be noted that the treated water will be distributed to the Initial Industrial Estate area via the treated water transmission and distribution pipeline system. The treated water transmission and distribution pipeline system (from WTP to the Initial Industrial Estate area) is not included in the IEE Study and therefore will not be considered further in this IEE Study.

It is understood that the treated water transmission and distribution system component is included in the Environmental and Social Impact Assessment (ESIA) Study of the Initial Industrial Estate (prepared by United Analyst and Engineering Consultants Co., Ltd).

Figure 4.5 General Layout Plan

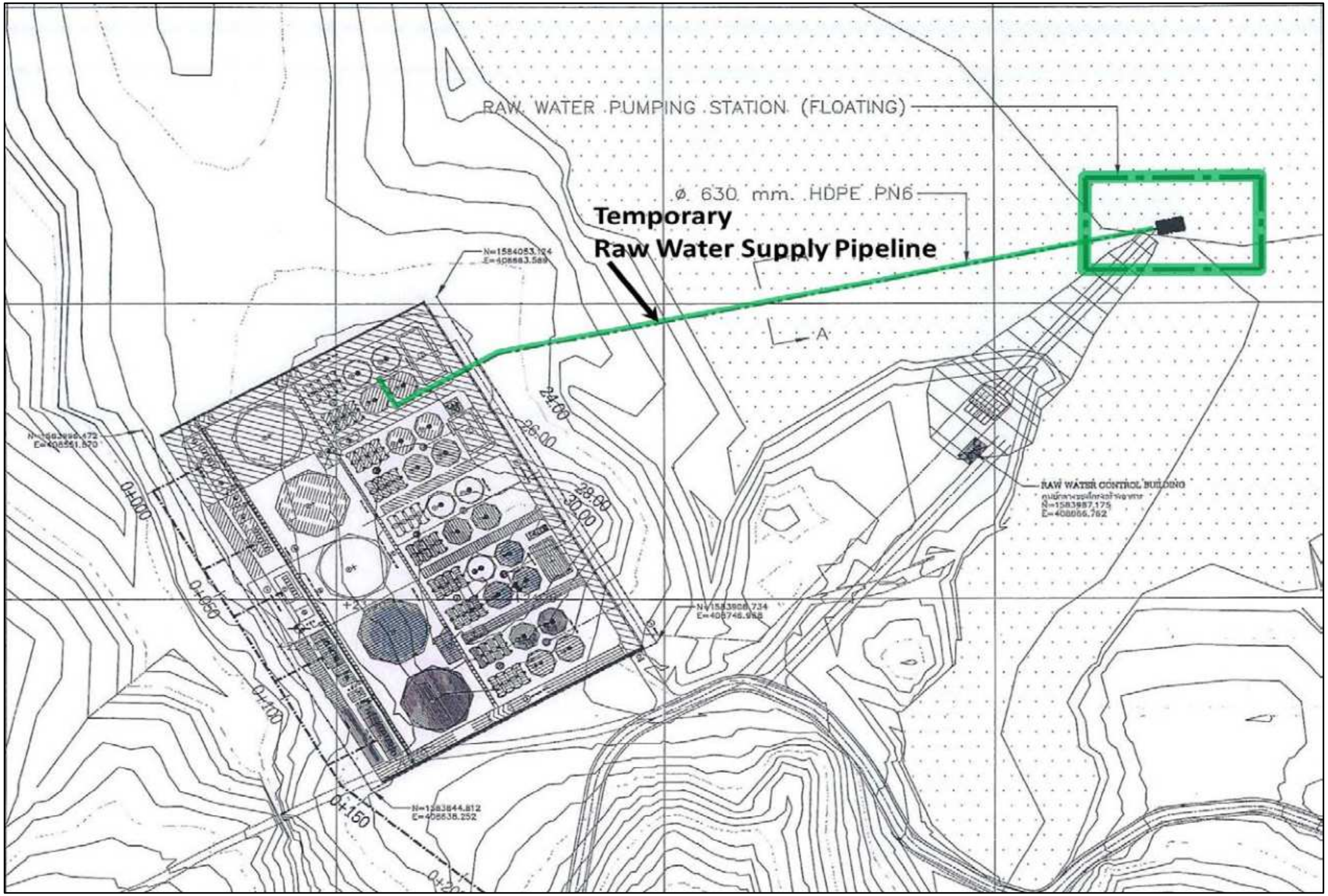
Source: MIEH, 2016

Figure 4.6 Water Treatment Plant Layout



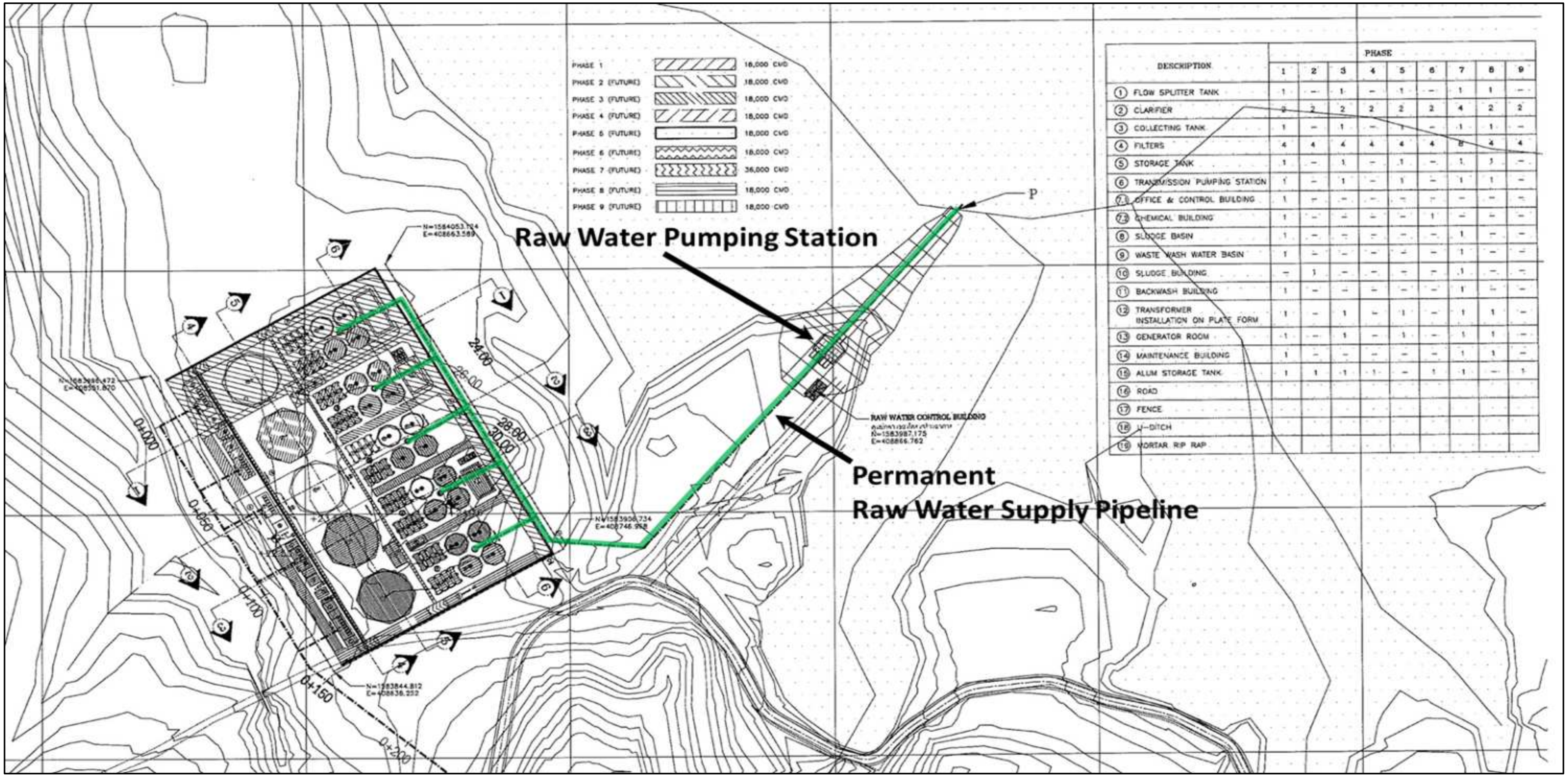
Source: MIEH, 2016

Figure 4.7 Temporary RWPS and Temporary Water Supply Pipeline for Phase 1



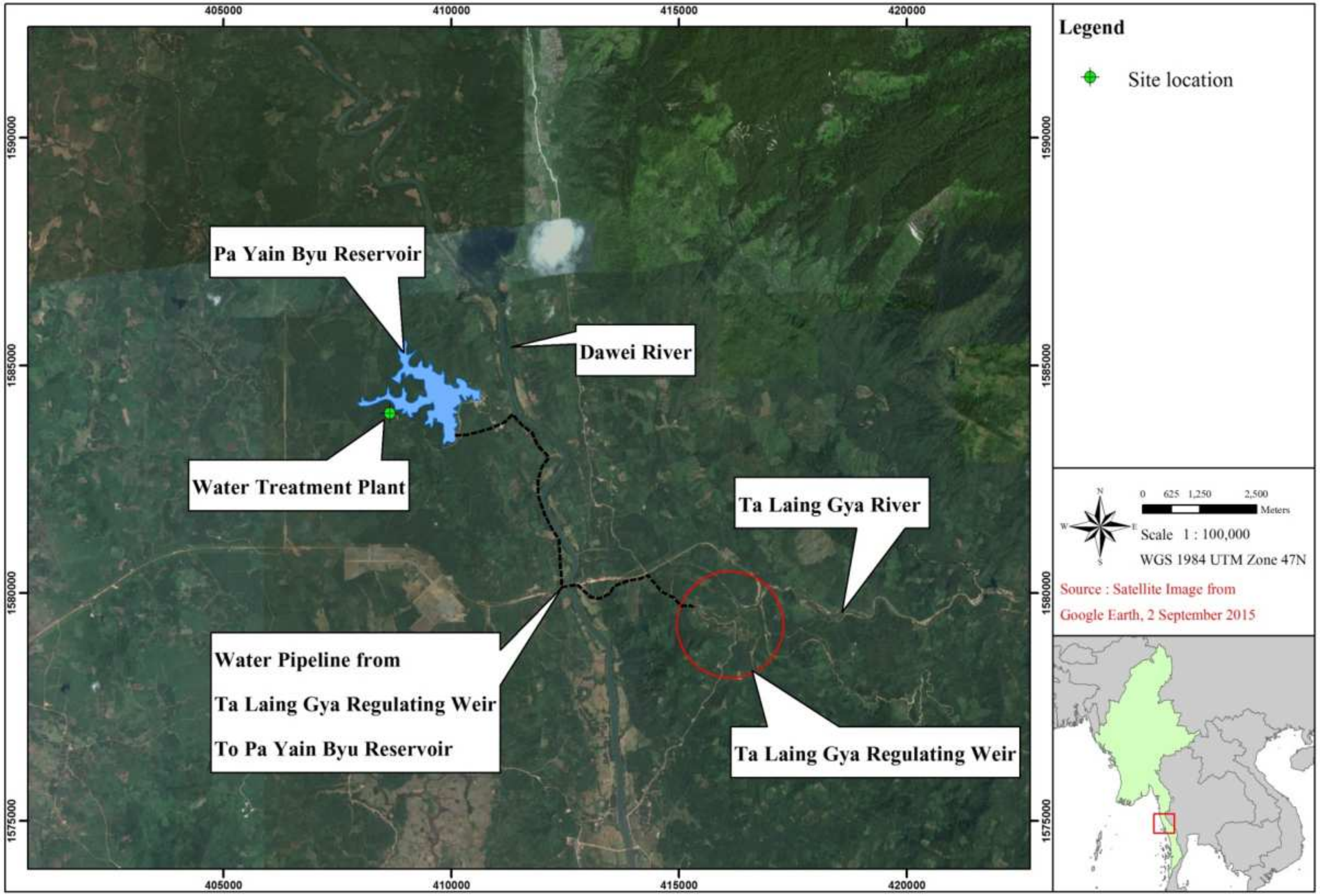
Source: MIEH, 2016 (modified by ERM)

__Figure 4.8   Permanent RWPS and Permanent Water Supply Pipeline for Phases 2 to 8__



Source: MIEH, 2016 (modified by ERM)

Figure 4.9 Proposed Location of Ta Laing Gya Regulating Weir/ Dam and its Feature



Source: ERM, 2016

4.7 PROJECT LIFE CYCLE OVERVIEW

Project life cycle analysis identifies the key issues and concerns that are likely to evolve over the entire lifespan of a project.

In the case of the proposed Project, these issues may arise during the construction, operation and maintenance, and decommissioning phases. These issues are considered in this IEE Study and will be discussed further during the IEE Study, prior to any irreversible actions being undertaken by the Project Proponent, the Contractors and other Project associates. The following sub-sections identify the key activities to be completed and facilities to be constructed and operated over the lifetime of the Project.

4.7.1 Construction Phase

Construction Activities

Construction activities for each phase of the Project will include: mobilisation, site preparation, civil works construction of all Project components, erection and installation of the required equipment, and commissioning. The indicative construction schedule is shown in ***Figure 4.13***.

The Engineering, Procurement and Construction (EPC) Contractor will be responsible for overall construction activities. All material, workmanship and testing shall be in accordance with the appropriate international specifications, standards and codes of practice.

The overall Project construction activities for each phase of the Project are described below.

Mobilisation

Site construction work will start once civil design of site preparation is finalised. All work will be conducted in accordance with the detailed master construction schedule, to be provided by the EPC Contractor. Prior to commencement of work, all Contractors will be required to provide detailed site specific plans related to:

- Equipment use;
- Excavation and backfilling management;
- Soil erosion management;
- Traffic management;
- Storm water pollution prevention plan;
- Dust prevention plan;
- Environmental and Social Management Plan;
- Waste Management Plan; and
- Plan drawings of laydown, traffic flow, parking, trash storage, and recycling areas.

Site Preparation

Site preparation, including site clearance activities, will be undertaken, and will include excavation of approximately 4,334 m^3 of earth in total for all phases of the

Project. It is anticipated that the excavated material will be collected and stored onsite for reuse in the development of the Initial Industrial Estate.

Appropriate dewatering equipment will be used to remove and dispose of all surface and ground water entering excavations and other parts of the work. The excavation areas will be kept dry and ground water level will be maintained at least 300 mm below the bottom of each excavation. Dewatering will continue until construction is no longer impacted by ground or surface water. The dewatering system will collect the water to be pumped or permitted to flow by gravity to discharge or storage areas.

Water Consumption

The source of water for construction activities and workers consumption will be the Pa Yain Byu reservoir. The water will be treated on site to the relevant drinking water standards for use as drinking water. The total estimated water consumption rate for construction activities is anticipated to be 35 m^3/day for each phase of the Project. In addition, the average consumption rate per worker is anticipated to be 200 litres/day for each phase of the Project.

Fuel and Electricity Consumption

During construction, approximately 220 litres of diesel fuel will be used onsite per day for each phase of the Project. The source of the diesel fuel will be the DSEZ Construction Support Site located approximately 12 km from the Project Site.

The fuel consumption of 220 litres/day can be broken down as follows:

- One (1) JCB – 40 litres/day;
- One (1) Crane – 40 litres/day;
- One (1) Water Truck – 20 litres/day;
- Two (2) Pickup Trucks – 20 litres/day;
- One (1) Service Truck – 20 litres/day;
- One (1) Generator – 40 litres /day; and
- Miscellaneous – 40 litres/day.

The source of electricity for the construction activities will be the diesel generator (50 KVA). The electricity consumption rate is anticipated to be 25 kW/day.

Wastewater

Wastewater will be generated from the toilet facilities and workers accommodation (sewage). Wastewater will also be generated from the canteen. The sewage generated onsite will be collected through underground pipes into a holding tank, from where the sewage will be routed to an onsite septic tank. It is anticipated the total domestic wastewater will be approximately 1,700 litres per day for each phase of the Project (10 litres per construction worker).

Solid Waste

The solid waste generated during construction will include steel pipes, steel plates, structural steel, wooden crates and domestic solid waste from the construction workers. In addition, there will also be biomass waste associated with the clearance of trees, shrubs and grass. The solid waste will be disposed of offsite once per week, potentially at the designated landfill within the Industrial Estate of DSEZ as shown in ***Figure 4.10.*** The designated landfill is located approximately 7.3 km from the Project site.

Hazardous Waste

Hazardous waste will be collected and initially stored on site, after which it will be transported to a transfer station. From the transfer station, it will be transported to waste treatment facilities in Thilawa Special Economic Zone in Yangon.

Access Road

The access road from the main dirt road is shown in ***Figure 4.10***. The length of the access road is 4 km and the width of the access road is 13 m.

Transportation of Construction Material and Workforce

The workers accommodation will be located at the main Dawei Workers Camp, located approximately 1.5 km from the Project site. The workers will be transported to site in vehciles that can accommodate 20 people.

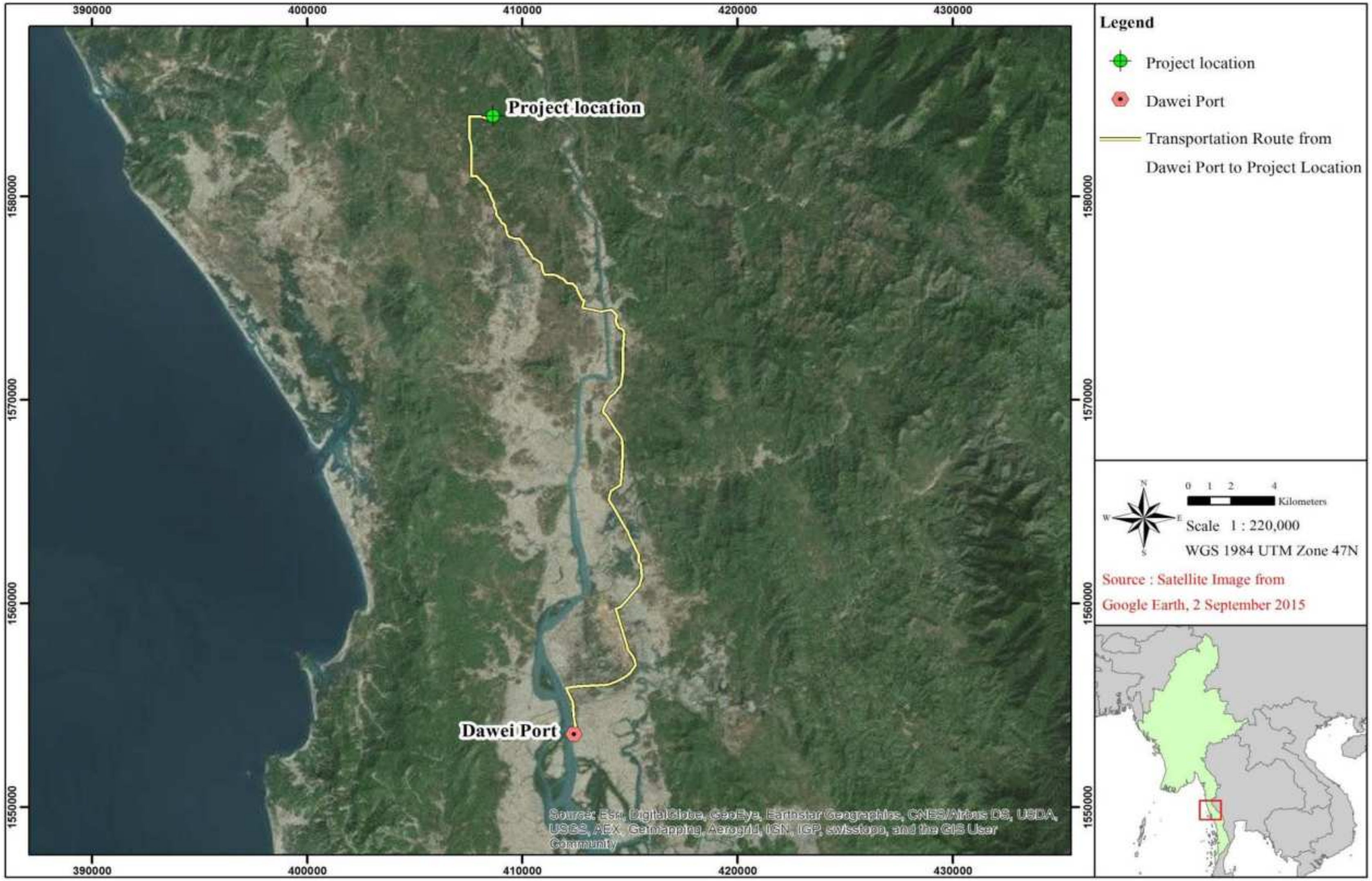
Heavy cargo will be transported by barge from Ranong Port, Thailand to the existing Dawei Port located in Dawei City. A total of 6 barges are anticpated during the construction phase. The inland transportation of the heavy cargo will start from Dawei Port to the Project site using a paved road to DSEZ and then the existing dirt road within the DSEZ area. With approval from the Transport Superintendent, the cargo will be transported to the Project site with necessary traffic escorts. The proposed transportation route is approximately 40 km and is shown in ***Figure 4.11***.

For other construction materials and workers residing in Thailand the proposed ground transportation route is from Baan Phu Nam Ron border in Kanchanaburi Province, Thailand to the Project site using two lane road link (currently under construction). Construction materials such as structure steel, piping, plant mechanical equipment, electrical and instrumentation equipment and other construction consumables will be used for this route approximately once per week during the construction phase. The ground transportation route is shown in ***Figure 4.12.***

Figure 4.10 Tentative Transportation Route for Solid Waste Disposal

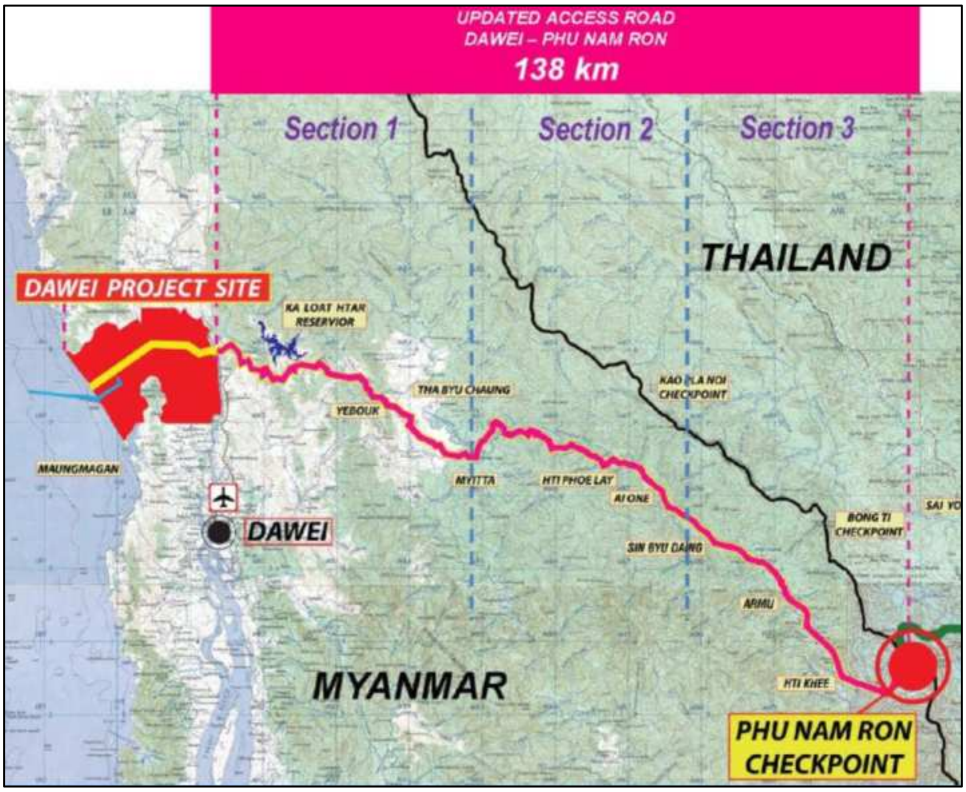
Source: ERM, 2016.

Figure 4.11 Tentative Transportation Route for Heavy Cargo from Dawei Port



Source: ERM, 2016.

Figure 4.12 Transportation Route from Baan Phu Nam Ron to DSEZ (and Project Site)



Source: MIEH, 2016

<u>Construction Workforce</u>

The total anticipated workforce during construction is 170 persons for each phase of the Project. The proposed working hours are 10 hours per day and 6 days per week.

The approximate ratio of local workers to non-local workers is 8 local workers for every 1 non-local worker.

<u>Commissioning</u>

After 75 to 80%, completion of the construction activities of Phase 1, priorities shall be shifted from the overall geographic area to that dictated by utilities and process completion. All major equipment will be installed, tested and commissioned under the supervision of the respective representatives.

<u>Construction Schedule</u>

Construction for Phase 1 is expected to start in the fourth quarter of 2017 and be completed within 10 months, with Phase 1 operation targeted in the fourth quarter of 2018. Other development phases will be planned in accordance with the increasing water demand due to the development of the Initial Industrial Estate as shown in ***Table 4.1***.

The indicative Project schedule is outlined in ***Figure 4.13***. Key dates to note for Phase 1 Construction are as follows:

Site Mobilisation and Temporary Facilities:	October 2017 to November 2017
Site Preparation Work:	October 2017 to December 2017
Civil Work:	October 2017 to May 2018
Testing & Commissioning:	July 2018 to September 2018
Tentative Commencement of Phase 1 Operation:	October 2018

Figure 4.13 Indicative Construction Schedule for Phase 1

	2017			2018									
Water Treatment Plant - Phase 1	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
Site Mobilisation & Temporary Facilities	■	■											
Site Preparation Work	■	■	■										
Civil Work													
Raw Water Pumps Intake	■	■	■	■									
Control House		■	■	■									
Flow Splitting Tank Foundation			■	■									
Clarifier Tank Foundation				■									
Collecting Tank Foundation				■									
Sand Filter Tank Foundation				■	■								
Clear Water Tank Foundation / Steel Tank				■	■								
Chemical House				■	■	■	■	■	■				
Generator House						■	■						
Backwash Pump House						■	■						
Sludge Sump & Wastewash Water Sump						■	■	■					
Sludge Dewatering Pump Building													
Maintenance Building						■	■						
Testing & Commissioning										■	■	■	
COD													■

Source: MIEH, 2016 (modified by ERM)

4.7.2 *Operation Phase*

Operation Activities

The Project will be owned and operated by the Project Proponent. The Operation & Maintenance (O&M) of the Project will be undertaken by the Project Proponent. O&M staff with relevant experience of operating similar plants and with adequate knowledge of comparable technology will be deployed prior to Phase 1 commercial operation date (COD) to commission and take over the Project from the EPC Contractor.

The below sections will discuss further the key activities during Operation Phase.

Project Key Components during Operation

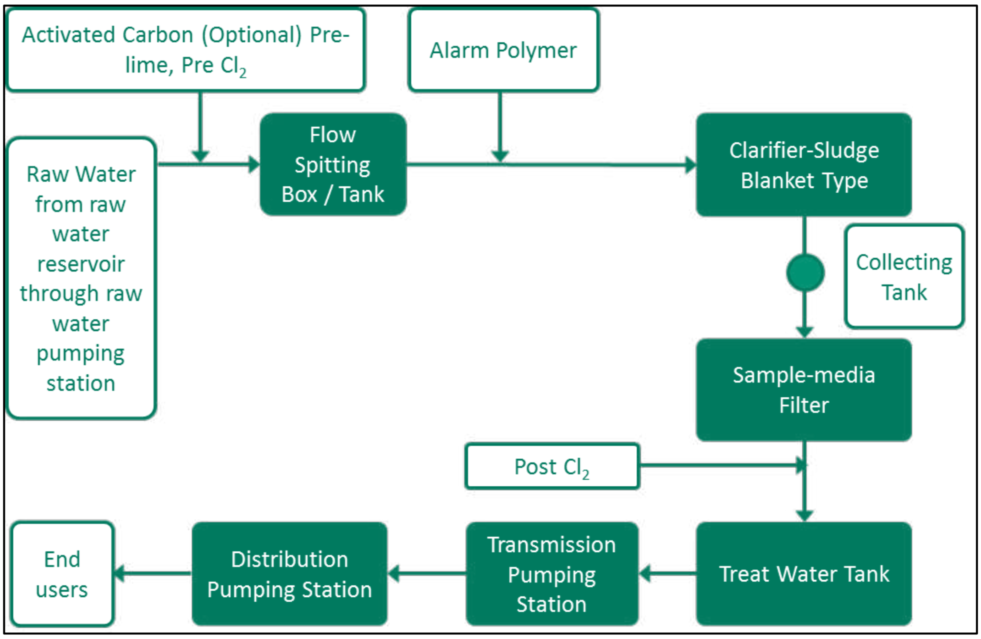
The key Project components during operation are described in ***Table 4.2***. In addition, the Process Flow Diagram is shown in ***Figure 4.14***.

Table 4.2 Key Project Components during Operation

Component	Description
Raw Water Pumping Station (RWPS)	RWPS at Pa Yain Byu reservoir. The RWPS will have a design flow average hourly rate of 765 m^3/hr for 24 hour production.
Water Supply Pipeline (Temporary for Phase 1)	630mm diameter pipeline will connect the temporary RWPS to the WTP, using floating pontoon, with total length of 295 m.
Water Supply Pipeline (Permanent for Phase 2-8)	630mm diameter underground pipeline will connect the permanent RWPS to the WTP, with total length of 480 m.
Pumping Station Control Building	Reinforced concrete structure building to house the electrical and control equipment.
Flow Splitting Tank	Flow splitting tanks to split flow equally between clarifiers hydraulically. The flow splitting tanks will have a capacity of 18,367 m^3/day.
Clarifier	Clarifiers to remove solid particulates from the raw water. The clarifiers will have a capacity of 383 m^3/hr.
Collecting Tank	Collecting tanks to collect all effluent from clarifiers before distributing equally to filter units. The collecting tanks will have a capacity of 18,367 m^3/day.
Filters	Filters to remove particulates and suspensions. The filters will have a capacity of 187.5 m^3/hr.
Chemical System	The chemicals used in the chemical system comprises of alum, lime/caustic soda, polymer, chlorine (Cl_2) and powdered activated carbon (PAC). The chemical system will have a design rate of 18,000 m^3/day.
Waste Wash Water Basin	Waste wash water basin to store the waste wash water from filters and supernatant water from the sludge dewatering machine. The waste wash water basin will have a design capacity of 18,000 m^3/day. Waste wash water will be recycled and mixed with raw water resulting in zero discharge.
Sludge Basin	The sludge basin will store the sludge extracted from the clarifiers before delivery to the sludge dewatering machine.
Sludge Dewatering	Sludge dewatering will be undertaken by mechanical means using belt filter press with gravity belt filter press thickener (GBT) of alum sludge.
Treated Water Tanks	Treated water tanks to store treated water prior to transfer to the distribution pumping station (DPS). The treated water tank will have an minimum total capacity of 750m^3.

Source: MIEH, 2016

Figure 4.14 ***Process Flow Diagram of Water Treatment Process)***



Source: MIEH, 2016

The treated water to be sent to the transmission and distribution pumping stations will be in accordance with the following specification:

- After clarification, turbidity <10 NTU; and
- Treated water will meet the Thailand and International Standards for industrial use and human consumption as shown in ***Annex A***.

<u>Water Consumption</u>

During operation, the raw water requirements for each phase are as shown in ***Table 4.3.***

Table 4.3 ***Raw Water Requirements during Operation***

Parameter	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
Accumulated Capacity (m^3/day)	18,367	36,735	55,102	73,469	91,837	110,204	146,939	165,306
Raw Requirement Each Phase (m^3/day)	18,367	18,367	18,367	18,367	18,367	18,367	36,735	18,367

<u>Hazardous Substances</u>

During operation, the hazardous substances are those associated with the chemicals system of the water treatment process. Each of the chemicals has its own dedicated system as described below:

- **Alum System:** A liquid alum (8% AlO_3, by weight) (1.35 kg/l) will be used for the purpose of coagulation. The alum will be stored in onsite vertical tanks.

- **Polymer System:** A dry anionic polymer will be used for the purposes of a flocculant aid. The polymer will be stored in a dry bulk bag of appropriate size (25 to 50 kg/bag).
- **Chlorine System:** Either liquid chlorine or chlorine will be used for the purpose of oxidation (pre-chlorine) and disinfection (post-chlorine). The maximum dosing rate for pre-chlorination will be 8 g/m^3 and the maximum dosing rate for post-chlorination will be 4 g/m^3. The liquid chlorine will be stored in bulks solution tanks and the chlorine gas will be stored in chlorine gas tanks.
- **Lime or Caustic Soda System:** Lime or caustic soda will be used for pH adjustment / alkalinity addition. Lime will be stored in a dry bulk bag of appropriate size (25 to 50 kg/bag) on wood/plastic pellets. Caustic soda will be stored in bulk tanks.
- **Powdered Activated Carbon (PAC) System:** The PAC system is an optional system that may be established for the Project for taste, odour and colour reduction of the treated water.

<u>Solid Waste</u>

The solid waste generated during the operation phase will predominately comprise of the sludge from the water treatment process. It is anticipated that approximately 828 kg/day of sludge will be generated, which will be treated in the sludge dewatering system. The treated sludge (sludge cake) will be used for earth work within the Industrial Estate of the DSEZ.

In addition, there will be domestic solid waste, which will be collected and segregated for recyclable and non-recyclable waste (i.e. paper, plastic). Solid waste will be disposed of once per week to a future landfill within the Industrial Estate of the DSEZ.

<u>Hazardous Waste</u>

Hazardous waste will be collected and initially stored on site, after which it will be transported to a transfer station. From the transfer station, it will be transported to waste treatment facilities in Thilawa Special Economic Zone in Yangon.

<u>Transportation of Operational Material and Workforce</u>

It is anticipated that the workers accommodation will be located at the Initial Township area, approximately 2 km from the Project site. The construction workers will be transported by car/truck to the Project site.

For other operational materials the proposed ground transportation route is from Phu Nam Ron border, Thailand to the Project site using two lane road link (currently under construction). There will be approximately 3 trips per month during the operation phase.

<u>Operational Workforce</u>

The anticipated workforce during operation will range from 37 workers during Phase 1 to 68 workers in Phase 8. The workers accommodation will be located within the Dawei Township.

In total, there will be 3 shifts per day and the workers will work 8 hours per shift. The operational phase will require 80% skilled labour and 20% non-skilled labour. In accordance with Myanmar law[1], at least 25% of the workers will be Myanmanr nationals during the the first 2 years of operation. In addition, during years 2 to 4 of operation at least 50% of the workers will be Myanmar nationals and after 5 years of operation a minmum of 75% will be Myanmar nationals.

The total number of operational workers (skilled and non-skilled) required for each phase of the Project are shown in ***Table 4.4***.

Table 4.4 Operational Workforce Requirements for Each Phase

	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5	Phase 6	Phase 7	Phase 8
Number of Workers	37	39	61	65	66	68	68	68

Operation Schedule

The targeted commencement of Phase 1 operation is anticipated for the fourth quarter of 2018.

4.7.3 Decommissioning

The Project will be decommissioned according to the requirements of the authorities and industry best practices at that time .

4.8 Project Alternatives

4.8.1 Location

No alternatives to the Project site location have been considered. The location of the Project at the Pa Yain Byu reservoir has been selected due to the reservoir proximity to the Initial Industrial Estate of DSEZ and the reservoir capacity to supply the water required for treatment in the WTP. There are also limited ground water resources in the Project area therefore the Project needs to be located close to sufficient surface water.

4.8.2 Technology

A description of the WTP technology is presented in ***Section 4.7.2.*** There are no practical alternatives to the main technology, however there are alternatives to the chemicals that could be used in the pre-oxidation process. Chlorine or ozone can be used for pre-oxidation; chlorine has been selected as it is the most commercially used, resulting in lowest investment, maintenance and operating costs compared with the use of ozone.

[1] The new foreign investment law of 2012.

4.8.3 *No Project Option*

The Project is required to provide a sustainable and reliable water supply to the Initial Industrial Estate of DSEZ. There is no feasible no-project option if this Project aim is to be achieved.

5 DESCRIPTION OF THE SURROUNDING ENVIRONMENT

5.1 INTRODUCTION

The baseline conditions within the Project Study Area have been characterised based on the consideration of secondary data from published sources as well as primary data collected in order to fill data gaps. This Chapter of the report is organised by resource/receptor, with an initial discussion of the findings of the desktop review followed by an identification of key data gaps, the methods used to fill them and the findings of the primary data gathering exercises.

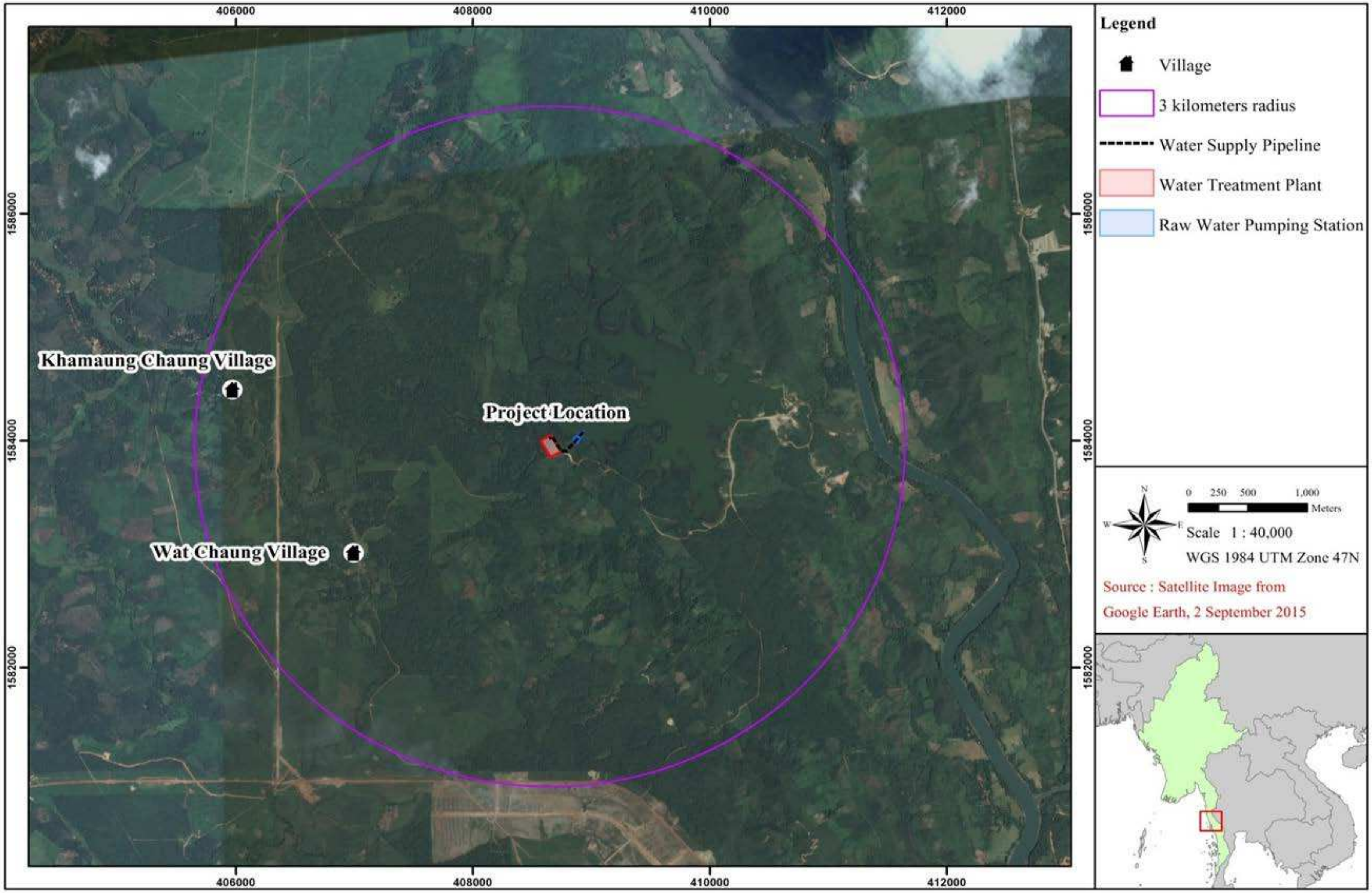
5.2 SETTING THE STUDY LIMITS

The Project Study Area refers to the area that needs to be studied in order to adequately understand and describe the baseline conditions likely to be affected by the Project. At a minimum, the Study Area will encompass the Project Footprint and the Area of Influence (AoI), whereby the AoI includes the following:

- the primary Project site(s) and related facilities that the Project Proponent develops or controls;
- associated facilities that are not developed and funded as part of the Project but are essential for the Project and without which the Project cannot proceed;
- areas potentially affected by cumulative impacts resulting from other developments known at the time of the IA, further planned phases of the Project or any other existing circumstances; and
- areas potentially affected by impacts from predictable (but unplanned) developments as a result of the Project.

Based on the above, the Project Study Area (see ***Figure 5.1***) comprises a 3 km radius of the Project site as described in ***Chapter 4*** Project Description and Alternatives.

Figure 5.1 Project Study Area



Source: ERM, 2016

5.3 METHODOLOGY FOR DATA COLLECTION AND ANALYSIS

5.3.1 Secondary Data

Secondary data sources for information on environmental, social and health baseline conditions in this report include the following:

- Collection of available data from existing sources including:
  - Government agencies;
  - Research and academic organizations;
  - Published sources;
  - External stakeholders and the public; and
  - Local experts.
- Review of aerial photographs and satellite imagery;
- Previous IEE/EIA/ESHIA reports carried out near the Project, as follows:
  - Initial Environmental Examination on Pa Yain Byu Reservoir for the Small Reservoir Project in Dawei District, the Republic of the Union of Myanmar Phisut Technology Co., Ltd. 2015; and
  - Environmental and Social Impact Assessment of Dawei SEZ Initial Industrial Estate Project, Prepared for Myandawei Industrial Estate Company Limited, Prepared by United Analyst and Engineering Consultant Co., Ltd. (UAE), December 2015.

Sources of information are cited as appropriate in the text, and included in the References section of this report.

5.3.2 Primary Data (Baseline Field Surveys)

Sustainable Environment Myanmar Co., Ltd. (SEM) and ERM undertook baseline field surveys in order to gather additional baseline data for this Project. A summary of the surveys conducted is shown in ***Table 5.1***, and the sampling locations are shown in ***Figure 5.2***. Photographs of the surveys are shown in ***Figure 5.3*** to ***Figure 5.7***. Additional details on the sampling and analysis methodology for the baseline field surveys can be found in ***Annex B***.

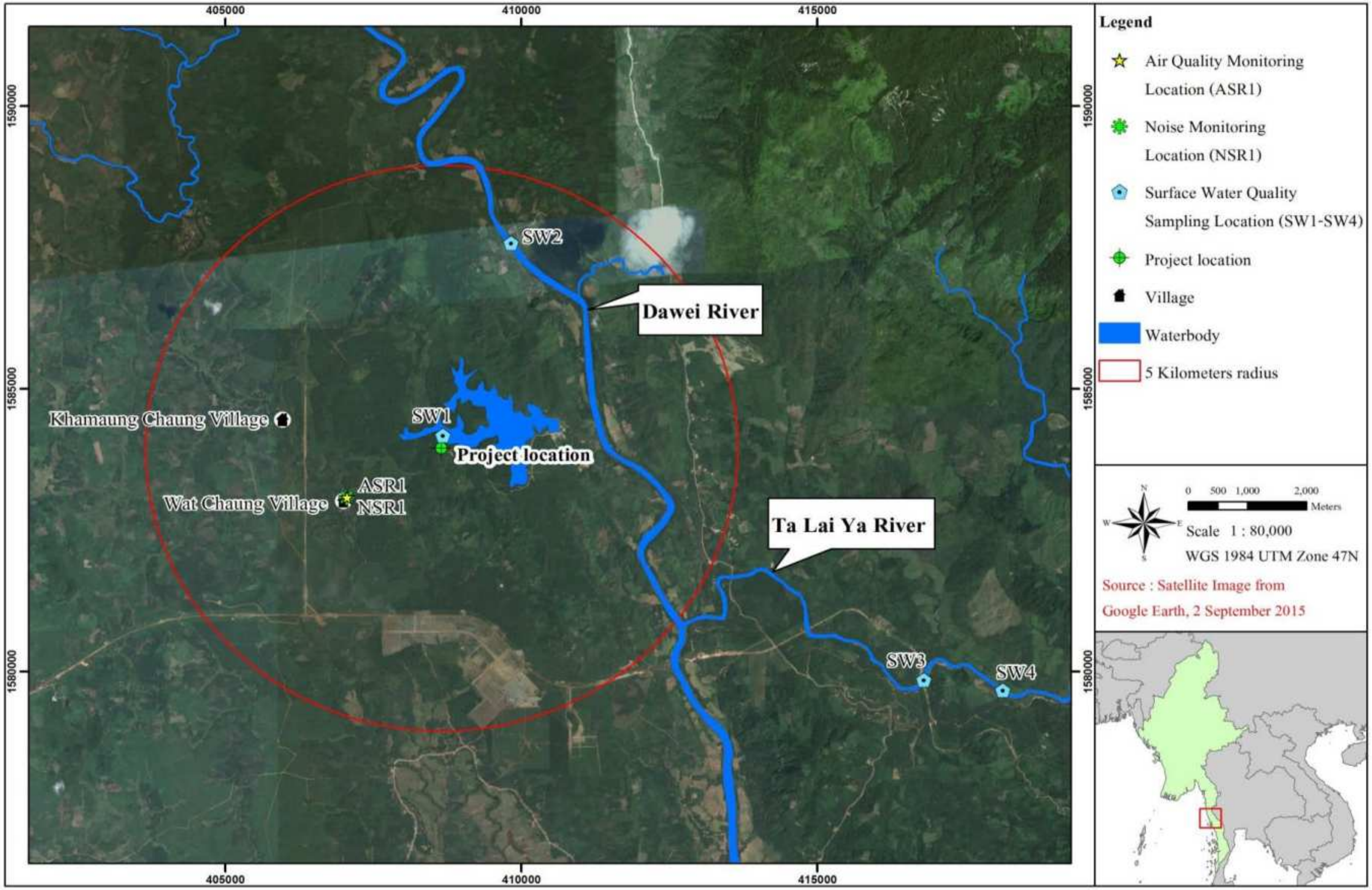
Table 5.1 Summary of Baseline Field Surveys

Aspect	Summary of Details	
Environmental Aspects		
Air Quality & Meteorology	Survey Date	26^{th} – 29^{th} January, 2016
	Parameters Measured	1) Nitrogen dioxide (NO_2) 2) Carbon monoxide (CO) 3) Particulate Matter less than 10 microns (PM10) 4) Particulate Matter less than 2.5 microns (PM2.5) 5) Sulphur Dioxide (SO_2) 6) Wind Speed 7) Wind Direction
	Sampling Period and Number of Samples	One location, one time within three days.
	Location	Near residential area. Wat Chaung Village, Yebyu Township, Tanintharyi Region.
Noise Level	Survey Date	26^{th} – 28^{th} January, 2016
	Parameters Measured	LAeq (A-weighted loudness equivalent)
	Sampling Period and Number of Samples	One location, one time within two days. Noise monitored for LAeq 1 hour (dBA) for required period of 48 hours. Monitoring also continued for an additional 24 hours.
	Location	Near residential area. On the playground, Wat Chaung Village, Yebyu Township, Tanintharyi Region.
Surface Water Quality	Survey Date	28^{th} January, 2016
	Parameters Measured	1) pH 2) Odour 3) Colour 4) Temperature 5) DO 6) Turbidity 7) Flow measurement 8) Total hardness 9) Alkalinity 10) BOD 11) COD 12) TOC 13) TSS 14) Turbidity 15) EC 16) Oil & Grease 17) Total Coliform Bacteria
	Sampling Period and Number of Samples	One time at 4 locations
	Location	Pa Yain Byu Reservoir, Dawei River, and stream (see ***Figure 5.2***)
Biodiversity	Survey Date	26^{th} – 28^{th} January, 2016
	Parameters Measured	Survey was conducted for the following: • Habitat Identification • Direct Observation • Questionnaire Result • Market Survey
	Location, Sampling Period and Number of Samples	Survey was conducted continuously within the Project Study Area (3 km radius of Project site).

<table>
<tr><th>Aspect</th><th colspan="2">Summary of Details</th></tr>
<tr><td colspan="3">Social Aspects</td></tr>
<tr><td rowspan="3">Socio-Economic Survey</td><td>Survey Date</td><td>26th – 29th January, 2016</td></tr>
<tr><td>Parameters Measured</td><td>Key informant interviews with village leaders. Interviews were undertaken to better understand the profile of the population of each village (e.g. population size, leadership structure, ethnicity, religion, sources of income);
In-depth Interview/ Focus groups with key groups within each village. Focus groups were conducted in each village with representatives from the following groups - women, youth, healthcare providers and those involved in utilising ecosystem services and cultural heritage. The types of information gathered included economic activities (e.g. industries of employment, income levels), provision of community infrastructure and services (e.g. access to education, water and sanitation services and healthcare, transportation), and health issues/ concerns; and
Household surveys. A total of 59 household surveys were completed to better understand the demographic profile of the villages. To the extent possible, 10% of each village was surveyed. The focus was on gathering information on economic activities, land uses, access to community services and key challenges within each village.</td></tr>
<tr><td>Location, Sampling Period and Number of Samples</td><td><table><tr><th>Villages</th><th>Total Households</th><th>Sample</th></tr><tr><td>Wat Chaung Village</td><td>116</td><td>12</td></tr><tr><td>Khamaung Chaung Village</td><td>471</td><td>47</td></tr><tr><td>Total</td><td>587</td><td>59</td></tr></table></td></tr>
<tr><td rowspan="3">Cultural Heritage Survey</td><td>Survey Date</td><td>26th – 27th January, 2016</td></tr>
<tr><td>Parameters Measured</td><td>Survey was taken for:
Direct Observation
Questionnaire Result
Cultural Heritage Site Identification</td></tr>
<tr><td>Location, Sampling Period and Number of Samples</td><td>Survey was conducted continuously within the Project Study Area (3 km radius of Project site).</td></tr>
</table>

Source: SEM Survey Team, 2016

Figure 5.2 Sampling Locations for Environmental Baseline Field Surveys



Source: ERM, 2016

Figure 5.3 Air and Noise Baseline Field Survey

Source: ERM Field Survey 2016

Figure 5.4 Surface Water Baseline Field Survey

Source: ERM Field Survey 2016

Figure 5.5 Socio-Economic Baseline Field Survey

Source: ERM Field Survey 2016

Figure 5.6 Cultural Heritage Baseline Field Survey

Source: ERM Field Survey 2016

Figure 5.7 Biodiversity Baseline Field Survey

Source: ERM Field Survey 2016

5.4 PHYSICAL COMPONENTS

5.4.1 Topography and Landscape

The Project site is located in the Dawei Special Economic Zone (DSEZ) in Tanintharyi Region of southern Myanmar. Within Tanintharyi Region, mountains approaching 914 m (3,000 feet) in height run from north-west to south-east. Some of the mountain ranges run into the sea and rise again as islands along the coast. Long and narrow plains can be found along the rivers and the coastal areas[1].

The Project Site is primarily located on alluvial soil, red brown forest soil, and granite. The bedrock, consisting of banded granite and sandstone and large pebbly sandstones, is well exposed along both banks of the Ta Laing Gya River. The topsoil is mainly composed of silty soil, with thickness 1 m or less, and containing organic materials[2].

5.4.2 Climate and Meteorology

Information presented in this section has been collected through a combination of publically available data supplemented by meteorological monitoring that has been undertaken by ERM as part of the baseline monitoring programme. Meteorology data collected during the baseline survey included wind speed and wind direction. Baseline meteorological sampling was undertaken in parallel with the ambient air

[1] http://www.modins.net/myanmarinfo/state_division/taninthayi.htm

[2] Phisut Technology Co., Ltd. 2015. Initial Environmental Examination on Pa Yain Byu Reservoir for the Small Reservoir Project in Dawei District, the Republic of the Union of Myanmar.

quality monitoring near residential area; Wat Chaung Village, Yebyu Township, Tanintharyi Region described in ***Section 5.4.3.1***.

5.4.2.1 Myanmar Climatic Conditions

Most of Myanmar belongs to the tropical region. The climate of Myanmar is roughly divided into three (3) seasons: Summer, Rainy Season, and Winter Season. Summer months are from March to Mid-May; the rainy season is from Mid-May to the end of October and the Winter Season starts in November up to the end of February. Due to widely differing topography of the country, Myanmar's climate conditions also differ widely from one location to another[1]. March and April are the hottest months with the average highest temperature in Central Myanmar generally above 43°C (109.4°F) while temperature in Northern Myanmar is approximately 36°C (96.8°F). The coldest month is January, with the average temperature varies from 11°C (51.8°F) to 23°C (73.4°F) in the winter season. The mean relative humidity ranges between 58 and 79%.

The southwest monsoon starts in late March or early April with local turbulence that includes tornados and cyclones, with winds that can reach up to 200 – 300 kph. From October to mid-March the northeast monsoon arrives which is dry and cool. The monsoon rain in the Dry Zone of Myanmar is bimodal with a drought period during July when dry desiccating winds blow from the south of Myanmar.

Rainfall patterns during the dry season are highly variable. There has been an observed decrease of approximately 45 – 65 % of rainfall over the last five years (2007 – 2012) and further analysis has confirmed the increase in drought occurrence over the past few decades in the Dry Zone region[2]. Approximately 90% of the total annual rainfall is received during the rainy season which lasts approximately five and half months and the rest in the remaining months. Annual rainfall in coastal and deltaic regions is generally as high as 5,000 mm whereas it is only about 600 mm in the Dry Zone.

5.4.2.2 Tanintharyi Region Climate Condition

The Project site is located in Tanintharyi Region of southern Myanmar. The region is characterised by high annual rainfall (approximately 5,300 mm per year). Mean temperature ranges between 22°C and 32°C.[1]

5.4.2.3 Project Site Climatic Conditions:

Climatic information for the study was obtained from a station located at Wat Chaung Village, Yebyu Township, Tanintharyi Region, which is situated in latitude 14°19'5.10"N and longitude 98°8'17.50"E, approximately 1.8 km west of the Project site and meteorology data collected during the baseline survey described in ***Section 5.4.3.1***.

1 http://www.unccd.int/ActionProgrammes/myanmar-eng2005.pdf

2 United Nations Development Programme (2012), Op cite

5.4.3 Air Quality and Greenhouse Gas

Greenhouse gas (GHG) sources of CO_2 emissions identified in the 2000 greenhouse gas inventory for Myanmar were as follows: 10.6% energy, 0.6% industrial processes, 30.7% agriculture, 54.3% land use change and forestry and 3.8% waste. The energy generation sector in Myanmar contributes a net positive 7,863.47 tonnes of CO_2 equivalents (CO_2 +CH_4 +N_2O). Summary of GHG emissions in Myanmar for the year 2000 is presented in ***Table 5.2*** with a total net amounting to – 67,820.5 Gg CO_2e and total CO_2 emission was estimated to be 41,563.75 Gg.

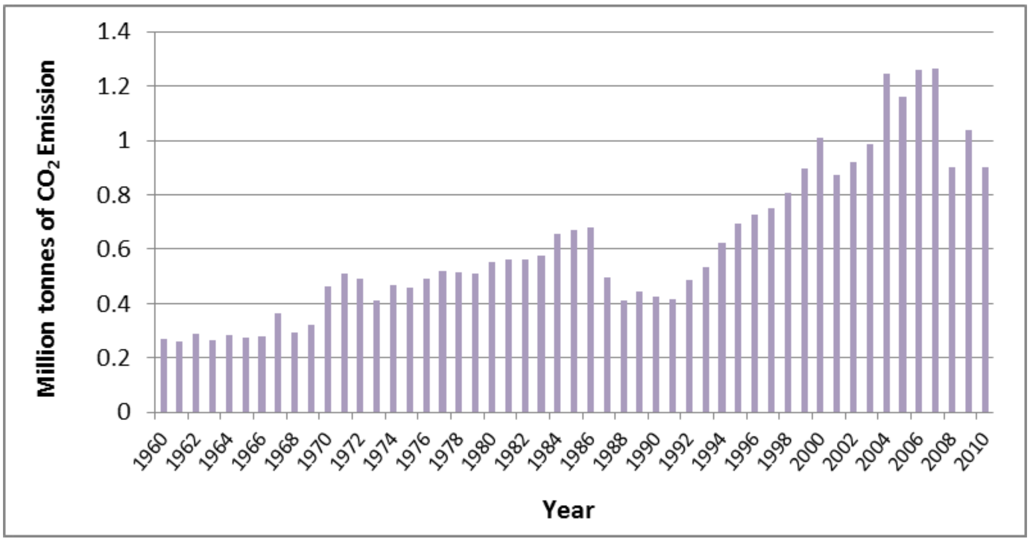
Table 5.2 Summary of GHG Emissions and Removals in Myanmar in 2000

Sector	CO_2 Emission (Gg)	CO_2 Removal (Gg)	CH_4 (Gg)	N_2O (Gg)	Total CO_2e (Gg)	%
Energy	7,658.65	-	5.62	0.28	7,863.47	10.6
Industrial Process	248.59	-	-	-	463.29	0.6
Agriculture	-	-	963.58	8.4	22,843.25	30.7
Land use change and Forestry	33,656.51	142,221.19	144.85	4.26	-101,816.50	54.3
Waste	-	-	134.57	-	2,825.97	3.8
Total	41,563.75	142,221.19	1,248.62	12.94	-67,820.50	100

Source: Myanmar's First National Communication under the United Nations Framework Convention on Climate Change 2010, Ministry of Environment Conservation and Forestry.

According to CO_2 emission provided in the Database of World Bank Cross Country Data[1], CO_2 emission in Myanmar in 2010 was 31.28 million tonnes. CO_2 emissions are those stemming from the burning of fossil fuels and the manufacture of cement. Annual CO_2 emission during the period of 1960 - 2010 is presented in ***Figure 5.8***.

Figure 5.8 CO_2 Emission in Myanmar



[1] https://www.quandl.com/data/WORLDBANK/MMR_EN_ATM_CO2E_KT-Myanmar-CO2-emissions-kt, accessed 30 March 2015.

5.4.3.1 *Air Quality Primary Data*

Air quality was collected during the baseline field survey, the details, location and methodology of which were presented in ***Section 5.3***.

Nitrogen Dioxide (NO_2)

The ambient air quality results of NO_2 for the monitoring period are shown in ***Table 5.3***. The monitoring results for NO_2 are shown to be within the Myanmar National Environmental Guidelines (2015) for NO_2. The potential sources of the NO_2 could be attributed to tailpipe emissions.

Table 5.3 Measurement Results of NO_2 in Ambient Air at Wat Chaung Village

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
	Unit (μg/m³)		
10:00-11:00	110.37	3.76	3.76
11:00-12:00	26.03	6.02	4.20
12:00-13:00	100.06	9.16	15.18
13:00-14:00	67.86	26.09	37.38
14:00-15:00	61.99	33.83	39.07
15:00-16:00	61.80	56.76	67.79
16:00-17:00	76.92	89.74	85.04
17:00-18:00	111.91	112.91	116.71
18:00-19:00	100.94	131.54	131.07
19:00-20:00	92.75	112.73	139.92
20:00-21:00	72.56	89.74	123.17
21:00-22:00	72.40	85.60	107.24
22:00-23:00	66.26	84.38	90.84
23:00-00:00	56.19	89.84	70.68
00:00-01:00	62.15	82.15	77.29
01:00-02:00	58.82	67.60	65.57
02:00-03:00	81.24	66.51	60.39
03:00-04:00	74.88	65.91	64.78
04:00-05:00	49.32	61.24	61.21
05:00-06:00	63.56	62.12	54.22
06:00-07:00	66.73	61.15	52.49
07:00-08:00	39.45	56.66	54.31
08:00-09:00	21.57	10.07	8.50
09:00-10:00	4.30	3.76	3.76
Guideline Values* (1 hr.)	**200**	**200**	**200**
WHO Ambient Air Quality Guidelines or IFC/World Bank	**200**	**200**	**200**

*The Myanmar National Environmental Guidelines (2015) for NO_2.

Sulphur Dioxide (SO_2)

The ambient air quality results of SO_2 for the monitoring period are shown in ***Table 5.4***. The monitoring results for SO_2 are shown to be within the Myanmar

National Environmental Guideline (2015) for SO_2. Overall, baseline SO_2 levels are considered to be low and typical of the rural setting of the Project site.

Table 5.4 ***Measurement Results of SO_2 in Ambient Air at Wat Chaung Village***

Date/Time	26^{th} - 27^{th}, Jan 2016	27^{th} - 28^{th}, Jan 2016	28^{th} - 29^{th}, Jan 2016
	Unit ($\mu g/m^3$)		
24 hr.	4.45	6.87	17.55
Guideline Values* (24 hr.)	20	20	20
WHO Ambient Air Quality Guidelines or IFC/World Bank	20	20	20

*The Myanmar National Environmental Guideline (2015) for SO_2.

Particulate Matter (PM_{10} and $PM_{2.5}$)

The ambient particulate matter results for PM_{10} and $PM_{2.5}$ for the monitoring period are shown in ***Table 5.5*** and ***Table 5.6*** respectively. The monitoring results for PM_{10} and $PM_{2.5}$ are shown to be within the Myanmar National Environmental Guideline (2015) for PM_{10} and $PM_{2.5}$ respectively. The potential sources of the particulate matter are burning of wood for cooking and unpaved road dust.

Table 5.5 ***Measurement Results of PM_{10} in Ambient Air at Wat Chaung Village***

Date/Time	26^{th} - 27^{th}, Jan 2016	27^{th} - 28^{th}, Jan 2016	28^{th} - 29^{th}, Jan 2016
	Unit ($\mu g/m^3$)		
24 hr.	30.37	36.15	39.03
Guideline Values* (24 hr.)	50	50	50
WHO Ambient Air Quality Guidelines or IFC/World Bank	50	50	50

*The Myanmar National Environmental Guideline (2015) for PM_{10}.

Table 5.6 ***Measurement Results of $PM_{2.5}$ in Ambient Air at Wat Chaung Village***

Date/Time	26^{th} - 27^{th}, Jan 2016	27^{th} - $28^{th,}$ Jan 2016	28^{th} - 29^{th}, Jan 2016
	Unit ($\mu g/m^3$)		
24 hr.	7.64	10.57	10.34
Guideline Value* (24 hr.)	25	25	25
WHO Ambient Air Quality Guidelines or IFC/World Bank	25	25	25

*The Myanmar National Environmental Guideline (2015) for $PM_{2.5}$.

5.4.3.2 Carbon Monoxide (CO)

The ambient air quality results of CO for the monitoring period are shown in ***Table 5.7***. There are no Myanmar guideline values for CO, therefore the WHO's Air Quality Guidelines[1] for Europe have been used and the ambient air quality results for CO were found to be in accordance with the guidelines.

[1] Air quality guidelines for Europe. 1997. WHO regional publications, European series No. 23. World Health Organization.

Table 5.7 ***Measurement Results of CO in Ambient Air at Wat Chaung Village***

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
	Unit (μg/m^3)		
10:00-11:00	104.18	91.12	80.96
11:00-12:00	132.17	96.50	91.10
12:00-13:00	142.63	150.36	150.14
13:00-14:00	158.32	179.52	185.67
14:00-15:00	188.60	204.66	221.70
15:00-16:00	223.49	244.32	240.61
16:00-17:00	250.51	300.83	288.87
17:00-18:00	264.06	365.03	345.08
18:00-19:00	273.06	334.48	303.43
19:00-20:00	327.81	565.89	493.37
20:00-21:00	84.38	293.99	243.17
21:00-22:00	267.26	216.01	258.79
22:00-23:00	166.00	191.93	219.53
23:00-00:00	158.41	198.74	161.58
00:00-01:00	137.93	191.14	201.62
01:00-02:00	141.69	190.63	191.62
02:00-03:00	129.18	134.86	177.28
03:00-04:00	186.13	143.94	147.73
04:00-05:00	98.63	147.41	307.71
05:00-06:00	126.26	115.64	393.51
06:00-07:00	219.11	134.71	451.76
07:00-08:00	19.83	79.51	66.96
08:00-09:00	91.23	95.89	75.00
09:00-10:00	82.76	83.24	19.90
Guideline Value (Maximum 8 hr. daily Mean)	**10,000**	**10,000**	**10,000**

5.4.3.3 Wind Speed and Wind Direction Primary Data

Wind speed and wind direction was measured during the baseline field survey, the details, location and methodology of which were presented in ***Section 5.3***.

The wind rose for the monitoring period is shown in ***Figure 5.9*** and wind speed in ***Table 5.8***. The dominant wind direction during the time of monitoring was south (S) to southeast (SE). The wind speed throughout the monitoring period was ranged from 0.5 to 2.1 m/s and average wind speed: 0.14 m/s. Percent of calm was 81.94 (%).

Figure 5.9 Wind Rose Recorded at Wat Chaung Village

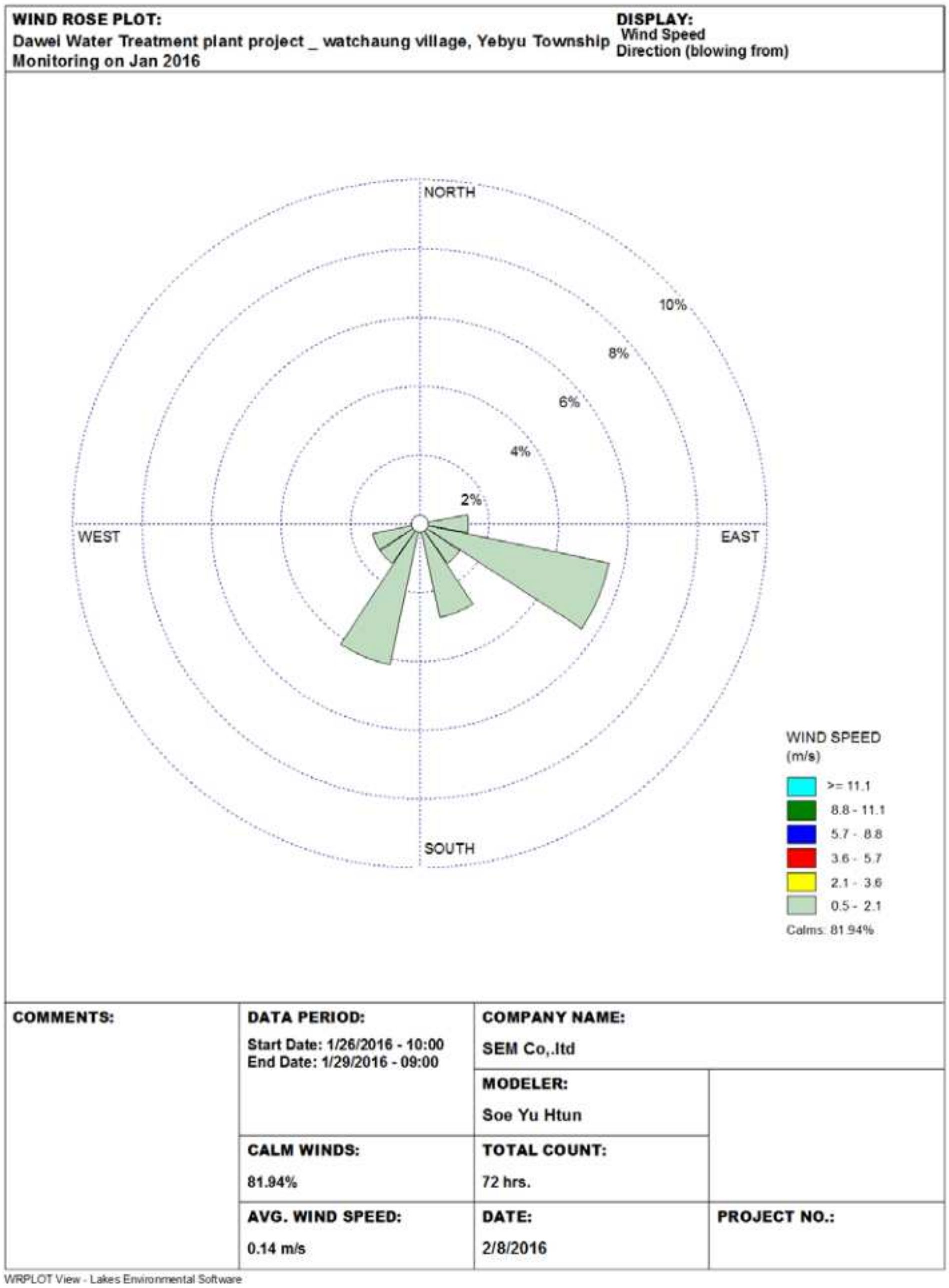


Table 5.8 Wind Speed Recorded at Wat Chaung Village

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
10:00-11:00	2.88	2.27	0.96
11:00-12:00	5.92	3.03	1.97
12:00-13:00	3.14	1.88	1.21
13:00-14:00	1.81	1.57	2.97
14:00-15:00	1.55	2.22	2.98
15:00-16:00	0.42	0.93	2.83
16:00-17:00	0.64	0.62	2.35
17:00-18:00	0.01	0.02	0.19
18:00-19:00	0.00	0.00	0.00
19:00-20:00	0.00	0.00	0.00
20:00-21:00	0.00	0.00	0.00
21:00-22:00	0.04	0.00	0.00
22:00-23:00	0.00	0.00	0.00
23:00-00:00	0.00	0.00	0.00
00:00-01:00	0.00	0.00	0.00
01:00-02:00	0.01	0.00	0.00
02:00-03:00	0.00	0.00	0.00
03:00-04:00	0.00	0.00	0.00
04:00-05:00	0.81	0.00	0.00
05:00-06:00	0.00	0.00	0.00
06:00-07:00	0.00	0.00	0.00
07:00-08:00	0.00	0.00	0.00
08:00-09:00	0.05	0.26	0.11
09:00-10:00	0.67	0.78	0.22

5.4.4 Geology

There have been various attempts at classification of Myanmar's geology in the past half-century, which has led to some inconsistencies in available literature. One of the more recent and comprehensive geological maps is the Myanmar Geosciences Society Geological map of Myanmar. A modification of this map by Gardiner et al (2014) is shown in ***Figure 5.10***. Based on the information presented in this map, the Project area is located within the Mogok-Mandalay-Mergui Belt, and can be classified as being part of the Carbiniferous Mergui Group, interspersed with mesozoic and cenozoic granitoids and other volcanics.

Gardiner et al (2014) conducted an excellent literature review of the characteristics of the Mogok-Mandalay-Mergui Belt (the MMM Belt), particularly with regards to metallogeny. It is quoted as follows[1]:

"The MMM Belt can be subdivided into the Slate Belt (Mitchell et al., 2004), running broadly north-south from Mandalay towards Mergui and Phuket, and the Mogok

[1] N. J. Gardiner*, L. J. Robb and M. P. Searle, REVIEW - The metallogenic provinces of Myanmar, Applied Earth Science (Trans. Inst. Min. Metall. B) 2014 VOL 123 NO 1

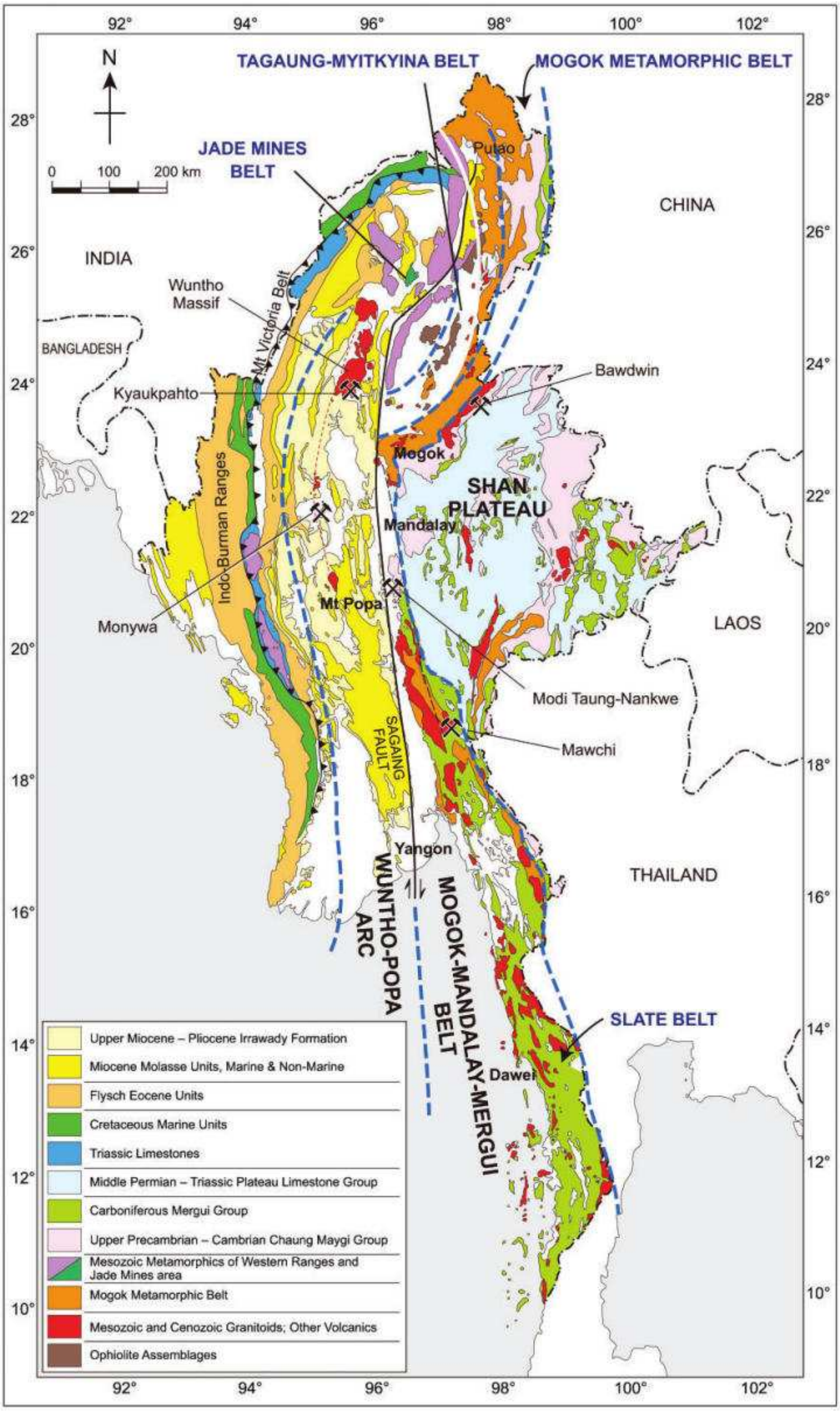
Metamorphic Belt. The Slate Belt represents a predominantly late Palaeozoic succession of pebbly mudstone and wacke, collectively defined as the Mergui Group (Mitchell, 1992). The presence of cool water fossils in these pebbly wackes or diamectites is thought to represent deposition on the margin of Gondwana (Mitchell et al., 2004).

The Mogok Metamorphic Belt was originally described by Searle and Haq (1964), but more recently has been the subject of a number of geochemical and geochronological studies (e.g. Barley et al., 2003; Searle et al., 2007; Mitchell et al., 2012). It comprises a high-temperature kyanite-sillimanite grade metamorphic terrane dominated by ruby-hosting, phlogopite- and diopside-bearing marbles, principally outcropping around Mogok, but with occasional pelite and psammite outcrops farther south.

The MMM hosts numerous I-type biotite and S-type two-mica granites of Cretaceous–Palaeogene age (Barley et al., 2003; Mitchell et al., 2012; Gardiner et al., 2014b), and with a continuation into peninsular Thailand these granites form a distinct unit of the Southeast Asian Tin Belts (e.g. Hutchison and Taylor, 1978; Fig. 3); what was once considered the 'Western Province' of Cobbing et al. (1986, 1992). Similarly, S-type granites towards the east of the Shan Plateau likely represent a northwards extension of the Central Belt (Khin Zaw, 1990)."

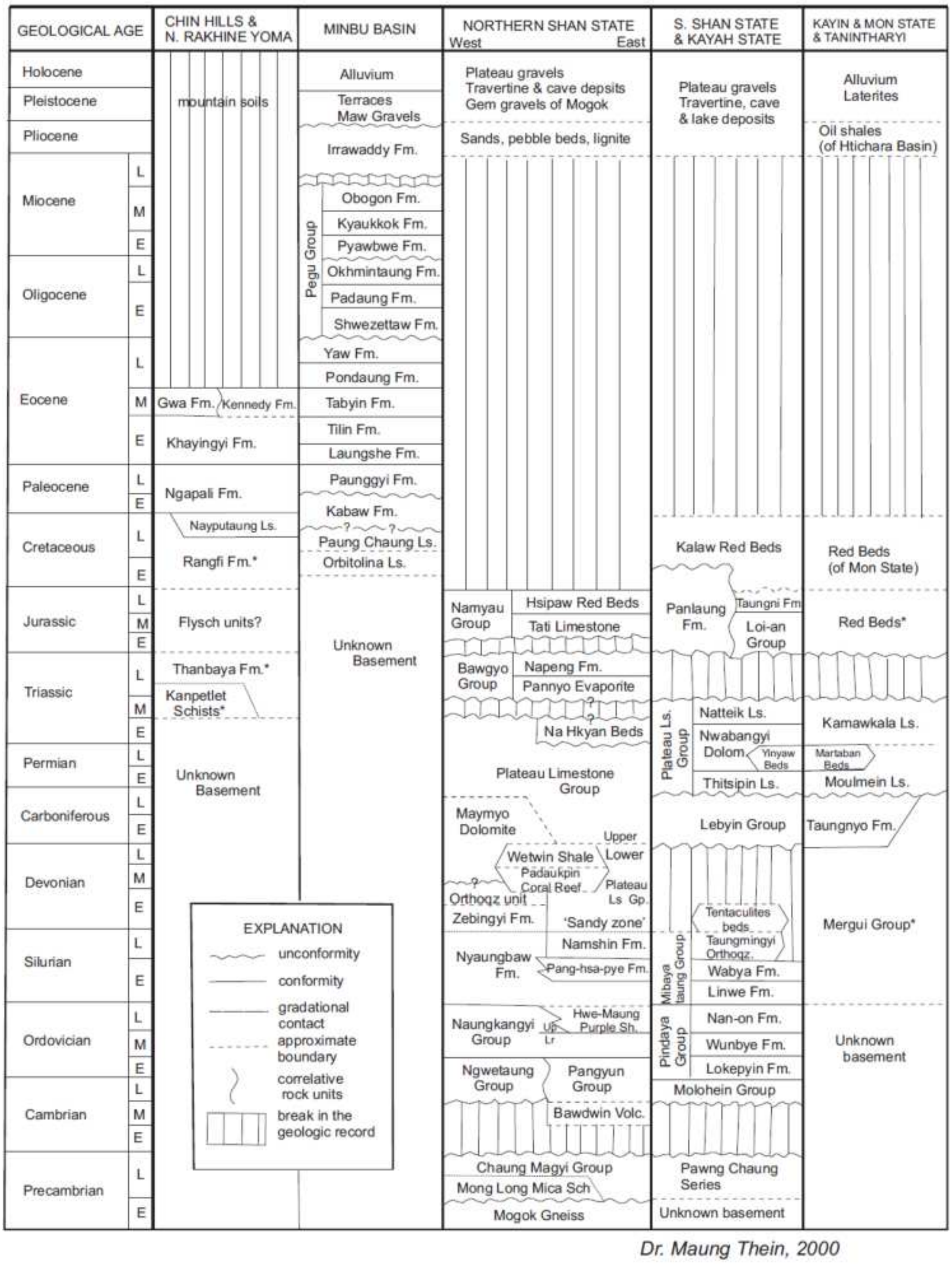
In terms of stratigraphy, the Mergui Group (where the Project is located), has geological age ranging from the Early Silurian period (443 million years ago) to the Late Carboniferous period (299 million years ago), as shown in ***Figure 5.11***.

Figure 5.10 Geological Map of Myanmar



Source: Gardiner et al, 2014.
http://www.maneyonline.com/action/showImage?doi=10.1179/1743275814Y.0000000049&iName=master.img-001.jpg&w=425&h=713, Geological map based on the recently published Myanmar Geosciences Society Geological map of Myanmar (MGS, 2013)

Figure 5.11 Stratigraphic Units of Myanmar



Source:
http://kyawlinnzaw.weebly.com/uploads/4/5/1/3/4513060/stra_correlation.pdf

5.4.5 Soil

A map showing soil types in Myanmar based on FAO's soil classification system is shown in ***Figure 5.12***. Based on this figure, the Project Area is located within Acrisol, Nitisol, and Gleysol soil types. These soil types can be described as follows[1]:

- **Acrisol** - Acidic soils, clay-rich, and associated with humid, tropical climates. Usually these soils have medium to heavy loamy texture. The acrisols typically have low fertility and elevated levels of aluminum, which pose limitations to its

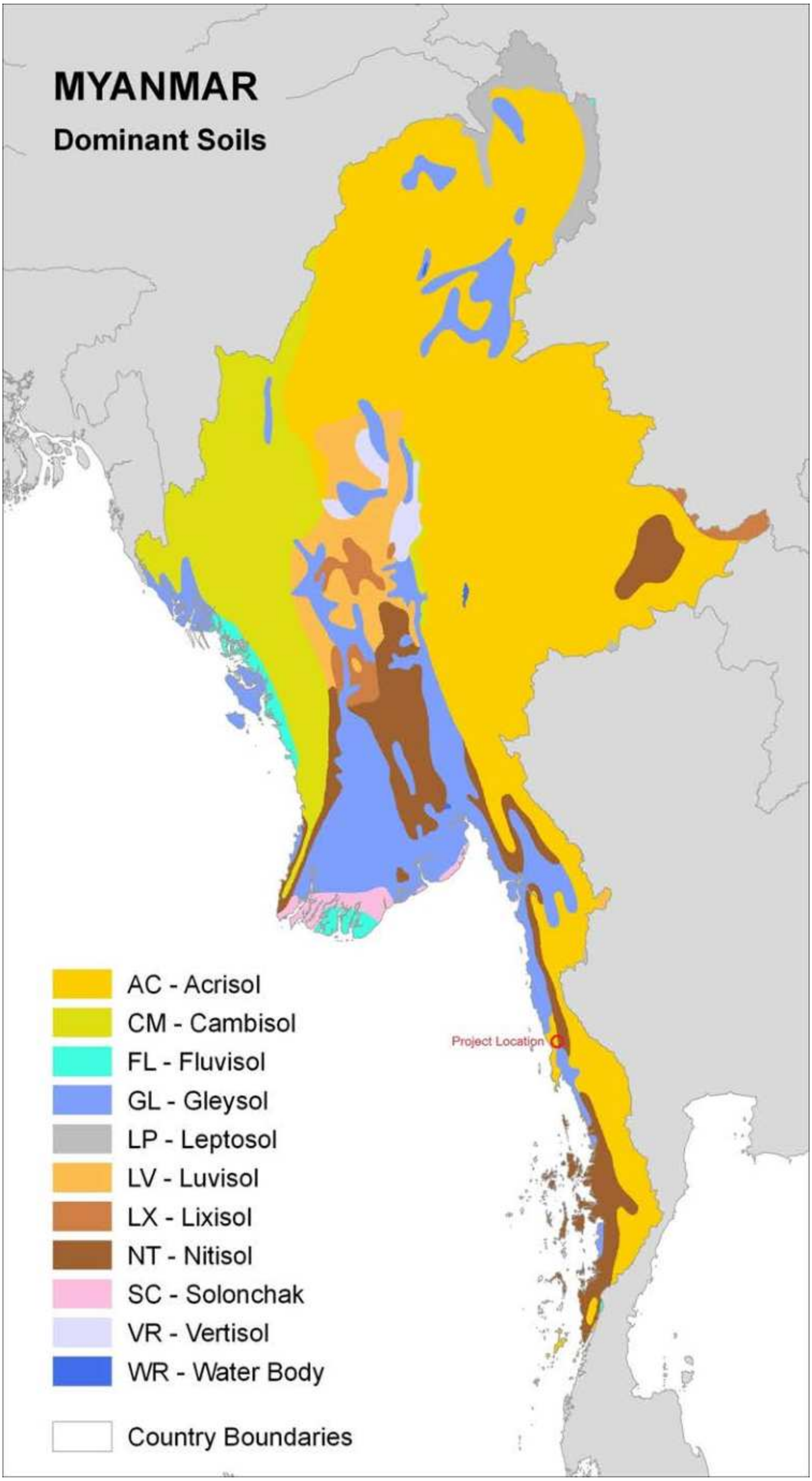
[1] FAO/UNESCO System of Soil Classification

agricultural use. However, tea, rubber tree, oil palm, coffee and sugar cane can be successfully cultivated[1].

- **Nitisol** - Deep, red, well-drained soil with a clay content of more than 30% and a blocky structure. Kaolinite, halloysite and iron oxides dominate their clay mineralogy. Nitisols typically show low phosphorus availability and low base status, but if ameliorated, they have high agricultural potential.
- **Gleysol** - Water saturated soils, typically not containing salt. It is a wetland soil consisting of reddish, brownish or yellowish colours, interspersed with greyish/blueish colours deeper in the soil. The texture of these soils is clayey to clay, and they usually contain high levels of iron. Gleysols can be basic or acidic, and, in tropical locations such as Myanmar, are mostly suitable for rice paddy cultivation.

[1] CHESWORTH, WARD. Encyclopedia of Soil Science. 2001. pp. 22-24

Figure 5.12 Soil Types and Distribution in Myanmar



Source: Map created by FAO/NRL from Harmonized World Soil Database (HWSD) - FAO

5.4.6 Surface Water

5.4.6.1 Hydrology

An overview of the major river basins in Myanmar is shown in ***Figure 5.13.*** The Project lies in Tanintharyi Region, which consists of several rivers and small streams originating from the mountains along the eastern border region. The total drainage area of Tanintharyi Region is about 40,600 km^2, with total surface water of 130.927 km^2.

A map of the major water bodies nearby the Project is shown in ***Figure 5.14***. The Project is directly adjacent to Pa Yain Byu Reservoir. The Dawei River lies approximately 2.7 km to the east of the Project site.

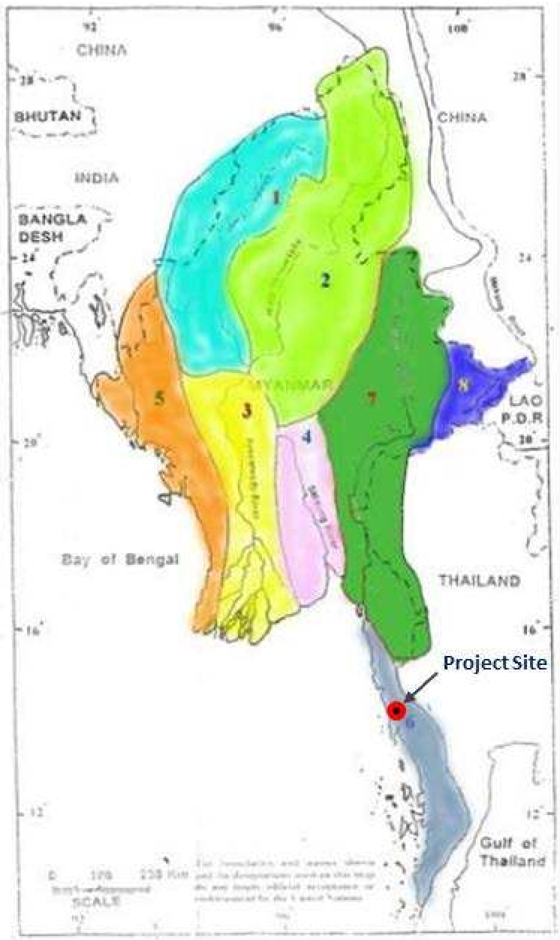
Runoff

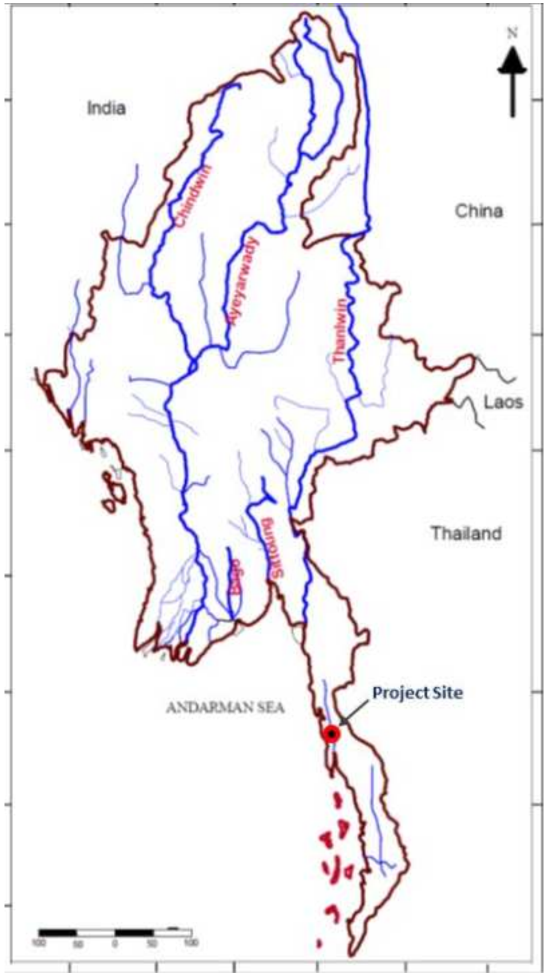
Pa Yain Byu Creek is in the Dawei Basin and close to Ta Laing Gya Basin. Based on analysis carried out in the IEE for Pa Yain Byu Reservoir (Phisut Technology Co., Ltd., 2015), average annual runoff at Pa Yain Byu Pond (1982-2010) was about 18.54 MCM. The maximum annual runoff was 28.47 MCM in 1997 and minimum annual runoff was 9.63 MCM in 1987. The maximum monthly runoff was in August.

Flooding

Flooding analysis for the catchment area surrounding Pa Yain Byu Reservoir was carried out using the rational method in the IEE for Pa Yain Byu Reservoir (Phisut Technology Co., Ltd., 2015). Based on the analysis, maximum rainfall depth and flood peak for various return periods are shown in ***Table 5.9*** and ***Table 5.10***. For a return period of 1-in-10 years, the maximum rainfall intensity is 404 mm/day and the flood peak is 68.53 m^3/s. For a return period of 1-in-100 years, the maximum rainfall intensity is 616 mm/day, and the flood peak is 104.52 m^3/s.

Figure 5.13 Myanmar River Basins[1]





River Basin Number	Name of the River Basin	Drainage area (1000 * km²)	Surface water (km³)	Ground water (km³)
I	Chindwin	115.3	141.293	57.578
II	Upper Ayeyarwady	193.3	227.920	92.599
III	Lower Ayeyarwady	95.6	85.800	153.249
IV	Sittoung	48.1	81.148	28.402
V	Rakhine State	58.3	139.245	41.774
VI	Taninthari Division	40.6	130.927	39.278
VII	Thanlwin	158.0	257.918	74.779
VIII	Mekong	28.6	17.634	7.054
	Total	737.8	1081.885	494.713

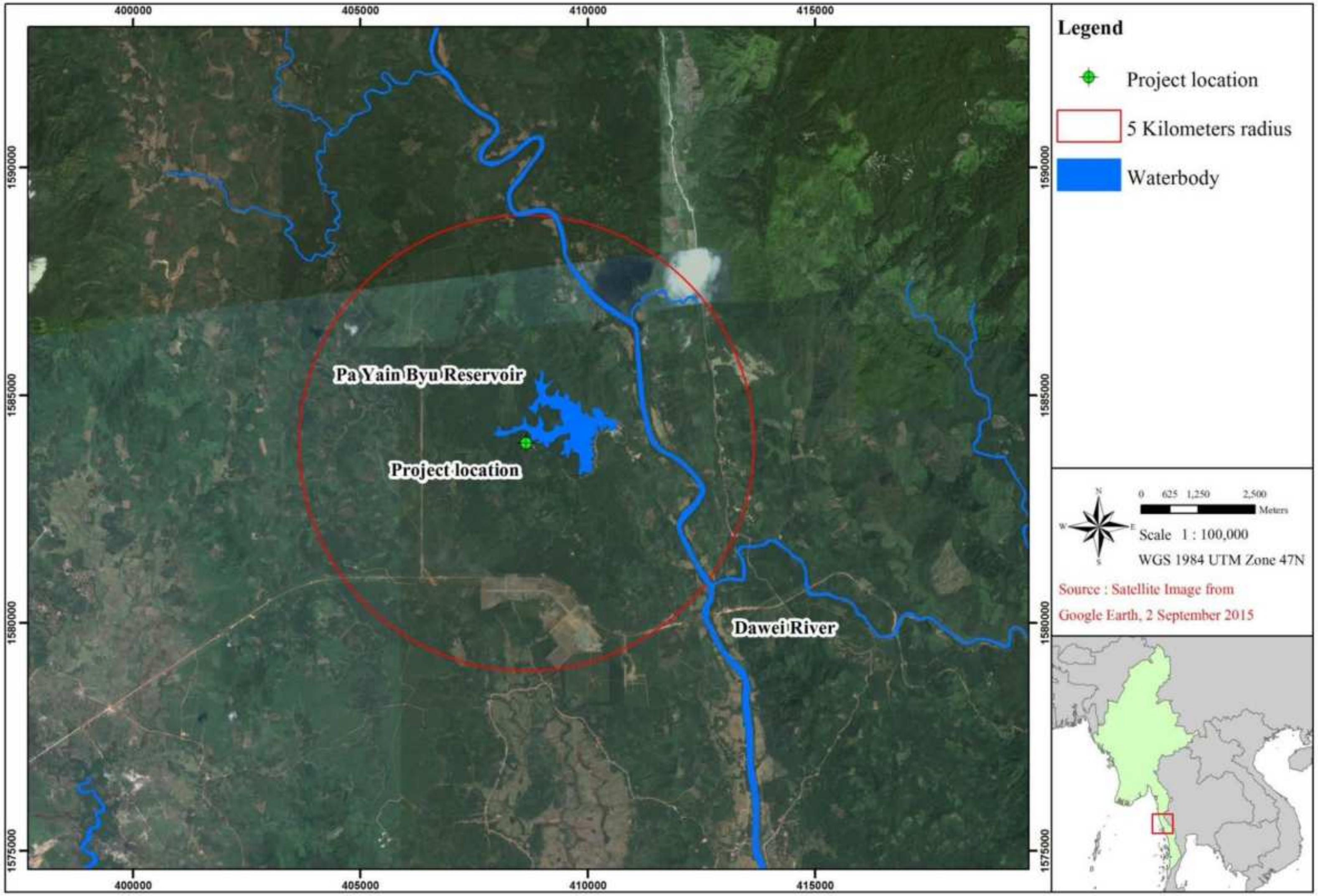
Source: U Win Kyaw, WWD 2014, Myanmar, 19 Mar 2014)

(a) Myanmar River Basins (b) Potential Water Resources

Source: U Win Kyaw, WWD, 2014 Myanmar 19 March 2014 and http://www.a-a-r-s.org/ws-eowm/download/Plenary3/Myanmar.pdf

[1] Global Water Partnership on the ground: IWRM Promotion & Implementation in Myanmar, GWP strategy launch@ the World Water Day 2014 Celebration United Nations University, Tokyo Japan 21 March 2014. Presentation available in http://www.slideshare.net/fullscreen/globalwaterpartnership/gwp-on-the-ground-myanmar-case-21mar2014tokyo/3, Retrieved on 27 January 2015

Figure 5.14 Major Water Bodies in the Project Area



Source: ERM, 2016

Table 5.9 Maximum Rainfall Depth for Various Return Periods at Dawei Station

Return Period (Years)	Maximum Rainfall Depth (mm) per day
2	234
5	336
10	404
20	469
25	490
50	553
100	616
200	679
500	762
1000	825

Source: IEE for Pa Yain Byu Reservoir (Phisut Technology Co., Ltd., 2015), originally from Feasibility Study of Ka Loat Htar Dam and Reservoir, Draft Final Report 2012

Table 5.10 Flood Peak for Various Return Periods at Pa Yain Byu Pond

Return Period (Years)	Flood Peak (m^3/s)
2	39.69
5	57.04
10	68.53
20	79.56
25	83.05
50	93.82
100	104.52
200	115.17
500	129.2
1000	139.84

Source: IEE for Pa Yain Byu Reservoir (Phisut Technology Co., Ltd., 2015), originally from Feasibility Study of Ka Loat Htar Dam and Reservoir, Draft Final Report 2012

5.4.6.2 Surface Water Quality

Secondary Data

A number of previous studies on baseline water quality near the Project area have been reviewed and summarized, in order to provide proper comparisons with the collected primary data (which will be described below). A summary of the relevant secondary data is presented below, and a map of all of the relevant sampling stations is shown in ***Figure 5.15***.

Environmental Impact Assessment for Main Road (SEATEC, 2012c)

- *Relevant Sampling Locations*: Surface water and sediment quality were measured during March 2012 (dry season) and May 2012 (wet season). The stations nearest to the Project, and those that will be included within this discussion on the Project baseline, are SW12 and SW13, located in the Dawei River, downstream of the Pa Yain Byu Reservoir.
- *Summary of Results:* COD in surface water at SW12 and SW13 was found to be high (5,929 mg/L at SW12 and 96,595 mg/L at SW13). Physical characteristics of the sediment in the Dawei River 0.3 km north of the Bridge and canal KM 3+000 was mostly sand, while the sediment at the Dawei River 0.3 km south of

the bridge and canal KM 12+000 was mixed with equal portions of sand, silt, and clay. All sediment analyzed were well within compared sediment quality guidelines.

Environmental Impact Assessment for Dawei Industrial Estate Project (2013)

- *Relevant Sampling Locations:* Surface water quality and sediment sampling were conducted during December 2012 (after monsoon season) and March 2013 (before monsoon season). The stations nearest to the Project, and those that will be included within this discussion on the Project baseline, are SW1 and SW2, which were located upstream and downstream of the Pa Yain Byu Reservoir, respectively.
- *Summary of Results:* During the first sampling period (2-6 December 2012), most of parameters at SW1 and SW2 complied with the proposed surface water standard, except phenol at SW1. At SW2, total solids and turbidity were elevated, and some heavy metals (zinc, copper, lead and nickel) were slightly higher than the standard. Sediments in Dawei River at SW1 and SW2 were mostly clay (52.1-66.4% and 55.3-68.9%, respectively). Heavy metal concentrations in sediment were far below the proposed sediment quality guidelines[1].

Environmental and Social Impact Assessment of Dawei SEZ Initial Industrial Estate Project (UAE, 2015)

- *Relevant Sampling Locations:* Surface water quality and sediment samples were conducted during February 2015. The stations nearest to the Project, and those that will be included within this discussion on the Project baseline, were IE-SW1 (in Ekani Chaung Creek) and IE-SW2 (in Yalai Chuang Creek).
- *Summary of Results:* At IE-SW1 and IE-SW2, all surface water results met the compared standard[2], except for phenols at IE-SW1 (0.011 mg/L). Small quantities of E. coli were detected at IE-SW1 (27 MPN/100 mL) and IE-SW2 (41 MPN/100 mL). Sediments at IE-SW1 and IE-SW2 mostly met the compared standard[3], except for arsenic at IE-SW2 (55.2 mg/kg). Sediments were mostly composed of sand (54.9 and 44 %, respectively).

IEE on Pa Yain Byu Reservoir (Phisut Technology Co., Ltd., 2015)

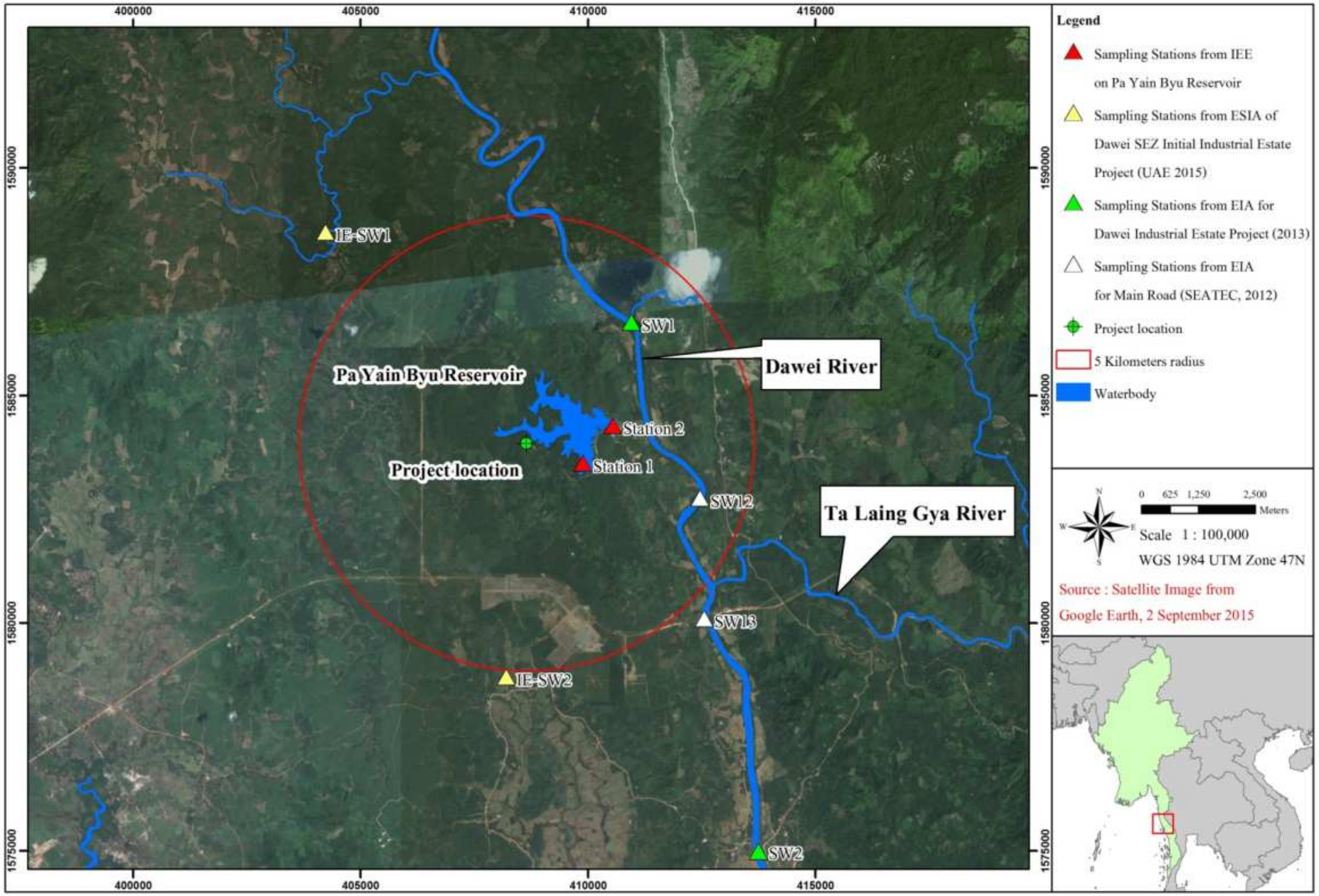
- *Relevant Sampling Locations:* Field investigation of surface water sampling was performed at two stations ("Station 1" and "Station 2") along the Pa Yain Byu Reservoir by Italian-Thai Development Plc. (ITD) Environmental Team.
- *Summary of Results:* Results from the sampling points in the IEE for the small reservoir showed that all measured parameters were below relevant standards[1].

1 NOAA Screening Quick Reference Table, 1999

2 Thailand Surface Water Quality Standard, Class 3

3 NOAA Screening Quick Reference Table, 1999

Figure 5.15 Locations of Surface Water Sampling from Previous Projects



Source: ERM, 2016

Primary Data (Surface Water Baseline Field Survey)

To complement the existing surface water quality data, additional primary data was collected during the baseline field survey for the Project (***Table 5.1*** and ***Figure 5.2***). The primary data focused on parameters that are likely to be relevant or impacted by Project operations, i.e. TSS, DO, and total coliform due to discharge of sanitary wastewater during construction. The results from the survey are shown in ***Table 5.11.***

Note that there are no Myanmar or WHO guideline values available for surface water quality. Although there are guidelines/standards for drinking water quality, as well as wastewater effluent, these are not relevant to natural surface water bodies. Therefore, the surface water quality results were compared to Thailand's Surface Water Quality Standards. [1]

All parameters were within the compared Standard for "Medium clean fresh surface water resource", with the exception of BOD, which was exceeded at SW1, SW2, and SW3. High BOD levels indicate the presence of organic matter. Although this is most likely due to sewage discharged upstream, it could also be related to the presence of dead plant matter, algae, or animal droppings.

1 Surface Water Quality Standards from the Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) , published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994)

Table 5.11 Results from Surface Water Baseline Survey

Parameter	Unit	LOQ	Results				Standard 1[a]
			SW1	SW2	SW3	SW4	
Date /Time	-	-	28.01.2016 07:00 am	28.01.2016 8:20 am	28.01.2016 10:00 am	28.01.2016 10:45 am	-
Weather	-	-	Slightly sunny	Sunny	Sunny	Sunny	-
Transparency	-	-	High	Low	High	High	-
Temperature (water)	°C	-	25.80	27.24	25.66	26.97	-
pH	-	-	6.56	6.10	6.65	6.52	5.0 – 9.0
DO	mg/l	-	6.80	8.50	8.90	8.50	4.0
EC	µs/cm	-	10.10	49.90	20.30	20.40	-
TDS	ppm	-	6.43	31.13	13.04	13.00	-
Total Hardness as $CaCO_3$	mg/L as $CaCO_3$	5.0	7.5	90.2	10.0	10.3	-
Alkalinity	mg/L as $CaCO_3$	1.0	3.6	30.3	6.6	6.7	-
Biochemical Oxygen Demand (BOD)	mg/L	-	**6.4**	**4.4**	**3.8**	0.1	2.0
Chemical Oxygen Demand (COD)	mg/L	5.0	30.0	11.0	11.0	<5.0	-
TOC	mg/L	0.1	6.2	41.3	0.7	0.7	-
pH	-	-	5.3	6.3	6.2	6.2	-
Total Suspended Solids (TSS)	mg/L	2.5	6.0	4,105	3.7	3.7	-
Turbidity	NTU	0.02	9.91	3,967	2.83	3.02	-
Electrical Conductivity	µS/cm	0.5	14.5	54.6	22.7	22.7	-
Color	Color Unit	5	150	30	15	15	-
Oil & Grease	mg/L	2.0	10.4	10.1	8.7	5.6	-
Total Coliform Bacteria	MPN/100 mL	1.8	230	2,400	330	490	20,000

Note: There are no Myanmar or WHO guideline values available for surface water quality. The surface water quality results were compared to Thailand standard.

Bold means higher than the standard.

(1) Surface Water Quality Standards from the Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) , published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994).

- Classification of surface water **Class 3**: Medium clean fresh surface water resource used for:
  1) Consumption, but passing through an ordinary treatment process before use;
  2) Agriculture

5.4.7 *Groundwater*

5.4.7.1 *Groundwater Use*

Exploitation of Myanmar's aquifers has thus far been limited to municipal water supply and intensive irrigation of vegetables and other high value crops from hand-dug wells[1].

Water use in Myanmar has been on the increase, particularly in the agricultural and industrial sectors. ***Table 5.12*** shows the water use in different sectors for the year 2008-09. As much as 89% of water use is tapped for irrigation purposes, while about 8% is for domestic consumption and 3 % is for industry.

Table 5.12 Water Use by Different Sectors

Sector	Surface Water	Groundwater	Total
Domestic	1.15 (3%	2.55 (68%)	3.7 (8%)
Industrial	1.17 (3%)	0.33 (9%)	1.5 (3%)
Irrigation	41.97 (94%)	0.85 (23%)	42.82 (89%)
Total	**44.29**	**3.73**	**48.02**

Source: Ministry of Agriculture and Irrigation[2]

5.4.7.2 *Hydrogeology*

There are 13 different types of aquifers in Myanmar, namely Alluvium, Irrawaddian, Peguan, Limestone, Igneous (or Volcanic) and Other Minor Aquifers. The Project area is underlain by Igneous and Lebyin aquifers (***Figure 5.16***). The quality and quantity of groundwater varies depending on the lithology and depositional environments[2].

The estimated groundwater potential in the Lower Ayeyarwady Region is 153 km^3, while the groundwater potential in Tanintharyi Region is 39.28 km^3, as shown in ***Table 5.13***.

Table 5.13 Estimated Groundwater Potential across Myanmar

Sr	River Basin	Catchment Area (km^2)	Groundwater Potential (km^3)
1	Chiuindwin	115,300	57.58
2	Ayeyarwady (Upper)	193,300	92.60
3	Ayeyarwady (Lower)	95,600	153.25
4	Sittoung	48,100	28.40
5	Rivers in Rakhine State	58,300	41.77
6	Rivers in Tanintharyi Region	40,600	39.28
7	Thanlwin (within Myanmar)	158,000	74.78
8	Mekong (within Myanmar)	28,600	7.05
	Total	**737,800**	**494.71**

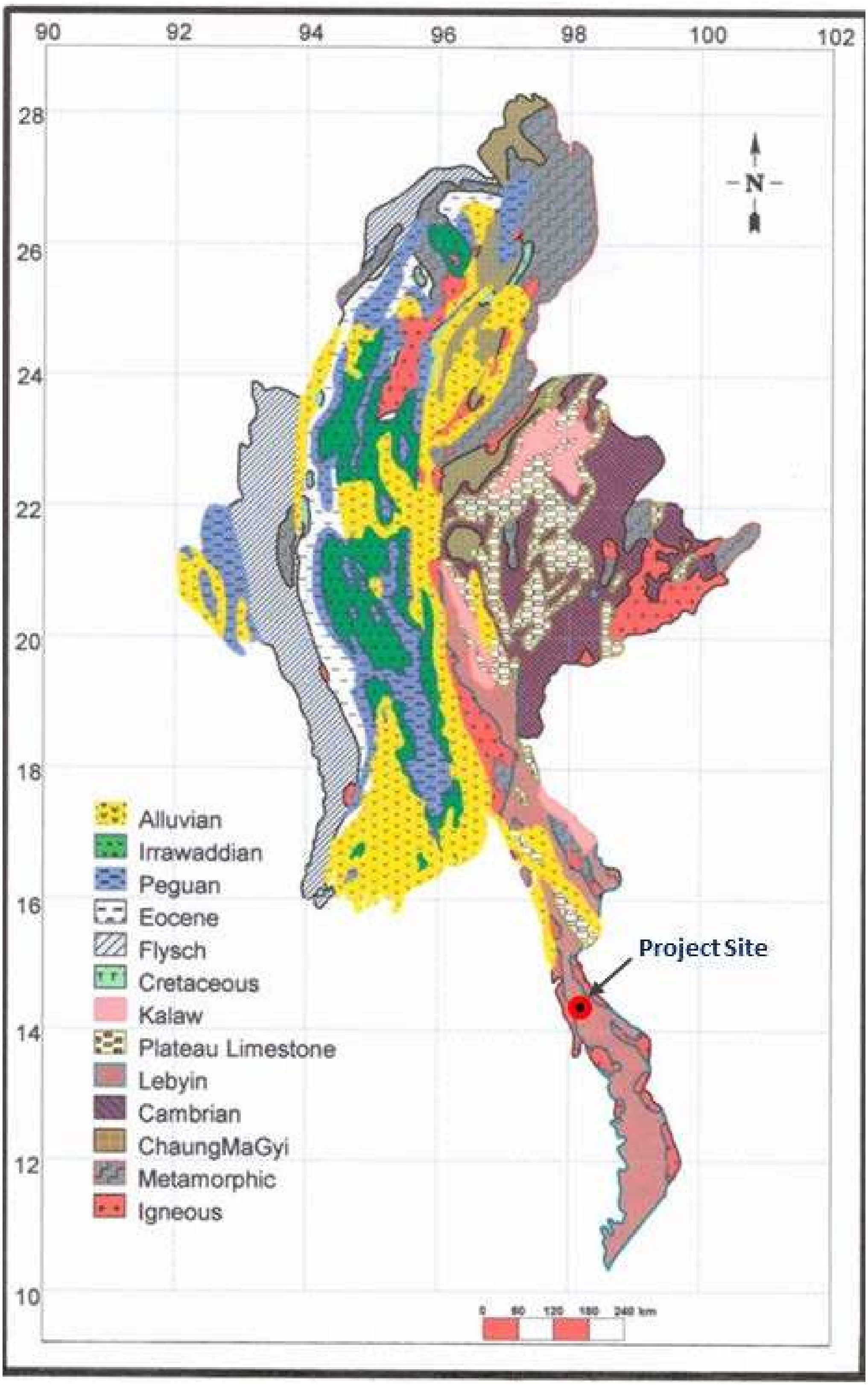
Source: FAO[3]

[1] http://www.fao.org/nr/water/espim/country/myanmar/print1.stm
[2] http://danishwater.dk/wp-content/uploads/2013/09/Ministry-of-Agriculture-and-Irrigation-Department-of-Water-Resources-Utilization-Sustainable-Development-and-Management-of-Groundwater-in-Myanmar.pdf
[3] http://www.fao.org/docrep/008/ae546e/ae546e04.htm

The China Geological Survey has organized the publication of a document titled “Groundwater Serial Maps of Asia”, which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012, and summarizes research on groundwater systems in Asian countries, including Myanmar. Excerpts of two useful maps from this document, a Hydrogeological Map, and Groundwater Resources Map, are presented in ***Figure 5.17*** and ***Figure 5.18***, respectively.

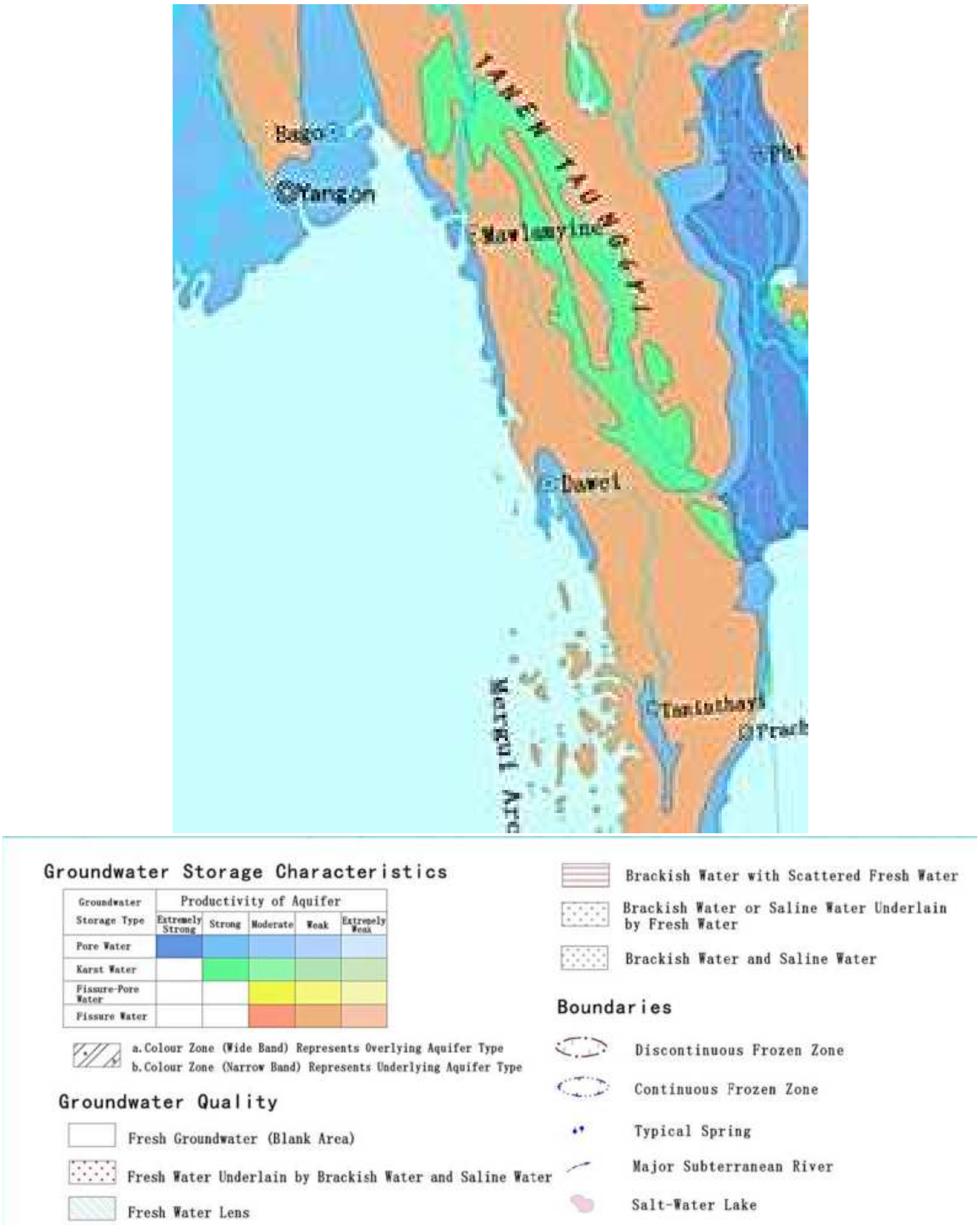
Based on these maps, the productivity of aquifers near the Project area can be classified as “Strong Pore Water”, or “Weak Fissure Water”, and groundwater quality is considered “Fresh Groundwater”. The groundwater type ranges from “Pore Water” to “Fractured Water”. Groundwater resources classifications consist of "Discontinuous Aquifer in Hilly Area" and "Continuous Aquifer in Plain and Intermontaine Basin", with Natural Recharge Modulus ranging from 200,000-500,000 m^3/km^2-yr.

Figure 5.16 Major Aquifers of Myanmar Relative to Project Area



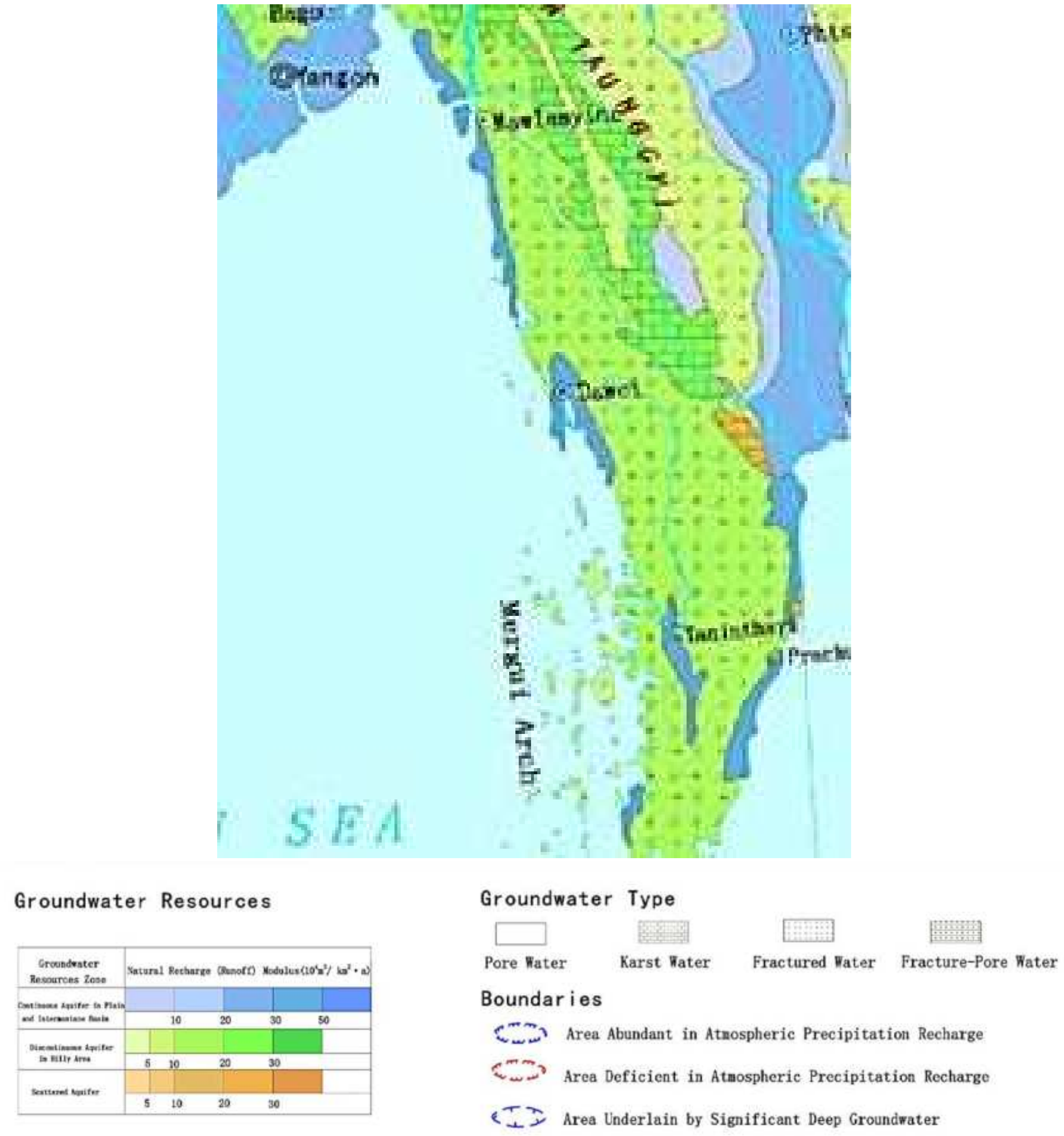
Source: Adapted from http://danishwater.dk/wp-content/uploads/2013/09/Ministry-of-Agriculture-and-Irrigation-Department-of-Water-Resources-Utilization-Sustainable-Development-and-Management-of-Groundwater-in-Myanmar.pdf. Retrieved on 28 January 2015

Figure 5.17 Hydrogeological Map of Project Area



Source: Adapted from Groundwater Serial Maps of Asia", which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012

Figure 5.18 Groundwater Types in Project Area



Source: Adapted from Groundwater Serial Maps of Asia", which was compiled by the Institute of Hydrogeology and Environmental Geology of CAGS in 2012

5.4.7.3 *Groundwater Quality*

Secondary Data

A number of previous studies on baseline groundwater quality near the Project area have been reviewed for this Project. A summary of the relevant secondary data is presented below, and a map of all of the relevant sampling stations is shown in ***Figure 5.19***.

Initial Environmental Examination (IEE) for Dawei Sea Port & Industrial Estate Development (TEAM, 2012a)

- *Relevant Sampling Locations*: Groundwater quality was sampled during October 2011, March 2012, and May 2012, at seven stations near the Project site (GW3-GW9), which are shown on ***Figure 5.19***.
- *Summary of Results:* All pH results show that groundwater in this area are acidic, which are below standards. Suspended solids at station GW4 are much higher than suspended solids at other stations. Cadmium results at GW3-GW7 exceeded the standard[1].

Environmental Impact Assessment for Dawei Industrial Estate Development Project (2013)

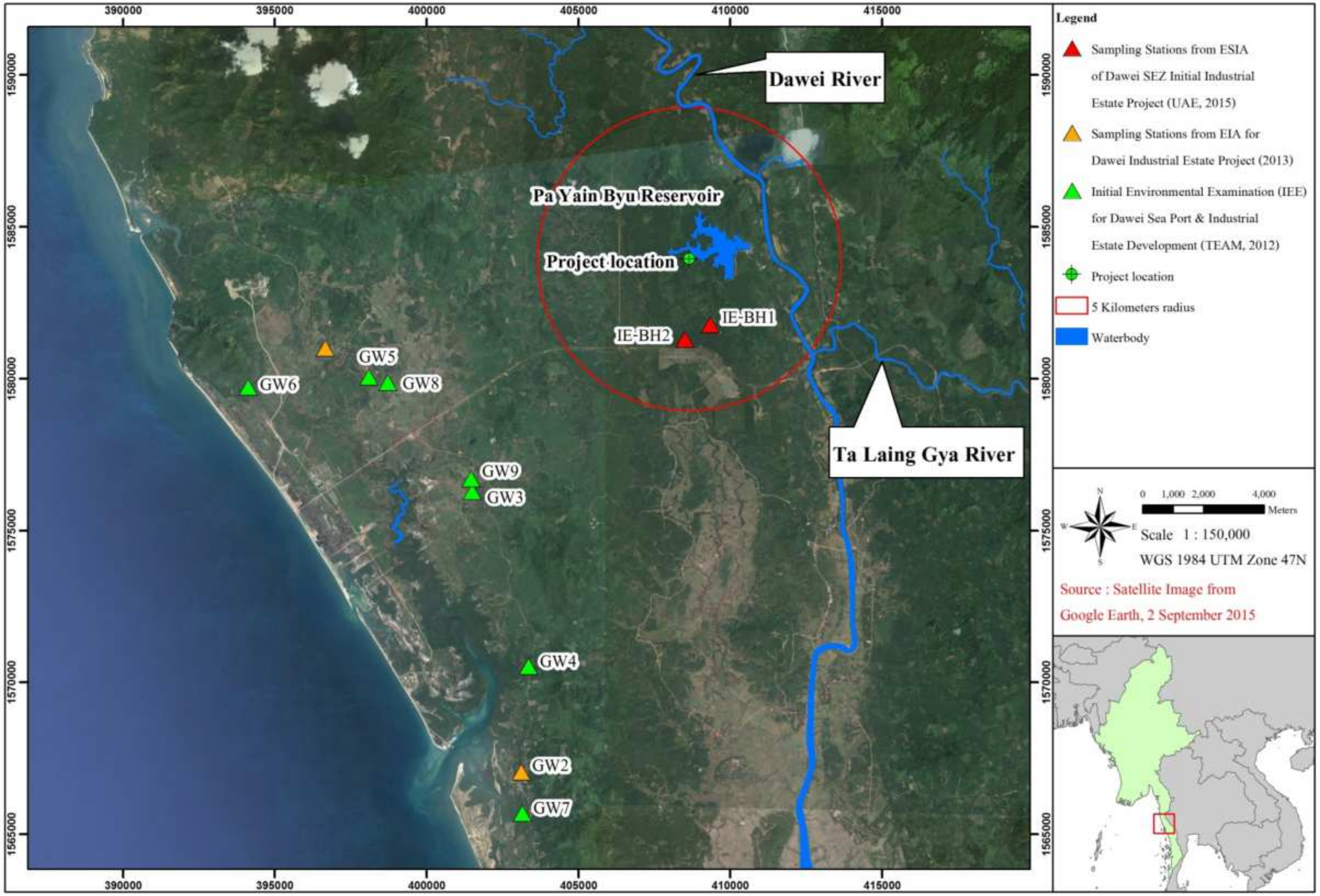
- *Relevant Sampling Locations*: Groundwater quality was sampled during December 2012 and March 2013, at two stations near the Project site (GW1 and GW2), which are shown on ***Figure 5.19***.
- *Summary of Results*: All measured parameters complied with the relevant standards[1], except for pH. Water in both wells were acidic with pH of 4.7 and 5.0, respectively during the first sampling, and 4.8 and 5.2, respectively during the second sampling respectively and below standards. TCB and E.Coli also were detected with higher value at GW2 during the first sampling period.

Environmental Impact Assessment for Dawei SEZ Initial Industrial Estate Project (2015)

- *Relevant Sampling Locations*: Groundwater quality was sampled during March 2015, at two stations near the Project site (IE-BH01 and IE-BH02), which are shown on ***Figure 5.19***.
- *Summary of Results*: Most measured parameters complied with the relevant standards[1]. Exceptions were suspended solids (376 mg/L at IE-BH01 and 165 mg/L at IE-BH02), lead (0.115 mg/L at IE-BH01 and 0.180 mg/L at IE-BH02) and mercury (0.0022 mg/L at IE-BH01). Water in both wells were acidic with pH of 4.7 and 5.0, respectively during the first sampling, and 4.8 and 5.2, respectively during the second sampling respectively and below standards. TCB and E.Coli also were detected with higher value at GW2 during the first sampling period.

[1] WHO Drinking Water Standard, 1993

Figure 5.19 Locations of Groundwater Sampling from Previous Projects



Source: ERM, 2016

5.4.8 Noise

Primary Data (Noise Baseline Field Survey)

Noise was collected during the baseline field survey, the details, location and methodology of which were presented in ***Section 5.3***.

A summary of noise level (LAeq) results are presented in ***Table 5.14***. Complete hourly results are shown in ***Annex B***. During the daytime, the measured noise levels were found to be lower than the values in the Myanmar National Environmental Quality (Emission) Guidelines. However, during the night time, measured noise levels were found to significantly exceed the Guidelines on both days that measurements were taken. The primary potential noise sources at NSR 1 include general noises from the village (such as speech, small vehicles, cooking, etc.), as well as wind conditions. The increased noise levels in the evening are due to the use of diesel generators, which were observed during the site visits.

Table 5.14 Results from Noise Baseline Field Survey

Period	Survey Results (dBA, One Hour LAeq)		Myanmar National Environmental Quality (Emission) Guidelines Value
	NSR 1 26th – 27th 2016	**NSR 1 27th – 28th 2016**	**(Residential, Institutional, Educational)**
Day Time	49	45	55*
Night Time	**61**	**60**	45**

* Daytime, 07:00 – 22:00 (10:00 – 22:00 for Public holidays)
**Nighttime, 22:00 – 07:00 (22:00 – 10:00 for Public holidays)

5.5 BIOLOGICAL COMPONENTS

5.5.1 Biodiversity Context

5.5.1.1 Global EcoRegions

The Project Study Area resides within the Myanmar Coastal Rain Forests (IM0132) EcoRegion[1]. This ecoregion represents the lowland evergreen and semi-evergreen rain forests of the western side of Arakan Yoma and Tenasserim ranges along the west coast of Myanmar. A small area extends into southeast Bangladesh. It falls within the tropical wet climate zone of the Köppen climate system. Although low in endemism, it has a rich fauna and flora, largely as a result of its lush vegetation, extensive range of habitats from mangroves to mountains, and position as a corridor between the Sundaic, Indochinese, and Indian sub-regions. Two mammal species (both bats) are considered endemic to the EcoRegion. More than 350 bird species are found in the diverse habitats of this ecoregion, although none are considered ecoregional endemics.

[1] WWF 2016 WWF EcoRegions Southern Asia: Western Myanmar into Bangladesh. Myanmar Coastal Rain Forests (IMO132) http://www.worldwildlife.org/ecoregions/im0132

Most of the seasonal evergreen forest and almost all the freshwater swamp of this ecoregion have been cleared for agriculture. This ecoregion is inadequately protected. The continued development of flat, lowland areas for irrigated paddy rice and subsistence crops such as hill rice, cassava, yams, and vegetables on hilly ground will be a major threat in the future. Wildlife trade and poaching are a major threat to the rapidly declining large mammals and medicinal plants.

5.5.1.2 *Key Biodiversity Areas*

No Important Bird Areas (IBA), Alliance for Zero Extinction (AZE), Important Plant Areas (IPA) and Important Sites for Freshwater Biodiversity are present within 100km of the Project Area.

5.5.1.3 *Protected Areas*

One (1) protected area is within 100km of the Project Area. The Tanintharyi Nature Reserve is located to the North East of the Project Area approximately 34km away. It is 1700km^2 in area and is an IUCN category VI reserve. The Reserve is adjacent to the Kaeng Krachan National Park in Thailand. The reserve plays host to a rich diversity of flora and fauna and contains habitats for threatened species. The Reserve is primarily tropical evergreen forest and mixed deciduous forest with patches of bamboo and grassland.

5.5.1.4 *Species of Conservation Significance*

The following species of conservation significance exist within the Myanmar Coastal Rain Forests (IM0132) EcoRegion. Endemic Species are listed in ***Table 5.15***. Species classified as Critically Endangered, Data Deficient, Endangered or Vulnerable on the IUCN Red List are shown in ***Table 5.16***.

Table 5.15 Endemic Species with the Myanmar Coastal Rain Forests (IM0132) EcoRegion

Scientific Name	Common Name	Class	IUCN Red List Category
Oligodon planiceps	-	Reptilia	Data Deficient
Cyrtodactylus consobrinoides	Pulo Condore Bow-fingered Gecko	Reptilia	Not Assessed
Xenochrophis bellula	-	Reptilia	Not Assessed
Lycodon kundui	Burmese Wolfsnake	Reptilia	Not Assessed
Heosemys depressa		Reptilia	Critically Endangered
Lygosoma anguinum	Burmese Writhing Skink	Reptilia	Data Deficient
Oligodon mcdougalli	Mcdougall's Kukri Snake	Reptilia	Not Assessed
Rana oatesii	Toungoo Frog	Amphibia	Not Assessed

Table 5.16 Critically Endangered, Data Deficient, Endangered and Vulnerable Species within the Myanmar Coastal Rain Forests (IM0132) EcoRegion

Scientific Name	Common Name	Class	Redlist Category
Ardea insignis	White-bellied Heron	Aves	Critically Endangered
Rhodonessa caryophyllacea	Pink-headed Duck	Aves	Critically Endangered
Aythya baeri	Baer's Pochard	Aves	Endangered
Aceros subruficollis	Plain-pouched Hornbill	Aves	Vulnerable
Emberiza aureola	Yellow-breasted Bunting	Aves	Vulnerable
Mulleripicus pulverulentus	Great Slaty Woodpecker	Aves	Vulnerable
Turdoides longirostris	Slender-billed Babbler	Aves	Vulnerable
Leptoptilos javanicus	Lesser Adjutant	Aves	Vulnerable
Columba punicea	Pale-capped Pigeon	Aves	Vulnerable
Manis javanica	Malayan Pangolin	Mammalia	Endangered
Manis pentadactyla	Chinese Pangolin	Mammalia	Endangered
Hapalomys longicaudatus	Marmoset Rat	Mammalia	Endangered
Tapirus indicus	Malayan Tapir	Mammalia	Endangered
Axis porcinus	Hog Deer	Mammalia	Endangered
Elephas maximus	Asiatic Elephant	Mammalia	Endangered
Prionailurus viverrinus	Fishing Cat	Mammalia	Endangered
Lutra sumatrana	Hairy-nosed Otter	Mammalia	Endangered
Cuon alpinus	Dhole	Mammalia	Endangered
Trachypithecus phayrei	Phayre's Leaf Monkey	Mammalia	Endangered
Hylobates lar	White-handed Gibbon	Mammalia	Endangered
Bos javanicus	Banteng	Mammalia	Endangered
Trachypithecus germaini		Mammalia	Endangered
Panthera tigris	Tiger	Mammalia	Endangered
Melogale personata	Burmese Ferret-badger	Mammalia	Data Deficient
Berylmys mackenziei	Kenneth's White-toothed Rat	Mammalia	Data Deficient
Tragulus javanicus	Lesser Mouse-deer	Mammalia	Data Deficient
Eudiscopus denticulus	Disk-footed Bat	Mammalia	Data Deficient
Macaca arctoides	Stump-tailed Macaque	Mammalia	Vulnerable
Helarctos malayanus	Sun Bear	Mammalia	Vulnerable
Ursus thibetanus	Asiatic Black Bear	Mammalia	Vulnerable
Hemigalus derbyanus	Banded Palm Civet	Mammalia	Vulnerable
Arctictis binturong	Binturong	Mammalia	Vulnerable
Viverra megaspila	Large-spotted Civet	Mammalia	Vulnerable
Neofelis nebulosa	Clouded Leopard	Mammalia	Vulnerable
Pardofelis marmorata	Marbled Cat	Mammalia	Vulnerable
Lutrogale perspicillata	Smooth-coated Otter	Mammalia	Vulnerable
Rusa unicolor	Sambar	Mammalia	Vulnerable
Macaca leonina		Mammalia	Vulnerable
Nycticebus bengalensis		Mammalia	Vulnerable
Petinomys vordermanni	Vordermann's Flying Squirrel	Mammalia	Vulnerable
Batagur baska	River Terrapin	Reptilia	Critically Endangered

Scientific Name	Common Name	Class	Redlist Category
Heosemys depressa		Reptilia	Critically Endangered
Manouria emys	Asian Brown Tortoise	Reptilia	Endangered
Nilssonia formosa	Burmese Peacock Softshell	Reptilia	Endangered
Indotestudo elongata	Elongate Tortoise	Reptilia	Endangered
Lygosoma anguinum	Burmese Writhing Skink	Reptilia	Data Deficient
Dryocalamus gracilis	Scarce Bridal Snake	Reptilia	Data Deficient
Enhydris maculosa	Blanford's Spotted Water Snake	Reptilia	Data Deficient
Lissemys scutata		Reptilia	Data Deficient
Oligodon planiceps		Reptilia	Data Deficient
Sibynophis bistrigatus	Günther's Many-tooth Snake	Reptilia	Data Deficient
Morenia ocellata	Burmese Eyed Turtle	Reptilia	Vulnerable
Siebenrockiella crassicollis	Black Marsh Turtle	Reptilia	Vulnerable
Amyda cartilaginea	Asiatic Softshell	Reptilia	Vulnerable
Pelochelys bibroni	Asian Giant Softshell	Reptilia	Vulnerable
Cuora amboinensis	Southeast Asia Box Turtle	Reptilia	Vulnerable
Heosemys grandis		Reptilia	Vulnerable
Ophiophagus hannah	King Cobra	Reptilia	Vulnerable

5.5.1.5 Invasive Species

Invasive species are any species that are non-native to a particular ecosystem and whose introduction and spread causes, or are likely to cause, socio-cultural, economic or environmental harm or harm to human health (FAO, 2013). Invasive species are naturalized species that reproduce often in large numbers and are spread over a large area, damaging native species (FAO, 2005).

Invasive species have the capacity to exacerbate their role in ecosystem degradation through combination threats by habitat change, climate change over-exploitation of ecosystem resources and pollution, which further enhances their threat to biodiversity and the human condition (Emerton and Howard, 2008).

The taxa or types of organisms that can become invasive are animals (vertebrates and invertebrates), plants and micro-organisms (including those are free-living as well as those that cause disease in plants, animals, and people) (Emerton and Howard, 2008).

According to the Global Invasive Species Database (GISD) (2015), 97 species have been identified as invasive species in Myanmar. A checklist of invasive species is provided in ***Annex C***. However, the database does not specifically mention on which part of Myanmar that the invasive species were identified.

5.5.2 Field Survey

5.5.2.1 Methodology

An assessment of the biodiversity values was undertaken through a desktop assessment and direct field observations. ERM has utilized the framework for assessment provided by the *IFC Performance Standard 6, Biodiversity Conservation* *and Sustainable Management of Living Natural Resources* to guide the assessment. This includes the use of terminology and assessment processes as outlined in the Standard. The Standard is consistent with the intent and requirements of the Myanmar *Environmental Impact Assessment Procedure* and relevant laws and regulations

The desktop assessment focused on existing studies of the study area and on-line information. The following information sources were reviewed:

- Protected Planet
- WWF Wildfinder
- Key Biodiversity Areas (including Important Bird Areas, Alliance for Zero Extinction, Important Plant Areas)
- Fishbase
- Myanmar Environment Portal
- Myanmar Ministry of Environmental Conservation and Forestry
- IEE report for the Pa Yain Byu Reservoir

Location was reviewed with Google Earth prior to field work to identify potential areas of Modified Habitats [1] and Natural Habitats [2] due to absence of this component in Myanmar laws/ guideline; therefore, it is defined by the International Finance Corporation (IFC) Performance Standard 6 (PS6). The focus of the desktop assessment was identifying areas of Natural Habitat that may play host to species of conservation significance. Critical Habitats[3] would be assessed if relevant triggers under IFC PS6 were identified.

Field surveys consisted of a rapid field reconnaissance focusing on the Project Area and the Area of Influence[4] (AoI). Local community interviews and market survey were also undertaken to supplement the field observations.

5.5.2.2 *Results*

A rapid biodiversity survey was conducted in the Project Area and AoI for the Project on the 26th – 28th January 2016. During the field visit, transect walks and stationary observation were conducted in the morning and in the afternoon over two (2) days.

Questionnaires were provided to local communities in the villages of Wat Chang and Cha Muang Chaung. Two (2) local markets (near the Project area and in Dawei) were also observed.

[1] Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition

[2] Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified an area's primary ecological functions and species composition.

[3] Critical habitats are areas with high biodiversity value, including (i) habitat of significant importance to Critically Endangered and/or Endangered11 species; (ii) habitat of significant importance to endemic and/or restricted-range species; (iii) habitat supporting globally significant concentrations of migratory species and/or congregatory species; (iv) highly threatened and/or unique ecosystems; and/or (v) areas associated with key evolutionary processes.

[4] The AoI was deemed to be 3 km from the Project Area. This distance was determined based on the surrounding land uses and vegetation types within the landscape. The primary land use within the AoI is agriculture

5.5.2.3 Terrestrial Habitats

Terrestrial habitats observed within the Project Area and Area of Influence was primarily of cleared agricultural land in production or fallow and palm oil plantations.

The distribution of Natural Habitats and Modified Habitats within the Project Area and AoI is shown in ***Figure 5.20*** to ***Figure 5.22****.*

Natural Habitats consisted of evergreen and deciduous forests. No Natural Habitat was identified within the Project Area. The percentage area of natural habitat within the AoI was <5% and was located along natural drainage features and some steep hill slopes as shown in the photograph below.

Figure 5.20 Natural Habitat located on hillslopes

Source: ERM Field Survey 2016

Modified Habitats consisted of timber plantations, rubber plantations, palm oil plantations, rice paddies, fruit and nut tree plantations and fallow agricultural land. These agricultural areas were located mainly to the South of the Project Area. Palm oil plantations dominate this area.

Photographs of modified habitats within the AoI are shown below.

Figure 5.21 ***Modified Habitat showing Palm Oil Plantation***

Source: ERM Field Survey 2016

Figure 5.22 ***Modified Habitats showing Rubber Plantation***

Source: ERM Field Survey 2016

The Project Area consisted entirely of Modified Habitat, being a palm oil plantation. The percentage area of land uses identified as Modified Habitat within the AoI is shown in ***Table 5.17***.

Table 5.17 ***Area of Land use for Modified Habitats within the Area of Influence***

Land Use	Area (Km^2)	Percentage of Area within AoI
Water bodies	0.5	5%

Land Use	Area (Km^2)	Percentage of Area within AoI
Cultivated Fields and Rice Paddies	0.9	10%
Plantations (Timber, Rubber, Palm Oil, Fruit and Nut)	6.6	70%
Fallow Land	1.4	15%

5.5.2.4 Terrestrial Flora and Fauna

Observations made during the rapid field assessment included Natural Habitats consisting of remnant evergreen and deciduous forests. Typical species of forest trees include *Xylia keri, Salmalia malabrica, S. insigni, Dalbergia kurzii, Lannea grandis, Teminalia balerica, T. chebula, Eugenia spp., Anogeissus acuminata, Terminalia spp., Vitex pubescens, Adina cordifolia,* and *Spondias pinnata.* Bamboo breaks of *Melocanna bambusoides* are also likely prevalent.

No floral species of conservation significance were identified within the Project Area and AoI.

Fauna observations made during the rapid field assessment identified the species as shown in ***Table 5.18*** below. Interviews undertaken with local villagers did not identify any species of conservation significance within the AoI. Common farm animals were the only fauna identified by local people during the interviews. Similarly, no species of conservation significance were identified during market surveys.

Table 5.18 Fauna Observations during Rapid Field Assessment

Scientific Name	Common Name	Class	IUCN Red List
Callosciurus caniceps	Grey Squirrel	Mammalia	LC
Muntiacus muntjak*	Barking Deer	Mammalia	LC
*Malayopython reticulatus**	Reticulated Python	Reptilia	LC
Naja sumatrana	Equatorial Spitting Cobra	Reptilia	LC

**Observed during survey for the Pa Yain Byu Reservoir IEE*

No fauna species of conservation significance was identified within the Project Area and AoI.

5.5.2.5 Aquatic Habitats

Aquatic habitats identified within the AoI include riverine lotic habitats and riparian areas adjacent to the Dawei River to the East of the Project Area. It is considered that this riverine environment Natural Habitat.

Lentic habitats were observed within the Pa Yain Byu Reservoir. Still, non-flowing water forms the habitat within the impoundment. This habitat is considered as Modified Habitat as it is within a human-made dam.

5.5.2.6 Aquatic Flora and Fauna

No direct observations were made of aquatic flora and fauna during the field visit. Previous surveys for the Pa Yain Byu Reservoir indicate that common catfish are present within the Dawei River.

5.6 SOCIO-ECONOMIC COMPONENTS

The following section provides an overview of the local socio-economic environment, focusing on the villages that may be impacted by the Project. This includes Wat Chaung Village and Khamaung Chaung Village. Wat Chaung Village is located approximately 1.8 km west of the Project site and Khamaung Chaung Village is located approximately 3.5 km north-west of the Project site, in the Dawei District, in Taninthayi Region, Myanmar (***Figure 4.4 in Chapter 4***).

The information presented in this section was collected through a two-step process. Step 1 was a desktop review of publically available data. This included a review of documents published by government agencies, non-governmental organizations, and research institutions. Step 2 was a visit to the Project area on 26th-29th January 2016 to collect primary data, the focus of which was to ground truth the information collected in Step 1 and fill gaps in the secondary data. Primary data was collected through key informant interviews (i.e. village leaders, health professionals, cultural heritage specialists), focus groups with key groups within the local villages (i.e. women, youth, fishermen/ hunters), and household surveys. (See cultural components as defined in ***Section 5.7***).

5.6.1 Land Use and River Use

5.6.1.1 Land Use

The Project will cover an area of approximately 0.02 km^2 (4.13 acres). Most of the area that will be developed is currently covered by oil palm plantations (***Figure 5.23***); however, a small area has been fenced, and all vegetation has been removed.

Figure 5.23 Existing Oil Palm Plantations within the Project Footprint

Source: ERM Field Survey 2016

The Project study area, as defined in ***Section 5.2***, is approximately 28.22 km^2 (6,972.23 acres) (***Figure 4.4 in Chapter 4***). Most of the land within the Project study area is used by local villages for agriculture. The most common crops are cashew, rubber tree, betel nut and betel Leaf, palm oil and pepper. ***Figure 5.24*** illustrates the existing land uses within the Project study area.

Figure 5.24 Existing Plantations within the Project Study Area

Oil palm

Betel nut

Cashew

Rubber tree

Source: ERM Field Survey, 2016

5.6.1.2 River Use

The Dawei River lies approximately 3 km to the east of the Project site and the Ta Laing Gya River is located approximately 11 km south-east of the Project site. The villagers in Wat Chaung Village and Khamaung Chaung Village occasionally fish in the Dawei River and the Ta Laing Gya River, and largely only for household consumption. Fishermen who tend to fish (as a source of income) in the Dawei River and the Ta Laing Gya River are from other nearby villages - e.g. U Tharan Village and Myauk Pu Village (***Figure 5.25***).

Figure 5.25 River Use

Fishing at Dawei River

Fishing at Ta Laing Gya River

Source: ERM Field Survey, 2016

5.6.2 Demographic Profile

As of 2015, it was estimated that the population of Myanmar was approximately 56 million. Myanmar has an annual growth rate of approximately 1% (CIA 2016).

In terms of the villages located in the Project area, Khamaung Chaung Village, with a population of approximately 1,457 people, is larger than Wat Chaung Village, with a population of approximately 460 people. The villages in terms of ethnicity, language and religion, reflect the broader Myanmar population – i.e. are Buddhist Burmans that speak Myanmar (***Table 5.19***).

Table 5.19 Village Overview

Village	Households*	Estimated population	Ethnicity	Language	Religion
Khamaung Chaung	471	1,457 (m: 731/ f:726)	Burmans	Myanmar, Dawei	Buddhist
Wat Chaung	116	460 (m: 243/ f: 217)	Burmans	Myanmar, Dawei	Buddhist

Source: ERM Field surveys, 2016

5.6.3 Economy and Livelihoods

In 2015, Myanmar's gross domestic product (GDP) was estimated to be $65.78 billion. Nearly one-third of the country's population lives in poverty (CIA 2016). Poverty in Myanmar is disproportionately concentrated in rural areas, where poor people rely on agriculture and casual employment for income (World Bank 2016).

The following section provides a brief overview of key economic sectors – including agriculture, fishing, forestry and industry. In terms of the Project area, the villagers are largely reliant on the agricultural sector for income.

5.6.3.1 Agriculture

Approximately half of all agricultural land in Myanmar is devoted to cereal crops, such as rice. Other agricultural products include beans, sesame, groundnuts, sugarcane, and hardwood.

The agricultural sector is the primary employer in the Project area (***Table 5.20***). Some people are self-employed (i.e. produce crops on their own land), while others earn money as day laborers on farms.

In terms of crops, a range of crops are grown in the Project area including rubber, cashew, betel nut and leaf, pepper, and palm oil. The crops grown are identified in ***Figure 5.26***. The most common crop in Myanmar – cereal crops – is not grown in the Project area.

Household income varies widely - from 25,000 to 20,000,000 Kyats/year – and is largely dependent on the size of the land holding (***Table 5.20***). Crops are sold at the local market – i.e. Dawei Market. Crops are transported to market using a variety of methods including bus, motorbike, and pick-up truck.

Table 5.20 Household Income from Agriculture

Village	Average land holding	Households	Income*	Markets	Notes
Khamaung Chaung	7.5 acres	351	25,000-20,000,000 Kyats/year	Dawei Market	• The key water sources for agriculture include rainwater and wells. • People typically travel to market by bus, motorbike, and pick-up truck.
Wat Chaung	5 acres	48	250,000-1,050,000 Kyats/year	Dawei Market	• The key water sources for agriculture include rainwater and wells. • People typically travel to market by bus, motorbike.

*Household income is dependent on size of total land holding.
Source: ERM Field Survey 2016

Figure 5.26 Village Agricultural Practices


Palm oil


Betel nut


Cashew nut


Rubber


Pepper


Betel leaf

Strips of nipa palm leaves

Broom grass

Source: ERM Field Survey 2016

5.6.3.2 Livestock Rearing

In addition to crops, livestock rearing is another source of income in Myanmar. A variety of animals are raised, including duck, cattle, water buffalo, goats, sheep, chickens, and pigs. In 2013/2014, duck was the most commonly raised livestock, with 18.3 million, followed by cattle and chicken.

In terms of the Project area, villagers raise a variety of livestock, including poultry, cattle, goats and pigs (***Table 5.21*** and ***Figure 5.27***). However, more households are involved in crop production, than livestock rearing.

Instead of selling the livestock, in many instances the livestock are reared for personal consumption, with the exception of cattle. The milk from the cattle is often sold at the market, while the cattle themselves help around the farm (e.g. to till the land).

Table 5.21 Household Income from Livestock

Village	Income*	Households	Livestock	Markets	Notes
Khamaung Chaung	300,000-1,500,000 Kyats/year	50	Cattle, buffalo, pig, poultry and goat	Dawei Market	Cattle and buffalo are used for agricultural purposes. Pig and poultry are consumed or sold – depending on the household needs. Goats are sold or household consumption.
Wat Chaung	-	-	Cattle, pig and poultry	-	Cattle are used for agricultural purposes. Poultry and pig are for household consumption.

*Household income is dependent on the number of livestock
Source: ERM Field surveys 2016

Figure 5.27 Village Livestock Practices

Ducks

Chicken and Pig

Cattle

Buffalo

Source: ERM Field Surveys 2016

5.6.3.3 Fisheries and Aquaculture and Forestry

The fishing industry contributes approximately 8% to the GDP in Myanmar. The industry is separated into three components – inland fisheries, marine fisheries and aquaculture. The marine sector makes up approximately 52% of the industry, followed by inland fisheries (28%) and aquaculture (20%).

Inland fisheries in Myanmar are mostly associated with open water (e.g. riverine and estuarine systems) and flood plains. Inland water bodies, such as natural lakes, reservoirs, river systems and ponds, cover about 8.1 million hectares, of which 1.3 million hectares are permanent while the remaining hectares are seasonally inundated floodplains.

In the Project area, a small number of people in Khamaung Chaung Village indicated that they are actively involved in the inland fishing sector. Those involved largely fish in village ponds (***Figure 5.28***) from January to April (when the ponds are full with water). Dip nets are used to catch fish - including snakehead murrel (*Channa striata*), and climbing perch (*Anabas testudineus*). Unlike other areas of Myanmar, there does not appear to be any aquaculture in the Project area.

Similar to Khamaung Chaung Village, a small number of people in Wat Chaung Village indicated that they fish, but much of the fishing is for household consumption. Those involved largely fish at the Pa Yain Byu reservoir and use dip nets.

Figure 5.28 Village Fisheries Practices

Fishing at a pond in Khamaung Chaung Village — Fishing method

Source: ERM Field Survey 2016

Fish constitutes approximately 75% of the animal protein consumed in Myanmar. It is anticipated that approximately 10-15% of monthly household expenditure for food is on fish or fish products.

Most villagers rear livestock instead of relying on fish as a source of protein, which differs from other areas of Myanmar. A small number of villagers buy (fresh and dried) fish from at the Dawei Market, which is located approximately 30 km south of the Project site (***Figure 5.29***).

Figure 5.29 The Dawei Market

Dawei Market — Fish at the Dawei Market

Source: ERM Field Survey 2016

5.6.3.4 *Forestry*

None of the villages in the Project area are involved in the forestry sector. The only nearby forest is the Tanintharyi Nature Reserve, which is a government owned reserve located near U Tharan Village (and approximately 32 km from the Project site).

Villagers in the Project area use wood for cooking. The wood is collected from areas close to the villages – e.g. nearby agricultural properties.

5.6.3.5 *Industry*

The Project will be developed to supply industrial water for the light and medium industries, which will be developed as part of the Initial Industrial Estate of the Dawei Special Economic Zone. MIE as "the Concessionaire" or "the Project Proponent" is developing the Industrial Estate and related infrastructure and utilities – e.g. Dawei Industrial Estate Small Port (***Figure 5.30***) - together with Small Unit of Gas Generator Power Plant and Township. Development of the Industrial Estate has created some local employment, and will continue to do so as the Industrial Estate is constructed. A small number of males, including youth, have secured employment at the Industrial Estate.

Figure 5.30 Existing Facility in DSEZ

Dawei Industriala Estate Small Port

Source: MIE 2016 and ERM Field Survey 2016

In the Project area, although the majority of people are involved in the agricultural sector, a small number of people own and/ or operate businesses. This includes a range of shops – e.g. food stalls, shops that sell diesel (***Figure 5.31***). Household income varies - from 100,000 to 5,600,000 Kyats/year – depending on the size of the business holding.

Figure 5.31 Local Businesses

Diesel for motorbikes in recycled bottles for sale

Local shop

Sewing

Basketwork

Charcoal maker

Raw rubber sheets

Source: ERM Field Survey 2016

5.6.4 Transportation

A variety of transport methods are used in Myanmar, including roads, rail, air and water. In some areas the modes of transport are well developed, while in other areas they are quite limited.

Dawei District, where the Project is located, has a relatively well developed transport system. Existing infrastructure includes:

- Rail: There is one daily train from Yangon to Dawei via Mawlamyine and Ye, which takes just over 24 hours.
- Water: There are ferries from Myeik (4 hours) and Kawthoung (10 hours) to Dawei. The coastal ferry does not operate during the rainy season.
- Air: Air KBZ, Myanmar Airways and Apex Airline have flights which fly from Yangon to Dawei (1 hour) daily.
- Road: It takes 18 hours to travel from Yangon to Dawei via road, and 7 hours to travel via from Kanchanaburi Province in Thailand via the Thai-Myanmar border (Phu Nam Ron Border Crossing) to Dawei.

Traffic accidents in Myanmar increased between 2013 and 2014 (***Table 5.22***). The overall number of accidents, injuries and fatalities in 2014 were 10,818, 18,621 and 3,064, respectively. For the Taninthayi Region, the statistics are 252, 406 and 97, respectively. On the other hand, the number of traffic accidents and injuries in Taninthayi Region were decreased between 2013 and 2014.

Table 5.22 ***Road Traffic Accidents by States and Regions in Myanmar (2013-2014)***

No.	State/Region	2014 January to October			2013 January to October		
		Accident	Injury	Fatality	Accident	Injury	Fatality
1.	Naypyitaw	279	472	143	306	450	172
2.	Kachin	352	507	136	259	445	109
3.	Kayah	102	140	33	95	150	20
4.	Kayin	313	629	96	294	537	62
5.	Chin	69	146	30	57	109	24
6.	Sagaing	1,241	2,302	312	530	881	144
7.	**Taninthayi**	**252**	**406**	**97**	**316**	**624**	**76**
8.	Bago	1,163	2,193	340	1,208	2,108	288
9.	Magway	923	2,060	221	785	1,610	179
10.	Mandalay	1,116	1,960	354	988	1,603	300
11.	Mon	434	712	193	456	723	203
12.	Rakhine	263	465	76	215	334	69
13.	Yangon	2,295	3,231	425	2,177	3,210	324
14.	Shan	401	742	137	341	665	106
15.	Shan(Lashio)	307	402	169	235	396	84
16.	Shan(Kyaington)	137	287	73	139	257	65
17.	Ayeyarwady	1,171	1,967	229	875	1627	190
	Total	**10,818**	**18,621**	**3,064**	**9,276**	**15,729**	**2,415**

Source: Road Transport and Administration Department 2014

In terms of modes of transport, the most commonly owned vehicles are motorcycles and bicycles, with higher levels of ownership in urban areas compared to rural areas (***Table 5.23***).

Table 5.23 ***Vehicle Ownership***

Mode of Transport	Total	Urban	Rural
Car/ truck/ van	3.1%	8.1%	1.2%
Motorcycle/ moped	38.7%	41.2%	37.7%
Bicycle	35.9%	46.9%	31.7%
4-Wheel tractor	2.5%	1.4%	2.9%
Canoe/boat	3.9%	0.6%	5.1%
Motor boat	2.25%	0.5%	2.8%
Cart	21.6%	2.5%	29.1%

Source: Road Transport and Administration Department 2014

Within the Project area, most of the roads are considered to be of poor quality. This is largely due to the fact that the roads are dirt and experience heavy rains during the wet season (which causes erosion).

In terms of modes of transport, some villagers own their own vehicles – such as motorbikes and cars. Those that do not have vehicles rely on public transport, including buses, and motorcycle taxis. A small number of traditional carts were identified during the field survey ***(Figure 5.32***).

Figure 5.32 ***Village Vehicle Ownership***

Motorcycle

Cart

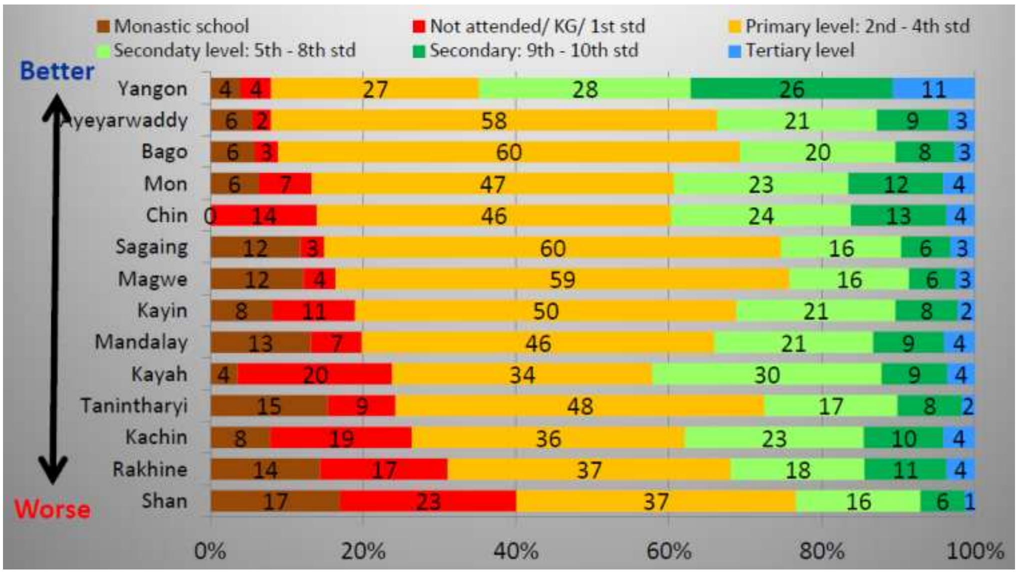
Source: ERM Field Survey 2016

5.6.5 Education and Schools

As of 2015, the adult literacy rate in Myanmar was 91.2%. However, the rate differs between men and women – with literacy being higher amongst males. The male literacy rate is 95.2%, while the literacy among females is 91.2% (CIA, 2016).

In terms of schools, it is common for children to attend primary school, but few move on to secondary school and even fewer complete years 9 and 10 or tertiary education. In the Tanintharyi Region, approximately 48% of students attended primary school in 2011; however, less than 20% of these students reached high school (***Figure 5.33***).

Figure 5.33 ***Household Education Attainment Levels in Myanmar***



Source: Poverty Profile Integrated Household Living Conditions Survey 2011

There is a primary school in Wat Chaung Village, while there is a primary and middle school in Khamaung Chaung Village (***Figure 5.34***). The Yebyu Basic Educational High School, which services the two villages, is located approximately a 15 minute motorbike ride away from each village. Nearly 70% of youth in the villages obtain middle school level education, while approximately 10% obtain a high school level education.

Figure 5.34 Village Schools

Primary school at Wat Chaung Village

Primary and secondary school at Khamaung Chaung

Source: ERM Field Survey 2016

5.6.6 Infrastructure and Services

5.6.6.1 Energy and Utilities

In Myanmar, most of the population is reliant on firewood for cooking (***Table 5.24***). This practice is contributing to the increasing rates of deforestation seen within the country.

Table 5.24 Access to Energy

Source	Cooking
Electricity	16.4%
LPG	0.4%
Kerosene	0.2%
Biogas	0.3%
Firewood	69.2%
Charcoal	11.8%
Coal	0.3%
Other	1.4%

Source	Lighting
Electricity	32.4%
Kerosene	8.1%
Candle	20.7%
Battery	17.0%
Generator	9.3%
Water mill	1.6%
Solar system	8.7%
Other	2.2%

Source: Ministry of Immigration and Population, May 2015

In terms of lighting, a range of sources are available in the country. The most commonly used are electricity, candle, and solar system.

The villages in the Project area largely use wood for cooking while some use liquefied petroleum gas (LPG) (***Figure 5.35***). (LPG can be purchased at the Dawei Market.) A range of lighting sources exist including local generators, solar systems, kerosene and candles (***Figure 5.36***). A small number of households have access to electricity.

Figure 5.35 Access to Energy for Cooking

Firewood

LPG

Source: ERM Field Survey 2016

Figure 5.36 Access to Energy for Lighting

Kerosene

Solar system

Generator

Electricity

Source: ERM Field Survey 2016

5.6.6.2 Waste Management

In Myanmar, it is anticipated that approximately 0.45 kilograms of waste is produced per capita per day (*Glawe et al. n.d.*). This includes organic waste, commercial waste and paper and plastic waste.

It is estimated that nearly 65% of the waste generated is organic waste. This is attributed to the size of the agricultural sector, as the agricultural sector largely generates organic waste.

In most major cities – such as Yangon – household waste is collected and disposed of for a small fee. However, outside major cities, waste disposal is typically the responsibility of the household. In both instances, solid waste is disposed of at open dump sites, in other words uncontrolled sites. In a small number of cases, composting and recycling is carried out.

In terms of waste in the Project study area, wastewater (e.g. greywater from sinks and baths) is largely directed back into the ground (***Figure 5.37***). Solid waste disposal is the responsibility of each household. Most households either burn their waste or dump their waste on nearby land, neither of which is regulated or controlled (***Figure 5.38***). There is public waste bin in Khamaung Chaung village; however, the waste is dumped on nearby land near, outside the village boundaries not far from the village's graveyard.

Figure 5.37 Wastewater Discharge

Source of greywater (sinks)

Source of greywater (baths)

Source: ERM Field Survey 2016

Figure 5.38 Solid Waste Disposal

Burned solid waste

Waste bins

Source: ERM Field Survey 2016

5.6.6.3 *Water Use*

In terms of water use, approximately, 89% of water withdrawn in Myanmar is used for agricultural purposes, while the remainder is used by municipalities (10%) and industry (1%). This is expected to change in the coming years as the industrial sector expands and requires more water.

Approximately 91% of the total water withdrawn is from surface water, while the remaining 9% is from groundwater. The groundwater that is withdrawn is largely used for domestic purposes (FAO 2011).

Villages in the Project area largely rely on groundwater as a source of drinking water; however, it is not the only source. Some villagers collect rainwater for domestic purposes (e.g. via Myanmar jars); while others buy bottled of drinking water (***Figure 5.39*** and ***Figure 5.40***).

Figure 5.39 Drinking Water

Myanmar jar

Plastic Drinking Water Bottle Container

Source: ERM Field Survey 2016

Figure 5.40 Water Sources

Underground wells

Brick lined wells

Source: ERM Field Survey 2016

5.6.6.4 *Sanitation*

Sanitary latrine coverage of the population in 2012 was 93% for urban areas and 76.8% for rural areas, and access to improved drinking water was available for 80% of the population in Myanmar.

Waste is typically discharged directly back into the ground. For sewage water, each household has a pit.

5.6.7 Community Health and Safety

The life expectancy in Myanmar is 64 years of age for men and 68 years of age for women (***Table 5.25***). Between 2000 and 2012, the life expectancy increased by 3 years for both males and females; however, during this same time the average increase in life expectancy in Myanmar's neighbouring countries was 5 years (WHO 2013).

Table 5.25 Key Health Indicators

Indicator	Myanmar	Thailand	Laos
Total population (2015)	56.3 million	67.9 million	6.9 million
Life expectancy at birth (2015)	64 males 68 females	71 males 78 females	61 males 65 females
Total expenditure on health per capita (2013)	37	658	95
Total expenditure on health as % of GDP (2013)	1.8	4.6	2.0
Total fertility rate (2015)	2.16	1.51	2.82
Infant mortality rate (deaths per 1,000 live births) (2014)	43	9	52
Under five mortality rate (deaths per 1,000 live births) (2015)	51	13	71

Source: WHO 2016 and CIA 2016

5.6.7.1 Morbidity

Morbidity is the state of being in poor health and encompasses both acute and chronic diseases. Many of the leading causes of morbidity in Myanmar are associated with communicable diseases and pregnancy/ child birth (***Table 5.26***).

Table 5.26 Leading Causes of Morbidity in Myanmar (2012)

No.	Causes	Percent
1.	Other injuries of specified, unspecified and multiple body regions	10.0
2.	Other complications of pregnancy and delivery	6.9
3.	Single spontaneous delivery	6.0
4.	Diarrhoea and gastroenteritis of presumed infectious origin	5.8
5.	Other viral diseases	3.8
6.	Other pregnancies with abortive outcome	2.6
7.	Gastritis and duodenitis	2.4
8.	Malaria	2.4
9.	Cataract and other disorders of lens	2.4
10.	Other acute upper respiratory infections	2.0
11.	Pneumonia	1.8
12.	Other conditions originating in the perinatal period	1.7
13.	Toxic effects of substances chiefly non-medicinal as to source	1.6
14.	Fractures of other limb bones	1.5
15.	Disease of appendix	1.5
	All other causes	47.6
	Total	**100.0**

Source: Ministry of Health 2014

Malaria is considered to be a key health issue. The cities of Yangon and Mandalay and areas above 1000 metres in elevation are considered to be malaria-free, making malaria largely an issue in rural areas of the country, most notably in Bago, Kachin, Kayah, Kayin, Shan, and Tanintharyi. The issue is compounded by the increasing presence of multi-drug resistant malaria, which is now widespread along much of the Myanmar-Thailand border.

In terms of morbidity in the villages in the Project study area, communicable and non-communicable diseases are present. Data from the Yephyu Township General Hospital (based on hospital visits in 2015), a nearby health care facility, indicates that the leading causes of morbidity in the area are diarrhea (1,818 people), dysentery (678 people), malaria (671 people), tuberculosis (157 people), and hepatitis (15 people).

Similarly, data available from the Dawei General Hospital, another local health care facility, indicates that the leading causes of morbidity are dengue fever, acute respiratory infection, malaria, hypertension, and tuberculosis (***Table 5.27***).

Table 5.27 Leading Causes of Morbidity in Dawei General Hospital

Morbidity	Year				
	2011	2012	2013	2014	2015
Injury	560	500	906	850	1,408
Dengue haemorrhagic fever	150	559	468	448	1,500
Acute respiratory infection	601	670	352	846	811
Malaria	729	227	219	218	200
Diarrhoea	-	240	538	-	-
Cerebrovascular accident	118	-	-	-	321
Hypertension	115	-	202	243	379
Human immunodeficiency virus	-	-	-	-	171
Tuberculosis	-	-	-	203	129
Pneumonia	-	-	352	-	-

Source: Dawei General Hospital 2016

5.6.7.2 Mortality

Mortality is the measure of deaths per population over time, and is a key indicator of population health. The leading cause of mortality in Myanmar is human immunodeficiency virus (HIV)/ acquired immune deficiency syndrome (AIDS) (a communicable disease) (***Table 5.28***).

Myanmar has one of the highest rates of HIV / AIDS infection in Southeast Asia. In 2013, the number of people living with HIV in Myanmar was estimated to be around 190,000; while an estimated 11,000 people died of AIDS in 2013 (UN AIDS 2015). This may change in the future, as recent data shows that rates of HIV/ AIDS have begun to decline.

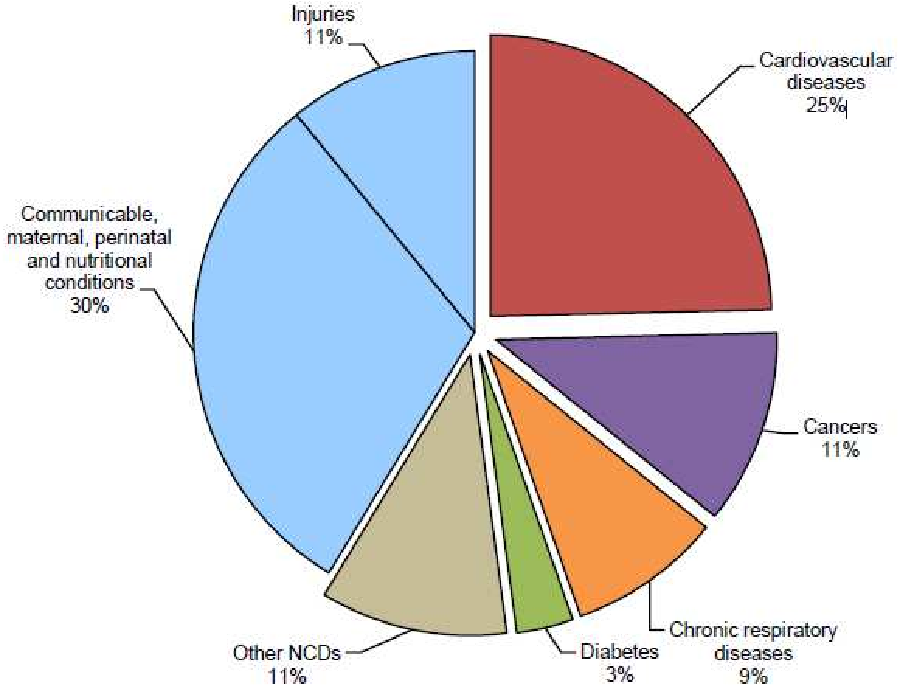
Table 5.28 Leading Causes of Mortality in Myanmar (2012)

No.	Causes	Percent
1.	Human immunodeficiency virus (HIV) / Acquired immune deficiency syndrome (AIDS)	6.6
2.	Septicaemia	6.1
3.	Other injuries of specified, unspecified and multiple body regions	5.4
4.	Slow foetal growth, foetal malnutrition and disorders related to short gestation and low birth weight	4.6
5.	Other diseases of the liver	4.0
6.	Other disease of respiratory system	3.7
7.	Intrauterine hypoxia and birth asphyxia	3.4
8.	Heart failure	3.3
9.	Respiratory tuberculosis	3.2
10.	Intracranial haemorrhage	2.9
11.	Other heart diseases	2.8
12.	Intracranial injury	2.7
13.	Malaria	2.6
14.	Pneumonia	2.6
15.	Stroke, not specified as a haemorrhage or infarction	2.5
	All other causes	43.6
	Total	**100.0**

Source: Ministry of Health 2014

Although communicable diseases top the list of causes of mortality, there are a number of non-communicable diseases that also contribute. The World Health Organization estimated that in 2014 non-communicable diseases accounted for 59% of all deaths in Myanmar (***Figure 5.41***).

Figure 5.41 Proportional Mortality (2014)



Source: WHO, 2014

The trends in mortality and fertility indicate that Myanmar is currently in demographic transition - while the current population is young, Myanmar is moving slowly towards an ageing population (WHO 2014). This reflects broader global trends, and will present new challenges for the health system.

In terms of the mortality in the villages in the Project area, hypertension appears to be a key issue. In addition, based on information from the Dawei General Hospital, other contributors to mortality include injuries, sexually transmitted diseases (e.g. HIV/AIDS), and infant health issues (e.g. low birth weight) (***Table 5.29***).

Table 5.29 Leading Causes of Mortality in Dawei General Hospital

Mortality	Year				
	2011	2012	2013	2014	2015
Injury	14	2	18	30	44
Dengue haemorrhagic fever	2	2	-	1	2
Acute respiratory infection	1	2	-	-	-
Malarial	-	-	1	-	-
Diarrhoea	-	2	-	-	-
Cerebrovascular accident	-	-	-	1	5
Hypertension	3	-	-	-	-
Hypertension	-	-	2	-	7
HIV with tuberculosis	-	-	7	-	-
Severe Pneumonia	-	-	2	-	-
Tuberculosis	-			2	-
Low Birth Weight with birth asphyxia	-	-	-	-	19
People Living with HIV/AIDS with complications	-	-	-	-	12
Heart diseases	-	-	-	-	9

Source: Dawei General Hospital 2016

5.6.7.3 Healthcare Facilities

According to the Ministry of Health, in 2012, Myanmar had 987 public hospitals with a total of 54,503 beds (***Table 5.30***). As of 2012, there were 28,077 doctors. This includes 11,460 doctors in the public sector and 16,617 doctors based in co-operatives/ the private sector (***Table 5.31***).

Table 5.30 Health Facilities in Myanmar

Health Facilities	1988-1989	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Hospitals (public sector)	631	839	846	871	924	987
Total no. of hospital beds	25,309	36,949	38,249	39,060	43,789	54,503
No. of primary and secondary health centres	64	86	86	86	86	87
No. of Maternal and Child Health Centres	348	348	348	348	348	348
No. of rural health centres	1,337	1,473	1,481	1,504	1,558	1,556
No. of school health teams	80	80	80	80	80	80
No. of traditional medicine hospitals	2	14	14	14	14	14
No. of traditional medicine clinics	89	237	237	237	237	237

Source: Ministry of Health 2014

Table 5.31 Health Personnel in Myanmar

Health Manpower	1988-1989	2007-2008	2008-2009	2009-2010	2010-2011	2011-2012
Total no. of doctors	12,268	21,799	23,740	24,536	26,435	28,077
- Public	4,377	7,976	9,583	9,728	10,927	11,460
- Co-operative & private	7,891	13,823	14,808	14,808	15,508	16,617
Dental surgeon	857	1,867	2,092	2,308	2,562	2,770
- Public	328	793	777	703	813	848
- Co-operative & private	529	1,074	1,315	1,605	1,749	1,922
Nurses	8,349	22,027	22,885	24,242	25,644	26,928
Dental nurses	96	177	244	262	287	316
Health assistants	1,238	1,788	1,822	1,845	1.899	1,536
Female health visitors	1,557	3,197	3,238	3,278	3,344	3,371
Midwives	8,121	18,098	18,543	19,051	19,556	20,044
Health supervisor	1,161	1,973	2,013	2,174	2,621	2,330
Traditional medicine practitioners						
- Public	290	945	950	890	890	885
- Private	2,500	5,163	5,397	5,737	5,737	5,867

Source: Ministry of Health 2014

The villages in the Project study area do not have their own health care facilities. However, the villages are visited by a health care professional on a monthly basis. If an issue arises, villagers typically visit one of a number of nearby health care facilities, including:

- Ae Kani Rural Health Care Center, which has one nurse;
- Yephyu Township General Hospital, which has 6 doctors, 21 nurses, 2 health assistants, 6 technicians, and 7 support staff; and
- Dawei General Hospital, which has 106 doctors, 298 nurses, 52 technicians, 6 gazette officers, and 132 support staff (***Figure 5.42*** and ***Table 5.32***).

Figure 5.42 Health Care Facilities

Ae Kani Rural Health Care Center

Yephyu Township General Hospital

Dawei General Hospital

Dawei General Hospital

Source: ERM Field Survey 2016

Table 5.32 Village Healthcare Facilities

Village	Description of Healthcare Facilities
Khamaung Chaung	• There is no health care facility in the village. • Most people have home births with support from a midwife. There is a trained midwife who resides in Khamaung Chung Village. • A nurse visits the village monthly. The nurse administers vaccinations, which occurs at the village leader's home. • In case of an incident or serious disease, most people go to Ae Kani Rural Health Care Center, Yephyu Township General Hospital and Dawei General Hospital. During the dry season, it is approximately a 20 minute motorbike ride to the hospital; however, during the wet season it is typically a 1 hour ride.
Wat Chaung	• There is no health care facility in the village. • Most people have home births with support from a midwife while some villagers will travel to the local hospital. • In case of an incident or serious disease, most people go to Ae Kani Rural Health Care Center, Yephyu Township General Hospital and Dawei General Hospital. During the dry season, it is approximately a 1 hour motorbike ride to the hospital; however, during the wet season it is typically a 2 hour motorbike ride.

In addition to existing health facilities, the use of traditional medicine exists, and often forms an integral part of the country's health services. However, the use of traditional medicine does not seem to be a common practice in the villages located in the Project study area.

5.6.7.4 *Behavioral Factors*

Behavioral factors, such as tobacco and alcohol use, diet and physical activity, are often seen as being key determinants of health.

In Myanmar, most of the population abstains from consuming alcohol. The World Health Organization estimates that approximately 92.1 percent of the population (over 15 years of age) abstains from drinking alcohol. The rate of abstinence is considerably higher in Myanmar when compared to other nearby countries (WHO, 2014).

In terms of the Project area villages, alcohol appears to be consumed in most of the villages, but only in small quantities. However, consumption was not identified as an issue in most villages.

Similar to alcohol, most villages indicated that drug use was not an issue of concern. However, betel nut use is prevalent in most of the Project area villages. Chewing betel nut can have a number of health consequences, including discoloration of teeth and gums, mouth and stomach ulcers, gum disease, oral cancers, and heart disease.

Villagers indicated that they buy cheroot from the Dawei Market. Cheroot is a cigar that is distinctive to Myanmar. It is made from a blend of tobacco and fragrant wood chips, and is consumed by women and men in the villages located in the Project study area.

5.7 CULTURAL COMPONENTS

This section provides an overview of the cultural heritage resources known to be present or potentially located in the Project study area. The Protection and Preservation of Cultural Heritage Regions Law (PPCHRL), which was amended in 2009, is the principal piece of cultural heritage legislation in Myanmar. The PPCHRL defines cultural heritage as an ancient [1] monument or ancient site that is required to be protected and preserved by reason of its historical, cultural, artistic, or anthropological value. This includes:

- Archaeological resources (e.g. sites, artifacts, ruins);
- Ancient above ground resources (e.g. monuments, buildings, structures, and facilities over 100 years old); and
- Living heritage sites (e.g. temples, Pagoda, cemeteries, shrines, and sacred sites).

5.7.1 *Data collection*

The data presented in this section was collected through a two-step process. Step 1 was a desktop review of publicly available information and step 2 was a field survey.

The objectives of the desktop study were to: establish the cultural context, including an understanding of the history of the Project study area, and identify known cultural

1 "Ancient" is defined by the Protection and Preservation of Cultural Heritage Regions Law, as amended, as any monument or site over 100 years old at the time of its investigation or evaluation by the Department of Archaeology.

heritage resources within the Project study area. The desktop study involved a review of relevant secondary data, including information available from academic journals and books, government agencies, non-governmental organisations and other online publications.

The field survey was designed to: ground truth the secondary data and identify additional cultural heritage sites. The survey involved focus groups and interviews with key representatives from Wat Chaung Village and Khamaung Chaung Village – i.e. the villages potentially impacted by the Project.

Information from the desktop review and field survey was used to help identify known sites as well as identify potential locations of undiscovered cultural heritage sites in the Project study area.

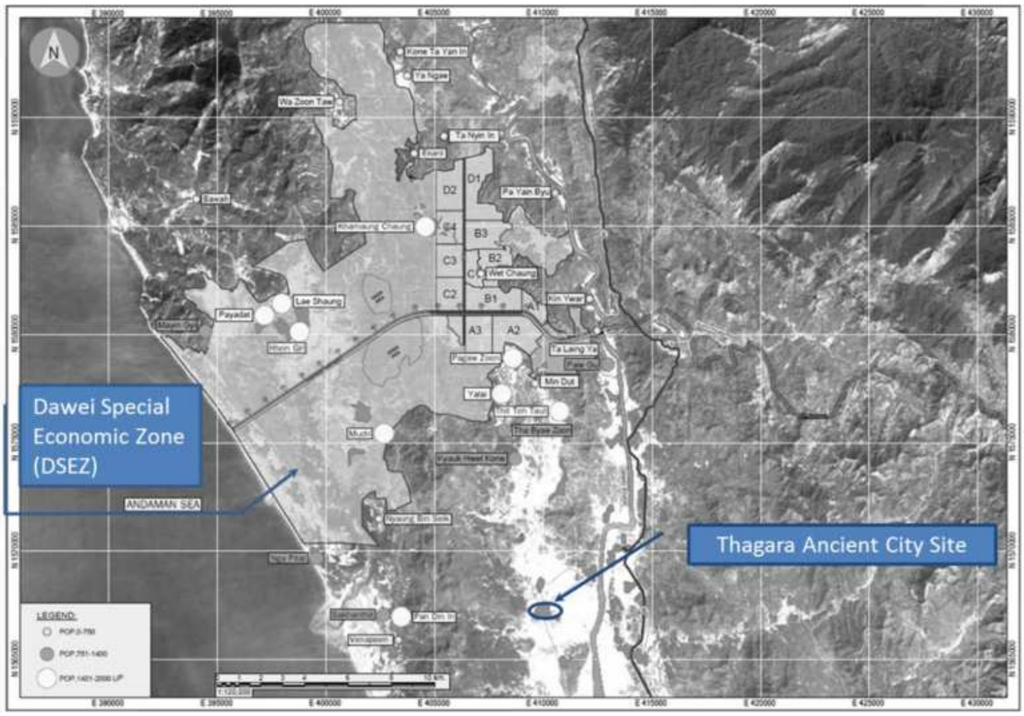
5.7.2 Archaeological Sites

Archaeological sites are places (or groups of physical sites) in which evidence of past activity is preserved. Research in the Dawei District has identified archaeological sites dating from up to the 8th Century. There were a total of ten ancient cities in Dawei District, Aungthawaddy, Hmingkari, Thagara, Sinseint, Dauntkwe, Weidi, Mute hti, Kamyaw, Kyatsarpyin and Tharawaddy. However, the main archaeological site is the ancient city of Thagara (also spelled Thagaya).

However, none of the identified archaeological sites are located within the Project study area. This was supported by the site visit, which did not identify any standing or ruined buildings, structures, or walls indicative of a large, complex archaeological site within the Project study area. The Project study area has been modified (e.g. used for plantations or is under preparation for construction works), which reduced the chance of finding archaeological sites.

The closest archaeological site is Thagara. Thagara is located 11 km west of Dawei and 1.5 km from the boundary of the DSEZ (***Figure 5.43***). The site is 1.6km from east to west and 1.1km from north to south.

Figure 5.43 Thagara Ancient City Site



Source: Mapping Thagara Village: Intangible Heritage of an Ancient Site near Dawei. Modified by ERM, 2016

5.7.2.1 Thagara

Thagara was founded in 751 A.D. It was built by the Pyu, a Tibeto-Burmese group. It is one of "thirty-two important settlements or tribes subject to the Pyu" mentioned by the New T'ang History [1].

Thagara was excavated by the Myanmar Department of Archaeology between 1999 and 2001. The excavation releveled four to five earthen ramparts around the inner and outer areas of Thagara. The outer ramparts are curvilinear and have four gates. There are at least two inner rectangular walls, one of which surrounds the central palace.

Among the objects recovered from Thagara area were: a 13 cm high image of the Buddha, locally made of lead and copper, dating to the 5th-8th centuries; a 7.5 cm high image of the Buddha seated on a throne similar in style to ones of the late Polonnaruva period (10th - 13th century) in Rakhine State; and a 6 cm high image of the walking Buddha in the Sukhathai style.

In addition, urns 13-17 cm in height, varying in length of neck, body shape and decoration, were excavated. These are important because they link Dawei District with the Pyu cities of central Myanmar. Terracotta urns have also been unearthed from a cemetery site south of the Thagara walled area and in the surrounding rice field bunds, some at 8-10 cm below the surface, others nearly at the surface.

1 Adshead, S. A. M. (2004), T'ang China: The Rise of the East in World History, New York

Beads have been found abundantly in Thagara. Very small (1-3 cm) blue and red beads were found in the urns of the cemetery sites. Medium - sized (1-3cm) finished and unfinished beads were found within the Thagara city walls, suggesting a workshop.

5.7.3 Ancient Above Ground Resources

Ancient above ground cultural heritage resources are immovable structures, groups of structures, monuments, or facilities with historic and/or artistic value to stakeholders. Historic significance can stem from association with important persons, events, or periods in local, regional, or national history. Artistic importance can result from the form, uniqueness, aesthetic value, or association with a local, regional, or nationally important artist.

Examples of ancient above ground resources include temples, stupas, mosques, churches, places and government buildings, residential buildings, commemorative monuments or markers, infrastructure such as roads and bridges, city-walls, moats and forts, and artificial landscape features irrigation canals and ponds. No ancient above ground resources were found in the Project study area through the desk-based study or site visit.

5.7.4 Living Heritage Sites

Living heritage sites are structures or natural features that are part of a living cultural tradition. These often include structures, buildings, important locations, or natural landscape features that have religious, sacred, ritual, or cultural significance to stakeholders. Potential types of living heritage sites in the Project study area include: churches, mosques, cemeteries, temples, shrines, pilgrimage sites, ritual sites, stupas, and monasteries.

Since the majority of the population in Myanmar practices Buddhism, including those living in the villages in the Project study are, Buddhist living heritage sites are type of living cultural heritage sites most likely to be found in the Project study area. The Buddhist stupa, also known as pagoda, is one of the most common types of living cultural heritage sites found across Myanmar. Stupas, derived from the Sanskrit word “stup” meaning to “pile up” or “heap”, are commemorative earthen mounds or, more commonly, bell shaped brick structures. There are four principal types of stupas:

- Sarirka: stupas containing body relics of the Buddha, his disciples, or arahants;
- Paribhagika: stupas housing objects used by the Buddha or his disciples;
- Votive: stupas erected by mostly wealthy devotees; and
- Uddesika: stupas built on locations of significant events in the Buddha’s life.

In addition to stupas, Buddhist phayas or temples and monasteries are commonly found in Myanmar. Similar to stupas they can be located either within population centers or in more isolated locations associated with significant places or landscape features. Depending on their age, temples and monasteries may also represent ancient above ground resources.

There are a number of pagodas in the vicinity of the DSEZ such as the Nabule Settawya (Foot Print Pagoda), the Setkapala Kywemin Cheya Pagoda and the U-Inn-Taung Pagoda.

The most important of the three pagodas is the Nabule Settawya (Buddha Foot Print) Pagoda, located near Le shaung Village in Yephyu Township, 0.4 km from the Project site. The Buddha Foot Print at Nabule commemorates the visit of the Buddha to Dawei. A pagoda festival is celebrated every year in the month of Kason in May at Nabule Settawya (Buddha Foot Print) Pagoda.

Associated with the Buddha Foot Print at Nabule is another Foot Print, of a Bull. The Dawei chronicles[1] attribute the founding of Thagara to a Prince Maung Nwa ("Mr.Bull") who became a hermit and married an Ngakomma fish. The Bull Foot Print, therefore, refers to the founding of Thagara by Maung Nwa.

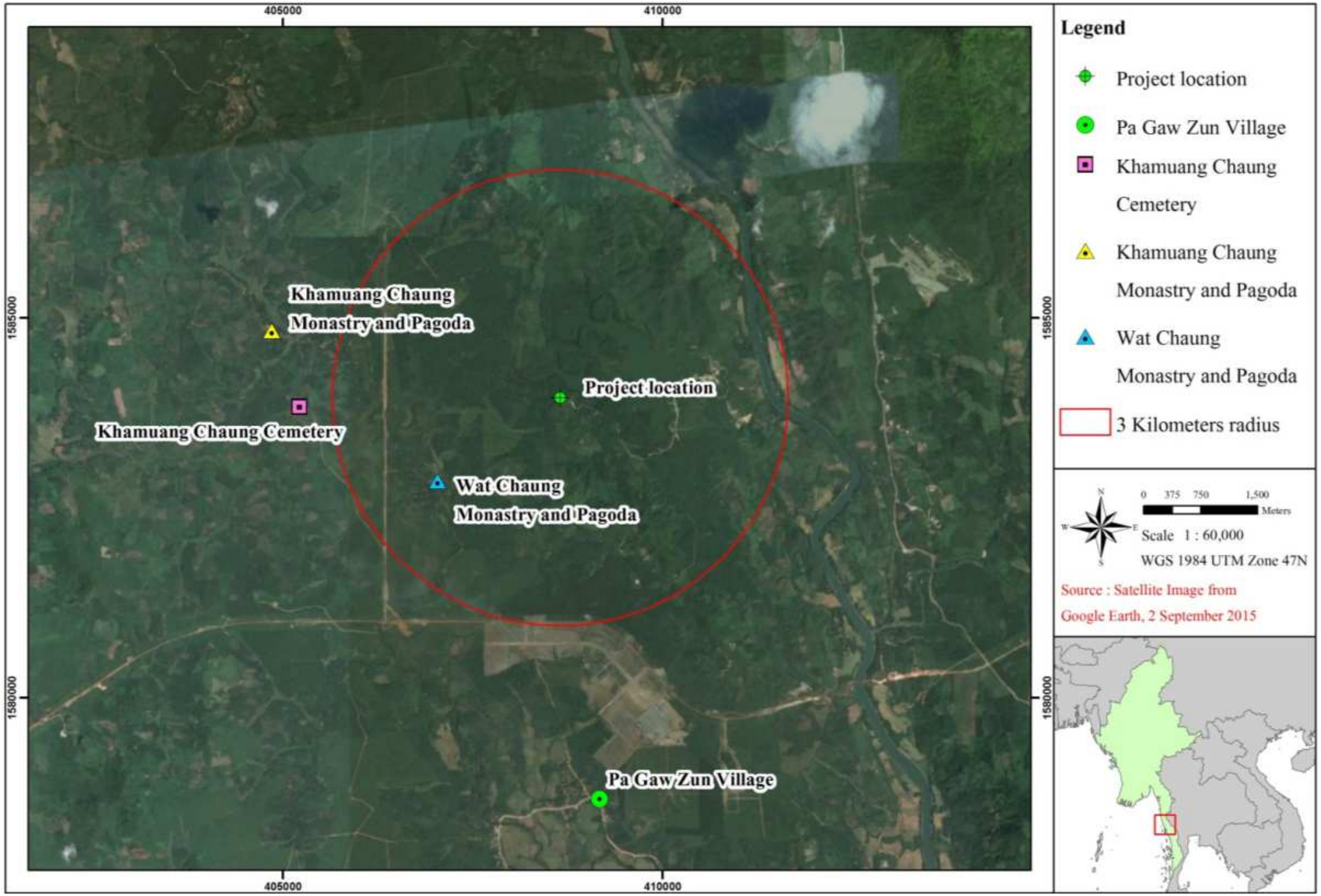
Other nearby pagodas include the Setkapala Kymemincheya (Foot Print of the Buffelo King) Pagoda, which is a small pagoda not too far away from the Settawya Pagoda, and the U Inn Taung Pagoda, which is slightly further away in a forest sanctuary.

The site visit identified several additional Buddhist living heritage sites (see ***Figure 5.44*** below) including:

- A Pagoda in the Pa Gaw Zun Village;
- A Monastery and a few Pagoda in Khamuang Chaung Village;
- A Monastery and a few Pagoda in Wat Chaung Village; and
- A burial site outside of Khamuang Chaung Village.

[1] Moore, Elizabeth (2013) 'The Sacred Geography of Dawei: Buddhism in peninsular Myanmar (Burma).' Contemporary Buddhism: An Interdisciplinary Journal, 14 (2). pp. 298-319.

Figure 5.44 Living Cultural Heritage Sites Near The Project Study Area



Source: ERM, 2016

The monasteries (***Figure 5.44*** and ***Figure 5.46***) are open throughout the day and worshipers are able to visit and perform rites at any time.

The Pagoda in Pa Gaw Zun village is approximately 5 kilometers outside of the Project study area. In addition to Buddhist rituals, ceremonies are also held at the Pagoda, in particular award ceremonies at the end of the school year.

The Pagoda and Monastery of Khamuang Chaung Village are both located next to the Project study area, 3.5 kilometres from the Water Treatment Plant site. The village was founded in 1866 and the monastery in 1999. It is composed of eight buildings, 4 of which are religious and 4 dependencies such as dormitory for the monks for example. Six monk live there and Buddhist rituals and ceremony are still performed at the pagoda. In particular, there is a ceremony in October for Buddha that draws the entire village in the monastery. Worshipers were observed using the monastery for daily and weekly prayers as well as community events during site visit.

The burial site (***Figure 5.45***) is still used by people in Khamuang Chaung to bury their dead. The oldest grave is from 1968 and the newest that has been observed was from December 2015.

Figure 5.45 Khamuang Chaung Cemetery

Source: ERM Field Survey 2016

Figure 5.46 Living Cultural heritage of Villages within the Project Study Area

A monastery in Khamuang Chaung Village

A pagoda in Wat Chaung Village

A pagoda in Khamuang Chaung Village

A statue of Buddha in Wat Chaung Village

A monastery in Khamuang Chaung Village

A monastery in Wat Chaung Village

Source: ERM Field Survey 2016

Wat Chaung Village was founded in 1816 according to interviews conducted during the site visit. The Wat Chaung Village monastery has been built in 1998 and is used for Buddhist rituals and ceremonies. Two monks live at the monastery. Dhama School, with around 60 students from the village, also takes place there every Sunday.

5.7.5 *Intangible Cultural Heritage*

A range of national festivals and ceremonies (i.e. intangible cultural heritage) are held throughout Myanmar. Examples include the Water Festival and Myanmar New Year. Pagoda complexes and monasteries are often at the centre of these festivals and ceremonies.

No intangible cultural heritage (e.g. tradition, ritual and religious practice, ceremonies) was identified through the desktop review or field survey specific to the Project study area.

5.8 VISUAL COMPONENTS

The significant visual components within the Project study area are associated with surface water features, land use features and archeological sites. These features have been described separately in ***Section 5.4.6***, ***Section 5.6.1*** and ***Section 5.7.2*** respectively.

The Project site is generally low level plain, with physical settings around the Project comprised of oil palm plantations. However, a small area has been fenced, and all vegetation has been removed. Prior to acquisition of the land, the Project site was used by local villages for agriculture. The most common crops are cashew, rubber tree, palm oil and pepper.

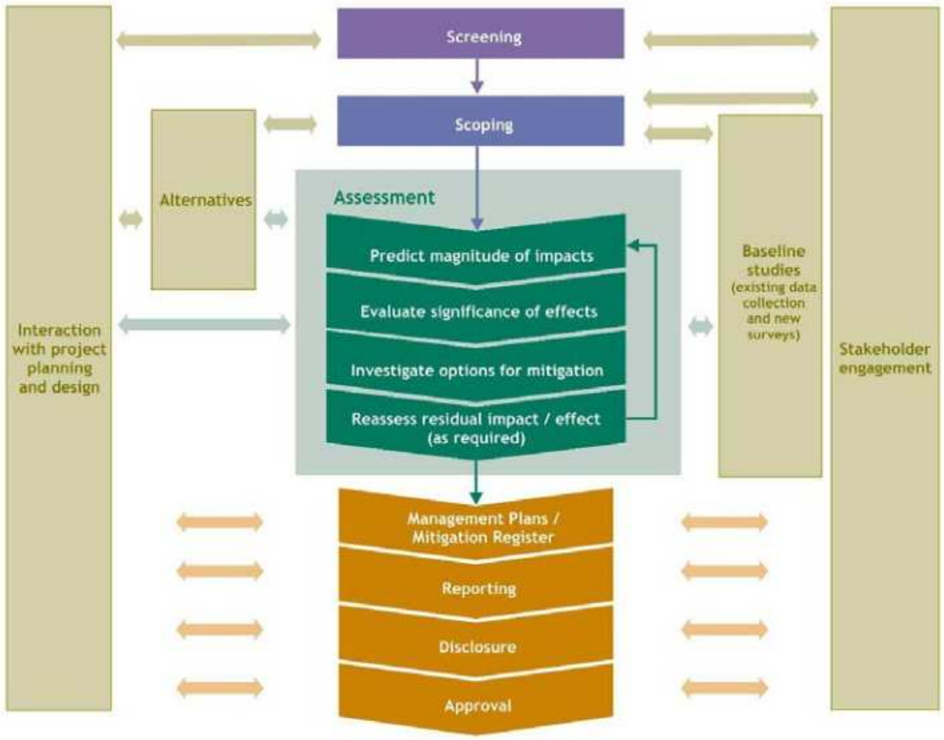
6 IMPACT ASSESSMENT AND MITIGATION MEASURES

6.1 IMPACT ASSESSMENT METHODOLOGY AND APPROACH

6.1.1 Introduction

This Chapter presents the methodology used to conduct the impact assessment. The IEE methodology follows the overall approach illustrated in ***Figure 6.1***. The IEE has been undertaken following a systematic process that evaluates the potential impacts the Project could have on aspects of the physical, biological, social/ socio-economic and cultural environment; identifies preliminary measures that the Project will take to avoid, minimise/reduce, mitigate, offset or compensate for potential adverse impacts; and identifies measures to enhance potential positive impacts where practicable.

Figure 6.1 Overall Impact Assessment Process



6.1.2 Screening

At the initial stage of the IEE, preliminary information was provided to aid in the determination of what legal and other requirements apply to the Project. The screening process of this Project has been conducted and the Project Proponent has discussed and agreed with the relevant authorities that an Initial Environmental Examination (IEE) Study is required for the Project.

6.1.3 Scoping

Scoping has been undertaken to identify the potential Area of Influence for the Project (and thus the appropriate Study Area), to identify potential interactions between the Project and resources/receptors in the Area of Influence and the impacts that could result from these interactions, and to prioritize these impacts in terms of their likely significance.

This stage is intended to ensure that the IEE focuses on those issues that are most important for design, decision-making and stakeholder interest. The findings of the scoping exercise are reported in ***Section 6.2*** of this report.

Table 6.1 presents the resources/receptors considered in the scoping stage, together with the changes that might indicate a potential Project-related impact.

Table 6.1 Resources/Receptors and Potential Impacts Considered in Scoping

Resources/Receptors	Changes that May Indicate Potential Impacts
Environmental	
Geology	Changes to geology, geomorphology, topography
Soil	Changes to physical and chemical properties and soil ecology
Surface Water	Changes to physical, chemical or biological quality of rivers, lakes, seas and other surface water bodies; Introduction of exotic species, changes in habitat quality, abundance, diversity; Effluent discharge.
Groundwater	Contamination of shallow or deep groundwater resources, change in ground water resources
Sediments	River/waterbed morphology, physical and chemical properties, benthic organisms
Fisheries	Changes in fisheries productivity
Vegetation	Changes to vegetation population, health, species abundance and diversity and impact on endangered and economic species, food chain effects
Wildlife	Changes to wildlife assemblages, impact on endangered and economic species, food chain effects
Air	Emissions of NOx, SOx, PM, CO, VOC, greenhouse gases (CO_2, CH_4, and N_2O), ozone, TSP etc.
Noise and Vibration	Change in noise or vibration levels
Aesthetics	Physical presence of facilities, increased night time light
Waste	Generation of wastes – hazardous and non-hazardous
Social / Socio-economic	
Population and physical displacement	Changes in total population, gender ratio, age distribution. Physical displacement from residence as a result of Project and its activities
Social and Cultural Structure	Disruption in local authority and governance structure; change in social behaviours; alterations to social and cultural networks; intra and inter-ethnic conflict
Economy and employment	Change in national/local economy, employment, standard of living, occupation
Resource ownership and use	Temporary or permanent restriction for accessing or using land or water, changes in livelihood activities based on natural resources; changes in ownership of such resources.
Cultural Resources	Physical disturbance of shrines, burial grounds, archaeological resources or other desecration or change in access to cultural resources, rituals or celebrations carried out in their premise.
Education and skills	Change in availability or quality of education or skills provision, supply and demand in certain skill sets etc.
Infrastructure and public services	Improvement or pressure on existing urban/rural infrastructure or services including: transportation; power, water, sanitation, security, waste handling facilities etc.

Resources/Receptors	Changes that May Indicate Potential Impacts
Community Health and Safety	
Mortality and Key Health Indicators	Change in the mortality profile of the community; changes in life expectancy, birth rates, death rates, maternal mortality rates etc.
Environmental Change	Decreased air quality (e.g. NOx, SOx, VOC, CO, PM), contamination of surface waters and potable ground water, increased vibration and noise, increased night time light beyond acceptable limits, changes to the visual environment.
Communicable and Non Communicable Diseases	Change in incidence and /or prevalence of communicable and non-communicable diseases or disease causing factors
Vector Borne Diseases	Changes in the incidence and or prevalence of vector borne diseases, the density of these vectors and their breeding grounds.
Sexually Transmitted Diseases	Changes in the incidence and /or prevalence of sexually transmitted diseases and the factors that contribute to this (external workforce, transport routes etc.)
Nutritional Status	Changes to nutritional status and food security
Health Care/ Recreational Facilities	Changes in availability of and access to health care and recreational facilities including green space
Psychosocial /Lifestyle Factors	Drug use/abuse, prostitution, communal violence, crime, suicide and depression; changing expectations of quality of life
Community Safety	Risk to community safety from gas leaks from the gas supply pipeline

6.1.4 *Project Description*

In order to set out the scope of the Project features and activities, with particular reference to the aspects which have the potential to impact on the environment, a Project Description has been prepared. Details of the Project facilities' design characteristics, as well as planned and possible unplanned Project activities, are provided in ***Chapter 4*** of this IEE Report.

6.1.5 *Description of the Surrounding Environment*

To provide a context within which the impacts of the Project can be assessed, a description of physical, biological, social / socio-economic and cultural conditions that would be expected to prevail in the absence of the Project is presented. The description of the surrounding environment is reported in ***Chapter 5*** of this report. The Section includes information on all resources/receptors that were identified during scoping as having the potential to be significantly affected by the Project.

6.1.6 *Public Consultation and Disclosure*

An effective IEE Process requires engagement with relevant stakeholders throughout the key stages. This assists in understanding stakeholder views on the Project and in identifying issues that should be taken into account in the prediction and evaluation of impacts. Details on Public Consultation and Disclosure activities undertaken for this Project to date are presented in ***Chapter 8***.

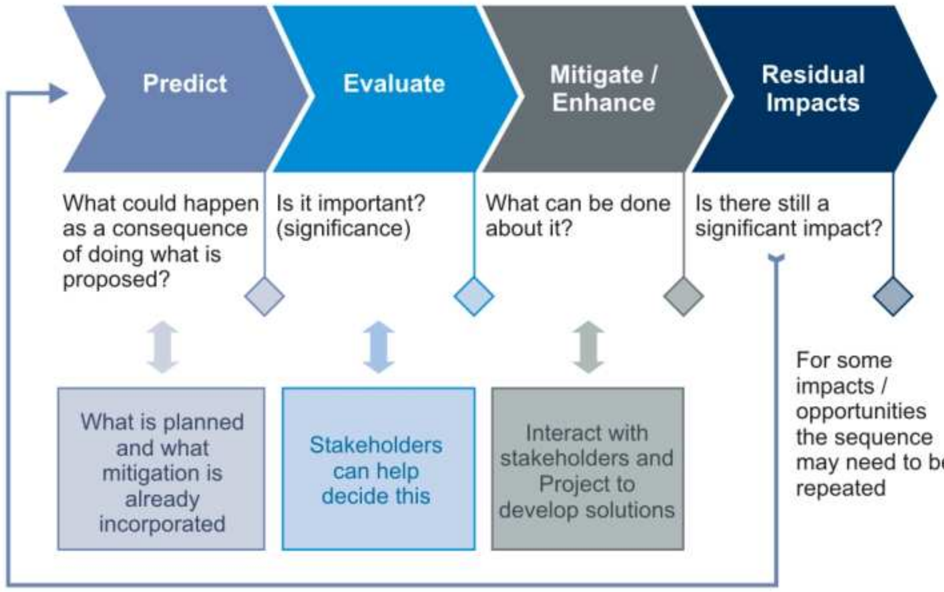
6.1.7 *Impact Assessment*

Impact identification and assessment starts with Scoping and continues through the remainder of the IEE Process. The principal impact assessment steps are summarized in ***Figure 6.2*** and comprise:

- **Impact prediction:** to determine what could potentially happen to resources/receptors as a consequence of the Project and its associated activities;

- **Impact evaluation:** to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor;
- **Mitigation and enhancement:** to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts; and
- **Residual impact evaluation:** to evaluate the significance of impacts assuming effective implementation of mitigation and enhancement measures.

Figure 6.2 Impact Assessment Process



6.1.7.1 Prediction of Impacts

Prediction of impacts is essentially an objective exercise to determine what is likely to happen to the environment, social, or health aspects as a consequence of the Project and its associated activities. From the potentially significant interactions identified in Scoping, the impacts to the various resources/receptors are elaborated and evaluated. The diverse range of potential impacts considered in the IEE process typically results in a wide range of prediction methods being used, including quantitative, semi-quantitative and qualitative techniques.

6.1.7.2 Evaluation of Impacts

Once the prediction of impacts is complete, each impact is described in terms of its various relevant characteristics (e.g., type, scale, duration, frequency, extent). The terminology used to describe impact characteristics is shown in ***Table 6.2***. The definitions for the "type" designations are shown in ***Table 6.2.*** Definitions for "extent", "duration", "scale", and "frequency" are resource/receptor-specific, but typical examples are shown in ***Table 6.2.***

Table 6.2 Impact Characteristic Terminology and Definitions

Characteristic	Definition	Designations	Description
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	Direct	Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected).
		Indirect	Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land).
		Induced	Impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project (e.g., influx of camp followers resulting from the importation of a large Project workforce).
Extent	The "reach" of the impact (e.g., confined to a small area around the Project Footprint, projected for several kilometres, etc.).	Local	The potential impact is limited to the Project area and vicinity.
		Regional	The potential impact covers a large area and/or affects the area beyond a local level.
		International	Potential impact may occur on a large scale at the regional level, and may expand to the national or international level.
Duration	The time period over which a resource / receptor is affected.	Temporary	Temporary potential impact occurs, or short-term impacts occur only occasionally.
		Short-term	Potential impact occurs over short term.
		Long-term	The potential impact occurs continuously for a long period of time and/or it is a permanent impact.
Scale	The size of the impact	No fixed designations	Intended to be a numerical value or a qualitative description of "intensity" or scale, e.g., the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.
Frequency	A measure of the constancy or periodicity of the impact.	No fixed designations	Intended to be a numerical value or a qualitative description of frequency, e.g. continuous, daily, weekly, etc.

The above characteristics and definitions apply to planned and unplanned events. An additional characteristic that pertains only to unplanned events is *likelihood*. The *likelihood* of an unplanned event occurring is designated using a qualitative scale, as described in ***Table 6.3***.

Table 6.3 Definitions of Likelihood Designations (for Unplanned Events only)

Likelihood	Definition
Unlikely	The event is unlikely but may occur at some time during normal operating conditions.
Possible	The event is likely to occur at some time during normal operating conditions.
Likely	The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Once impact characteristics are defined, the next step in the impact assessment phase is to assign each impact a 'magnitude'. As shown in ***Figure 6.3***, magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;
- Duration;
- Scale; and
- Frequency.

Additionally, for unplanned events only, magnitude incorporates the 'likelihood' factor discussed above.

Magnitude essentially describes the intensity of the change that is predicted to occur in the resource/receptor as a result of the impact. The magnitude designations themselves are universally consistent, but the definitions for these designations vary depending on the resource/receptor. The universal magnitude designations are:

- Positive;
- Negligible;
- Small;
- Medium; and
- Large.

In the case of a *positive* impact, no magnitude designation (aside from 'positive') is assigned. It is considered sufficient for the purpose of the IA to indicate that the Project is expected to result in a *positive* impact, without characterizing the exact degree of positive change likely to occur.

In the case of impacts resulting from unplanned events, the same resource/receptor-specific approach to concluding a magnitude designation is utilized, but the 'likelihood' factor is considered, together with the other impact characteristics, when assigning a magnitude designation.

In addition to characterizing the magnitude of impact, the other principal impact evaluation step is definition of the sensitivity/vulnerability/ importance of the impacted resource/receptor. There are a range of factors to be taken into account when defining the sensitivity/vulnerability/importance of the resource/receptor, which may be physical, biological, cultural or human. Other factors may also be considered, such as legal protection, government policy, stakeholder views and economic value. As in the case of magnitude, the sensitivity/vulnerability/importance designations themselves are universally consistent, but the definitions for these designations vary on a resource/receptor basis. Examples of receptor/resource sensitivity are provided in ***Table 6.4***. The sensitivity/ vulnerability/importance designations used herein for all resources/ receptors are:

- Low;
- Medium; and
- High.

Figure 6.3 Magnitude Designation

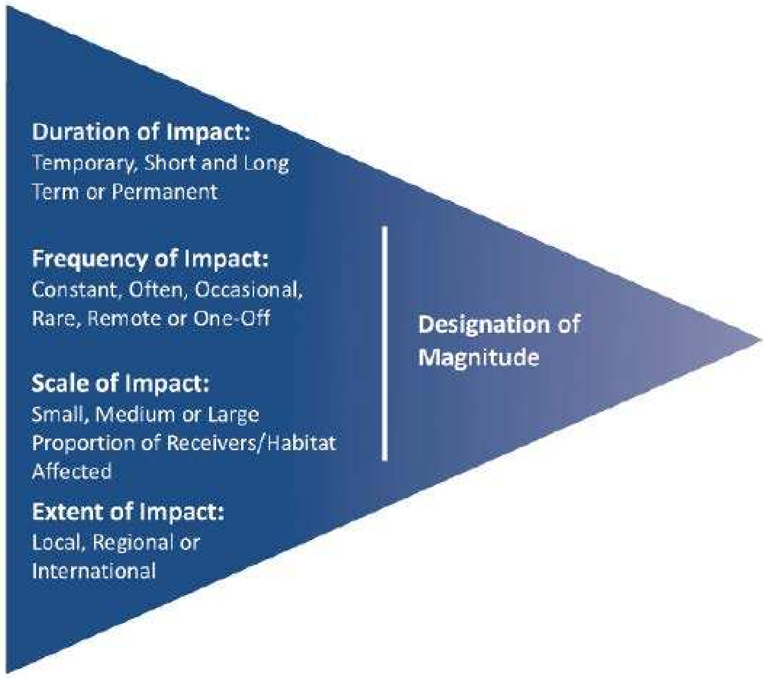


Table 6.4 Example Definitions of Receptor Sensitivity

Sensitivity of Receptor	Example Definitions of Receptor Components			
	Abundance or quantity	**Condition**	**Adaptability**	**Value**
Low	Typically found/ Similar abundance in all area.	In a good and tolerant condition. Has experienced similar levels of change, which was acceptable.	Immediately adapts and accepts changes without difficulties.	Valuable but not site specific.
Medium	Abundance is limited in some areas.	Under some stressed condition.	Adapts/ accepts changes with some difficulties.	Valuable at local level, in current situation or under the protection of the law.
High	Very scarce. Specific characteristics.	Under high pressure and tends to worsen.	Cannot withstand the increasing pressure and experiences negative, permanent changes.	Highly valuable at the national and international level, or under the protection of the law.

Once magnitude of impact and sensitivity/vulnerability/importance of resource/receptor have been characterized, the significance can be assigned for each impact. Impact significance is designated using the matrix shown in ***Table 6.5***.

Table 6.5 Impact Significance

		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

The matrix applies universally to all resources/receptors, and all impacts to these resources/receptors, as the resource/receptor-specific considerations are factored into the assignment of magnitude and sensitivity/vulnerability/ importance designations. ***Figure 6.4*** provides a context for what the various impact significance ratings signify.

It is important to note that impact prediction and evaluation take into account any embedded controls (i.e., physical or procedural controls that are already planned as part of the Project design, regardless of the results of the IEE Process). This avoids the situation where an impact is assigned a magnitude based on a hypothetical version of the Project that considers none of the embedded controls.

Figure 6.4 Context of Impact Significances

An impact of **negligible** significance is one where a resource/receptor (including people) will essentially not be affected in any way by a particular activity or the predicted effect is deemed to be 'imperceptible' or is indistinguishable from natural background variations. An impact of **minor significance** is one where a resource/receptor will experience a noticeable effect, but the impact magnitude is sufficiently small and/or the resource/receptor is of low sensitivity/vulnerability/ importance. In either case, the magnitude should be well within applicable standards. An impact of **moderate** significance has an impact magnitude that is within applicable standards, but falls somewhere in the range from a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. Clearly, to design an activity so that its effects only just avoid breaking a law and/or cause a major impact is not best practice. The emphasis for moderate impacts is therefore on demonstrating that the impact has been reduced to a level that is as low as reasonably practicable (ALARP). This does not necessarily mean that impacts of moderate significance have to be reduced to minor, but that moderate impacts are being managed effectively and efficiently. An impact of **major** significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. An aim of ESHIA is to get to a position where the Project does not have any major residual impacts, certainly not ones that would endure into the long-term or extend over a large area. However, for some aspects there may be major residual impacts after all practicable mitigation options have been exhausted (i.e. ALARP has been applied). An example might be the visual impact of a facility. It is then the function of regulators and stakeholders to weigh such negative factors against the positive ones, such as employment, in coming to a decision on the Project.

6.1.8 Identification of Mitigation and Enhancement Measures

Once the significance of an impact has been characterised, the next step is to evaluate what mitigation and enhancement measures are warranted. For the purposes of this IEE, ERM has adopted the following Mitigation Hierarchy:

- **Avoid at Source, Reduce at Source:** avoiding or reducing at source through the design of the Project (e.g., avoiding by siting or re-routing activity away from sensitive areas or reducing by restricting the working area or changing the time of the activity);
- **Abate on Site**: add something to the design to abate the impact (e.g., pollution control equipment, traffic controls, perimeter screening and landscaping);

- **Abate at Receptor:** if an impact cannot be abated on-site then control measures can be implemented off-site (e.g., noise barriers to reduce noise impact at a nearby residence or fencing to prevent animals straying onto the site);
- **Repair or Remedy**: some impacts involve unavoidable damage to a resource (e.g. agricultural land and forestry due to creating access, work camps or materials storage areas) and these impacts can be addressed through repair, restoration or reinstatement measures; and
- **Compensate in Kind, Compensate Through Other Means:** where other mitigation approaches are not possible or fully effective, then compensation for loss, damage and disturbance might be appropriate (e.g., planting to replace damaged vegetation, financial compensation for damaged crops or providing community facilities for loss of fisheries access, recreation and amenity space).

The priority in mitigation is to first apply mitigation measures to the source of the impact (i.e., to avoid or reduce the magnitude of the impact from the associated Project activity), and then to address the resultant effect to the resource/receptor via abatement or compensatory measures or offsets (i.e., to reduce the significance of the effect once all reasonably practicable mitigation measures have been applied to reduce the impact magnitude).

6.1.9 Residual Impact Evaluation

Once mitigation and enhancement measures are declared, the next step in the IEE Process is to assign residual impact significance. This is essentially a repeat of the impact assessment steps discussed above, considering the implementation of the proposed mitigation and enhancement measures.

6.2 Outcomes from Screening and Scoping

Potential impacts have been identified through a systematic process whereby the features and activities (both planned and unplanned) associated with the construction and operation of the Project have been considered with respect to their potential to interact with resources/receptors. Potential impacts have each been classified in one of three categories:

- **No interaction:** where the Project is unlikely to interact with the resource/receptor (e.g., wholly marine projects may have no interaction with the terrestrial environment);
- **Interaction likely, but not likely to be significant:** where there is likely to be an interaction, but the resultant impact is unlikely to change baseline conditions in an appreciable/detectable way; and
- **Significant interaction**: where there is likely to be an interaction, and the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor.

As a tool for conducting scoping, the various Project features and activities that could reasonably act as a source of impact were identified, and these have been listed down the vertical axis of a Potential Interactions Matrix. The resources/receptors relevant to the baseline environment have been listed across the horizontal axis of the matrix. Each resulting cell on the Potential Interactions Matrix thus represents a potential interaction between a Project feature/activity and a resource/receptor.

The completed Potential Interactions Matrix of the Project is presented in ***Figure 6.5***. It should be noted that the list of project activities is not intended to be exhaustive but rather an identification of key aspects of the Project that have the potential to interact with the environment/cause environmental impacts. The list of resources/receptors is also a focused list of the key aspects of the environment that are considered vulnerable or important in the context of the Project.

Figure 6.5 Scoping Matrix

Project Activity/ Hazards \ Resource/ Receptors	Air Quality and Greenhouse Gas	Landscape and Visual Amenity	Surface Water and Groundwater	Sedimentation/Siltation	Land Contamination	Noise and Vibration	Soil Erosion	Waste Including Hazardous Materials	Land/River Use	Geology and Topography	Terrestrial flora/fauna	Aquatic Species	Community Health and Safety	Demographic Pattern (incl physical displacement)	Economy and Livelihoods	Transportation	Education and Skills	Infrastructure and Services	Fishing Resources	Occupational Health and Safety	Cultural Heritage Resources
	Environmental Resources												Socio/Economic Resources								
Construction Phase																					
Water Treatment Plant																					
Site Formation & Access Road	■	▒	■	■	■	■	■	■	■	■	■	▒	■	■	■	■	□	■	□	■	□
Excavation and Foundation work (inc. filling disposal material)	■	▒	■	■	■	■	■	■	■	■	■	▒	■	■	■	■	□	■	□	■	□
Civil Construction	■	▒	□	■	■	■	■	■	□	■	■	▒	■	■	■	■	■	■	■	■	■
Equipment/Material/Worker Transport	▒	□	□	□	□	■	□	■	□	□	▒	□	■	■	□	■	□	■	□	■	□
Pre-commisioning	▒	□	■	□	□	■	□	■	□	□	□	□	■	□	■	□	□	□	□	■	□
Commisioning	▒	□	■	□	□	■	□	■	□	□	□	□	■	□	■	■	□	□	□	■	□
Wastewater Discharges and Run-off	□	□	■	▒	■	□	□	■	□	□	▒	■	■	□	□	□	□	□	■	□	□
Non-Hazardous Waste Storage and Disposal	□	□	■	□	■	□	□	■	□	□	▒	□	▒	□	□	■	□	■	□	■	□
Hazardous Waste Storage and Disposal	□	□	■	□	■	□	□	■	□	□	▒	□	■	□	□	■	□	■	□	■	□
Accidental events/ spills/ dropped objects	▒	□	■	□	■	□	□	□	□	□	■	■	■	□	■	□	□	▒	■	■	▒
Pumping Station and Water Supply Pipeline																					
Site Formation & Access Road	■	▒	■	■	■	■	■	■	■	■	■	▒	■	■	■	■	□	■	□	■	□
Excavation and Foundation work	■	▒	■	■	■	■	■	■	■	■	■	▒	■	■	■	■	□	■	□	■	□
Construction of Pumping Station and Water Supply Pipeline (floating)	■	▒	■	▒	□	■	□	■	■	□	□	■	■	□	■	■	□	□	□	■	□
Construction of Pumping Station and Water Supply Pipeline (land)	■	▒	■	▒	■	■	■	■	■	■	■	▒	■	□	■	■	□	▒	▒	■	□
Equipment/ Material/ Worker Transport	▒	□	□	□	□	□	□	■	□	□	□	▒	■	□	□	■	□	□	□	■	□
Pre-commisioning	▒	□	■	□	□	■	□	■	□	□	□	□	■	□	■	□	□	□	□	■	□
Commisioning	▒	□	■	□	□	■	□	■	□	□	□	□	■	□	■	■	□	□	□	■	□
Wastewater Discharges and Run-off	□	□	■	▒	■	□	□	■	□	□	▒	■	■	□	□	□	□	□	■	□	□
Non-Hazardous Waste Storage and Disposal	□	□	■	□	■	□	□	■	□	□	▒	□	▒	□	□	■	□	■	□	■	□
Hazardous Waste Storage and Disposal	□	□	■	□	■	□	□	■	□	□	▒	□	■	□	□	■	□	■	□	■	□
Accidental events/ spills/ dropped objects	▒	□	■	□	■	□	□	□	□	□	■	■	■	□	■	□	□	▒	■	■	▒
Operation Phase																					
Water Treatment Plant																					
Operation of Water Treatment Plant	■	▒	■	□	■	■	■	■	▒	▒	■	■	■	■	■	□	□	■	▒	■	▒
Waste Storage and Disposal	□	□	■	□	■	□	□	■	□	□	▒	▒	■	□	□	■	□	■	□	■	□
Accidental events (spill, uncontrolled release)	■	□	■	▒	■	□	□	□	□	□	■	▒	■	▒	▒	▒	□	■	■	■	▒
Pumping Station and Water Supply Pipeline																					
Operation of Pumping Station and Water Supply Pipeline (floating)	□	▒	□	▒	□	■	□	■	■	□	□	■	■	□	□	□	□	□	■	■	□
Operation of Pumping Station and Water Supply Pipeline (land)	□	▒	□	▒	■	■	□	■	■	▒	■	□	■	□	□	□	□	□	□	■	□
Waste Storage and Disposal	□	□	■	□	■	□	□	■	□	□	□	□	■	□	□	■	□	■	□	■	□
Accidental events (leaks, uncontrolled release)	■	□	■	▒	■	□	□	□	□	□	■	■	■	□	□	□	□	■	▒	■	▒

Key

Scoped Out	□
Scoped Out with supporting reason	▒
Further Consideration in IA	■

Source: ERM, 2016

6.3 AIR QUALITY

6.3.1 Introduction

This Section presents an assessment of the potential impacts of the proposed Project on ambient air quality during the construction and operational phases.

Air sensitive receivers (ASRs) and potential sources of air emissions were identified and an assessment of the potential air quality impacts arising from these air emissions was carried out. Mitigation measures and recommendations are provided for consideration where necessary to be implemented to reduce any potential residual impacts to acceptable levels where practicable.

6.3.2 Scope of Assessment

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2***, the following potential impacts on air quality are considered further in this IEE.

Construction Phase

- Water Treatment Plant
  - Site Formation
  - Excavation and Foundation Work
  - Civil Construction
  - Equipment/Material/Worker Transport
- Pumping Station and Water Supply Pipeline
  - Site Formation
  - Excavation and Foundation Work
  - Construction of Pumping Station and Water Supply Pipeline (floating)
  - Construction of Pumping Station and Water Supply Pipeline (land)
  - Equipment/Material/Worker Transport

Operation Phase

- Water Treatment Plant
  - Operation of Water Treatment Plant

6.3.3 Construction Phase

Construction activities related to the proposed Project will result in limited short-term air quality impacts. Dust in term of Total Suspended Particulates (TSP) and fine particles (PM_{10} and $PM_{2.5}$) are the key pollutants during construction. Emissions from construction worker vehicles and construction equipment are anticipated to have minimal short-term impacts.

Potential impacts to air quality and dust from the Project may occur due to the following activities:

- Site preparation activities of WTP and water supply pipeline including site clearing and grubbing, excavation and filling, and construction of access road; and
- Vehicle movement on dirt road.

Site Preparation Activities and Construction of Access Road

During the construction stage of the Project, fugitive dust may be generated by excavation and movement of earth materials, contact of construction machinery with bare soil, and exposure of bare soil and soil piles to wind. The anticipated volume of soil to be removed due to excavation activities is 4,334 m^3. Dust dispersion can lead to a temporary deterioration in air quality by increasing TSP and PM_{10}.

AP-42 Section 13.2.3, Miscellaneous Source, Heavy Construction Operation, provides information on emission factors to assess particulates emissions from construction. A conservative emission factor for construction activity operation is 1.2 tons of total suspended particulate (TSP) per acre per month (or 98.8 kg/hectare/day). The value is most applicable to construction operations with medium activity level, moderate silt contents, and semiarid climate. This emission factor is not directly applicable for particulate matter less than 10 µm (PM_{10}), therefore, for this Project, PM_{10} emissions estimate, which is assumed to equal TSP, will be conservatively high.

The Emission rate (Q) and Dust concentration (C) can be estimated as shown below.

$$\mathrm{Q}\ (mg/s) = \frac{98.8\ (kg/ha/d) * \mathrm{area}\ (ha) * 10^6 (mg/kg)}{24 * 60 * 60 (s/d)} \qquad \textbf{\textit{Eq. 6-1}}$$

The construction of the WTP will cover an area of 0.017 km^2 (1.7 hectares) within the Project area, while the access road is assumed to be constructed on 0.052 km^2 (5.2 hectares, 4 km long, with a width of road surface and pavement of 13 m).

Total Project construction area is approximately 0.069 km^2 (6.9 hectares).

The dust concentration is estimated by using the box model of ***Equation 6-2***:

$$\mathrm{C}\ (mg/m^3) = \frac{\mathrm{Q}\ (mg/s)}{\mathrm{d}\ (m) * \mathrm{W}\ (m/s) * \mathrm{M}\ (m)} \qquad \textbf{\textit{Eq. 6-2}}$$

where

C	=	Dust Concentration (mg/m^3)
Q	=	Emissions at Source (mg/s, from ***Table 6.1***)
d	=	Width (the smallest dimension is used for worst case scenario) (m) i.e. width of WTP site (100 m)
W	=	Average wind speed (m/s, 0.14 m/s from baseline survey of the Project)
M	=	Mixing Height (m) (based on the data from neighbouring Thailand, the average mixing height of Chiang Mai Province is 900 m (PCD, 2012))

The results of the dust emission rate and dust concentration calculations are shown in ***Table 6.6***.

Table 6.6 Dust Concentration from Construction Works

Source	Total Area (ha)	Dust Emission Rate (mg/s)	Project Contribution (PC) (mg/m^3)	Project Contribution (PC) ($\mu g/m^3$)	Existing Baseline PM_{10} ($\mu g/m^3$)	Predicted Environmental Concentration (PEC) ($\mu g/m^3$)
WTP site and access road	6.9	7,890.28	0.626	626	30.37-39.03	656.37 - 665.03

The dust concentration resulting from construction activities is added to the PM_{10} ambient concentration at the Project site. The highest combined dust concentration would be 665.03 µg /m^3 during construction of the WTP site and access roads. This value exceeds the ambient PM_{10} standard of 24-hour Interim 1 (150 µg/m^3).

Note that the calculations have taken into account the worst case scenario (i.e. simultaneous land clearing activities throughout the Project site and access road) with no mitigation measures (e.g. spraying of water in the construction area) in place. Therefore, the actual emissions are anticipated to be less than the calculated values. In addition, any impacts from land clearance will only occur during the beginning of the construction phase and is expected to last for a few months only.

Vehicle Movement on Dirt Road

Ap-42 Section 13.2.2, Miscellaneous Sources, Unpaved Roads, provided an equation to assess particulate emissions from vehicle travel on unpaved roads. The following equation is used to estimate emission per vehicle mile traveled (VMT) on industrial unpaved roads:

$$E = [k(s/12)^a (W/3)^b] \left[\frac{365 - P}{365}\right] \qquad \textbf{Eq. 6-3}$$

where

E = size-specific emission factor (pounds per vehicle miles traveled, lb/VMT)

s = surface material silt content (%) (11% mean silt content)

W = mean vehicle weight (tons) (assumed to be 16 tons for large vehicle weight)

C = emission factor for 1980's vehicle fleet exhaust, brake wear and tire wear.

P = number of days in a year with at least 0.254 mm (0.1 in) of precipitation (158 days, based on the precipitation data from nearby in Mergui, Tanintharyi, Myanmar)

where k, a, b, c and d, for the PM_{10}, are empirical constants given below

k = 1.5, a = 0.9, b = 0.45, C = 0.00047

The emission factor, calculated in above equation, is 1.67 lb/VMT. Using metric conversion of 1 lb/VMT = 281.9 g/VKT, the emission factor for PM10 is 470 g/VKT.

For the construction activities, it is assumed that heavy vehicles will travel on 4 km dirt road. There are assumed to be 20 heavy vehicles operating at once. The PM_{10} emission factor is multiplied by the number of vehicles per day and by the road length to compute PM_{10} emission per day as follow:

PM-10 emission per day = EF (g/VKT) x Vehicle/day x kilometres
= 470 (g/VKT) x 20 (Vehicle/day) x 4 km
= 37,600 g/day

$$= \frac{37{,}600 \times 10^3 \text{ mg/day}}{24 * 60 * 60\ (s/day)}$$

= 435 mg/s

The dust concentration is estimated by using the box model of ***Equation 6-2***. It is assumed that road width is 13 m. The results of the dust emission rate and dust concentration calculations are shown in ***Table 6.7***.

Table 6.7 Dust Concentration from WTP Site

Source	Emission Factor	Distance Travelled	Dust Emission Rate (mg/s)	Width (m)	Project Contribution (PC) (mg/m^3)	Project Contribution (PC) ($\mu g/m^3$)	Existing Baseline PM_{10} ($\mu g/m^3$)	Predicted Environmental Concentration (PEC) ($\mu g/m^3$)
Access road	470 g/VKT	4 km	435	13	0.266	266	30.37-39.03	296.37-305.03

The PM_{10} concentration resulting from vehicle travel on unpaved roads is added to the PM_{10} ambient concentration. The highest combined dust concentration would be 305.03 $\mu g/m^3$. This value exceeds the ambient PM10 standard of 24-hour Interim 1 (150 $\mu g/m^3$).

Fugitive dust emissions from site preparation activities and vehicles transportation on dirt roads are anticipated to have short-term impacts for approximately 10 months of Phase 1 construction phase. This might lead to increase in dust particles near construction site and roads, but those increases would be short-term in duration. The sensitive receptors/resources that may be affected by potential impacts to air quality and dust in the Project area are residences/communities located nearby. The nearest ASR- A1 is located about 1.8 km from the Project boundary; therefore, the fugitive dust on the ASR's is anticipated to be low.

The significance of potential impacts to air quality is assessed in the following table.

Impact	Fugitive dust emissions associated with the site preparation activities of WTP and water supply pipeline including site clearing and grubbing, excavation and filling, and vehicle movement on dirt road. Dust dispersion can lead to a temporary deterioration in air quality by increasing TSP and PM_{10}.				
Nature	**Negative**	Positive	Neutral		
	Potential Impact to air quality is considered to be negative.				
Type	**Direct**	Indirect	Induced		
	Impact to air quality is direct impact through the generation of dust from site preparation and transportation on unpaved roads.				
Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impacts are considered short-term, as the construction will last for 10 months.				
Extent	**Local**	Regional	International		
	Impacts would be limited to within Project site and roads and hence would be considered to be local.				
Scale	The highest dust concentration would exceed PM_{10} standard of 24-hour Interim 1 (150 µg/m^3). Dust dispersion could potentially be a short-term impacts to air quality by increasing Total Suspended Particulates (TSP) and Particulate Matter <10 microns (PM_{10}). But those increases will only occur within the Project site boundary and near dirt roads.				
Frequency	Construction and unpaved road dust emission will be released intermittently but repeatedly throughout the construction period which will last for approximately 10 months.				
Magnitude	Positive	Negligible	Small	Medium	**Large**
	Short-term change in air quality is possible and could increase TSP and PM_{10}. The highest cumulative dust concentration is expected to exceed the ambient PM10 standard of 24-hour Interim 1 (150 µg/m^3) in some locations. Impact magnitude is considered to be large. However, the impacts are expected to be limited, localized (within 100 m from the worksite boundary) and short-term (i.e., throughout the construction period of 10 months).				
Receptor/ Resource Sensitivity	**Low**	Medium	High		
	Existing air quality in the project area is shown to be within the Myanmar National Environmental Guideline which is typical in rural areas. Most of the land within the study area is used by local villages for agriculture, and no receptors in the vicinity are expected to potential impact to air quality. The nearest sensitive receptor is Wat Chaung Village located approximately 1.8 km west of the Project site. The receptor sensitivity is considered low.				
Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Large Impact Magnitude and Low Resource Sensitivity will result in an overall Moderate Impact.				

Mitigation and Management Measures

The following dust suppression measures and good site practices are recommended for the construction phase:

- Water spraying of or covering all exposed areas, access roads and stockpiles;
- Cleaning wheels and the lower body parts of trucks at all exits of the construction site;
- Watering the main haul road regularly to suppress dust emissions during truck movement;
- Prohibiting the burning of waste or vegetation on site;
- Maintaining and checking the construction equipment regularly;

- Switching off engines when idling; and
- Vehicle / equipment exhausts observed to be emitting significant black smoke from their exhausts will be serviced/ replaced.
- During transportation by trucks, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport to prevent dust emissions.
- Limit maximum speed on unpaved roads to 30 km/h and within the Project boundary to 20 km/h.
- The height from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emission arising during materials handling;
- Use of the grievance mechanism (refer to ***Chapter 8***) will be utilised to record complains from affected stakeholders such that nuisance air quality impacts can be identified and rectification measures implemented; and
- Contractual provisions to be included with all material suppliers (e.g. quarries and haulage contractors) to ensure that the above management measures are implemented throughout the supply chain.

Table 6.8 presents the environmental monitoring parameters for air quality during the construction phase.

Table 6.8 Environmental Monitoring Programme for Air Quality during the Construction Phase

Aspect	Sampling locations	Parameters	Frequency
Air Quality	Wat Chaung Village (ASR1)	Parameters • NO_2 • SO_2 • PM10 and PM2.5 • CO • Wind Speed and Wind Direction	Monitoring 24 hours, (3-day continuously) every 6 months

Residual Impacts

Based upon the implementation of the mitigation measures, the residual impact level can be reduced to **negligible**.

6.3.4 Operation Phase

No gaseous emission is anticipated during operation of WTP and pumping station. However, there is a potential emission from worker vehicle and chemical transportation. It is anticipated that chemical transportation will be less than 5 trips per month. Given the Project will construct a crushed rock access road with prime coat to the Project site, fugitive dust emission from transportation over unpaved road is not anticipated.

A further potential air-quality impact which may result from Project operation is the release of unpleasant odours. The most likely sources of such odours would be sludge from water treatment. It is understood that the sludge produced is primarily chemical in nature and would cause limited odor emissions. The sludge produced in the Project is very low content in organic sulfate, hence the potential for odor (such as H_2S) generation from biochemical process is low. Sludge will be treated in the sludge dewatering system. It is anticipated that the treated sludge (sludge cake) will be disposed to the proposed landfill within the DSEZ. The overall significance of the potential impact is considered low provided that the equipment is correctly installed and maintained (i.e. in accordance with manufacturer's guidelines).

The significance of potential impacts to air quality is assessed in the following table.

<table>
<tr><td rowspan="1">Impact</td><td colspan="5">No major source to air quality is anticipated. However, there is a potential emission from vehicle transportation and odor nuisance from handling of sludge.</td></tr>
<tr><td rowspan="2">Nature</td><td>Negative</td><td colspan="2">Positive</td><td colspan="2">Neutral</td></tr>
<tr><td colspan="5">Potential impacts would be considered to be adverse (negative).</td></tr>
<tr><td rowspan="2">Type</td><td>Direct</td><td>Indirect</td><td>Induced</td><td colspan="2">Cumulative</td></tr>
<tr><td colspan="5">Impact to air quality is direct impact through the generation of air pollutant and odour.</td></tr>
<tr><td rowspan="2">Duration</td><td>Temporary</td><td>Short-term</td><td>Long-term</td><td colspan="2">Permanent</td></tr>
<tr><td colspan="5">Impacts are considered long-term throughout the Project operation phase.</td></tr>
<tr><td rowspan="2">Extent</td><td>Local</td><td colspan="2">Regional</td><td colspan="2">International</td></tr>
<tr><td colspan="5">Potential impacts would likely be restricted to the local area.</td></tr>
<tr><td>Scale</td><td colspan="5">The quantities of air pollutants emitted from Project activities are substantially low and would not change ambient air quality in the Project area.</td></tr>
<tr><td>Frequency</td><td colspan="5">Impacts would occur intermittently but repeatedly throughout the day for the duration of the operation phase.</td></tr>
<tr><td rowspan="2">Magnitude</td><td>Positive</td><td>Negligible</td><td>Small</td><td>Medium</td><td>Large</td></tr>
<tr><td colspan="5">Potential impacts to air quality in Project area is expected to be of Negligible magnitude due to no major source during operation.</td></tr>
<tr><td rowspan="2">Receptor/ Resource Sensitivity</td><td>Low</td><td colspan="2">Medium</td><td colspan="2">High</td></tr>
<tr><td colspan="5">Most of the land within the Project study area is used by local villages for agriculture, and no receptors in the vicinity are expected to potential impact to air quality. The nearest sensitive receptor is Wat Chaung Village located approximately 1.8 km west of the Project site. The receptor sensitivity is considered low.</td></tr>
<tr><td rowspan="2">Significance</td><td>Negligible</td><td>Minor</td><td>Moderate</td><td colspan="2">Major</td></tr>
<tr><td colspan="5">The combination of a Low Resource Sensitivity and Negligible Impact Magnitude will result in an overall Negligible Impact.</td></tr>
</table>

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- Maintain vehicle and equipment according to manufacturers' specifications.
- Switching off engines when idling.
- Vehicle / equipment exhausts observed to be emitting significant black smoke from their exhausts will be serviced/ replaced.
- Clean Project area and the surrounding area on a daily basis to prevent dust.
- During transportation by trucks, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport to prevent dust emissions.
- The height from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emission arising during materials handling.
- Collect and handling sludge in appropriate containers.
- Regularly de-sludge the lagoon as accumulated sludge contributes to bad odour.
- Use of the grievance mechanism (refer to ***Chapter 8***) will be utilised to record complains from affected stakeholders.

Residual Impacts

With the implementation of control measures, adverse impact to air quality is expected to be **negligible.**

6.4 GREENHOUSE GAS

6.4.1 *Introduction*

This Section provides an estimate of the greenhouse gas (GHG) emissions that are likely to be emitted by the Project, as related to the issue of climate change. GHGs are assessed in order to provide an indication of what a Project's GHG emissions will be, and to find ways to mitigate them early on in the development process.

6.4.2 *Scope of Assessment*

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2***, the following potential impacts on greenhouse gas are considered further in this IEE.

Construction Phase

- Water Treatment Plant
  - Site Formation
  - Excavation and Foundation Work
  - Civil Construction
  - Equipment/Material/Worker Transport
- Pumping Station and Water Supply Pipeline
  - Site Formation
  - Excavation and Foundation Work
  - Construction of Pumping Station and Water Supply Pipeline (floating)
  - Construction of Pumping Station and Water Supply Pipeline (land)
  - Equipment/Material/Worker Transport

Operation Phase

- Water Treatment Plant
  - Operation of Water Treatment Plant

6.4.3 *Construction Phase*

During construction, the Project will involve the movement of equipment in the construction areas such as crane, trucks and etc., which will contribute to GHG emissions from the combustion of fuel. The most prevalent GHGs emitted from combustion are CO_2, CH_4, and N_2O.

GHG emissions are estimated using emission factors for the three (3) main greenhouse gases (CO_2, CH_4 and N_2O), and converted to CO_2 equivalent using global warming potential (GWP). ***Table 6.9*** presents the GWPs on a 100-year time horizon relative to CO_2 for ozone-depleting substances and their replacements (*IPCC, 2007*).

Table 6.9 Greenhouse Gas and Global Warming Potentials

Designation or Name	Chemical formula	100 yr GWP (AR4)[1]

Carbon dioxide	CO_2	1
Methane	CH_4	28
Nitrous oxide	N_2O	265

Source: [1] IPCC Fifth Assessment Report (AR5) (2013)

GHG emissions are estimated in terms of CO_2 equivalent (CO_2e) according to the following equation:

$$\text{Emissions}_{GHG,\ fuel} = \text{Fuel Consumption}_{fuel} \times \text{Emission Factor}_{GHG,\ fuel} \qquad \textit{Eq. 6-4}$$

Where:

Emissions $_{GHG,fuel}$	=	emissions of a given GHG by type of fuel (kg GHG)
Fuel Consumption $_{fuel}$	=	amount of fuel combusted (TJ)
Emission Factor $_{GHG,fuel}$	=	default emission factor of a given GHG by type of fuel (kg of greenhouse gas/TJ).

The type of fuel used for all equipment is diesel. To convert the consumption of diesel in volume (liters) to energy (TJ), the following conversion factors can be applied:

- 1 kg = 10^{-3} tonne = 10^{-6} Gg,
- 1 liter = 10^{-3} m^3
- Default net calorific value for gas/diesel oil = 43.0 TJ/Gg[1]
- Density of Diesel = 874.31 kg/m^3 [2]

Fuel consumption for diesel (in terms of TJ of energy) can therefore be calculated as follows:

Fuel Consumption (TJ)	=	Diesel Use (l) x Diesel Density (kg/m^3) x Net Calorific Value (TJ/Gg) x 10^{-9} (Gg/kg)
	=	Diesel Use (l) x 43.0 (TJ/Gg) x 874.31 (kg/m^3) x 10^{-9} (Gg/kg)
	=	Diesel Use (l) x 3.67 x 10^{-5} (TJ/l)

It is expected that construction activities for Phase 1 will be completed within 10 months (approximately 43 weeks). Construction hours are anticipated to be 10 hours per day, 6 days per week. Therefore, total days for construction are approximately 258 days.

GHG emissions from construction equipment are estimated following the approach of the IPCC (***Equation 6-4***) and converted to CO_2e using GWP (***Table 6.9***), with fuel consumption (as provided in ***Chapter 4***) and emission factor for diesel mobile combustion (***Table 6.10***). The release emissions in CO_2 equivalent is estimated to be at 156.40 tonnes, as shown in ***Table 6.11***. This is considered insignificant emissions according to IFC (25,000 tonnes CO_2e per year).

1 Table 1.2 in Chapter 1 of Volume 2, IPCC (2006)

2 Table 3-8 Density of distillate oil (Diesel), API (2009)

Table 6.10 Default Emission Factors (kg of greenhouse gas per TJ on a Net Calorific Basis)

Sources/Fuel	CO_2	CH_4	N_2O
Stationary Combustion			
Gas/Diesel Oil	74100	3.0	0.6
Mobile Combustion			
Road Transport - Gas/Diesel Oil	74100	3.9	3.9

Source: IPCC Chapter 2 - Stationary Combustion and Chapter 3 Mobile Combustion of Volume 2

Table 6.11 GHG Emission during Construction Phase 1

Source Type	Quantity	Activity Data		Total Fuel Consumption		GHG Emission				
						(kg CO_2e)				(ton CO_2e)
		Fuel Consumed	Working Day			CO_2	CH_4	N_2O	Total	Total
		(liter/day)	(day)	(liter)	(TJ)					
Emission Factors for Mobile Combustion - Gas/Diesel Oil (kg of greenhouse gas per TJ)						74100	3.9	3.9		
Emission Factors for Stationary Combustion - Gas/Diesel Oil (kg of greenhouse gas per TJ)						74100	3.0	0.6		
Global Warming Potential for 100-year time horizon						1	28	265		
JCB	1	40	258	10,320.00	0.378744	28,064.93	41.36	391.43	28,497.72	28.50
Crane	1	40	258	10,320.00	0.378744	28,064.93	41.36	391.43	28,497.72	28.50
Water Truck	1	20	258	5,160.00	0.189372	14,032.47	20.68	195.72	14,248.86	14.25
Pickup Truck	2	20	258	5,160.00	0.189372	14,032.47	20.68	195.72	14,248.86	14.25
Service Truck	1	20	258	5,160.00	0.189372	14,032.47	20.68	195.72	14,248.86	14.25
Miscellaneous	-	40	258	10,320.00	0.378744	28,064.93	41.36	391.43	28,497.72	28.50
Generator	1	40	258	10,320.00	0.378744	28,064.93	31.81	60.22	28,156.97	28.16
Total GHG emissions during construction phase										**156.40**

The significance of potential impacts to greenhouse gas during construction of Project Stage 1 is assessed in the following table.

Impact	Potential impacts on climatic condition due to GHG emissions.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to climate would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced		
	Potential impacts would likely be direct impacts through the release of emissions from combustion process of construction equipment.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	Many of the major greenhouse gases can remain in the atmosphere for tens to hundreds of years after being released.				
Extent	Local	Regional	**International**		
	Greenhouse gases can potentially affect the Earth's climate.				
Scale	The emissions from construction phase are calculated to be 156.40 tonnes CO_2e. Compared to Myanmar's CO_2 release of 31.28 million tons in 2010, the total GHG releases from the Project are insignificant (approximately 0.0005%).				
Frequency	Emissions will be released intermittently, but repeatedly throughout the construction period.				
Magnitude	Positive	**Negligible**	**Small**	Medium	Large
	Minor emissions of GHG will be emitted as a result of the Project, and considered insignificant emissions according to IFC PS3 (25,000 tonnes CO_2e per year). Magnitude is considered Negligible.				
Receptor/ Resource Sensitivity	**Low**	Medium	High		
	GHG is global pollutant. The greenhouse effect is enhanced by greenhouse gas emissions of anthropogenic nature. Minor emissions of GHG will be emitted as a result of the Project, and not likely to significantly change atmospheric GHG concentrations. Receptor/resource sensitivity is rated as Low.				
Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall Negligible potential impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during construction to reduce GHG emissions:

- Implement the same mitigation measures to minimize impacts to Air Quality (***Section 6.3***);
- Develop and implement preventive maintenance plan for machines, and engines to ensure combustion efficiency; and
- Develop vehicle maintenance plan.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

6.4.4 *Operation Phase*

It is expected that there is no major combustion source for GHG emission during operation phase. There will be a small number of trips for vehicle transportation. A potential GHG source may result from use of electricity from external provider in Myanmar. The Project is planning to purchase approximately 1,049 kW (9,189.24 MWh) of electricity from the national grid. The GHG emissions are calculated using GHG protocol tools for purchased electricity. The total estimated Scope 2 emissions during operation phase are approximately 1,589.4 tonnes CO_2e (***Table 6.12***). This is considered insignificant emissions according to IFC.

Table 6.12 GHG Emissions from Purchased Electricity during Operation Phase

Source	Electricity Consumption (MWh)	Emissions (tonnes CO_2e)	Source of Emission Factor
Purchased Electricity	9,189.24	1,590	Based on the national average of all fuel in Power Plant in Myanmar. (Source: World Resource Institute (2015). GHG Protocol Tool for Stationary Combustion. Version 4.7)

The significance of potential impacts to greenhouse gas during operation phase is assessed in the following table.

Impact	Potential impacts on climatic condition due to GHG emissions.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to climate would be considered to be adverse (negative).				
Type	Direct	**Indirect**	Induced		
	The GHG Protocol considers purchased electricity as indirect emissions source because the emissions are a consequence of activities of the reporting organization but actually occur at sources owned or controlled by another organization.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	Many of the major greenhouse gases can remain in the atmosphere for tens to hundreds of years after being released.				
Extent	Local	Regional	**International**		
	Greenhouse gases can potentially affect the Earth's climate.				
Scale	Emissions during operation phase are calculated to be 1,590 tonnes. Compared to Myanmar's CO_2 release of 31.28 million tons in 2010, the total GHG releases from the Project are insignificant (approximately 0.005%).				
Frequency	Indirect emissions will be released throughout the operation period.				
Magnitude	Positive	**Negligible**	Small	Medium	Large
	Minor emissions of GHG will be emitted as a result of the Project, and considered insignificant emissions according to IFC. Magnitude is considered Negligible.				
Receptor/ Resource Sensitivity	**Low**	Medium	High		
	GHG is global pollutant. The greenhouse effect is enhanced by greenhouse gas emissions of anthropogenic nature. Minor emissions of GHG will be emitted as a result of the Project, and not likely to significantly change atmospheric GHG concentrations. Receptor/resource sensitivity is rated as Low.				
Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall Negligible potential impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during construction to reduce GHG emissions;

- Implement the same mitigation measures to minimize impacts to Air Quality (***Section 6.3***); and
- Develop energy efficiency programs to promote using less energy and electricity.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

6.5 NOISE

6.5.1 *Introduction*

This Section presents an assessment of the potential noise impacts arising from the construction and operational phases of the Project. Noise Sensitive Receivers (NSRs) and potential sources of noise generation were identified and an assessment of the potential impacts was carried out. Mitigation and management measures are recommended where necessary.

6.5.2 *Scope of Assessment*

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2***, the following potential impacts on noise are considered further in this IEE.

Construction Phase

- Water Treatment Plant
  - Site Formation
  - Excavation and Foundation Work
  - Civil Construction
  - Equipment/Material/Worker Transport
  - Pre-commissioning
  - Commissioning
- Pumping Station and Water Supply Pipeline
  - Site Formation
  - Excavation and Foundation Work
  - Construction of Pumping Station and Water Supply Pipeline (floating)
  - Construction of Pumping Station and Water Supply Pipeline (land)

Operation Phase

- Water Treatment Plant
  - Operation of Water Treatment Plant
- Pumping Station and Water Supply Pipeline
  - Operation of Pumping Station and Water Supply Pipeline (floating)
  - Operation of Pumping Station and Water Supply Pipeline (land)

6.5.3 *Construction Phase*

During the construction of WTP and pumping station, highest noise levels will primarily be generated by Project vehicles and various construction equipment (e.g. engines and mobile equipment), used to carry out land clearing activities, levelling and excavation work. During actual construction of plant facilities and equipment installation, noise emissions will be considerably lower.

The construction works will likely include the use of machinery and equipment, such as excavator, crane, generator, and movement of vehicle within the site, which are expected to be a major source of noise generation within the Project site and its surroundings. If improperly managed, there is risk of nuisance and health effects to nearby residents and construction workers onsite. ***Table 6.13*** shows a list of equipment expected to be used during construction activities, and the typical noise levels expected to be generated by such equipment.

Table 6.13 Construction Equipment Noise Level

No.	Items	Noise level at 50 ft (15.24 m) from Source (dBA)
1.	Excavator	81
2.	Backhoe	80
3.	Crane	83
4.	Water Truck	88
5.	Pickup Truck	88
6.	Service Truck	88
7.	Generator	81

Source: FTA (2006)
(http://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm)

Based on methodology from the US Department of Transportation for estimation of construction and equipment noise, noise levels at various distances from a source can be calculated using ***Equation 6-5*** as follows:

$$L_{eq}(equipment) = L_w - 20 * \log_{10}(D/D_o) \quad \textbf{\textit{Eq. 6-5}}$$

Where

L_{eq} *(equipment)* = the A-weighted, equivalent sound level at a receptor resulting from the operation of a single piece of equipment at distance D (dB(A))

Lw = Noise emission level of the particular piece of equipment at reference distance D_0 (dB(A))

D = Distance from the receptor to the piece of equipment (m)

D_0 = Reference distance where the source noise emission level was measured (m), i.e.50 ft (15.24 m)

(Source: FHWA[1])

1 http://www.fhwa.dot.gov/environment/noise/highway/hcn03.htm

For the Project, it is necessary to calculate the overall noise level produced by the simultaneous operation of several pieces of equipment. The overall noise level at a receptor is simply the sum (on an energy basis) of the individual contributions of each piece of equipment. Mathematically, the overall noise level at a receptor from several sources can be calculated using ***Equation 6-6***:

$$L_{eq}(site) = 10 * \log_{10}\left(\sum_{i=1}^{n} 10^{Leq\,(equipment)_i/_{10}}\right) \qquad \textit{Eq. 6-6}$$

Where

L_{eq} *(site)*	=	the A-weighted, overall equivalent sound level obtained by summing the individual equipment noise levels on an energy basis.
n	=	Number of sources
L_{eq} *(equipment)*$_i$	=	the A-weighted, equivalent sound level at a receptor resulting from the operation of a single piece of equipment at distance D from source, dB(A).

With the indicative construction equipment in ***Table 6.13*** and above equations, the noise level expected at various distances from sources during the construction phase is shown in ***Table 6.14.***

Table 6.14 Noise Decay from Construction Equipment Sources

Distance from Source (m)	Noise Level (dB)
1	117.40
15	93.88
30	87.86
50	83.42
100	77.40
200	71.38
300	67.86
400	65.36
500	63.42
1,000	57.40
1,800	**52.30**
Myanmar National Environmental Quality (Emission) Guidelines Value[1]	**55**

Note: [1] Guidelines for Residential, Institutional, Educational

For this Project, a distance from WTP site boundary to nearest sensitive receiver (NSR1) is 1,800 m to the south. Base on a site construction equipment noise emissions in ***Table 6.14***, the predicted noise level at the NSR when combining the background noise is presented in ***Table 6.15***.

Table 6.15 Cumulative Construction Noise Levels at the NSR

NSR	Distance from Project boundary (m)	Predicted noise level, dB(A)	Background noise Level, dB(A)	Cumulative noise level, dB(A)
NSR1	1,800	52.30	49.00	53.97
Myanmar National Environmental Quality (Emission) Guidelines Value[1], dB(A)		**55**		

Note: [1] Daytime, 07:00 – 22:00 (10:00 – 22:00 for Public holidays)

The construction works will be carried out during daytime (10 hours/day, 6 days/week), and will last for 10 months (Phase 1). The cumulative noise level at NSR1 is predicted at 53.97 dB(A), which is below the Myanmar National Environmental Quality (Emission) Guidelines value. Hence, the NSR will not be adversely affected by the construction of the Project site.

The noise impact magnitudes have been derived from guidance provided by the IFC and other applicable bodies, and are shown in ***Table 6.16***. The impact rating for long term exposure (for construction period of 10 months) and a Daytime Noise Level (Leq) of less than 55 dB is equivalent to a negligible potential impact magnitude.

Table 6.16 Potential Construction Noise Impact Magnitudes

Operating Period	Daytime Noise Level, LAeq, day dB				Night-time Noise Level, LAeq, night dB			
Impact Rating	Negligible	Small	Medium	Large	Negligible	Small	Medium	Large
Short term exposure < 1 month	<70	70-75	>75-80	>80	<55	55-60	>60-65	>65
Medium term exposure 1 to 6 months	<65	65-70	>70-75	>75	<45	45-55	>55-60	>60
Long term exposure > 6 month	<55	55-60	>60-65	>65	<45	45-50	>50-55	>55

Source: The ERM Impact Assessment Standard v1.1, Annex B – 2 Noise Impacts, August 2012

The significance of potential impacts to noise during construction phase is assessed in table below.

The cumulative noise level at NSR1 is predicted at 53.97 dB(A), which is below the Myanmar National Environmental Quality (Emission) Guidelines value. Hence, the NSR will not be adversely affected by the construction of the Project site.

Impact	Increased noise from construction equipment.			
Nature	**Negative**	Positive	Neutral	
	Potential impacts to noise would be considered to be adverse (negative).			
Type	**Direct**	Indirect	Induced	
	Potential impacts to noise would likely be direct impacts from Project activities.			
Duration	Temporary	Short-term	**Long-term**	Permanent
	The construction phase will last approximately 10 months. Based on ***Table 6.16***, operating period of more than 6 months is long term exposure to noise impact.			
Extent	**Local**	Regional	International	

<table>
<tr><td rowspan="2">Scale</td><td colspan="5">Potential impacts would be limited to the Project area and vicinity, and hence would be considered to be local.</td></tr>
<tr><td colspan="5">The noise level during daytime due to construction activity at nearest sensitive receptor at a distance of 1,800 m from the Project site is estimated to be 53.97 dB(A), which is below the Myanmar National Environmental Quality (Emission) Guidelines value.</td></tr>
<tr><td>Frequency</td><td colspan="5">Noise impacts have the potential to occur repeatedly throughout the day for the duration of construction phase.</td></tr>
<tr><td rowspan="2">Magnitude</td><td>Positive</td><td>Negligible</td><td>Small</td><td>Medium</td><td>Large</td></tr>
<tr><td colspan="5">The potential noise impact rating for long term exposure (10 months) and a Daytime Noise Level (Leq) of 53.97 dB is equivalent to negligible potential impact magnitude.</td></tr>
<tr><td rowspan="2">Receptor/ Resource Sensitivity</td><td colspan="2">Low</td><td colspan="2">Medium</td><td>High</td></tr>
<tr><td colspan="5">As the representative NSR is located away from the Project approximate 1.8 km, the receptor sensitivity is considered Low.</td></tr>
<tr><td rowspan="2">Significance</td><td>Negligible</td><td>Minor</td><td colspan="2">Moderate</td><td>Major</td></tr>
<tr><td colspan="5">The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall Negligible potential impact.</td></tr>
</table>

Mitigation and Management Measures

Mitigation measures, as below, will be implemented to ensure that the impact significance is kept as low as possible:

- Hours of general construction activity will be restricted to avoid sensitive periods of the day and also to avoid night working. Prohibit carrying out piling work before 07.00 am and after 05.00 pm;
- Limit noisy construction works from 07.00 am to 6.00 pm Monday to Saturday (construction work activities may be done on Sunday when necessary);
- Planting of buffer trees and shrubs where appropriate;
- Locating noisy equipment as far as possible from NSRs and ensure that the orientation is the optimum for low noise;
- Respond to noise-related complaints, and make modifications or other agreement with complainant where possible and appropriate;
- Inform the public and in particular the nearest sensitive receptors about the Project and potential construction-related consequences. The information should include Project schedule, specific time and date that noise/vibration-generating activity will occur;
- Transportation of materials/personnel should be carefully undertaken during construction phase;
- Ensure that all Contractors on site have effectively controlled noise levels from equipment. Effective noise controls include: regular inspection and maintenance of all vehicles and construction equipment working onsite, installation of sound suppressive devices (such as mufflers) on all mechanical plants as necessary, where practicable, vehicles and machinery that are used intermittently should not be left idling for long periods of time;
- No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB(C);

Table 6.17 presents the environmental monitoring parameters for noise during the construction phase.

Table 6.17 Environmental Monitoring Program for Noise during the Construction Phase

Aspect	Sampling locations	Parameters	Frequency
Noise	Wat Chaung Village (NSR1)	• Leq 1 hr • Leq Daytime, 07:00 – 22:00 (10:00 – 22:00 for Public holidays) • Leq Nighttime, 22:00 – 07:00 (22:00 – 10:00 for Public holidays)	Monitoring 48 hours, every 6 months

Residual Impacts

If the recommended mitigation measures are implemented, potential residual impact significance is considered **negligible.**

6.5.4 Operation Phase

During operation, there are not expected to be any significant sources of noise from the Project. All equipment will be accommodated inside building, quantitative assessment is considered not necessary for the operation phase. There may be some minor noise emitted from the operation of pumping station, and there would also be very minor noise impacts due to traffic associated with material transfer/operation personnel accessing the site, but these would be comparable to typical background noises in the Project area.

No noise sensitive receptors were identified within 300 km of the Project study area. The nearest sensitive receptor is located approximately 1,800 m from the Project site boundary. There is unlikely to be any significant potential noise impact over this distance.

The significance of potential impacts to noise during operation phase is assessed in the table below.

Impact	There are no significant sources of noise associated with the operational phase of the proposed Project. There may be minor noise from operation of WTP and pumping station.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to noise would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced		
	Potential impacts to noise would likely be direct impacts from Project activities.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	Impacts are considered long-term throughout the Project operation phase.				
Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project area and vicinity, and hence would be considered to be local.				
Scale	The noise level during operation will be significantly reduced scale compared with the construction phase and expected to be within Myanmar National Environmental Quality (Emission) Guidelines value.				
Frequency	Impacts would occur intermittently but repeatedly throughout the day for the duration of the operation phase.				
Magnitude	Positive	**Negligible**	Small	Medium	Large
	The additional noise from operation of WTP would not result in any change in the existing total ambient noise at the nearest sensitive location. Impact magnitude is considered negligible.				
Receptor/ Resource Sensitivity	**Low**	Medium	High		
	As the representative NSR is located approximately 1.8 km away from the Project, there would be no adverse noise impact at this location. The receptor sensitivity is considered Low.				
Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Low resource sensitivity and Negligible impact magnitude will result in an overall Negligible potential impact.				

Residual Impacts

It is not anticipated that adverse noise impacts would occur during operation phase. Potential residual impact significance is considered **negligible.**

6.6 SURFACE WATER

6.6.1 Introduction

During the construction and operation phases, different activities have the potential to generate wastewater, accidental spills, and sedimentation, which could lead to impacts on the hydrology and quality of surrounding freshwater bodies. In the Project study area, the Dawei River is identified as the most prominent potential receiving body. Therefore, it is important to understand the interaction between impacts generated from construction and operation activities of the Project and the subsequent effects on surface water quality and hydrology. This Section presents an evaluation of the potential impacts on surface water associated with the construction and operation of the proposed Project based on the impacts identified during Scoping (outlined in ***Section 6.2***). Mitigation measures have also been provided where necessary to be implemented alongside in-place controls to reduce the potential residual impacts to acceptable levels.

6.6.2 *Scope of Assessment*

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2***, the following potential impacts on surface water are considered further in this IEE.

Construction Phase

- Water Treatment Plant
  - Site Formation & Access Road
  - Excavation and Foundation Work
  - Pre-Commissioning
  - Commissioning
  - Wastewater Discharges and Runoff
  - Non-Hazardous Waste Storage and Disposal
  - Hazardous Waste Storage and Disposal
  - Accidental Events/Spills/Dropped Objects
- Pumping Station and Water Supply Pipeline
  - Site Formation & Access Road
  - Excavation and Foundation Work
  - Construction of Pumping Station and Water Supply Pipeline (floating)
  - Construction of Pumping Station and Water Supply Pipeline (land)
  - Pre-Commissioning
  - Commissioning
  - Wastewater Discharges and Runoff
  - Non-Hazardous Waste Storage and Disposal
  - Hazardous Waste Storage and Disposal
  - Accidental Events/Spills/Dropped Objects

Operation Phase

- Water Treatment Plant
  - Operation of Water Treatment Plant
  - Waste Storage and Disposal
  - Accidental Events (Spill, Uncontrolled Release)
- Pumping Station and Water Supply Pipeline
  - Waste Storage and Disposal
  - Accidental Events (Leaks, Uncontrolled Release)

6.6.3 *Construction Phase*

Construction activities of the Project will include: mobilisation, site preparation, civil works construction of all Project components, erection and installation of the required equipment, and commissioning. The Engineering, Procurement and Construction (EPC) Contractor will be responsible for overall construction activities.
Construction for Phase 1 is expected to start in the first quarter of 2017 and be completed within 10 months, with Phase 1 operation targeted in the first quarter of 2018. The anticipated workforce during construction is 170 persons. The proposed working hours are 10 hours/day and 6 days/week.

During the activities of the construction phase, potential water quality impacts may be broadly categorized into one of the following: sedimentation, wastewater discharge, inappropriate waste storage and disposal, and accidental spills. These potential impacts will be described and assessed further below.

Sedimentation

Site preparation, including site clearance activities, will be undertaken, and will include excavation of approximately 4,334 m^3 of earth. Dewatering will also be carried out, to collect the water to be pumped or permitted to flow by gravity to discharge or storage areas. These construction activities could cause runoff of unconsolidated sediments during rainfall. The generation of sediment laden run off could be transferred to the nearby freshwater bodies, which could increase total suspended solids and turbidity in receiving waters. Construction of the pumping station near the Dawei River may cause impacts on surface water quality if piling or dredging activities are required. This could result in localised impacts such as runoff and erosion of exposed bare soil, slopes and earth, and release of cement materials into surface water bodies with stormwater runoff.

Stormwater runoff will be drained to a common settlement tank to remove solids, before being discharged to a common drain. Potential impacts to surface water quality due to sedimentation are expected to be short-term and localised in nature, and can be controlled if runoff is adequately managed.

The significance of potential impacts to surface water due to sedimentation during the construction phase is assessed in the following table.

Impact	Potential for impacts to surface water due to sediment-laden runoff.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to surface water would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to surface water would be direct impacts from Project activities.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	The construction phase will last approximately 10 months. The duration of potential impacts is therefore long-term.				
Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project site footprint and pumping station, and water supply pipeline, and hence would be considered to be local.				
Scale	Site preparation, including site clearance activities, will be undertaken, and will include excavation of approximately 4,334 m^3 of earth, which has the potential to cause sedimentation of nearby water bodies. The scale of the impact from this sedimentation depends on the degree to which runoff is managed.				
Frequency	Impacts to surface water from sedimentation could occur intermittently but repeatedly throughout the day for the duration of the construction phase (10 months).				
Magnitude	Positive	Negligible	Small	**Medium**	Large
	Potential impacts to surface water quality in the Project area from sedimentation/runoff are expected to be of Medium magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total suspended solids and turbidity, as well as elevated levels of BOD and the presence of coliform bacteria. This suggests that the surface water quality is already somewhat impacted. Overall sensitivity is rated as Medium.				
Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during the construction phase:

- Install silt trap to treat surface run-off from bunded areas prior to discharge to the stormwater system;
- Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion and subsequent sedimentation;
- Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms;
- Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities;
- Provision of channels, earth bunds or sand bag barriers on site to direct stormwater to silt removal facilities;
- Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities;
- Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials; and
- Surface run-off from bunded areas should pass through oil/water separators prior to discharge to the stormwater system.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **minor**.

Wastewater Discharge

Wastewater discharge and runoff during the construction phase may lead to contamination of freshwater sources if not managed appropriately. During the construction phase, there are a number of anticipated wastewater sources.

Wastewater (sewage) will be generated from the toilet facilities and workers accommodation. Wastewater will also be generated from the canteen. The worker's accommodation is located at the Dawei Worker's Camp, approximately 1.5 km from the Project site. It is not adjacent to any water bodies, so there is minimum potential for impact to surface water quality. However, there will also be toilets onsite at the Project during construction. These may have the potential to impact the adjacent Pa Yain Byu Reservoir, or the Dawei River, if managed inappropriately. If not adequately designed and positioned to reflect the local hydrological and hydrogeological patterns, untreated sanitary wastewater due to leakages or overflows could have the potential to enter surface water. Periods of high rainfall could lead to overflow, or rapid through-flow, of the effluent to surface water prior to its full digestion in the septic tanks. Raw sewage can impact surface water quality by promoting the growth of algae and delivering pathogens that may be harmful to human and ecological receptors. Sanitary wastewater is generally characterized as having a high concentration of solids (suspended and dissolved), biochemical oxygen demand (BOD) and chemical oxygen demand (COD), nutrients (nitrogen, ammonia) and faecal coliform counts. The organic substances (e.g. hydrocarbon, protein) are decomposed in water, and the decomposition of organic matter will reduce the oxygen content dissolved in water. Quantities of sanitary wastewater discharge for the Project are not yet known, but estimates can be made based on the number of workers. It is anticipated the total domestic wastewater will be approximately 1,700 litres per day (10 litres per construction worker).

The sewage generated onsite will be collected through underground pipes into a holding tank, from where the sewage will be routed to an onsite septic tank.

Potential impacts to surface water quality are expected to be short-term and localised in nature, and can be controlled if wastewater treatment systems are adequately designed.

The significance of potential impacts to surface water due to wastewater discharges during the construction phase is assessed in the following table.

Impact	Potential for impacts to surface water due to wastewater discharges.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to surface water would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to surface water would be direct impacts from Project activities.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	The construction phase will last approximately 10 months. The duration of potential impacts is therefore long-term.				
Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project site footprint, as well as areas downstream of the Project site, and hence would be considered to be local.				
Scale	Based on experience with similar projects, the total approximate quantities of wastewater that could be a potential source of impact during this stage (assuming an average of 170 workers per day) include: • 1,700 L/day of sanitary wastewater				
Frequency	Impacts to surface water from wastewater discharges could occur intermittently but repeatedly throughout the day for the duration of the construction phase (10 months).				
Magnitude	Positive	Negligible	Small	**Medium**	Large
	Potential impacts to surface water quality in the Project area from wastewater discharges and runoff are expected to be of Medium magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total suspended solids and turbidity, as well as elevated levels of BOD and the presence of coliform bacteria. This suggests that the surface water quality is already somewhat impacted. Overall sensitivity is rated as Medium.				
Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during construction phase:

- Implement adequate sanitary facilities, (one toilet for every 25 workers up to the first 100, and one for every 50 thereafter) will be provided for the construction workforce.

- Liquid effluents arising from construction activities will be treated to the applicable Myanmar or IFC guideline prior to discharge.
- Oil-contaminated water, if any, will be collected and handled by local licensed wastewater sub-contractors (if available, to be determined at a later stage).

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **minor**.

<u>Waste Storage and Disposal</u>

During the construction phase, waste materials, if not stored and disposed of appropriately, have the potential to cause surface water contamination through direct release or from contaminated stormwater runoff.

The solid waste generated during construction will include steel pipes, steel plates, structural steel, wooden crates and domestic solid waste from the construction workers. In addition, there will also be biomass waste associated with the clearance of trees, shrubs and grass. A small proportion of the waste generated during construction will be hazardous, including used paint, engine oils, hydraulic fluids and waste fuel, spent solvents from equipment cleaning activities, and spent batteries or spent acid/alkali from the maintenance of machinery on site. The solid waste will be disposed of offsite, potentially at the designated waste storage area within the Initial Industrial Estate construction area.

Based on experience with similar projects, the total approximate quantities of non-hazardous and hazardous waste that could be a potential source of impact during this stage (assuming an average of 170 workers per day) include:

- 170 kg/day of solid (non-hazardous) waste; and
- 38 kg/month hazardous waste.

Infill will be used for backfilling, while steel waste will be sold as scrap. Construction waste will be collected and transported to a proposed landfill area within the Industrial Estate of the DSEZ. Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ. The construction contractor will handle, store and dispose of all waste in accordance with applicable guidelines.

The significance of potential impacts to surface water due to contamination from inappropriate waste storage and disposal during the construction phase is assessed in the following table.

<table>
<tr><td>Impact</td><td colspan="12">Potential for surface water contamination from inappropriate waste management.</td></tr>
<tr><td rowspan="2">Nature</td><td colspan="4">Negative</td><td colspan="4">Positive</td><td colspan="4">Neutral</td></tr>
<tr><td colspan="12">Potential impacts to surface water would be considered to be adverse (negative).</td></tr>
<tr><td rowspan="2">Type</td><td colspan="3">Direct</td><td colspan="3">Indirect</td><td colspan="3">Induced</td><td colspan="3">Cumulative</td></tr>
<tr><td colspan="12">Impacts to surface water would be direct impacts from Project activities.</td></tr>
<tr><td rowspan="2">Duration</td><td colspan="3">Temporary</td><td colspan="3">Short-term</td><td colspan="3">Long-term</td><td colspan="3">Permanent</td></tr>
<tr><td colspan="12">The construction phase will last approximately 10 months. The duration of impacts is therefore long-term.</td></tr>
<tr><td rowspan="2">Extent</td><td colspan="4">Local</td><td colspan="4">Regional</td><td colspan="4">International</td></tr>
<tr><td colspan="12">Potential impacts would be limited to the Project area and downstream of the Dawei</td></tr>
</table>

	River, and hence would be considered to be local.				
Scale	Construction activities will take place within the Project area. Based on experience with similar projects, the total approximate quantities of waste that could be a potential source of impact during this stage (assuming an average of 170 workers per day) include: • 170 kg/day of solid waste • 38 kg/month hazardous waste The scale of potential impacts due to release of waste is potentially large due to the quantities present during this stage, but appropriate waste management practices will mitigate the impacts.				
Frequency	Impacts to surface water due to inappropriate waste storage and disposal could occur intermittently but repeatedly throughout the day for the duration of the construction phase.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts to surface water quality in Project area due to inappropriate waste disposal are expected to be of Small magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total suspended solids and turbidity, as well as elevated levels of BOD and the presence of coliform bacteria. This suggests that the surface water quality is already somewhat impacted. Overall sensitivity is rated as Medium.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during construction phase:

- Implement the same mitigation measures to minimize impacts to Waste Management (***Section 6.9***);
- Provide training to workers for waste disposal in designated areas and use of sanitation facilities;
- Implement proper storage of the construction materials and wastes to minimise the potential damage or contamination of the materials;
- Implement construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period;
- Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance);
- Store wastes in closed containers away from direct sunlight, wind and rain;
- Store waste systematically to allow inspection between containers to monitor leaks or spills;
- Ensure that storage areas have impermeable floors and containment, of capacity to accommodate 110% of the volume of the largest waste container; and
- Waste to be disposed of properly, as follows:
  - Non-hazardous waste will be collected and transported to a proposed landfill area within the Industrial Estate of the DSEZ.
  - Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

Accidental Spills and Leaks

Surface water contamination may occur during the construction phase due to accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants or fuel from heavy equipment, and improper chemical/fuel storage. Additionally, pipeline hydrostatic test chemicals during the pre-commissioning activities may impact surrounding surface water quality, should leakages occur. Such spills can impact surface water quality either due to direct discharge or indirect discharge due to stormwater runoff. In addition, discharges of oily bilge or ballast water from barges could impact surface water quality during construction.

Note that impacts due to accidental spills and leaks are assessed separately as part of ***Section 6.13***.

Monitoring Measures for Surface Water during Construction

Table 6.18 presents the environmental monitoring parameters for surface water during the construction phase.

Table 6.18 Environmental Monitoring Program for Surface Water during the Construction Phase

Aspect	Sampling locations	Parameters	Frequency
Surface Water	Same locations as for environmental baseline sampling	As per Section 1.2 of Myanmar's Environmental Quality Guidelines, "Site Runoff and Wastewater Discharges (construction phase)": • Biological Oxygen Demand, Chemical Oxygen Demand, Oil and Grease, pH, Total Coliform Bacteria, Total Nitrogen, Total Phosphorus, Total Suspended Solids As per Section 1.2 of Myanmar's Environmental Quality Guidelines, "Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)": • 5-day Biochemical Oxygen Demand, Ammonia, Arsenic, Cadmium, Chemical Oxygen Demand, Chlorine (total residual), Chromium (hexavalent), Chromium (total), Copper, Cyanide (free), Cyanide (total), Fluoride, Heavy metals (total), Iron, Lead, Mercury, Nickel, Oil and grease, pH, Phenols, Selenium, Silver, Sulphide, Temperature Increase, Total Coliform Bacteria, Total Phosphorus, Total Suspended Solids, Zinc	Every 6 months

6.6.4 *Operation Phase*

The Project will be operated by the Project Proponent. The Operation & Maintenance (O&M) of the Project will be undertaken by the Project Proponent. O&M staff with relevant experience of operating similar plants and with adequate knowledge of comparable technology will be deployed prior to Phase 1 commercial operation date (COD) to commission and take over the Project from the EPC Contractor.

The targeted commencement of Phase 1 operation is anticipated for the first quarter of 2017. The operation lifespan is not currently known, as the water treatment plant is expected to be required indefinitely to supply water to the Dawei SEZ. The anticipated workforce during operation phase will range from 37 workers during Phase 1 to 68 workers in Phase 8.

During some of the activities of the operation phase, potential water quality impacts may be broadly categorized into one of the following: wastewater discharge, inappropriate waste storage and disposal, impacts to hydrology from increased impervious surfaces, and accidental spills. These potential impacts will be described and assessed further below.

Wastewater Discharges

During operation, water withdrawn from the Reservoir is treated, and the treated water to be sent to the transmission and distribution pumping stations will be in accordance with Thailand and International Standards for industrial use and human consumption (see ***Annex A***).

There will be wastewater generated from the waste wash basin in the treatment process. The waste wash basin will store waste wash water from filters and supernatant water from the sludge dewatering machine, which will eventually be discharged to a stormwater drain. The waste wash water basin will have a design capacity of 18,000 m^3/day. The Project will ensure that discharged wastewater complies with applicable Myanmar Environmental Quality Guidelines.

In addition, sanitary wastewater will be generated by onsite workers. Sanitary wastewater will be treated by a package sewage treatment facility. Volumetric capacity will be designed to ensure it can accommodate the 37 – 68 workers present onsite during the various phases of operation. As a worst case scenario of 10 L per day wastewater per worker, the maximum sewage discharge per day would be 680 L. The sewage water system will consist of underground pipelines with catch basins. The sewage water will be collected by sewage water pipe and gravity flow, which will convey the sanitary wastewater to the sewage water treatment device. One set of septic tanks will be installed underground to treat the sanitary wastewater.

The significance of potential impacts to surface water due to wastewater discharges during the operation phase is assessed in the following table.

Impact	Potential for impacts to surface water due to wastewater discharges during plant operation.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to surface water would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to surface water would be direct impacts from Project activities.				
Duration	Temporary	Short-term	Long-term	**Permanent**	
	The operation phase will last indefinitely, depending on the water requirements of the Dawei SEZ. The duration of potential impacts is therefore permanent.				
Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project site footprint, as well as areas downstream of the Project site, and hence would be considered to be local.				
Scale	Sources and estimated quantities of wastewater generation from the Plant during the operation and maintenance phase are as follows: • Waste wash basin discharge: 18,000 m^3/day • Sanitary wastewater (sewage): Maximum 0.680 m^3/day The scale of potential impacts due to release of wastewater is potentially large due to the quantities present during this stage, but in-place treatment and management systems will reduce effluent levels to within EQG standards.				
Frequency	Impacts to surface water from wastewater discharges could occur intermittently but repeatedly throughout the day for the duration of the operation phase.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts to surface water quality in the Project area from wastewater discharges and runoff are expected to be of Small magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total suspended solids and turbidity, as well as elevated levels of BOD and the presence of coliform bacteria. This suggests that the surface water quality is already somewhat impacted. Overall sensitivity is rated as Medium.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- Implement adequate sanitary facilities for onsite personnel.
- Liquid effluents arising from operations will be treated to the applicable EQG guideline prior to discharge.
- Design drainage pipes and culverts for the controlled release of storm flows.
- Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into sanitary sewers via grease traps. The sanitary sewer should then be treated prior to discharge or reuse as greywater.
- The sewage from the entire plant area will be collected and treated in a sewage treatment plant (STP). No untreated sewage will be directly discharged into the Reservoir or Dawei River near the site, or disposed of on land, for the duration of the project life cycle.
- The stormwater drainage system will be periodically inspected for blockages and cleaned at least once before the monsoon season each year; and
- Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

Waste Storage and Disposal

The solid waste generated during the operation phase will predominately comprise of the sludge from the water treatment process. It is anticipated that approximately 828 kg/day of sludge will be generated, which will be treated in the sludge dewatering system. The treated sludge (sludge cake) will be disposed to a future landfill within the DSEZ. Further details of this landfill are not yet available. In addition, there will be domestic solid waste, which will be collected and segregated for recyclable and non-recyclable waste (i.e. paper, plastic). Solid waste will be disposed of to a future landfill within the DSEZ.

If the above wastes are not stored and disposed of appropriately, have the potential to cause impacts to surface water quality through leakage or rainfall runoff.

The majority of the generated wastes from the Project during the operation phase will be non-hazardous. A small proportion of the waste generated will be hazardous, including used paint, engine oils, hydraulic fluids and waste fuel, spent solvents from equipment cleaning activities, and spent batteries or spent acid/alkali from the maintenance of machinery on site. The sludge cake could also potentially be hazardous.

Based on previous experience with similar projects, the total approximate quantities of non-hazardous and hazardous waste that could be a potential source of impact during this stage (assuming a maximum of 68 workers per day) include:

- 68 kg/day of solid (non-hazardous) waste;
- 15 kg/month hazardous waste; and
- 828 kg/day of sludge from water treatment process.

During operation, waste will be collected and transported to tentative proposed landfill area within the Industrial Estate. Sludge cake will be used for earth works within the Industrial Estate area. Hazardous Waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ. The Project Proponent will handle, store and dispose of all waste in accordance with applicable guidelines.

The significance of potential impacts to surface water due to contamination from waste storage and disposal during the operation phase is assessed in the following table.

<table>
<tr><td>Impact</td><td colspan="4">Potential for surface water contamination from inappropriate waste management.</td></tr>
<tr><td rowspan="2">Nature</td><td>Negative</td><td>Positive</td><td colspan="2">Neutral</td></tr>
<tr><td colspan="4">Potential impacts to surface water would be considered to be adverse (negative).</td></tr>
<tr><td rowspan="2">Type</td><td>Direct</td><td>Indirect</td><td>Induced</td><td>Cumulative</td></tr>
<tr><td colspan="4">Impacts to surface water would be direct impacts from Project activities.</td></tr>
<tr><td rowspan="2">Duration</td><td>Temporary</td><td>Short-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="4">The operation phase will last indefinitely, depending on the water requirements of the Dawei SEZ. The duration of potential impacts is therefore permanent.</td></tr>
</table>

Extent	**Local**		Regional		International	
	Potential impacts would be limited to the Project site footprint, as well as areas downstream of the Project site, and hence would be considered to be local.					
Scale	Based on experience with similar projects, the total approximate quantities of non-hazardous and hazardous waste that could be a potential source of impact during this stage (assuming a maximum of 68 workers per day) include: • 68 kg/day of solid (non-hazardous) waste • 15 kg/month hazardous waste • 828 kg/day sludge from water treatment process					
Frequency	Impacts to surface water due to inappropriate waste storage and disposal could occur intermittently but repeatedly throughout the day for the duration of the operation phase.					
Magnitude	Positive	Negligible	**Small**	Medium	Large	
	Potential impacts to surface water quality in Project area due to inappropriate waste disposal are expected to be of Small magnitude.					
Receptor/ Resource Sensitivity	Low		**Medium**		High	
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total suspended solids and turbidity, as well as elevated levels of BOD and the presence of coliform bacteria. This suggests that the surface water quality is already somewhat impacted. Overall sensitivity is rated as Medium.					
Significance	Negligible	**Minor**	Moderate	Major		
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.					

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- Implement the same mitigation measures to minimize impacts to Waste Management (***Section 6.9***).
- Provide training to workers for waste disposal in designated areas and use of sanitation facilities.
- Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance).
- Store wastes in closed containers away from direct sunlight, wind and rain.
- Store waste systematically to allow inspection between containers to monitor leaks or spills.
- Ensure that storage areas have impermeable floors and containment, of capacity to accommodate 110% of the volume of the largest waste container; and
- Waste to be disposed of properly, as follows:
  - Non-hazardous waste will be collected and transported to a proposed landfill area within the Industrial Estate of the DSEZ.
  - Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

Impacts to Surface Water Hydrology from Increased Impervious Surfaces

During the operation phase, the physical footprint of the water treatment plant will increase the impermeable area of the Project site, resulting in changed hydrological characteristics, such as reduced water infiltration to the soil, which could create additional surface run-off (and increase the flow velocity of this run-off), as well as reducing infiltration into subsurface aquifers. Surface water bodies may have the potential to be affected by changes to their flow rates and discharge volumes due to variation in the drainage patterns in their basin. In addition, the increased stormwater runoff from the Project's impermeable surfaces will have to be accommodated by the drainage channels of the Project site.

To provide an estimate of stormwater volume that will need to be accommodated by the drainage channel/irrigation canal, peak runoff discharges around the Project site have been estimated using an analytical calculation which takes into account catchment area, rainfall intensity and runoff coefficient (also called the "Rational Method"). The peak runoff discharge from the impermeable surfaces of the Project site is estimated as follows:

$$Q = 0.278 \times 10^{-6} CIA \qquad \textbf{\textit{Eq. 6-7}}$$

where

Q = estimated runoff flow rate (m^3/s)

C = runoff coefficient

I = rainfall intensity (mm/hour)

A = catchment area (m^2)

For rainfall intensity, a return period of 25 to 100 years is commonly used in sizing detention ponds or drainage ditches (Osman Akan, 1993[1]). To obtain maximum rainfall intensities of a storm of certain duration usually requires either 1) reference to an Intensity-Duration-Frequency (IDF) curve specific to the region, or 2) very frequent rainfall data (at least hourly) over a long period of time. Unfortunately neither of these data are available for the Project area, or even for Tanintharyi Region. However, Sitiwong and Yonchai (2013) derived IDF curves for neighboring Kanchanaburi Province in Thailand. Using the data from their curves, and assuming a 1-in-100 year storm of 15-minute duration, the maximum rainfall intensity in the region was approximately 250 mm/h. For the purposes of this assessment, this maximum rainfall intensity will be used to approximate representation for the Project area in the runoff calculations.

As a worst case scenario, taking the catchment area to be equivalent to a concrete surface (C = 0.90), and the area of the Project footprint (including pipelines) to be 1.68 ha (16,800 m^2), the estimated runoff for a worst case 15-minute duration storm with a return period of 100 years, would be approximately 1.05 m^3/s. To compare this with the peak runoff rate that would have existed for the same footprint in the natural setting prior to the project, the same formula can be used, but C (the runoff coefficient) would be 0.20 (sandy or loam soil). Based on this, the prior peak runoff rate for the Project footprint would have been 0.23 m^3/s.

Although the relative increase in runoff rate is substantial due to the increase in impervious area, the runoff rate of 1.05 m^3/s (or 3,780 m^3/hr) is not very high from a

[1] Osman Akan, A. 1993. Urban Stormwater Hydrology. http://books.google.co.th/books?id=ZyJtRojkDg0C&pg=PA6&lpg=PA6&dq=design+ponds+return+period+duration+rainfall&source=web&ots=-U4jCFGjeK&sig=dLhEjM42jFuFitaIl3VXcTUSRtI&hl=en&sa=X&oi=book_result&resnum=5&ct=result

drainage capacity perspective. If drainage channels are designed to allow for this maximum runoff rate, impacts to hydrology are not expected to be significant.

The significance of potential impacts to surface water due to increased runoff from impervious surfaces during the operation phase is assessed in the following table.

Impact	Potential for surface water impacts from altered hydrology due to an increase in impervious surfaces in the Project area.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to surface water would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to surface water would be direct impacts from Project activities.				
Duration	Temporary	Short-term	Long-term	**Permanent**	
	The operation phase will last indefinitely, depending on the water requirements of the Dawei SEZ. The duration of potential impacts is therefore permanent.				
Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project site footprint, as well as areas downstream of the Project site, and hence would be considered to be local.				
Scale	The estimated runoff from Project surfaces for a worst case 15-minute duration storm with a return period of 100 years, would be approximately 1.05 m^3/s.				
Frequency	Impacts to surface water due to increased rainwater runoff would occur during rainfall events, and will be more frequent during the rainy season.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts to surface water in the Project area due to increased rainfall runoff from impervious surfaces are expected to be of Small magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	There are a number of current water uses in the Project area, and the Dawei River is considered an important water resource. The resource/receptor sensitivity is considered Medium.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- Ensure that drainage channels have enough capacity to accommodate the increased rainfall runoff from the Project's impervious surface.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

Accidental Spills and Leaks

During operation, hazardous substances are associated with some of the chemicals of the water treatment process, as described below:

- **Alum System:** A liquid alum (8% AlO_3, by weight) (1.35 kg/l) will be used for the purpose of coagulation. The alum will be stored in onsite vertical tanks;
- **Polymer System:** A dry anionic polymer will be used for the purposes of a flocculant aid. The polymer will be stored in a dry bulk bag of appropriate size (25 to 50 kg/bag);

- **Chlorine System:** Either liquid chlorine or chlorine will be used for the purpose of oxidation (pre-chlorine) and disinfection (post-chlorine). The maximum dosing rate for pre-chlorination will be 8 g/m^3 and the maximum dosing rate for post-chlorination will be 4 g/m^3. The liquid chlorine will be stored in bulks solution tanks and the chlorine gas will be stored in chlorine gas tanks;
- **Lime or Caustic Soda System:** Lime or caustic soda will be used for pH adjustment / alkalinity addition. Lime will be stored in a dry bulk bag of appropriate size (25 to 50 kg/bag) on wood/plastic pellets. Caustic soda will be stored in bulk tanks; and
- **Powdered Activated Carbon (PAC) System:** The PAC system is an optional system that may be established for the Project for taste, odour and colour reduction of the treated water.

Note that impacts due to accidental spills and leaks are assessed separately as part of ***Section 6.13***.

Impacts due to Flooding from Reservoir

It is noted that the creation of the Pa Yain Byu Reservoir has altered the natural hydrology of the area, and may increase the likelihood of flooding (in addition to having already intentionally flooded some areas compared to pre-reservoir conditions). This was also raised as a stakeholder concern, as noted in ***Chapter 8***. It is not within the scope of this IEE to assess impacts associated with the Pa Yain Byu Reservoir. However, the impacts were assessed in the Initial Environmental Examination on Pa Yain Byu Reservoir for the Small Water Reservoir Project (Phisut Technology Co., Ltd., 2015). A brief summary of this assessment, and mitigation measures, has been included in ***Section 6.13***.

Monitoring Measures for Surface Water during Operation

Table 6.19 presents the environmental monitoring parameters for surface water during the operation phase.

Table 6.19 Environmental Monitoring Program for Surface Water during the Operation Phase

Aspect	Sampling locations	Parameters	Frequency
Surface Water	Same locations as for environmental baseline sampling	As per Section 1.2 of Myanmar's Environmental Quality Guidelines, "Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)": • 5-day Biochemical Oxygen Demand, Ammonia, Arsenic, Cadmium, Chemical Oxygen Demand, Chlorine (total residual), Chromium (hexavalent), Chromium (total), Copper, Cyanide (free), Cyanide (total), Fluoride, Heavy metals (total), Iron, Lead, Mercury, Nickel, Oil and grease, pH, Phenols, Selenium, Silver, Sulphide, Temperature Increase, Total Coliform Bacteria, Total Phosphorus, Total Suspended Solids, Zinc	Every 6 months

6.7 SOILS AND GROUNDWATER

6.7.1 Introduction

This Section presents an evaluation of the potential impacts on groundwater levels and quality and issues pertaining to quality of the in-situ soils. Impacts relating to topsoil loss due to surface water flows are discussed and assessed in ***Section 6.6***. This is primarily due to the fact that management of surface water is related to ensuring that topsoil does not become mobilised as suspended solids.

This Section also develops management, mitigation and monitoring measures needed to ensure that any identified impacts can be reduced to as low as reasonably practical. Such measures are presented and will form part of the overall EMP for the Project (see ***Chapter 7***).

6.7.2 Scope of Assessment

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2*** the following potential impacts on soils and groundwater are considered further in this IEE.

- Water Treatment Plant
    - Site Formation & Access Road
    - Excavation and Foundation Work
    - Civil Construction
    - Pre-Commissioning
    - Commissioning
    - Wastewater Discharges and Runoff
    - Non-Hazardous Waste Storage and Disposal
    - Hazardous Waste Storage and Disposal
    - Accidental Events/Spills/Dropped Objects
- Pumping Station and Water Supply Pipeline
    - Site Formation & Access Road
    - Excavation and Foundation Work
    - Construction of Pumping Station and Water Supply Pipeline (floating)
    - Construction of Pumping Station and Water Supply Pipeline (land)
    - Pre-Commissioning
    - Commissioning
    - Wastewater Discharges and Runoff
    - Non-Hazardous Waste Storage and Disposal
    - Hazardous Waste Storage and Disposal
    - Accidental Events/Spills/Dropped Objects

Operation Phase

- Water Treatment Plant
    - Operation of Water Treatment Plant
    - Waste Storage and Disposal
    - Accidental Events (spill, uncontrolled release)
- Pumping Station and Water Supply Pipeline
    - Operation of Pumping Station and Water Supply Pipeline (land)

- Waste Storage and Disposal
- Accidental Events (Leaks, Uncontrolled Release)

6.7.3 Construction Phase

During construction, the following potential soil and groundwater impacts are anticipated:

- Loss of soil structure, quantity and quality due to improper management during site clearance activities;
- Changes to groundwater levels during development due to abstraction/dewatering (if necessary);
- Soil and groundwater contamination due to improper construction waste storage and disposal;
- Soil and groundwater contamination due to improper discharge of waste water discharges and runoff; and
- Soil and groundwater contamination due to potential leaks, spills and contaminated fill materials during all phases of Project construction.

It is noted that soil and groundwater contamination due to improper construction waste storage and disposal would be the result of contaminated surface water run-off being discharged from waste storage and disposal areas. The production and discharge of this contaminated surface water is assessed extensively within ***Section 6.6***. It is considered that this impact has therefore already been covered and will not be re-assessed within the context of impacts to soil and groundwater. This is also the case with the impacts due to improper discharge of waste water and runoff which if direct to either a surface water, groundwater or soil receptor would all be subject to similar impacts and thus mitigation, management and monitoring measures. In addition, soil and groundwater contamination due to potential leaks, spills and leaks is assessed separately in ***Section 6.13***.

Loss of Soil due to Improper Management during Site Clearance Activities

Soil works, including vegetation clearance, potential grading and levelling, compaction, construction of various structures must be carried out at the Project site, access roads, and for the laying of the right of way for the water supply pipeline (floating and land). Changes to soil structure may be caused by mechanical disturbance to the soil from these activities. Exposure of soil to rain and wind may in turn cause erosion and loss of top soil. The anticipated volume of spoil to be removed due to excavation activities is 4,334 m^3. This phase of the Project is generally the most intensive in terms of potential for topsoil loss. Poor topsoil management can lead to a loss of topsoil through either the air (as dust) or as sediment entrained within surface water flows. Soil erosion can also result from poor management of stockpiled soils, excavated areas and general construction areas.

Additionally, soil will be compacted at the Project site, right of way for water supply pipeline (floating and land) and access roads to ensure soil stability. Movement of heavy vehicles in the construction area will also result in soil compaction and damage to the soil structure. This compaction of the soil may potentially result in changed hydrological characteristics, such as reduced permeability and water infiltration to the soil, which could create additional surface run-off (and increase the flow velocity of this run-off), as well as reducing infiltration into subsurface aquifers.

Soils near the Project are mostly degraded, and are therefore prone to erosion. If compaction and erosion are not managed, associated potential impacts could include excessive sedimentation of local waterways, loss of topsoil and reduction in soil fertility, and detrimental changes to site hydrology. However, soil compaction erosion due to construction activities will only be limited to the vicinity of Project, right of way for water supply pipeline and access roads.

Loss of topsoil, if not controlled, can result in a waste of valuable topsoil resource which can be used in rehabilitation activities and or/agriculture. Presently there are no mitigation, management and monitoring measures directly associated with topsoil management. The significance of impact is assessed in the following table.

Impact	Loss of topsoil resources during construction				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to groundwater would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impact on topsoil is direct				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	Impacts are considered long term as a loss of topsoil may occur over a period longer than the construction phase.				
Extent	**Local**	Regional	International		
	Impact is expected to be limited to the project footprint only, and therefore the extent is considered local.				
Scale	The scale of this impact is expected to be small given that it will occur over a relatively small area (Project site, right of way for water supply pipeline and access roads) compared to the rest of the landscape.				
Frequency	This impact will occur throughout the construction phase, with the most intensive time being during the clearance of the Project site.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts associated with topsoil loss are anticipated to be small based upon the limited extent and scale.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	The resource sensitivity (being the topsoil) is considered to be medium as it is a valuable asset which can be easily lost due to inappropriate management practices.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

During soil disturbing activities, the mitigation measures developed with regards to surface water quality (***Section 6.6***) will serve to prevent soil loss through limiting Total Suspended Solid (TSS) loading in surface water bodies. Additionally, mitigation measures developed within Air Quality (***Section 6.3)***, particularly those aimed at dust prevention, will also minimise soil losses. Other mitigation measures to be implemented include:

- Delineation of clearance boundaries to limit the areas to be cleared;
- Scheduling clearance activities (if possible) to avoid extreme weather events such as heavy rainfall, extreme dry and high winds;
- Revegetation areas with temporary land use, conducting progressive rehabilitation;
- Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers;

- Reuse topsoil as much as possible within rehabilitation activities;
- Control erosion through diversion drains, sediment fences, and sediment retention basins; and
- Where topsoil is to be stored for later use in rehabilitation activities, the following basic principles are to be applied:
  - Stockpiles to be separated into topsoil and sub-soil and be located at least 50 m from any surface water source or groundwater well.
  - To the extent possible, stockpiles are to be located in areas surrounded by natural wind barriers to minimise the potential for wind erosion.
  - Stockpile storage areas are to be prepared in advance of the removal of topsoil as much as possible.
  - Topsoil heights are to be restricted in height to 2 m above ground level to minimise wind erosion, and they are only to be partially compacted on the upper layer in order to promote aeration, maintain soil vertical structures, reduce runoff and encourage infiltration.

Residual Impacts

Based upon the implementation of the above management and mitigation measures, the residual impact level can be reduced to **negligible**. This is due to the fact that all topsoil would be retained and/or reused in the development of the Initial Industrial Estate, thus reducing the scale even further and the magnitude to **negligible**.

6.7.4 Operation Phase

During operation, the following potential soil and groundwater impacts are anticipated:

- Loss of soil due to increased erosion potential during operations;
- Soil and groundwater contamination due to improper construction waste storage and disposal;
- Soil and groundwater contamination due to improper discharge of waste water discharges and run-off; and
- Soil and groundwater contamination due to potential leaks, spills and leaks.

As for the construction impacts, it is noted that soil and groundwater contamination due to improper construction waste storage and disposal would be the result of contaminated surface water run-off being discharged from waste storage and disposal areas. The production and discharge of this contaminated surface water is assessed extensively within ***Section 6.6***. It is considered that this impact has therefore already been covered and will not be re-assessed within the context of impacts to soil and groundwater. This is also the case with the impacts due to improper discharge of waste water and runoff which if direct to either a surface water, groundwater or soil receptor would all be subject to similar impacts and thus mitigation, management and monitoring measures. In addition, soil and groundwater contamination due to potential leaks, spills and leaks is assessed separately in ***Section 6.13***.

<u>Loss of soil due to increased erosion potential during operations</u>

During operation, the physical footprint of the water treatment plant (WTP), water supply pipeline (land) and raw water pumping station (RWPS) located on the embankment of the reservoir will increase the impermeable area of the Project, resulting in changed hydrological characteristics, such as reduced water infiltration to the soil, which could create additional surface run-off (and increase the flow velocity of this run-off).

The increased impervious surfaces from the Project footprint (1.68 ha) are expected to cause rainfall runoff rates. This increased flow rate of 0.105 m^3/s has the potential to cause soil erosion and sedimentation. Details of the flow rate calculation are provided in ***Section 6.6***. If the drainage channel surrounding the Project is designed with enough capacity to accommodate this increased flow rate, then the potential impacts can be minimized.

The significance of potential impacts to soil due to erosion from increased run-off from impervious surfaces during the operation phase is assessed in the following table.

<table>
<tr><td rowspan="1">Impact</td><td colspan="20">Potential for soil erosion due to altered hydrology due to an increase in impervious surfaces in the Project area.</td></tr>
<tr><td rowspan="2">Nature</td><td colspan="20">Negative | Positive | Neutral</td></tr>
<tr><td colspan="20">Potential impacts to soil would be considered to be adverse (negative).</td></tr>
<tr><td rowspan="2">Type</td><td colspan="20">Direct | Indirect | Induced | Cumulative</td></tr>
<tr><td colspan="20">Impacts to soil would be indirect impacts due to the presence of the Project footprint.</td></tr>
<tr><td rowspan="2">Duration</td><td colspan="20">Temporary | Short-term | Long-term | Permanent</td></tr>
<tr><td colspan="20">The operation phase will last indefinitely, depending on the water requirements of the Dawei SEZ. The duration of potential impacts is therefore permanent.</td></tr>
<tr><td rowspan="2">Extent</td><td colspan="20">Local | Regional | International</td></tr>
<tr><td colspan="20">Potential impacts would be limited to the Project site footprint, as well as areas downstream of the Project site, and hence would be considered to be local.</td></tr>
<tr><td>Scale</td><td colspan="20">The estimated runoff from Project surfaces for a worst case 15-minute duration storm with a return period of 100 years, would be approximately 0.105 m^3/s.</td></tr>
<tr><td>Frequency</td><td colspan="20">Impacts to soil due to erosion from increased rainwater runoff would occur during rainfall events, and will be more frequent during the rainy season.</td></tr>
<tr><td rowspan="2">Magnitude</td><td colspan="20">Positive | Negligible | Small | Medium | Large</td></tr>
<tr><td colspan="20">Potential impacts to soil in the Project area due to increased rainfall runoff from impervious surfaces are expected to be of Small magnitude.</td></tr>
<tr><td rowspan="2">Receptor/ Resource Sensitivity</td><td colspan="20">Low | Medium | High</td></tr>
<tr><td colspan="20">Existing soil quality in the Project area is generally fair, but soil is susceptible to erosion. Overall sensitivity is rated as Medium.</td></tr>
<tr><td rowspan="2">Significance</td><td colspan="20">Negligible | Minor | Moderate | Major</td></tr>
<tr><td colspan="20">The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.</td></tr>
</table>

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- Ensure that the drainage channel has enough capacity to accommodate the increased rainfall runoff from the Project's impervious surfaces.

Residual Impact Level

If the recommended mitigation measure is implemented, the residual impact significance is anticipated to be **negligible**.

6.8 TERRESTRIAL BIODIVERSITY

Impacts to biodiversity have been evaluated in the context of the Project Facilities fully described in ***Chapter 4***, including details of planned construction and operation activities.

This assessment refers to the land development, construction and operation of the Water Treatment Plant including the main facilities and supporting facilities as described in ***Chapter 4***. The construction and operation of the Project are also considered.

Table 6.20 summarises the nature of impacts to biodiversity values related to these activities. These terms are used in the scoping of Project impacts on biodiversity values and relate to the identified threats from the activities.

Table 6.20 Nature of impacts on biodiversity values

Term	Description
Direct Impacts	Means direct physical displacement or impact from the Project on a species' habitat or lifecycle.
Indirect Impacts	Means a secondary impact resulting from a direct impact from the Project on a species' habitat or lifecycle.
Spatial Impacts	Means impacts on species' habitats or lifecycle including: isolation of populations or individuals; impacts on species endemism; impacts on the heterogeneity of species; environmental gradients; edaphic interfaces (derived from soil toils); connectivity between habitats and climate change adaptation importance.
Temporal Impacts	Means: • Temporary Impact means a reversible impact on a species' habitat or lifecycle; and • Permanent Impact means an irreversible impact on a species' habitat or lifecycle.

Source: ERM, 2015.

6.8.1 *Resources and Receptors*

For this assessment of impacts on terrestrial and aquatic biodiversity, the key resources and receptors identified are:

- Natural Habitats and Modified Habitats identified in the baseline assessment (See ***Chapter 5***);
- Terrestrial fauna identified in the baseline including avifauna, mammals and herpetofauna; and
- Aquatic fauna.

Note ***Section 6.10*** assesses Project impacts on socio-economic receptors and is the main section to consider provisioning ecosystem services such as social implications of Project impacts on wild capture fisheries, aquaculture, productive land (e.g. rice fields), and standing crops (e.g. Acacia spp. and fruit trees).

6.8.2 *Assessment of Impacts*

Table 6.21 summarises the threats to biodiversity values related to the activities during construction. These threats to biodiversity relate to the activities that are likely to occur during Project construction. ***Table 6.22*** provides an assessment of significance for the modified habitats within the Project area. A number of the threats relate to both construction and operation activities and as such an assessment of significance has been undertaken in this Section.

Table 6.21 Threats to biodiversity values during Pre-Construction and Construction

Term	Description
Permanent Loss of Habitat	Permanent loss of habitat or species due to permanent or temporary site activities for the Project
Disturbance and Displacement of Species	Disturbance to, or displacement/exclusion of a species from foraging habitat due to construction activities, de-commissioning activities, and operational and maintenance activities.
Edge Effects on Habitats	Disturbance or damage to adjacent habitat and species caused by movement of vehicles and personnel, potential mobilisation of sediment, artificial lighting, dust, spillage of fuels and chemicals, emissions and noise, and subsidence.
Alteration of Water Flow Regimes	Effects on downstream habitats caused by alterations to natural flow regime.
Light/Noise Impacts	Effects on species caused by permanent alterations in night time light conditions;
Alien Species (Plants and Animals)	Introduction or spreading of alien species during the construction works.
Air/Water Pollution	Contamination of the environment that has a direct or indirect impact on a species either through exposure to harmful substances.
Mortality	Mortality of individual fauna species as a result of vehicle or machinery strike or falling debris during clearing activities.

Table 6.22 Assessment of Impacts to Habitats during Construction

Impact	Description	Comment	Sensitivity	Magnitude	Significance
Temporary loss of habitat	Temporary disturbance of terrestrial and aquatic habitat in areas required to facilitate construction. Temporary disturbance will mainly be associated with access roads to construction areas, laydown areas and construction camps.	Construction activities will require clearing of Modified Habitats to facilitate the construction process which will remove habitat. The habitats are common and widespread within the region (low sensitivity) and the loss will be limited to that necessary for construction. The areas to be temporarily disturbed are considered unlikely to impact the viability or functioning of adjacent ecosystems (small magnitude). Where possible topsoil will be managed locally and natural regeneration or rehabilitation using native species will be undertaken in areas not required for the operation of the Project.	Low	Small	Negligible
Permanent loss of habitat	Permanent loss of 1.68 ha of habitat within the infrastructure footprint and inundation areas. Habitat loss includes 1.68 ha of modified habitat. These areas will be cleared or inundated during construction.	The construction activities will result in the loss of 1.68 hectares of Modified Habitat. The habitats are Modified Habitats and consist of primarily agricultural land (low sensitivity) and the loss will be limited to that necessary for construction. The areas to be disturbed are considered unlikely to impact the viability or functioning of adjacent ecosystems (small magnitude). Where possible topsoil will be managed locally and natural regeneration or rehabilitation using native species will be undertaken in areas not required for the operation of the Project.	Low	Small	Negligible
Temporary disturbance to fauna behaviors	Disturbance and displacement of resident fauna due to noise, light and/or vibration as a result of construction activities (excavation, blasting, clearing, spoil disposal, camps, plant and vehicle movement).	Noise and light disturbances have the potential to influence fauna breeding, roosting or foraging behaviour of native fauna. The consequences of these influences are dependent on the extent of disturbance but in extreme cases these factors can influence local populations if breeding and communication is inhibited. Excessive noise can impede fauna communication and deter the use of habitats nearby. Similarly, introducing light sources has the potential to deter foraging and dispersal activities of nocturnal species. The impact is likely to be small and localised (low sensitivity) and unlikely to impact significantly on fauna (small magnitude).	Low	Small	Negligible

Impact	Description	Comment	Sensitivity	Magnitude	Significance
Edge effects degrading habitat	The construction associated with the Project will generate newly disturbed forest edges around the margins of the reservoir, along access roads and at the infrastructure locations.	Edge effects are an indirect impact of land clearing. Where vegetation clearing occurs, adjacent vegetation and habitats are exposed to increased noise, light, dust and wind environment as well as increased competition from predators and invasive species. In extreme cases some of these effects have potential to alter the habitat characteristics of the ecotone and influence suitability for native flora and fauna. 'New' habitat edges will be created where infrastructure is located in natural habitat areas, not previously disturbed. In general, the habitats that may be impacted are common and widespread within the region (Low sensitivity) and the impact is not likely to impact the viability/function of adjacent habitats (Small magnitude).	Low	Small	Negligible
Degradation of habitat	Introduction of alien species and competition with native communities	Invasive or alien species have the potential to be introduced or spread throughout the Project area through increased movement of people, vehicles, machinery, vegetation and soil. An increase in the prevalence of weeds or other pests has the potential to reduce the quality of habitat for some native flora and fauna, including threatened species (Sensitivity medium). Invasive flora species can rapidly germinate in disturbed areas whereby affecting the ability of native vegetation communities to re-establish. Alien animals also have the potential to be introduced or increased in abundance. These animals may adversely impact native fauna as a result of increased competition for resources, predation or habitat degradation. Vehicle movement and activities which introduce a risk of invasion will be focussed along the access track and construction areas (Magnitude small).	Medium	Small	Minor
	Accidental release of hazardous substances stored or used during construction phases.	The Project components include the storage and handling of hazardous materials, including refuelling. Accidental release or spill of these materials can be toxic to flora and fauna locally and downstream if substances are released into the aquatic environment. Such that impacts are likely to be localised (magnitude small) and the Area of Influence does not contain habitats or species of significance (Sensitivity medium).	Medium	Small	Minor

Impact	Description	Comment	Sensitivity	Magnitude	Significance
Water Quality Impacts	Erosion and runoff at waterways crossings leading to downstream degradation of water quality, and aquatic habitats.	A range of Project activities have the potential to lead to indirect dust and runoff impacts to native flora, fauna and habitat during the construction phase as well as longer term edge effects and noise impacts. During construction, land preparation has the potential to generate dust which may settle on vegetation adjacent to the construction area. Excessive dust deposition on flora may act to suppress growth through limiting photosynthesis and the dusted foliage may also become unpalatable to foraging fauna. The construction activities will be temporary and short lived, and dust generation is likely to be localised to active work areas. Rainfall will generally remove dust from foliage. Land preparation will create exposed bare earth areas that are vulnerable to erosion (wind and/or runoff) until infrastructure construction or replanting is completed to stabilise the surface. Erosive processes transport and deposit sediment to downstream habitats (both aquatic and terrestrial). The indirect impact has potential to degrade downstream habitat areas or change habitat characteristics, and as such influencing suitability for native flora and fauna communities. Impacts are likely to be localised (magnitude small) and no species of conservation significance were detected (Sensitivity medium).	Medium	Small	Minor
Fauna mortality		Fauna mortality can occur during vegetation clearing activities in the event individuals are struck by vehicles and machinery. Animals that are unable to disperse during clearing activities are vulnerable to being injured or destroyed through interaction with machinery or falling debris. It is likely that most individuals will disperse (Sensitivity low) from clearing locations into adjacent habitats however some less mobile species may experience a localized reduction (Magnitude small) in abundance during this period, such as amphibians, reptiles and small mammals.	Low	Small	Negligible

6.8.3 *Avoidance/ Minimisation of Impacts*

The mitigation hierarchy aims to achieve the best possible outcome to minimise effects on biodiversity and should be applied sequentially to: avoid or minimise; mitigate; rehabilitate/ restore and finally to compensate/ offset if required.

6.8.4 *Construction Phase*

Disturbance to habitat in modified and natural habitat areas during construction has the potential to impact the local and downstream biodiversity as well as impacts to priority biodiversity values. Mitigation measures can be implemented to manage the disturbance during construction such that biodiversity values are not significantly impacted or impacts are reduced by the application of the mitigation hierarchy (avoid, minimise, mitigate and compensate through offsets).

To further mitigate potential impacts to biodiversity values, the remainder of the mitigation hierarchy principle was applied. The impact assessment (***Table 6.22***) identified potential impacts to both modified habitats. Modified habitat types were not identified to play a significant role in habitat suitability for priority biodiversity values.

Management measures specific to managing the natural environment will be incorporated into the Project Construction Management Plans and these will include (but not be limited to) those identified in ***Table 6.23***. These general environmental management measures will assist in reducing the potential for degradation of habitat, behaviour disturbance, fauna mortality and habitat fragmentation for native species.

In addition to the general measures for the management of potential impacts to the natural environment, measures specific to managing potential impacts to conservation significant values are also considered.

Table 6.23 Mitigation and Management Measures, Construction Phase

Nature of Impact	Overview of Measures
Loss of habitat	• The design and layout plan will be prepared to minimise tree cutting and protected area disturbance where possible. The Project Proponent shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning these restrictions, as well as the punishment that can expected if any staff or worker or other person associated with the Project violate rules and regulations; • The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing; and • Project will utilize or upgrade existing roads where possible to minimize unnecessary clearing requirements.
Disturbance to fauna behaviour	• Construction vehicles and machinery will be maintained in accordance with industry standard to minimise unnecessary noise generation; • Arrangement of transportation schedules will aim to avoid peak hours of road usage to minimise heavy traffic through habitat areas; • For construction areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible; and • Commitment will be made to raise awareness of the construction work force and make arrangements for restriction of poaching.

Nature of Impact	Overview of Measures
Barrier to movement and habitat fragmentation	• The Project shall implement landscaping and re-vegetation after completion of construction in suitable areas to establish a suitable riparian corridor; and • In-stream works will be carried out in low-flow conditions where possible.\
Edge effects	• Dust suppression techniques will be utilised during construction, to control the dispersion of dust created by clearing lands at the construction sites; • The Project shall implement landscaping and re-vegetation after completion of construction using native species where possible; • To avoid/minimize releasing sediment load into the river, erosion control measures will be implemented and maintained e.g. using silt fence and temporary re-vegetation to minimize sediment transport from steep slope releasing to the river and smaller waterways; and •
Degradation of habitat	• Construction and domestic waste will be appropriately stored and disposed of to avoid attracting native and alien species to the construction areas; • For areas in direct runoff path to a watercourse, sediment and erosion control devices will be installed and maintained until vegetation replanting can occur to stabilise disturbed surfaces; • Oil, chemical and solid waste will be stored, and handled and disposed of by standard procedure; • Weed and pest management measures should be implemented to avoid introduction of weeds to natural and modified habitat areas; • Limit maximum speed on unpaved roads to 30 km/h and within the Project boundary to 20 km/h; • Construction materials and chemicals will be appropriately secured and locked down during flood season to avoid accidental release to the natural environment; • Engineering works will be designed to comply with the agreed water quality standards; • Water quality monitoring will begin as soon as possible after the Project begins in accordance with the monitoring detailed in ***Section 6.6*** and ***Chapter 7***; and • Emergency response plan and procedures will be prepared and implemented for the construction activities of the Project. This will include emergency drills and education of Project workers.
Fauna mortality	• Limit maximum speed on unpaved roads to 30 km/h and within the Project boundary to 20 km/h; • Commitment will be made to raise awareness of values of natural habitat areas to construction work force and arrangements will be made for restriction of poaching and forest product collection; • Hunting wild animals will be strictly prohibited to apply for all staff; and • Fishing and using of illegal fishing gear anywhere in the reservoir and along Dawei River will be prohibited.

Summary of the significance of site development activities is provided in the following table.

Impact	Site Development and Construction of WTP, Pumping Station and Water Supply Pipeline.				
Impact Nature	**Negative**	Positive	Neutral		
	The impact on the terrestrial and aquatic biodiversity is negative.				
Impact Type	**Direct**	**Indirect**	Induced		
	Direct terrestrial habitat loss in the Project Footprint in areas to be developed. Indirect effects on remnant/ isolated habitats.				
Impact Duration	Temporary	Short-term	Long-term	**Permanent**	
	Although construction is estimated to take 10 months, the loss/ conversion of habitats will be permanent.				
Impact Extent	**Local**	Regional	International		
	The impact is expected to be local for habitats.				
Impact Scale	It is anticipated that the Project will cover a land area of approximately 1.68 ha.				
Frequency	Construction occurs only once.				
Impact Magnitude	Positive	**Negligible**	**Small**	Medium	Large
	Considering the magnitude of impacts to each habitat discussed above, the overall magnitude of this impact is Negligible to Small.				
Receptor Sensitivity	**Low**	Medium	High		
	Given the large proportion of the area affected is covered by habitats with medium sensitivity, the overall sensitivity is considered Low.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	Critical
	The significance of this impact is Negligible to Minor.				

6.8.5 *Operation Phase*

Impacts to Biodiversity Values

Table 6.24 summarises the threats to biodiversity values related to the activities during operation. These threats to biodiversity are derived from IFC PS 6 and relate to the activities that are likely to occur during Project operation. ***Table 6.25*** provides mitigation and management measures during operation phase.

Table 6.24 Assessment of Impacts to Habitats during Operation

Impact	Description	Comment	Sensitivity	Magnitude	Significance
Disturbance	Disturbance to, or displacement/exclusion of a species from foraging habitat due to operational and maintenance activities.	Operational activities that have potential to disturb native fauna include the use of night lighting at infrastructure and facility locations. Lighting required for operation and safety at the facilities can influence nocturnal foraging behaviours as well as disrupt sleep patterns of crepuscular species.	Low	Small	Negligible
Fauna mortality	Mortality of individual fauna species as a result of vehicle or machinery strike or falling debris during WTP, Pumping Station and Water Supply Pipeline maintenance vegetation clearing activities.	Fauna mortality can occur during vegetation clearing activities in the event individuals are struck by vehicles and machinery. Vegetation clearing or lopping will be required to maintain the safe vegetation height beneath the transmission line. Animals that are unable to disperse during clearing activities are vulnerable to being injured or destroyed through interaction with machinery or falling debris. It is likely that most individuals will disperse (Sensitivity low) from clearing locations into adjacent habitats however some less mobile species may experience a localized reduction (Magnitude small) in abundance during this period, such as amphibians, reptiles and small mammals.	Low	Small	Negligible

Table 6.25 Mitigation and Management Measures, Operation Phase

Nature of Impact	Overview of Measures
Disturbance to fauna behaviour	• Vehicles and machinery will be maintained in accordance with industry standard to minimise unnecessary noise generation; • For areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible; and • Speed limits to maximum of 20 km/hr for vehicles will be enforced to minimise potential for fauna strike.
Fauna mortality	• Commitment will be made to raise awareness of values of natural habitat areas and arrangements will be made for restriction of poaching and forest product collection; • Hunting wild animals will be strictly prohibited to apply for all staff; and • Fishing and using of illegal fishing gear will be prohibited.

Source: ERM, 2015.

Summary of the significance of site development activities is provided in the following table.

Impact	Site Development and Construction of WTP, Pumping station and Water Supply Pipeline.				
Impact Nature	**Negative**	Positive	Neutral		
	The impact on the terrestrial and aquatic biodiversity is negative				
Impact Type	**Direct**	**Indirect**	Induced		
	Direct terrestrial habitat loss in the Project Footprint in areas to be developed. Indirect effects on remnant/ isolated habitats. Direct aquatic habitat loss through and road and river crossings.				
Impact Duration	Temporary	Short-term	Long-term	**Permanent**	
	The loss/ conversion of habitats will be permanent.				
Impact Extent	**Local**	Regional	International		
	The impact is expected to be local for habitats.				
Impact Scale	It is anticipated that the Project will cover a land area of approximately 1.68 ha.				
Frequency	Operation is continuous.				
Impact Magnitude	Positive	**Negligible**	**Small**	Medium	Large
	Considering the magnitude of impacts to each habitat discussed above, the overall magnitude of this impact is Negligible to Small.				
Receptor Sensitivity	**Low**	Medium	High		
	Given the small proportion of the area affected and the area is Modified Habitat, the overall sensitivity is considered Low.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	Critical
	The significance of this impact is Negligible.				

Residual Impacts on Biodiversity Values

There are no residual impacts to biodiversity values identified that require offsetting or compensating following mitigation.

6.9 WASTE MANAGEMENT

6.9.1 Introduction

During construction and operation, there are a range of activities which have the potential to generate a range of liquid and solid hazardous and non-hazardous waste streams. This Section identifies in the various types of waste that will be generated, potential impacts associated with their generation and disposal, and identifies appropriate mitigation, management and monitoring measures required to reduce residual impacts to an acceptable level.

Impacts associated to all liquid waste streams (both planned and unplanned) were noted as occurring to a range of receptors such as surface water, groundwater and soils. The unplanned impacts associated with the generation, storage and disposal of all liquid hazardous and non-hazardous waste streams are assessed in ***Section 6.13***.

This Section is therefore exclusively focused upon impacts associated with the generation and management of solid waste.

6.9.2 Scope of Assessment

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2,*** the following potential impacts due to solid waste generation require consideration in this IEE.

Construction Phase

- Water Treatment Plant
  - Site Formation & Access Road
  - Excavation and Foundation Work
  - Civil Construction
  - Pre-Commissioning
  - Equipment/Material/Worker Transport
  - Pre-commissioning
  - Commissioning
  - Non-Hazardous Waste Storage and Disposal
  - Hazardous Waste Storage and Disposal
- Pumping Station and Water Supply Pipeline
  - Site Formation & Access Road
  - Excavation and Foundation Work
  - Construction of Pumping Station and Water Supply Pipeline (floating)
  - Construction of Pumping Station and Water Supply Pipeline (land)
  - Pre-Commissioning
  - Commissioning
  - Non-Hazardous Waste Storage and Disposal
  - Hazardous Waste Storage and Disposal
  - Accidental Events/Spills/Dropped Objects

Operation Phase

- Water Treatment Plant
  - Operation of Water Treatment Plant
  - Waste Storage and Disposal
- Pumping Station and Water Supply Pipeline
  - Operation of Pumping Station and Water Supply Pipeline (floating)
  - Operation of Pumping Station and Water Supply Pipeline (land)
  - Waste Storage and Disposal

6.9.3 Construction Phase

During the construction phase, a range of solid waste materials will be generated either due to the daily activities of the construction workforce (e.g. generation of putrescible waste) as well as a range of general construction waste such as biomass, concrete, steel pipes, plastic pipes, steel plates, structural steel and wooden crates during the civil works phase of construction. In addition, hazardous waste will be generated such as oil rags and paints.

The municipal waste management network within the area is exceptionally limited. Therefore, any additional waste streams generated by the Project are likely to place additional stress on this already struggling waste management network if not carefully managed. It is therefore anticipated that all solid waste will be disposed of in the proposed landfill within the Industrial Estate of the DSEZ to minimise the impact on the municipal waste management network. However, once the location and timing for development of the landfill has been confirmed the impact assessment will need to be reviewed to ensure that this assumption still holds true. Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.

Whilst the Project plans to put in place systems to collect the waste, this may simply be exporting impacts off site. These impacts could include soil and groundwater impacts (depending on the nature of the final disposal site), human health impacts, impacts to surface water and indirect impacts to community health and safety due to contamination of drinking water or food. Additionally, it is noted that the improper storage of waste on-site can also give rise to a number of impacts. These include:

- Indirect impacts to community and work health and safety due to contamination of drinking water or food; accidental leaks or spills of oil, fuel or other hazardous materials could potentially pollute surface waters; and
- Soil may be contaminated by pollution from spills or leaks of fuel, oil and other hazardous liquid wastes which are incorrectly stored.

As discussed within ***Section 6.9.1***, these impacts associated with improper storage are related directly to management of impacts to soils, groundwater and surface water and are therefore addressed separately within ***Section 6.13.***

The significance of potential impacts to the capacity of the existing waste management network to deal with the solid waste and hazardous waste from the construction phase is assessed in the following table.

Impact	Impacts of Solid and Hazardous Waste Generation, Storage and Disposal upon the existing Waste Management network.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to soil would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to the existing waste management network would be direct.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	The construction phase will last approximately 10 months for Phase 1. Impacts from the Project could potentially last longer than this duration. The duration of impacts is therefore long-term.				
Extent	**Local**	Regional	International		
	Potential impacts would likely be restricted to the local area.				
Scale	Construction activities will take place within the Project area. The scale of potential impacts due to release of solid waste is potentially large due to the quantities present during this stage, particularly when considered in light of the limited waste management network in the area.				
Frequency	Impacts would occur intermittently but repeatedly throughout the day for the duration of the construction phase.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts to soil quality in Project area due to inappropriate waste disposal is expected to be of Small magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	If the solid waste and hazardous waste is disposed offsite within their designated waste storage areas the resource sensitivity should be **medium** as the waste disposal will be confined to that area.				
Significance	Negligible	**Minor**	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during construction phase:

- All waste collection and storage measures as detailed within ***Section 6.13***;
- A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the construction phase for all of the waste streams identified;
- Waste disposal facilities shall be sited and signposted throughout the construction site;
- Provide training to workers for waste disposal in designated areas and use of sanitation facilities;
- Implement proper storage of the construction materials and wastes to minimise the potential damage or contamination of the materials;
- Implement construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period;
- Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance);
- Store wastes in closed containers away from direct sunlight, wind and rain;
- Store waste systematically to allow inspection between containers to monitor leaks or spills;
- Ensure that storage areas have impermeable floors and containment, of capacity to accommodate 110% of the volume of the largest waste container;
- Waste to be disposed of properly, as follows:
    - Non-hazardous waste will be collected and transported to a proposed landfill area within the Industrial Estate of the DSEZ.

- Hazardous waste will be collected and initially stored on site, after which it will be transported to a transfer station. From the transfer station, it will be transported to waste treatment facilities in Waste Management Company in which registered Waste Management Licensing in Myanmar Authorities. Waste clean-up measures are to be undertaken on at least a fortnightly basis to collect any waste or unused materials from the construction site. All waste collected should be managed and disposed of in accordance with the accepted best practice for waste collection and disposal;
- Contractors employed to manage the waste should clearly identify within their bidding documents how the collected waste will be managed. All end points for collected waste are to be inspected and audited and noted to be developed such that all waste is able to be disposed of in an environmental responsible manner; and
- Monitoring of appointed waste contractors using chain-of custody documentation for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations.

Residual Impacts

If the recommended mitigation measures are implemented, the residual impact significance would be **negligible.**

6.9.4 *Operation Phase*

The solid waste generated during the operation phase will predominately comprise of the sludge from the water treatment process. It is anticipated that approximately 828 kg/day of sludge will be generated, which will be treated in the sludge dewatering system.

It is anticipated that the treated sludge (sludge cake) will be used for earth work within the Industrial Estate of the DSEZ. In addition, there will be domestic solid waste, which will be collected and segregated for recyclable and non-recyclable waste (i.e. paper, plastic). It is anticipated that the solid waste will be disposed of in the proposed landfill within the Industrial Estate of the DSEZ. However, once the location and timing for development of the landfill has been confirmed the impact assessment will need to be reviewed to ensure that this assumption still holds true.

The hazardous waste generated during operation will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.

The significance of potential impacts to the capacity of the existing waste management network to deal with the solid and hazardous waste from the Projects operation is assessed in the following table.

Impact	Impacts of Solid and Hazardous Waste Generation, Storage and Disposal upon the Existing Waste Management Network during Operation and Maintenance		
Nature	**Negative**	Positive	Neutral

	Potential impacts would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to the existing waste management network would be direct.				
Duration	Temporary	Short-term	Long-term	**Permanent**	
	The operation phase will last indefinitely, depending on the water requirements of the Dawei SEZ. The duration of potential impacts is therefore permanent.				
Extent	**Local**	Regional	International		
	Potential impacts would likely be restricted to the local area.				
Scale	Operation activities will take place within the Project area. The scale of potential impacts due to release of waste is potentially large due to the quantities present during this stage, particularly when considered in light of the limited waste management network in the area.				
Frequency	Impacts would occur intermittently but repeatedly throughout the day for the duration of the operation phase.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts to soil quality in Project area due to inappropriate waste disposal is expected to be of Small magnitude.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	If the solid waste and hazardous waste is disposed offsite within their designated waste storage areas the resource sensitivity should be medium as the waste disposal will be confined to that area.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- All waste collection and storage measures as detailed within ***Section 6.13*** will be implemented;
- A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the operation phase for all of the waste streams identified;
- Waste disposal facilities shall be sited and signposted throughout the site;
- Provide training to workers for waste disposal in designated areas and use of sanitation facilities;
- Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance);
- Store wastes in closed containers away from direct sunlight, wind and rain;
- Store waste systematically to allow inspection between containers to monitor leaks or spills;
- Ensure that storage areas have impermeable floors and containment, of capacity to accommodate 110% of the volume of the largest waste container;
- Waste to be disposed of properly, as follows:
  - Treated sludge (sludge cake) to be used for earth work within the Initial Industrial Estate of the DSEZ.
  - Non-hazardous waste will be collected and transported to a proposed landfill area within the Initial Industrial Estate of the DSEZ.
  - Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.
- Waste clean-up measures are to be undertaken on at least a fortnightly basis to collect any waste or unused materials from the Project site. All waste collected should be managed and disposed of in accordance with the required regulations;

- Contractors employed to manage the waste should clearly identify within their bidding documents how the collected waste will be managed. All end points for collected waste are to be inspected and audited and noted to be developed such that all waste is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations; and
- Monitoring of appointed waste contractors using chain-of custody documentation for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible.**

6.10 SOCIAL IMPACT ASSESSMENT

6.10.1 *Assessment Methodology*

Socio-economic Receptors

Impacts are described in the context of the effect that a Project or a Project's activities will have on a receptor. In this instance, the Project receptors are the villagers located within the Project study area that may be impacted or influenced by the Project. This includes villagers located in:

- Wat Chaung Village; and
- Khamaung Chaung Village.

Table 6.26 summarises the socio-economic impacts that were identified during the impact assessment, which was informed by the outcomes of the scoping study and engagement with relevant stakeholders. Most of the impacts are expected to be limited to the villages of Wat Chaung and Khamaung Chaung. However, there are a few activities that may impact the wider region – i.e. the Yebyu Township – such as employment opportunities and impacts associated with an increase in traffic.

Table 6.26 Impacts and Receptors

Potential Impacts	Receptors and Stakeholders
Economy and Livelihoods	
• Increase in local employment opportunities • Increase in business development opportunities • Change in social behaviours including fishing the Pa Yain Byu Reservoir	• Local government • Local villagers • Local businesses
Water Use	
• Project water withdrawal from the Pa Yain Byu Reservoir may impact existing water users.	• Local villagers • Local government • Local businesses
Community Health and Safety	
• Increase in communicable diseases, including vector borne diseases and sexually transmitted infections • Increased potential for traffic accidents and	• Local villagers • Project workforce (including contractors) • Local government • Local health care providers and infrastructure

Potential Impacts	Receptors and Stakeholders
incidents • Increased potential for safety issues associated with the presence of new infrastructure • Increased potential for contamination, including surface and groundwater, associated with the management chemicals and disposal of waste	• Regional villagers located along the transport routes
Community Infrastructure and Services	
• Increase in pressure on community infrastructure and services	• Local villagers • Project workforce (including contractors) • Local government • Local infrastructure providers
Occupational Health and Safety	
• Increase in noise leading to disruptions in community activities • Increase in dust leading to health implications	• Project workforce (including contractors) • Local government • Local villagers

Assumption and Limitations

The Project is still in the early stages of development and hence some aspects of the Project have not yet been finalized. This includes the location and timing for development of a landfill, which is expected to be constructed in the DSEZ for the disposal of waste generated by the DSEZ. It is assumed that local landfill facilities will not be required by the Project; instead the Project will use the proposed landfill within the Industrial Estate of the DSEZ. However, once the location and timing for development of the landfill has been confirmed the impact assessment will need to be reviewed to ensure that this assumption still holds true.

In term of water use, raw water will be extracted from Pa Yain Byu Reservoir. Based on the amount of water required for the WTP and studies that have reviewed water availability, it is assumed that water will be available year round in the Pa Yain Byu Reservoir and of sufficient quantity and quality to meet the needs of local villagers. At the moment, a limited number of local villagers utilise the reservoir for fishing, and it is not a primary source of water for household or agricultural uses.

In addition, villagers from outside the Project area utilise Dawei River and Ta Laing Gya River, which supply water to the Pa Yain Byu Reservoir. Based on existing studies regarding water availability, these villagers are not expected to be impacted by the Project.

By 2019, WTP Phase B will need additional water supply to meet demand by the DSEZ. It is assumed that this will involve development of the Ta Laing Gya Regulating Weir/ Dam, and that the weir/ dam will be able to provide the additional water required to meet the expected demand of 162,000 m^3/day. It is assumed that this will have no impact on local villagers. However, if the assumptions in the Project design criteria change including rainfall, demand by the DSEZ and/ or demand by local villagers, the potential impact on local villages will need to be reviewed.

6.10.2 Economy and Livelihoods

Description

The Project will generate a range of employment opportunities. During construction, it is expected that approximately 170 direct employment opportunities will exist. The number of people employed by the Project will decrease at the end of the construction phase. It is anticipated that approximately 68 direct employment opportunities will be created during the operation phase.

In addition, the Project will require goods and services throughout its lifecycle. There are opportunities for local businesses to provide these goods and services (e.g. construction equipment, food for the accommodation camp). As a result, existing local businesses may expand or new businesses may be established locally to meet these demands – providing employment opportunities. This is referred to as indirect employment.

However, at present a handful of villagers, mostly from Wat Chaung Village, fish at the Pa Yain Byu Reservoir. Fishing provides supplemental income for this small number of villagers; it is not a primary source of income for villagers nor a primary source of protein in their diet. (Instead villagers tend to purchase fish at the local market rather than catch it themselves.) The WTP, and supporting infrastructure, will prevent villagers from accessing the reservoir in the future.

Potential Impact

Project Proponent has committed to capitalizing on local employment and business development opportunities, which will help to ensure that where feasible opportunities are provided to local people and businesses. Project Proponent is to achieve at least 25% of its workforce to be Myanmar nationals during the first two years, at least 50% during the second two years, and at least 75% during the third two years.[1]

The Project will generate skilled and unskilled positions, with the number of unskilled positions dropping substantially after the construction period. Given that much of the local population is employed in the agricultural sector, this may limit the opportunity to employ local people, particularly during the operation phase given the skilled nature of the operational roles. (It will be important to capitalize on the skills that are transferrable from the agricultural sector to the Project in order to maximize local employment.)

In terms of indirect employment, the realization of opportunities will depend not only on the Project, but also on the initiative and business acumen of local entrepreneurs. Given the limited number of existing businesses (such business that supply food and diesel in the local villages), it is anticipated that the number of opportunities to create business development opportunities and/ or indirect employment may be limited.

The resulting impacts (e.g. increase in employment opportunities, increase in income for local people employed by the Project) were assessed as a positive – i.e. beneficial to the local villages. For this reason, the impact significance was not assessed.

In terms of fishing, Pa Yain Byu Reservoir is currently used by a handful of villagers from Wat Chaung Village for fishing. This activity will no longer be able to occur as

1 The new foreign investment law of 2012

the Project site will be fenced, and for safety purposes access will no longer be allowed. However, nearby areas, such as Wat Chaung Village's creek and Khamaung Chaung Village's pond will still be accessible to the local communities.

The level of reliance the villagers have on the reservoir that they catch is low, as there are suitable alternative fishing sites. These alternative sites, including the pond and creek (mentioned above), are already used by villages and will be able to meet their needs in the longer-term. Given this and the small number of people who utilize the reservoir, it is anticipated that the impact will be minor and negative.

The impact significance on economy during construction is provided in the following table.

Impact	Impact to Economy and Livelihoods				
Impact Nature	Negative	**Positive**	Neutral		
	An increase in employment opportunities and demand for goods and services are positive. The Project Proponent is committed to capitalizing on local content opportunities.				
Impact Type	**Direct**	Indirect	Induced		
	It directly impacts local villages.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	The impact is short-term because it occurs during the construction phase.				
Impact Extent	Local	**Regional**	Global		
	The Project will provide employment opportunities for local villages, and possibly villages from within the surrounding areas. Therefore, the impact is regional.				
Impact Scale	The impact scale is small.				
Impact Frequency	Throughout the construction of the Project.				
Impact Magnitude	**Positive**	Negligible	Low	Medium	Large
	The impact is positive.				

The impact significance on economy during operation is provided in the following table.

Impact	Impact to Economy and Livelihoods				
Impact Nature	Negative	**Positive**	Neutral		
	An increase in employment opportunities and demand for goods and services are positive. The Project Proponent is committed to capitalizing on local content opportunities.				
Impact Type	**Direct**	Indirect	Induced		
	It directly impacts local villages.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	The impact is long-term because it happens during operation phase.				
Impact Extent	Local	**Regional**	Global		
	The Project will provide employment opportunities for local villages, and possibly villages from within the surrounding areas (e.g. in-migration). Therefore, the impact is regional.				
Impact Scale	The impact scale is small.				
Impact Frequency	Throughout the construction of the Project.				
aImpact Magnitude	**Positive**	Negligible	Low	Medium	Large
	The impact is positive.				

The impact significance on livelihoods during construction and operation is provided in the following table.

Impact	Change in social behaviors including fishing the Pa Yain Byu Reservoir		
Impact Nature	**Negative**	Positive	Neutral
	Villagers will no longer be able to access the Project site to fish – which is a negative impact.		

Impact Type	**Direct**		Indirect		Induced
	The impact is direct to villagers from Wat Chaung Village for fishing.				
Impact Duration	Temporary	Short-term	**Long-term**		Permanent
	Impact has the potential to have a lasting effect.				
Impact Extent	**Local**		Regional		Global
	The impact is limited to a small handful of villagers in Wat Chaung Village.				
Impact Scale	The impact scale is small, given the small number of people currently accessing the site.				
Impact Frequency	The impact will likely occur throughout the construction and operation phase.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small.				
Vulnerability of Receptors	Low		**Medium**		High
	The vulnerability of receptor is likely to be medium. This is largely because there are viable alternative sites for fishing.				
Significance	Negligible	**Minor**	Moderate		Major
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

<u>Mitigation and Management Measures</u>

The following measures are proposed to enhance the potential Project benefits and manage the potential negative impacts:

- Develop and implement a local content plan. The plan should establish measures to facilitate local recruitment and procurement. This should include targets so that performance can be tracked and evaluated. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers;
- Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project, including the operation phase. This should include a skills audit to determine what skills will be required by the Project and what skills are available within the local villagers. This will need to be undertaken as early as possible so that a training program can be developed and implemented and villagers are able to meaningfully contribute to the Project;
- Inform local villagers of job opportunities in a timely manner. Ensure that the advertising process is locally and culturally appropriate;
- Inform local businesses of contracting opportunities in a timely manner. Ensure that the process is locally and culturally appropriate;
- Inform local villagers in Wat Chaung Village and Khamaung Chaung Village and relevant agencies, about the Project location, and the changes in access to the site, as early as possible. Continue to engage with stakeholders throughout construction and operation of the Project; and
- Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.

Residual Impacts

If the recommended mitigation measures are implemented, the residual impact significance is expected to be **negligible**.

6.10.3 *Water Use*

Description

Currently, villages in the Project area largely rely on groundwater as a source of drinking water; however, it is not the only source. Some villagers collect rainwater for domestic purposes while others buy bottled drinking water. There is currently no piped water supply to the Project area. In other words, villagers in Wat Chaung Village and Khaumng Chaung Village do not use water collected from the Project site.

Potential Impact

The source of water for construction activities, including workers, will be the Pa Yain Byu Reservoir. The water will be treated onsite to the relevant drinking water standards for use as drinking water. The total estimated water consumption rate for construction activities is anticipated to be 35 m^3/day, while the average consumption rate per worker is anticipated to be 200 litres/day. Therefore, during construction, a total of approximately 69 m^3/day will be required from the Pa Yain Byu Reservoir. (It should be noted that this calculation has taken into account the worst case scenario.) There will be additional 5 m^3/day demand for water spray for dust control.

The Pa Yain Byu Reservoir has a proposed total capacity of 162,000 m^3/day. Based on this, it is expected that there will be adequate water to support the Project's withdrawal, and, as such, the Project is not expected to have a significant impact on current water users (i.e. those who access the area to fish) of either the reservoir or the Dawei River or Ta Laing Gya River during construction.

In terms of demand during the operation phase, based on the Project Description in Chapter 4, average raw water demand will be approximately 18,367 m^3/day. A potable water demand for staff during operation is expected to be minimal and will be supplied from the treated water tank. Water supply for chemical preparation will be supplied from the treated water tank using a water pump.

Given recent studies, it is expected that the Project will not have an impact on water availability in the Pa Yain Byu Reservoir or the Ta Laing Gya reservoir during the Initial Industrial Estate Phases 1 to 8. For this reason, the Project is not expected to have a significant impact on current water users (i.e. those who access the area to fish) of either the reservoir or the Dawei River during operation. The impact significance on water use during construction is provided in the following table.

Impact	Project water withdrawal from the Pa Yain Byu Reservoir may have potential impacts on existing water users.		
Nature	**Negative**	Positive	Neutral
	Potential impacts to water use would be considered to be adverse (negative).		

Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to surface water would be direct impacts from Project activities.				
Duration	Temporary	**Short-term**	Long-term	Permanent	
	The construction phase will last approximately 10 months, so the duration of potential impacts is considered short-term.				
Extent	**Local**	Regional	International		
	Water use impacts from the Project would be local to the Project area at the Pa Yain Byu Reservoir and Dawei River.				
Scale	The maximum intake requirement for the Project during construction is expected to be 69 m^3/day.				
Frequency	Water intake for the Project would be intermittent but daily during construction.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small.				
Receptor/ Resource Sensitivity	**Low**	Medium	High		
	There are a small number of current water users in the Project area, and the Dawei River is considered an alternative water resource. Villages in the Project area largely rely on groundwater as a source of drinking water; however, it is not the only source. The resource/receptor sensitivity is considered Low.				
Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Low Resource Sensitivity and Small Impact Magnitude will result in an overall Negligible Impact.				

The impact significance on water use during operation is provided in the following table.

Impact	Project water withdrawal from the Pa Yain Byu Reservoir may have potential impacts on existing water users.				
Nature	**Negative**	Positive	Neutral		
	Potential impacts to water use would be considered to be adverse (negative).				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts to surface water would be direct impacts from Project activities.				
Duration	Temporary	Short-term	**Long-term**	Permanent	
	The impact is long-term because it happens during operation phase.				
Extent	**Local**	Regional	International		
	Water use impacts from the Project would be local to the Project area at the Pa Yain Byu Reservoir and Dawei River.				
Scale	In terms of demand during the operation phase, average raw water demand will be approximately 18,367 m^3/day.				
Frequency	Water intake for the Project would be intermittent but daily during operation.				
Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is likely to be medium.				
Receptor/ Resource Sensitivity	**Low**	Medium	High		
	There are a small number of current water users in the Project area, and the Dawei River is considered an alternative water resource. Villages in the Project area largely rely on groundwater as a source of drinking water; however, it is not the only source. The resource/receptor sensitivity is considered Low.				
Significance	**Negligible**	Minor	Moderate	Major	
	The combination of a Low Resource Sensitivity and Medium Impact Magnitude will result in an overall Negligible Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during operation phase:

- Manage the Project's water use so that there is sufficient flow in the river to maintain existing/ current village uses as well as biodiversity values; and
- Continue to engage with Project stakeholders throughout construction and operation of the Project. Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.

Residual Impacts

If the recommended mitigation measures are implemented, the residual impact significance is expected to be **negligible**.

6.10.4 *Community Health and Safety*

Description

The construction and operation of the Project will generate:

- Noise, which can result from a variety of onsite activities (e.g. construction of infrastructure, reversing sensors on large vehicles). Noise can lead to hearing loss and disrupt community activities (such as sleep); and
- Dust, which can be generated through vegetation clearing, site grading, driving on dry, dirt roads. This can impact the surrounding air quality, disrupting the amenity value of an area and potentially impacting community health (e.g. further aggravating existing respiratory illnesses).

In terms of noise and dust, given the distance to the nearest receptor, no impact is expected. For this reason, the impact is expected to be negligible. Further details are provided in ***Section 6.2*** and ***Section 6.4***.

There are a number of safety related issues that are likely to arise as a result of the Project. This includes:

- Traffic accidents/ incidents. An increase in traffic can lead to an increase in congestion, leading to frustration on the part of local villagers. However, given the low level of current road use, this is unlikely to occur. Instead, the key issue is likely to be the potential for an increase in accidents or incidents, which can lead to injuries and/ or fatalities (as described in ***Section 6.10***);
- The management of hazardous materials and waste. No hazardous chemicals will be used during construction; however, during operation operation, a number of chemicals will be used in treating the raw water including alum (for coagulation), polymer (for flocculent aid), lime (for pH adjustment), chlorine (for disinfection), and powdered activated carbon (PAC) (for taste, odor, color reduction). It is particularly important that these materials are managed appropriately so as not to contaminate the surrounding water sources, as many local villagers use groundwater and surface water for drinking and/ or other household activities. The Project Proponent has established procedures to dispose of hazardous materials and waste at specially designed facilities, which will be constructed by the Project Proponent;
- The presence of new infrastructure. There are often safety issues with the establishment of new infrastructure. This can lead to onsite accidents and injuries;
- The security personnel. The presence of security personnel could also present a risk to the community; and
- The spread of communicable diseases. The Project will employ a range of people during construction and operation. There is potential for the workforce to

introduce and/ or increase the rate of spread of communicable diseases in the Project area. This includes the introduction of a new disease and/ or a more virulent strain of an existing disease.

Potential Impacts

Impacts to community health and safety can result from an increase in traffic, the establishment of onsite infrastructure and the management of hazardous materials. To a lesser extent, given the small number of security personnel required, the presence of security forces could also present a risk to the community.

There are measures in place to ensure that hazardous materials are managed and disposed of appropriately by the Project. This will help minimize the potential for local water sources to be contaminated.

In addition, the Project site will be fenced, while any activities outside the main footprint (such as the temporary water pipeline and floating pontoon) will be appropriately sign posted. This will help ensure that accidents associated with new infrastructure will be minimized.

An increase in the transmission of communicable diseases may occur as the result of the introduction of workers into the area (who can carry with them communicable diseases), creation of vector habitat (e.g. when trenches or other similar holes are created that collect standing), and/ or the presence of commercial sex workers (which often occurs when a workforce made up of largely transient males enter an area for a short period of time).

The villages in the Project area do not have their own health care facilities. However, the villages are visited by health care professionals on a monthly basis. If an issue arises, villagers typically visit one of a number of nearby health care facilities, including Ae Kani Rural Health Care Center, Yephyu Township General Hospital, Dawei General Hospital. In addition, villagers are able to visit the existing Project Proponent clinic during working hours.

The existing local health care facilities have limited capacity to respond to an increase in the transmission of communicable diseases, leaving the local villagers vulnerable to an increase in the presence of communicable diseases.

To minimize the impact, a number of steps can be taken – most of the measures largely centre around (1) reducing the interaction between the workforce and local villagers (i.e. which reduces the potential for communicable disease to be passed from one person to the next), and (2) minimizing the creation of vector habitat. For example, the Project Proponent has established a camp to accommodate its workforce during construction and operation. (The camp will largely be used to accommodate workers from outside the local area.) This will help to reduce the interaction between workers and local villagers.

In addition, the Project Proponent has constructed a health care facility for its workers. The Project Proponent workers, as well as local villagers, are able to visit the facility to seek medical attention and/ or medication on work days between 7 am and 5 pm. The facility is staffed by a Thai medic and a Myanmar nursing assistant.

The impact significance on community health and safety during construction is provided in the following table.

Impact	Impact on Community Health and Safety				
Impact Nature	**Negative**	Positive	Neutral		
	The potential increase in health and safety risks in the local area is negative.				
Impact Type	**Direct**	Indirect	Induced		
	The impact is direct to the community health.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	Given, the potential for a long-term illness, impact has the potential to have a lasting effect.				
Impact Extent	**Local**	Regional	Global		
	The impact is limited within the local villages.				
Impact Scale	The impact scale is medium.				
Impact Frequency	The impact likely occurs during the construction phase with the rare frequency.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is likely to be medium.				
Vulnerability of Receptors	Low	**Medium**	High		
	The vulnerability of receptor is likely to be medium.				
Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

The impact significance on community health and safety during operation is provided in the following table.

Impact	Impact on Community Health and Safety				
Impact Nature	**Negative**	Positive	Neutral		
	The potential increase in health and safety risks in the local area is negative.				
Impact Type	**Direct**	Indirect	Induced		
	The impact is direct to the community health.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	Given, the potential for a long-term illness, impact has the potential to have a lasting effect.				
Impact Extent	**Local**	Regional	Global		
	The impact is limited within the local villages.				
Impact Scale	The impact scale is medium.				
Impact Frequency	The impact likely occurs during the operation phase with the rare frequency.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is likely to be medium.				
Vulnerability of Receptors	Low	**Medium**	High		
	The vulnerability of receptor is likely to be medium.				
Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures

Based on the above assessment, the following management measures associated with community health and safety are suggested:

- The waste management plan should be implemented and monitored. The plan should set out procedures for appropriately managing and disposing of hazardous materials and other forms of waste;
- Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project area villages – e.g. through the training of workers that have been sourced from the local villages;
- Establish amenities at the camp to help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers. This includes recreation facilities and health care infrastructure;
- Establish a workforce code of conduct. Include in the code specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers;
- Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases;
- Vector management procedures, including measures to reduce the presence of vector habitat and consideration of whether pesticides will be utilized to reduce the presence of vectors onsite;
- Provision of onsite health care facility, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities (further details are provided in ***Section 6.10.5***);
- Develop and implement emergency management procedures should a health issue escalate and require a rapid response. This should be done in conjunction with local health care providers; and
- Explore opportunities to invest in local health infrastructure and services. This includes potential education programs focused on disease transmission and symptoms in conjunction with relevant local stakeholders (e.g. local health care providers).

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as **minor** and **negative**. Ongoing monitoring should occur to track implementation and evaluate the management measures. This includes monitoring the Project Proponent's direct activities as well as Project contractors.

6.10.5 *Infrastructure and Services*

Description

It is expected that approximately 170 direct employment opportunities will exist and approximately 68 direct employment opportunities will be created during the operation phase. It is expected that in-migration will be limited given the scale and short duration of the construction phase of the Project.

There is potential for an increase in population in the local area (due to employment opportunities) to place additional pressure on existing infrastructure and services (e.g. health care, roads). This often results in a reduction in capacity of existing infrastructure and services to meet the needs of the local villagers (as well as the additional population added by the Project); leading to longer wait times and diminished quality of services as well as reduced access to and increased wear and tear on infrastructure. For example, an increase in road traffic can speed up the wear and tear experienced by roads, requiring roads to be fixed earlier than typically required. This creates a new cost sooner than anticipated for those involved in maintaining (and repairing) road infrastructure.

Potential Impacts

The construction period is expected to last 10 month. During this time, it is anticipated that the workforce will peak at 170 workers.

Although efforts will be made to source workers from the local area, it is anticipated that a number of workers will be brought in from outside the area, particularly given the skills required by the Project. It is the workers from outside the area that contributes to the pressure that is experienced by community infrastructure and services.

However, during construction the workforce will be accommodated at a camp – which will have a range of on-site amenities. This will minimize the need for the workforce to utilize (or rely on) local infrastructure – i.e. minimizing the pressure that may be experienced by community infrastructure and services. It is expected that at the conclusion of the construction phase, the workers brought in from outside the area will leave.

In terms of the operation phase, it is anticipated that approximately 68 people will be employed. It is assumed that some of these workers will come from outside the local area. Given the duration of the Project, it is anticipated that some of operational workforce will relocate to the Project area, bringing their families with them. These workers may place some additional pressure on the local infrastructure. However, given the small workforce, and assuming that some of the workers will be sourced from the local area, it is anticipated that this additional pressure can be accommodated.

In terms of traffic (and road infrastructure), the Project will need to transport a range of goods and materials via road as well as the workforce between the camp and the Project. It is anticipated that the amount of traffic will be greater during construction (when compared to the operation phase), as there will be more workers and goods and materials that will need to be transported. An increase in traffic along key roads may increase wear and tear and increase congestions. Given the poor quality of the existing road infrastructure, this will mean that upgrades may be required sooner than planned along the existing roads.

In addition, during both the construction and operation phase, the Project may place additional pressure on existing health care infrastructure – e.g. should a worker get sick, should an incident occur onsite resulting in an injury. However, there is limited capacity for the existing health care infrastructure to respond to this demand (due to the limited number of health care workers, facilities and diagnostic equipment). To help minimize this impact, the Project Proponent has established a health care facility for its workforce, which can also be used by local villagers. For this reason, if health care is required, workers will likely use the Project Proponent health care facility rather than local health care services. However in case of emergency (with multiple injuries or fatalities) or a serious medical condition arises, local facilities may be required (e.g. Dawei General Hospital).

In terms of the construction phase, the key issue is the impact that road infrastructure (i.e. additional wear and tear) may experience, while to a lesser extent there may be an increase in pressure on existing health care infrastructure. However, this impact is expected to be local in terms of the extent and scale and occur over a short period of time. In addition, the Project is expecting to upgrade a number of existing roads, which will help address the impact. For these reasons, the impact was assessed as **minor** and **negative**.

In terms of the operation phase, there is potential to impact more widely on community infrastructure (e.g. schools, community centers). This assumes that some workers will be brought in from outside the local area and bring with them their families. This may occur, but is expected to result in only a handful of families moving into the area. As a result, the extent and scale of the impact is likely to be local and the overall impact is likely to be small. For these reasons, the impact was assessed as **minor** and **negative.**

The impact significance on community infrastructure and services during construction is provided in the following table.

Impact	Impact on Community Infrastructure and Services				
Impact Nature	**Negative**	Positive	Neutral		
	An increase in population may put additional pressure on community infrastructure and services – which is a negative impact.				
Impact Type	**Direct**	Indirect	Induced		
	The impact is direct to the community infrastructure and services.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	Impact is likely to be temporary.				
Impact Extent	**Local**	Regional	Global		
	The impact is limited to the local villages.				
Impact Scale	The impact scale is small.				
Impact Frequency	The impact likely occurs during the construction phase with the rare frequency.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small.				
Vulnerability of Receptors	Low	**Medium**	High		
	The vulnerability of receptor is likely to be medium.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

The impact significance on community infrastructure and services during operation is provided in the following table.

Impact	Impact on Community Infrastructure and Services		
Impact Nature	**Negative**	Positive	Neutral
	An increase in population may put additional pressure on community infrastructure and services – which is a negative impact.		

Impact Type	**Direct**	Indirect	Induced		
	The impact is **direct** to the community infrastructure and services.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impact is likely to be short-term.				
Impact Extent	**Local**	Regional	Global		
	The impact is limited to the local villages.				
Impact Scale	The impact scale is small.				
Impact Frequency	The impact likely occurs during the operation phase with the rare frequency.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small.				
Vulnerability of Receptors	Low	**Medium**	High		
	The vulnerability of receptor is likely to be medium.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

Based on the above assessment, the following management measures are suggested:

- Provide appropriate amenities at the workforce accommodation camp – e.g. recreational opportunities. This will help reduce the need for workers to utilize local infrastructure and services;
- Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. Further details are provided in ***Section 6.11***. The traffic management plan should be developed in consultation with local stakeholders. Stakeholders should be notified about traffic routes in advance of the Project commencing and, where known, periods of increased traffic volumes. Where possible, traffic movements should be coordinated with key stakeholders so as to limit disruptions to local activities;
- Develop and implement community health management procedures, occupational health and safety procedures and emergency response procedures in consultation with relevant stakeholders (e.g. local health practitioners). These plans will ensure that appropriate and adequate health care services are provided onsite and at the accommodation camp to address/ manage worker illnesses and injuries; and
- Develop and implement a grievance mechanism.

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as **negligible** and **negative**. Ongoing monitoring should occur to track implementation and evaluate the management measures. This includes monitoring the Project Proponent direct activities as well as Project contractors.

6.10.6 Occupational Health and Safety

Description

The sources of health impact vary by operating area, nature of work, and the health of individual. The factors creating health impact are provided below.

- Noise disturbance: Staff working near machines could be exposed to high noise levels; however, exposure is likely to be over a short period of time (i.e. during their shifts). Severity of the impact from noise depends on various factors - e.g. noise intensity and frequency, type of noise, and duration of exposure;
- Dust: Construction activities, including site clearing, may generate dust which can have respiratory implications for workers – depending on the management measures in place;
- Light: Inappropriate lighting could result in accident in the workplace or could reduce the efficiency of work;
- Weather: Weather can have an effect on water, moisture and wind in the workplace. Particular caution should be taken during the rainy season when heavy rains can create hazards (e.g. on the road, when operating outside). In addition, staff working outdoor could be affected by heat, resulting in dehydration, heat cramps, or heat stroke;
- Chemical: Staff working near chemical tanks/ storage facilities could be exposed to chemicals, resulting in a health hazard;
- Ergonomics: Staff could be injured from inappropriate working posture;
- Psychology and livelihood: Staffs could have strain from work pressure and social relationship; and
- Medical service: In case of emergency, critical illness, or accident, patients might need to be sent to clinic or hospital for medical service.

Potential Impacts

There is the potential, without appropriate management, for an issue to arise, and result in harm to a worker. During construction, the key issues include noise, dust, and weather, all of which can create health hazards for the workforce. During the operation phase, the potential for exposure to chemicals can create a hazard for workers.

However, the likelihood of the hazards associated with noise and dust occurring is low, given all staff will be required to wear appropriate PPE at all times and dust suppression measures will be used onsite. Hazards associated with weather, including inclement weather events, will be managed through existing onsite procedures. For this reason, the likelihood of the impacts occurring is low.

In terms of exposure to chemicals, there is potential for an incident to occur. Chlorine and other chemicals can be safely used, but appropriate management needs to be in place, including appropriate onsite storage facilities and handling procedures. In addition, appropriate emergency management procedures will need to be established, in the event that an incident occurs. Assuming that these measures will be in place, the likelihood of the impact occurring is low. The impact significance is provided in the following table.

Impact	Impact on Occupational Health and Safety			
Impact Nature	**Negative**	Positive	Neutral	
	Impact on health of Project staff and contractors– which is a negative impact.			
Impact Type	**Direct**	Indirect	Induced	
	The impact is direct to Project staff and contractors.			
Impact Duration	Temporary	Short-term	**Long-term**	Permanent
	Impact has the potential to have a lasting effect.			

Impact Extent	**Local**	Regional	Global		
	The impact is limited to the local area.				
Impact Scale	The impact scale is medium.				
Impact Frequency	The impact likely occurs during the construction phase with the rare frequency.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The impact magnitude is likely to be small.				
Vulnerability of Receptors	Low	**Medium**	High		
	The vulnerability of receptor is likely to be medium.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

Based on the above assessment, the following management measures are suggested:

- Provide appropriate PPE for all staff;
- Ensure staff and contractors are aware of the hazards associated with their role, and appropriate measures to manage the hazards;
- Encourage staff and contractors to report incidents when they occur. Investigate any reported incidents that occur onsite to determine the root cause and establish improved management;
- Provide MSDSs for all chemicals used onsite, as well as appropriate storage facilities and handling procedures (based on the MSDSs);
- Provide training for all staff and contractors working with chemicals (based on the MSDSs). This can help reduce the potential for incidents;
- Provide eye wash and shower stations at chemical storage facilities;
- Track weather conditions to ensure PPE is appropriate for the conditions and that potential inclement weather events can be managed appropriately;
- Develop and implement emergency management procedures in conjunction with local health care providers;
- Coordinate with local and central hospitals in case of emergency or critical illness/injury; and
- Ensure that contractors working on the Project implement the above measures.

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as **negligible** and **negative**.

6.11 TRAFFIC

6.11.1 Introduction

This Section provides a basic description of the current status of the proposed transportation routes to be used for the construction and operation of the Project and identifies the potential impacts to the existing traffic conditions. Mitigation measures have been recommended to reduce the potential residual impacts to acceptable levels.

6.11.2 *Scope of Assessment*

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2***, the following potential impacts on traffic are considered further in this IEE.

Construction Phase

- Water Treatment Plant
  - Site Formation & Access Road
  - Excavation and Foundation Work
  - Civil Construction
  - Equipment/Material/Worker Transport
  - Commissioning
  - Wastewater Discharges and Runoff
  - Non-Hazardous Waste Storage and Disposal
  - Hazardous Waste Storage and Disposal
- Pumping Station and Water Supply Pipeline
  - Site Formation & Access Road
  - Excavation and Foundation Work
  - Construction of Pumping Station and Water Supply Pipeline (floating)
  - Construction of Pumping Station and Water Supply Pipeline (land)
  - Equipment/Material/Worker Transport
  - Commissioning
  - Wastewater Discharges and Runoff
  - Non-Hazardous Waste Storage and Disposal
  - Hazardous Waste Storage and Disposal

Operation Phase

- Water Treatment Plant
  - Equipment/Material/Worker Transport
  - Waste Storage and Disposal
- Pumping Station and Water Supply Pipeline
  - Equipment/Material/Worker Transport
  - Waste Storage and Disposal

6.11.3 *Construction Phase*

During construction, there are potential impacts associated with congestion and road traffic accidents due to an increase in road traffic. Road traffic will increase during the construction phase of the Project in areas surrounding the Project site and on the proposed transportation routes. The potential sources of road traffic during construction are associated with the following:

- Transportation of construction workers: Transportation of the construction workers (approximately 170) from the DSEZ Workers Camp to the Project site by cars/trucks. There will be a number of daily round trips from the DSEZ Workers Camp to the Project site depending on the workers shifts;

- Transportation of heavy cargo: The transportation of heavy cargo from the Dawei Port located in Dawei City to the Project site by trucks. There will be a number of daily round trips depending on the period of the construction phase;

- Transportation of construction waste: The construction waste will predominately comprise of sewage from the onsite septic tanks and general solid waste, including biomass waste from site clearance activities. The construction waste will be disposed offsite, potentailly at the proposed landfill within the Industrial Estate of the DSEZ. There will be a number of weekly round trips from the Project site to the waste storage area within the Industrial Estate of the DSEZ depending on the period of the construction phase. In addition, hazardous waste will be transported to the storage within the Industrial Estate of the DSEZ; and
- Transportation of other contruction materials and workers from Thailand: The transportation of other construction materials and workers from Baan Phu Nam Ron border in Kanchanaburi Province, Thailand by trucks and cars to the Project site. There will be weekly round trips depending on the period of the construction phase.

There are existing access roads from the DSEZ Workers Camp and DSEZ Industrial Estate to the Project site, however further modification of the access roads around the Project site is required to ensure they are sufficient to accommodate all vehicle types entering the site. The existing access roads are predominately used for the development of DSEZ and therefore the current usage is predominately associated with other construction vehicles. There are no major villages along this route which could experience impacts associated with increased congestion or traffic accidents.

There are also existing access roads from the Dawei Port to the Project site. The transportation route from Baan Phu Nam Ron border to the Project site is currently used by a number of road users. There are a number of communities and intersections located on the transportation routes to the Project site, therefore there are potential impacts to the communities/other road users associated with congestion and traffic accidents.

The transportation route from Baan Phu Nam Ron border to the Project site will use the two-lane road link (currently under construction). The two-land road link will potentially be expandable to four-lane road in the future. The transportation route from Baan Phu Nam Ron border to the Project site is currently used by a small number of road users who are travelling to DSEZ or to other destinations within Myanmar. There are a number of villages and intersections located on the transportation route from Baan Phu Nam Ron to the Project site, therefore there are potential impacts to the villages/other road users associated with congestion and traffic accidents.

The significance of the impact is assessed in the following table:

Impact	Impact on road traffic during construction phase				
Nature	**Negative**	Positive	Neutral		
	Increase in road traffic on the transportation routes that may result in congestion and traffic accidents.				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impact on road traffic is direct				
Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impacts are considered short-term as they will be limited to the construction period. For Phase 1 the construction period is anticipated to be 10 months.				
Extent	Local	**Regional**	International		
	Impact is expected to extend to transportation routes outside of the Project footprint and therefore the extent is considered regional.				
Scale	There will be a significant increase in traffic volume along the proposed transportation routes during the peak construction period.				
Frequency	This impact will occur throughout the construction phase.				
Magnitude	Positive	Negligible	Small	**Medium**	Large
	Potential impacts associated with traffic increase are anticipated to be medium based upon the extent and scale.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	The vulnerability of receptor is likely to be Medium due to the communities located along some of the proposed transportation routes to the Project site.				
Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures

The Project will prepare and implement a Road Traffic Management Plan, including a Journey Management Plan for the proposed transportation routes to be used for construction workers, waste disposal and construction materials. The Management Plans will recommend specific measures to ensure that the environmental, social and health impacts of increased traffic volumes are kept to a minimum and that local and regional traffic flows are well planned and managed in accordance with the appropriate regulations. Examples of specific mitigation measures to be implemented include the following:

- Traffic signs will be installed on all roads throughout construction areas depicting speed limits;
- Development and implementation of a waste management plan for appropriate transportation of solid and hazardous waste; and
- Road safety initiatives to minimise risks to other road users such as the following:
  - Limit maximum speed on unpaved roads to 30 km/h and within the Project boundary to 20 km/h.
  - The vehicle speed limit from Dawei Port to the Project site should comply with Myanmar legislation and the speed limit on Baan Phu Nam Ron should be set lower than the Myanmar legislation during the construction phase.
  - Ensuring that only licensed drivers are employed by the Project.
  - Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
  - Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents.

- o Ensuring all employees complete training prior to driving any Project vehicle. The content of the training should be tailored to the employee's role.
- o Exploring opportunities to work with local stakeholders to increase awareness within local villages about the hazards associated with traffic.

Residual Impacts

If the above mitigation measures are adhered to, the negative impacts associated with increased traffic flows will be reduced and are considered to have a **negligible** residual significance rating.

6.11.4 Operation Phase

During operation, there are potential impacts associated with congestion and road traffic accidents due to road traffic. Road traffic volumes during operation will be less than the construction phase in all areas surrounding the Project site, as well as on the proposed transportation routes. The potential sources of road traffic during operation are associated with the following:

- Transportation of operational workers: The operatioal workers (approximately 37 during Phase 1 and 68 by Phase 8) will be transported from the DSEZ area to the Project site by cars/trucks. There will be a number of daily round trips from the DSEZarea to the Project site depedning on the workers shifts;
- Transportation of operational waste: The operational waste will predominately comprise of tretated sludge from the water treatment process and other general solid waste. The treated sludge (sludge cake) will be used for earth work within the Initial Industrial Estate of the DSEZ and solid waste will be disposed offiste, potentially at the future role of landfill site within the Industrial Estate of DSEZ. There will be a number of daily round trips from the Project site to the Industrial Estate depending on the period of the construction phase; and
- Transportation of operational material: The transportation of operational materials from Baan Phu Nam Ron border in Kanchanaburi Province, Thailand by trucks. The transportation of operational materials is not anticpated on a daily basis and will be undertaken as required to provide additional/replacement equipment for the Project. There will be approximately 3 trips per month.

It is anticipated that the transportation route to be used for operational workers and operational waste could also be used by other road users visiting or working in the DSEZ. The transportation route for operational material will also be used by other roads users and vehicles. In addition, there are a number of villages and intersections along this transportation route. Therefore, there are potential impacts to other road users associated with congestion and traffic accidents for all of the proposed operational transportation routes.

The significance of the impact is assessed in the following table:

Impact	Impact on road traffic during operation phase				
Nature	**Negative**	Positive	Neutral		
	Increase in road traffic volumes in the Project area that may lead to congestion and traffic accidents.				
Type	**Direct**	Indirect	Induced	Cumulative	
	Impact on road traffic is direct.				
Duration	Temporary	Short-term	Long-term	**Permanent**	
	The operation phase will last indefinitely, depending on the water requirements of the DSEZ. The duration of potential impacts is therefore permanent.				
Extent	Local	**Regional**	International		
	Impact is expected to be predominately within the area of the Project site, expect when operational materials are required infrequently from Thailand.				
Scale	There will be an increase in traffic volume along the proposed transportation routes during operation but less than construction.				
Frequency	This impact will occur throughout the construction phase.				
Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impacts associated with traffic increase are anticipated to be small based upon the extent and scale.				
Receptor/ Resource Sensitivity	Low	**Medium**	High		
	The vulnerability of receptor is likely to be Medium due to the villages located along the transportation route from Baan Phu Nam Ron border to the Project site and the road users which will use the transportation routes within the DSEZ.				
Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The Project will prepare and implement a Road Traffic Management Plan, including a Journey Management Plan for the transportation routes to be used for operational workers, waste disposal and operational materials. The Management Plans will recommend specific measures to ensure that the environmental, social and health impacts of increased traffic volumes are kept to a minimum and that local and regional traffic flows are well planned and managed in accordance with the appropriate regulations. Examples of specific mitigation measures to be implemented include the following:

- Development and implementation of a waste management plan for appropriate transportation of solid and hazardous waste;
- Road safety initiatives to minimise risks to other road users such as the following:
  - Emphasizing safety aspects among drivers, particularly with regard to the recommended driving speed of 20 km/hr on access roads within the Project site.
  - Ensuring that only licensed drivers are employed by the Project.
  - Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure.
  - Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents.
  - Fatigue management; and
  - Ensuring all employees complete training prior to driving any Project vehicle. The content of the training should be tailored to the employee's role.

Residual Impacts

If the above mitigation measures are adhered to, the negative impacts associated with increased traffic flows will be reduced and are considered to have a **negligible** residual significance rating.

6.12 CULTURAL HERITAGE

6.12.1 Introduction

The cultural heritage baseline study documented known cultural heritage sites and assessed the potential for undiscovered archaeological sites throughout the Project area. Based on the baseline study results, the cultural heritage site most likely to be impacted by the Project is the living heritage site in the Wat Chaung village; however, management measures have been established to minimise any impacts. Other sites, such as the ancient city of Thagaya, are some distance from the Project site, and thus are unlikely to be impacted by the Project. In addition, there is limited potential for archaeological artefacts to be present in the Project study area, thus are unlikely to be impacted by the Project.

6.12.2 Scope of Assessment

Based on the Project Description in ***Chapter 4***, and the Scoping exercise in ***Section 6.2***, the following potential impacts on cultural heritage are considered further in this IEE.

Construction Phase

- Water Treatment Plant
  - Civil Construction

The focus of the assessment was on predicting and assessing the impacts to cultural heritage sites located within the Project study area (as described in the baseline in ***Chapter 5***). The significance of the predicted impacts was determined through an evaluation of the **magnitude** of the impacts and the **sensitivity** of the cultural heritage site. The magnitude of the impact is a combination of the duration of the impact (temporary, short-term, long-term, or permanent) and the extent (amount of the site that is impacted) of the impact. The criteria for determining the magnitude of an impact are summarized in ***Table 6.27***.

Table 6.27 Magnitude Criteria for Cultural Heritage

Magnitude	Definition
Negligible	No discernible change in the physical condition, setting, or accessibility of the site.
Small	Small part of the site is lost or damaged resulting in a loss of scientific (research) or cultural value; setting undergoes temporary or permanent change that has limited effect on the site's perceived value to stakeholders; stakeholder or scientific access to site is temporarily reduced.
Medium	A significant portion of the site is lost or damaged resulting in a loss of scientific or cultural value; setting undergoes permanent change that permanently diminishes the site's perceived value to stakeholders; stakeholder and scientific access to site is permanently restricted; impact negatively affects a site's potential eligibility for listing on the Schedule.
High	The entire site is damaged or lost resulting in a loss of all scientific or cultural value; setting is sufficiently impacted to cause site to lose all cultural value; site becomes completely inaccessible to stakeholders or scientists; impact makes the site ineligible for listing on the Schedule.

The sensitivity of a cultural heritage resource is determined based on the concept of "replicable", "non-replicable", and "critical" cultural heritage sites and an assessment of a site's scientific and/or perceived cultural value for local stakeholders (***Table 6.28***).

Table 6.28 Sensitivity Criteria for Cultural Heritage

Concept	Definition
Replicable	Replicable cultural heritage is defined as tangible forms of cultural heritage that can themselves be moved to another location or that can be replaced by a similar structure or natural features to which the cultural values can be transferred by appropriate measures. Archaeological or historical sites may be considered replicable where the particular eras and cultural values they represent are well represented by other sites and/or structures.
Non-replicable	Nonreplicable cultural heritage may relate to the social, economic, cultural, environmental, and climatic conditions of past peoples, their evolving ecologies, adaptive strategies, and early forms of environmental management, where the (i) cultural heritage is unique or relatively unique for the period it represents, or (ii) cultural heritage is unique or relatively unique in linking several periods in the same site.
Critical	Critical cultural heritage consists of one or both of the following types of cultural heritage: (i) the internationally recognized heritage of communities who use, or have used within living memory the cultural heritage for long-standing cultural purposes; or (ii) legally protected cultural heritage areas, including those proposed by host governments for such designation.

6.12.3 Construction Phase

Activities during the construction phase that can potentially lead to an impact on cultural heritage sites located within the Project are:

- the excavation of soil at the Project site;
- the generation of vibrations and dust by construction activities, such as inland transportation of heavy cargo from the Dawei Port located in Dawei City to the Project site using the existing dirt roads within the DSEZ area; and
- an increase in population due to employment.

During construction, the Project will excavate approximately 4,334 m^3 of soil. Excavation works have been known to cause damage to archaeological artefacts, particularly in instances where the artefacts are buried or unknown to exist.

Although there are no documented archaeological sites within the Project area, there is potential for undocumented archaeological artefacts to exist given the close proximity to the ancient city of Thagaya. Thagaya is part of the ancient Pyu cities, which are considered to have exceptional universal value. The Pyu cities reflect the Pyu Kingdoms that flourished for over 1,000 years between 200 BC and AD 900.

Excavation efforts could damage artefacts associated with the Thagaya, destroying their cultural heritage values. Given the value placed on Thagaya, the impact, it if occurred, was assessed as **moderate.**

A variety of construction activities can generate vibrations and dust (e.g. transport of materials and workers along dirt roads can generate dust). Vibrations and dust have been known to damage or disturb cultural heritage sites. For example, vibrations can damage the infrastructure (in particular the foundation), such as monasteries and pagodas, and impact the integrity of burial sites. Dust can disturb or diminish the value of a cultural heritage site, such as the sites in the Wat Chaung Village that are located near existing roads that will be used by the Project. However, it is anticipated that the vibrations generated by the Project will be minimal and that dust will be minimized through the management measures outlined in ***Section 6.3 and Section 6.11***. For these reasons, the impact was assessed as **negligible**.

There will be increase in the number of people residing in the area during construction (due to employment). This will include local as well as foreign workers. The foreign workers will be placed at a nearby camp. The workers may seek to use local places of worship, which will increase the number of people visiting local cultural heritage sites, which can in some instances, displace current users or change the experience that current users have when visiting a place of worship. However, given the short duration of the construction phase and the capacity of the local places of worship, the impact is expected to be **negligible**.

The significance of potential impacts to cultural heritage is assessed in the following table.

Impact	Due to the presence of the ancient city of Thagaya, there is the potential for undocumented archaeological artefacts to exist in the Project area. Soil excavation could result in damage to the cultural heritage sites. The other construction activities are unlikely to contribute to impacts on cultural heritage.			
Impact Nature	**Negative**	Positive	Neutral	
	Potential impacts to archaeological artefacts and cultural heritage sites would be considered to be adverse (negative).			
Impact Type	**Direct**	Indirect	Induced	
	Impacts to archaeological artefacts and cultural heritage sites would be direct impacts from Project activities.			
Impact Duration	Temporary	Short-term	Long-term	**Permanent**
	Damaging archaeological artefacts associated with Thagaya could destroy the cultural heritage value attributed to the artefacts – i.e. a permanent impact.			
Impact Extent	Local	**Regional**	International	

<table>
<tr><td></td><td colspan="5">Thagaya is part of the Pyu cities, which have exceptional universal value. This means that if the impact occurs, it is likely to extend beyond the local area.</td></tr>
<tr><td>Impact Scale</td><td colspan="5">Thagaya is part of the Pyu cities, which have exceptional universal value. This means that if the impact occurs, it is likely to extend beyond the local area.</td></tr>
<tr><td>Frequency</td><td colspan="5">The impact, if it occurs, will be permanent. So, frequency is unlikely to be a factor.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Positive</td><td>Negligible</td><td>Small</td><td>Medium</td><td>Large</td></tr>
<tr><td colspan="5">Small part of the site can be lost or damaged resulting in a loss of cultural heritage value.</td></tr>
<tr><td rowspan="2">Receptor Sensitivity</td><td colspan="2">Low</td><td colspan="2">Medium</td><td>High</td></tr>
<tr><td colspan="5">Thagaya is part of the Pyu cities, which have exceptional universal value.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>Negligible</td><td>Minor</td><td colspan="2">Moderate</td><td>Major</td></tr>
<tr><td colspan="5">The combination of a High Resource Sensitivity and Small Impact Magnitude will result in an overall Moderate Impact.</td></tr>
</table>

Mitigation and Management Measures

Based on the above assessment, the following management measures are suggested:

- Develop and implement of a Chance Find Procedure[1] in order to minimise impacts to undocumented archaeological sites.
- Cultural heritage training (e.g. as part of the site induction process) of all workers including Project management, construction staff and contract staff. The objective of training is to familiarise staff with the Chance Finds Procedure so that it is effectively implemented; and
- Grievance mechanism in place to identify and manage stakeholder issues and concerns (if any) regarding cultural heritage.

In addition, it is assumed that the management measures described in ***Section 6.11*** will be implemented as described and monitored over time.

Residual Impacts

Assuming that the above management measures will be implemented and monitored over time, the residual impact was assessed as **negligible**. This is largely because the Chance Find Procedure will help reduce the potential for an archaeological artefact to be damaged through excavation.

6.12.4 *Operation Phase*

The activities during the operation phase that can potentially lead to an impact on cultural heritage sites located within the Project including:

- the transportation of materials and workers to the Project site using the existing dirt road within the DSEZ area, which can generate dust; and
- an increase in population due to employment.

Transport of heavy cargo and workers to the Project site can generate dust can disturb or diminish the value of a cultural heritage site, such as the sites in the Wat

[1] A chance find procedure is a project-specific procedure that outlines the actions to be taken if previously unknown cultural heritage is encountered. The procedure can include notification of findings to a qualified archaeologist who will inspect the exposed heritage, identification of interested parties, relocation of the heritage, etc.

Chaung Village that are located near existing roads that will be used by the Project. However, it is anticipated that the dust will be minimized through the management measures outlined in ***Section 6.3 and Section 6.11***. For these reasons, the impact was assessed as negligible.

There will be increase in the number of people residing in the area during operation (due to employment). This will include local as well as foreign workers. The workers may seek to use local places of worship, which will increase the number of people visiting local cultural heritage sites, which can in some instances, displace current users or change the experience that current users have when visiting a place of worship. However, given the capacity of the local places of worship and the relatively small operation workforce, the impact is expected to be **negligible**.

The significance of potential impacts to cultural heritage is assessed in the following table.

<table>
<tr><td>Impact</td><td colspan="5">Dust from transportation of materials and workers to the Project site as well as the presence of additional people in the local area (due to employment) could impact the local cultural heritage, in particular the cultural heritage sites in Wat Chaung Village.</td></tr>
<tr><td rowspan="2">Impact Nature</td><td colspan="2">Negative</td><td colspan="2">Positive</td><td>Neutral</td></tr>
<tr><td colspan="5">Potential impacts to cultural heritage sites would be considered to be adverse (negative)</td></tr>
<tr><td rowspan="2">Impact Type</td><td colspan="2">Direct</td><td colspan="2">Indirect</td><td>Induced</td></tr>
<tr><td colspan="5">Impacts to cultural heritage sites would be direct impacts from Project activities.</td></tr>
<tr><td rowspan="2">Impact Duration</td><td>Temporary</td><td colspan="2">Short-term</td><td>Long-term</td><td>Permanent</td></tr>
<tr><td colspan="5">The impact is expected to be short-term, as the impact can easily be rectified.</td></tr>
<tr><td rowspan="2">Impact Extent</td><td colspan="2">Local</td><td colspan="2">Regional</td><td>International</td></tr>
<tr><td colspan="5">The extent of the impact is likely to be local.</td></tr>
<tr><td>Impact Scale</td><td colspan="5">The Project may impact living cultural heritage in the local area.</td></tr>
<tr><td>Frequency</td><td colspan="5">Seven days a week during the operation phase.</td></tr>
<tr><td rowspan="2">Impact Magnitude</td><td>Positive</td><td>Negligible</td><td>Small</td><td>Medium</td><td>Large</td></tr>
<tr><td colspan="5">No discernible change in the physical condition, setting, or accessibility of the cultural heritage sites.</td></tr>
<tr><td rowspan="2">Receptor Sensitivity</td><td colspan="2">Low</td><td colspan="2">Medium</td><td>High</td></tr>
<tr><td colspan="5">The impact is expected to be short-term, as the impact can easily be rectified.</td></tr>
<tr><td rowspan="2">Impact Significance</td><td>Negligible</td><td colspan="2">Minor</td><td>Moderate</td><td>Major</td></tr>
<tr><td colspan="5">The combination of Low Resource Sensitivity and Negligible Impact Magnitude will result in an overallNegligible Impact.</td></tr>
</table>

Mitigation and Management Measures

It is assumed that the management measures described in the ***Section 6.11*** will be implemented as described and monitored over time.

In addition, a grievance mechanism would help to identify and manage stakeholder issues and concerns (if any) regarding cultural heritage.

Residual Impacts

With the implementation of management measures, adverse impact to cultural heritage is expected to be **negligible.**

6.13 UNPLANNED EVENTS AND ACCIDENTAL EVENTS

6.13.1 *Introduction*

During construction and operation, there are a range of activities that could lead to unplanned and accidental events. This Section identifies those activities, potential impacts, and identifies appropriate mitigation, management and monitoring measures required to reduce residual impacts to an acceptable level.

6.13.2 *Scope of Assessment*

Based on the Project Description in ***Chapter 4*** and the Scoping exercise in ***Section 6.2*** the following potential impacts due to unplanned events and accidental events require consideration in this IEE.

Construction Phase

- Water Treatment Plant
  - Accidental Events/Spills/Dropped Objects
- Pumping Station and Water Supply Pipeline
  - Accidental Events/Spills/Dropped Objects

Operation Phase

- Water Treatment Plant
  - Accidental Events/Spills/Dropped Objects
- Pumping Station and Water Supply Pipeline
  - Accidental Events/Spills/Dropped Objects

6.13.3 *Construction Phase*

An Unplanned event is defined as 'a reasonably foreseeable event that is not planned to occur as part of the Project" but which may conceivably occur as a result of Project activities (e.g. accidents), even with a low probability".

During construction, the unplanned events associated to construction activities are listed as follows;

- Vessel Collision;
- Road Accident; and
- Accidental Spills and Leaks.

Assessing significance of risks associated to unplanned event considers the likelihood (or frequency) of incident occurrence and the consequence of the incident should it occur. The assessment of likelihood takes a qualitative approach based on professional judgement, experience from similar projects. The assessment of consequence is based on specialists' input and professional experience. The details are provided in the next sections.

Vessel Collision

During the construction phase, heavy cargo will be transported by barge from the port in Thailand to the existing port Dawei Port located in Dawei City. The increasing number of vessel navigating in-out the ports could enhance the risk of vessel collision or maritime incident. The significance of this impact is assessed in the following table.

Impact	Potential impacts due to vessel collision are varied from property damage, personnel injury or fatality depending on vessel type, size, and velocity at which it is travelling at the time of collision. In addition, the sea water quality would be affected by the oil leaked from the vessels.				
Impact Nature	**Negative**	Positive	Neutral		
	Any damage or loss from vessel collision is considered to be Negative impact.				
Impact Type	**Direct**	Indirect	Induced		
	Impacts from vessel collision would be directly from the Project activities.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	The impact duration is temporary.				
Impact Extent	**Local**	Regional	International		
	The impact would be limited to the location of the accident and adjacent area. It is considered to be Local.				
Impact Scale	Impact can vary from property damage, personnel injury to fatality.				
Frequency	NA. This incident is not expected to occur.				
Likelihood	The likelihood of vessel collision to occur is possible. This is due to increased number of vessel has a risk of vessel collision if the marine traffic is not properly managed.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is Medium.				
Receptor Sensitivity	**Low**	Medium	High		
	The sensitive receptor is Low because the existing port has been operated and recently used for transportation of material for construction of deep sea port.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Low Resource Sensitivity and Medium Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

- The Project should install navigation light or warning sign on the vessel as appropriate;
- Barges used for Project material transport will be independently inspected and audited by the Project EHS Management Team. Each barge will be inspected at least once every 6 months and records maintained. If any continued non-compliance is observed over two (2) audit inspections, the Project will terminate the services of the barge transporter.
- Only barge operators that comply with the relevant local and international standards and are permitted to operate barges for transportation purposes will be engaged; and
- Passage plans will be prepared for the Projects' vessels;

Residual Impacts

With the implementation of the above mitigation measures, the residual impacts would be expected to be **negligible**.

Road Accident

Construction materials will also be transported from from Baan Phu Nam Ron border in Kanchanaburi Province to the Project site by truck. There will be a number of daily round trips depedning on the period of the construction phase.This will increase risk of a car accident along the traffic route and in the project area. The significance of this impact is assessed in the following table.

Impact	Potential impact due to road accident could be personal injury, death, or property damage.				
Impact Nature	**Negative**	Positive	Neutral		
	Any damage or loss from car accident is considered to be Negative.				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts are directly from the Project activities.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	The impact duration is considered to be Temporary.				
Impact Extent	**Local**	Regional	International		
	The impact would be limited to the location of the accident which is considered to be local.				
Impact Scale	Potential impacts can vary from property damage, personal injury, or death.				
Frequency	NA. This incident is not expected to occur.				
Likelihood	The likelihood of road accident to occur is possible.				
Impact Magnitude	Positive	Negligible	Small	**Medium**	Large
	The impact magnitude is Medium.				
Receptor Sensitivity	Low	**Medium**	High		
	The sensitive receptor is Medium because the traffic route is currently upgraded to serve the project construction.				
Impact Significance	Negligible	Minor	**Moderate**	Major	
	The combination of a Medium Resource Sensitivity and Medium Impact Magnitude will result in an overall Moderate Impact.				

Mitigation and Management Measures

- Assign contractors to plan and stage drop off of materials to avoid congestion;
- Use flag persons and signs to reduce congestions and warn travelers;
- Strict instruction should be given for drivers of heavy equipment; and
- Communication line must be ensured in between workers and drivers of heavy equipment.

Residual Impacts

With the implementation of the above mitigation measures, the residual impacts would be expected to be of **minor**.

Accidental Spills and Leaks

The accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants or fuel from heavy equipment, and improper chemical/fuel storage could be occurred during the construction phase. Additionally, pipeline hydrostatic test chemicals during the pre-commissioning activities and also discharges of oily bilge or ballast water from barges may impact surrounding surface water quality, should leakages occur. The significance of this impact is assessed in the following table.

Impact	Potential impacts from accidental releases of hazardous substances such as fuels, oils or lubricants, as well as improper chemical/fuel storage could be contamination to surface and potentially underground water.				
Impact Nature	**Negative**	Positive	Neutral		
	Potential impacts would be considered to be adverse (negative).				
Impact Type	**Direct**	Indirect	Induced	Cumulative	
	Impacts would be direct impacts from Project activities.				
Impact Duration	Temporary	Short-term	**Long-term**	Permanent	
	The construction phase will last approximately 10 months. The duration of potential impacts is therefore long-term.				
Impact Extent	**Local**	Regional	International		
	Potential impacts would be limited to the Project site footprint and pumping station, water supply pipeline, and gas pipeline, and hence would be considered to be local.				
Impact Scale	The total approximate quantities of hazardous materials that could be a potential source of impact during this stage include: • 220 L/day diesel fuel; • Small, infrequent quantities of lubricants, oil; and • Hydrostatic test chemicals (unknown quantity). The scale of potential impacts is potentially large due to the quantities present during this stage, but accidental release is an unlikely, unplanned occurrence.				
Frequency	Potential impacts would be expected to be infrequent, only taking place during rainfall, after loss of containment or accidental spills.				
Likelihood	The likelihood of road accident to occur is unlikely.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	Potential impact due to accidental releases in the Project area is expected to be small magnitude.				
Receptor Sensitivity	Low	**Medium**	High		
	Surface water quality analysis from the baseline surveys indicated that the surface water near the Project site had elevated levels of total suspended solids and turbidity, as well as elevated levels of BOD and the presence of coliform bacteria. This suggests that the surface water quality is already somewhat impacted. Overall sensitivity is rated as Medium.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The following measures will be put in place for the Project during construction phase:

- Waste to be disposed of properly, as follows:
  - Non-hazardous waste will be collected and transported to a proposed landfill area within the Industrial Estate.
  - Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.

- Hazardous waste storage areas will comply with best practice/ international standards;
- Mitigation measures/ monitoring programme with regard to accidental events/ spills shall be communicated to the EPC Contractor at the early stages of the Project implementation;
- Contractor will prepare unloading and loading protocols and train staff to prevent spills and leaks;
- Contractor will prepare guidelines and procedures for immediate clean-up actions following any spillages of oils, fuels or chemicals;
- A site specific Emergency Response Plan will be prepared by the Contractor for soil clean-up and decontamination;
- Fuel tanks and chemical storage areas will be sited on sealed areas and provided with locks to prevent unauthorized entry;
- Use of spill or drip trays to contain spills and leaks;
- Use of spill control kits to contain and clean small spills and leaks;
- The storage areas for oil, fuel and chemicals will be surrounded by bunds or other containment devices to prevent spilled oil, fuel and chemicals from percolating into the ground or reaching the receiving waters;
- Contractor will implement a training program to familiarise staff with emergency procedures and practices related to contamination events;
- Implement a construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period;
- Provide dedicated storage areas for construction materials to minimise the potential for damage or contamination of the materials;
- Ensure storage areas have impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest storage container;
- Oil-contaminated water will be collected and handled by local licensed wastewater sub-contractors (if available, to be determined at a later stage); and
- Vehicle servicing areas, vehicle wash bays and lubrication bays will, as far as practical, be located within roofed and cemented areas. The drainage in these covered areas will be connected to sewers via an oil/water interceptor.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

6.13.4 Operation Phase

Most of the foreseeable unplanned events associated with the project activities are listed as follows;

- Failure of Treated Water Storage Tank;
- Uncontrolled Explosion; and
- Accidental Spills and Leaks.

However, these unplanned events have low probability to occur. This is because the Project has identified these risks and developed a range of design features to minimize the risk to be as low as possible. The details of assessment are provided as follows;

Failure of Treated Water Storage Tank

Treated water tank is used to store treated water prior to transfer to the distribution pumping station (DPS). The treated water tank will has a minimum total capacity of 750 m^3. The tank, if not maintained properly, could be failed to operate. The significance of this impact is assessed in the following table.

Impact	Failure of treated water storage tank, e.g. leak or rupture etc., could be the result of corrosion of the tank wall. Consequently, a large volume of water will be leaked from the tank and seepage into the receiving environment. This may cause the damage to property and surrounding environment.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts from failure of treated water storage tank are Negative.				
Impact Type	**Direct**	Indirect	Induced		
	Impacts from failure of treated water tank are resulted directly from the project activities.				
Impact Duration	Temporary	**Short-term**	Long-term	Permanent	
	Impacts are considered Short-term.				
Impact Extent	**Local**	Regional	International		
	The release of water in the storage tank into the surrounding environment is considered to be Local.				
Impact Scale	The potential impacts from the tank failure are expected to be Small provided that mitigation measures and good site practices are implemented.				
Frequency	NA. The incident is not expected to occur.				
Likelihood	The likelihood of tank failure is unlikely.				
Impact Magnitude	Positive	Negligible	**Small**	Medium	Large
	The magnitude of impact is small. This is because the project will implement the measures to prevent the corrosion of the tank for instance corrosion protection systems, preventive and maintenance program for the tank etc.				
Receptor Sensitivity	Low	**Medium**	High		
	The sensitivity of receptor is Medium because the surrounding area is agricultural area and modified habitat. In addition, the Pa Yain Byu Reservoir could be affected.				
Impact Significance	Negligible	**Minor**	Moderate	Major	
	The combination of a Medium Resource Sensitivity and Small Impact Magnitude will result in an overall Minor Impact.				

Mitigation and Management Measures

The treated water storage tank will have an impermeable floor and containment, of capacity to accommodate 110% of the volume.

Residual Impacts

If the recommended mitigation measures are implemented, residual impact significance would be **negligible**.

Uncontrolled Explosion

The potential sources of uncontrolled explosion in the Project area are the hazardous chemicals stored for instance Chlorine, caustic soda. If these chemical handled improperly, may lead to the explosion. The significance of this impact is assessed in the following table.

Impact	Potential impacts due to the uncontrolled explosion could be property damage, personal injury or death.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts from failure of uncontrolled explosion are Negative.				
Impact Type	**Direct**	Indirect	Induced		
	The impacts from explosion are considered to be directly from the Project activities.				
Impact Duration	Temporary	**Short-term**	**Long-term**	Permanent	
	The impact duration is considered to be both Short-term and Long-term depending on explosive level. Minor damages or injuries can be recovery in the Short-term, while the severe damage and injuries need a long period to recover.				
Impact Extent	**Local**	Regional	International		
	The blast from explosion may cause the damage to the project area and adjacent area. This is considered to be Local impact.				
Impact Scale	The potential impacts from the uncontrolled explosion are expected to be Small provided that mitigation measures and good site practices are implemented.				
Frequency	NA. The incident is not expected to occur.				
Likelihood	The likelihood of uncontrolled explosion is unlikely.				
Impact Magnitude	Positive	Negligible	**Small**	**Medium**	Large
	The magnitudes of impact are ranged from Small to Medium depending on the explosive level.				
Receptor Sensitivity	**Low**	Medium	High		
	The sensitivity of receptor is Low because the surrounding area is mostly oil plant plantation.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	
	The combination of a Low Resource Sensitivity and Small to Medium Impact Magnitude will result in an overall Negligible to Minor Impact.				

Mitigation and Management Measures

- Prepare an emergency response plan that include fire and explosion scenario. The plan shall include structure of response team, responsibilities, list of equipment and actions;
- Install bund/ dike around chemical storage area to contain the chemicals in case of chemicals in case of leakage or spill. The capacity of bund/ dike should be sufficient to contain 110% of the chemicals from the largest tank; and
- Training program for employee should consist of basic hazard awareness, site-specific hazards, safe work practices, and procedures for fire and explosion.

Residual Impacts

With the implementation of the above mitigation measures, the residual impacts would be expected to be of **negligible**.

<u>Accidental Spills and Leaks</u>

The Project uses a number of chemicals for water treatment including (1) alum (2) caustic soda (3) polymer (4) Chlorine and (5) PAC. These chemicals, if handled and stored improperly, it may result in the spill or leakage into environment. The significance of this impact is assessed in the following table.

Impact	When considering these chemical properties, some of them are harmful to human and aquatic system if they are released into environment. Caustic soda, for example is highly corrosive agent when released to the water receiving area, it might be poisonous to aquatic organisms.				
Impact Nature	**Negative**	Positive	Neutral		
	Impacts from chemical spill are Negative.				
Impact Type	**Direct**	Indirect	Induced		
	Potential impacts from chemical spills are directly from the project activities.				
Impact Duration	**Temporary**	Short-term	Long-term	Permanent	
	Impacts are considered to be Temporary. The spills can be cleaned and affected area can be rehabilitated after incident. All chemicals are not accumulated in the ecosystem.				
Impact Extent	**Local**	Regional	International		
	Chemical spills or leakages are considered to be local impacts.				
Impact Scale	The potential impacts from the chemical spills are expected to be Small provided that mitigation measures and good site practices are implemented.				
Frequency	NA. The incident is not expected to occur.				
Likelihood	The likelihood of chemical spills is Unlikely.				
Impact Magnitude	Positive	Negligible	**Small**	**Medium**	Large
	The magnitudes of impact are ranged from small to medium depending on the characteristic and volume of the chemicals				
Receptor Sensitivity	**Low**	Medium	High		
	The sensitivity of receptor is Low because the surrounding area is mostly oil plant plantation.				
Impact Significance	**Negligible**	**Minor**	Moderate	Major	
	The combination of a Low Resource Sensitivity and Small to Medium Impact Magnitude will result in an overall Negligible to Minor Impact.				

Mitigation and Management Measures

- Install bund/ dike around chemical storage area to contain the chemicals in case of chemicals in case of leakage or spill. The capacity of bund/ dike should be sufficient to contain 110% of the chemicals from the largest tank;
- Use of spill or drip trays to contain spills and leaks;
- Use of spill control kits to contain and clean small spills and leaks;
- Procedures for response to chemical spills will be included in the emergency response plan. This will include locations of spill containment and recovery equipment;
- Ensure that there is sufficient and appropriate spill response supplies in the Project area;
- Do not store chemicals in unsuitable containers or containers made of incompatible material;
- Provide dedicated storage areas for construction materials to minimise the potential for damage or contamination of the materials;
- Minimum required quantities of treatment chemicals will be used for operation of the treatment plant;

- Waste storage areas will be equipped with secondary containment and spill control measures;
- Liquid wastes such as waste oil, etc. will be collected and stored for recycling in cemented areas;
- All drainage/tanks, etc. will be positioned on concrete hard standing to prevent any seepage into ground or surface water;
- Disposal sites to be designed for hazardous and non-hazardous waste, including sludge disposal;
- Hazardous waste storage areas will comply with best practice/ international standards;
- Store and handle all hazardous substances in accordance with their MSDS.
- Keep a register for all hazardous substances on site and relevant Material Safety Data Sheets (MSDSs) readily accessible for reference;
- Chemical storage areas will be sited on sealed areas and provided with locks to prevent unauthorized entry;
- Provide enough space to allow for inspection between waste containers so as to identify any leaks or spills;
- Ensure storage areas have impermeable floor and containment, of capacity to accommodate 110% of the volume of the largest waste container;
- Guidelines and procedures should be established for immediate clean up actions following any spillages of oil, fuel or chemicals;
- As part of the facility-wide HSEMS, SOPs will be prepared to manage any chemical spills, leaks and/or seepages. SOPs will cover transport, handling, storage, use and disposal of chemicals. Operating personnel will be trained on the SOPs and monitored in their use on a daily basis; and
- Prepare safety procedures for loading/ unloading of chemicals.

Residual Impacts

With the implementation of the above mitigation measures, the residual impacts would be expected to be of **negligible** significance.

6.14 CUMULATIVE IMPACT ASSESSMENT

Cumulative impacts summarised in this Section refer to the additional impacts that may be generated by other developments or activities in the vicinity of the Project, that when added to the impacts of the proposed Project combine to cause a greater impact. Such impacts may arise due to spatial overlap (e.g. overlap in spatial extent of water quality changes) or temporal overlap (e.g. sound impacts caused by other activities at the same time from different sources).

6.14.1 *Scope of Assessment (Spatial and Temporal Boundaries)*

The methodology used in the setting of the spatial and temporal boundaries for this CIA was largely qualitative. The following factors have been considered within the methodology:

- Temporal boundaries have been set based on desktop review of available information pertaining to other proposed Projects within the area (see below), the present Project schedule, understanding of Government strategy with regards

to the long term development of the area, and the continual nature of some of the external stressors; and
- Geographic boundaries are a composite of the location of sensitive receptors, assessed impacts of the Project and the degree to which they may overlap with other external projects and stressors to impact upon an identified sensitive receptor.

For the purposes of this assessment, a general qualitative cumulative impact assessment of the 9 sub-projects in the Initial Development Phase of the Dawei Special Economic Zone will be conducted. These sub-projects represent a good spatial boundary with which to assess, as they are all near the Project Site, and there is at least some information available on them at this stage. As discussed in ***Chapter 4***, the Initial Development Phase consists of the following 9 sub-projects:

1. Two-Lane Road (connecting DSEZ with the Thailand border);
2. Small Port;
3. Initial Industrial Estate;
4. Initial Phase Power Plant;
5. Initial Township;
6. Small Water Reservoir;
7. Telecommunications Landline;
8. LNG Terminal; and
9. Boil-off Gas and Temporary Power Plants.

Figure 6.6 shows a map of these features in relation to the Project.

6.14.2 Relevant Sensitive Receptors

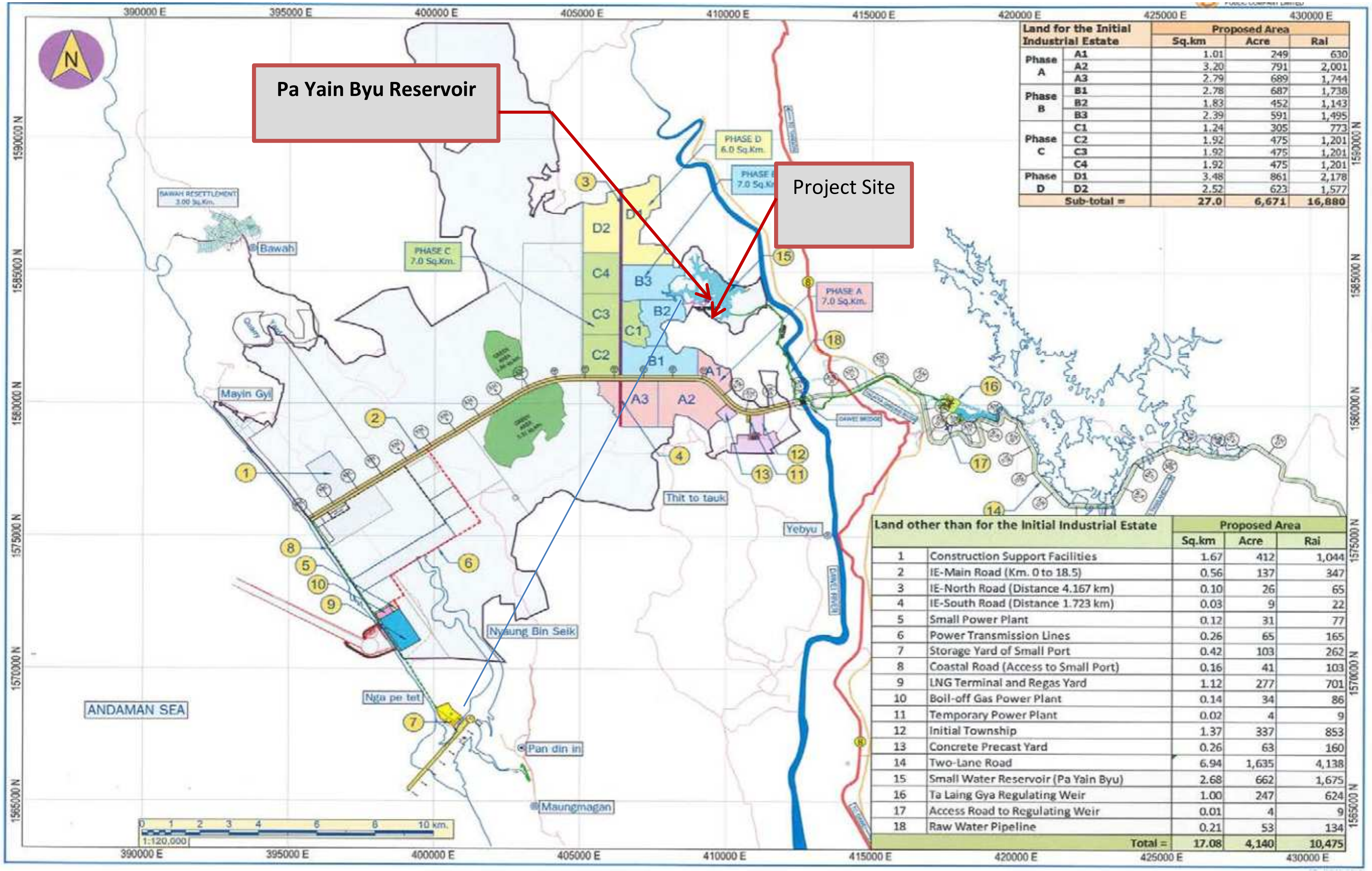
This IEE has identified and described the current condition of a range of Sensitive Receptors, some of which are relevant to this CIA. These include:
- Representative air sensitive receptors (ASR's) identified within ***Section 6.3***;
- Representative noise sensitive receptors (NSR's) identified within ***Section 6.5***;
- The Dawei River;
- In general, the inhabitants of the villages of Khamaung Chaung Village and Wat Chaung Village; and
- In addition, during stakeholder engagement, the small water reservoir (Pa Yain Byu Reservoir, #6 in above sub-projects) was identified as a potential area of concern due to previous instances of flooding.

Given the highly modified state of the area, there are no biodiversity features or species considered to be sensitive receptors (refer to ***Section 6.8***).

6.14.3 Cumulative Impact Assessment

The cumulative impact assessment has been carried out by a summary table, as shown in ***Table 6.29***.

Figure 6.6 Proposed Location of the Project in relation to DSEZ



Land for the Initial Industrial Estate		Proposed Area		
		Sq.km	Acre	Rai
Phase A	A1	1.01	249	630
	A2	3.20	791	2,001
	A3	2.79	689	1,744
Phase B	B1	2.78	687	1,738
	B2	1.83	452	1,143
	B3	2.39	591	1,495
Phase C	C1	1.24	305	773
	C2	1.92	475	1,201
	C3	1.92	475	1,201
	C4	1.92	475	1,201
Phase D	D1	3.48	861	2,178
	D2	2.52	623	1,577
Sub-total =		27.0	6,671	16,880

Land other than for the Initial Industrial Estate		Proposed Area		
		Sq.km	Acre	Rai
1	Construction Support Facilities	1.67	412	1,044
2	IE-Main Road (Km. 0 to 18.5)	0.56	137	347
3	IE-North Road (Distance 4.167 km)	0.10	26	65
4	IE-South Road (Distance 1.723 km)	0.03	9	22
5	Small Power Plant	0.12	31	77
6	Power Transmission Lines	0.26	65	165
7	Storage Yard of Small Port	0.42	103	262
8	Coastal Road (Access to Small Port)	0.16	41	103
9	LNG Terminal and Regas Yard	1.12	277	701
10	Boil-off Gas Power Plant	0.14	34	86
11	Temporary Power Plant	0.02	4	9
12	Initial Township	1.37	337	853
13	Concrete Precast Yard	0.26	63	160
14	Two-Lane Road	6.94	1,635	4,138
15	Small Water Reservoir (Pa Yain Byu)	2.68	662	1,675
16	Ta Laing Gya Regulating Weir	1.00	247	624
17	Access Road to Regulating Weir	0.01	4	9
18	Raw Water Pipeline	0.21	53	134
	Total =	17.08	4,140	10,475

Source: MIEH, 2016 (modified by ERM)

Table 6.29 Cumulative Impact Assessment

Project Name	Summary of Project and Potential Impacts	Anticipated Cumulative Impact Types	Impact Significance	Additional Mitigation Measures
Two-Lane Road (connecting DSEZ with the Thailand border)	• Approximately 138 km asphaltic concrete road from the Dawei Project to Baan Phu Nam Ron, Kanchanaburi Province at the Myanmar-Thailand border. • Custom, Immigration and Quarantine (CIQ) Complex at Myanmar-Thailand border. • Administration and rescue buildings, Vista Point and Commercial Areas. • Expandable to Four-Lane Road in the future plan. Most of the road will be located far from the Project, and so cumulative impacts are minimal. For the sections of the road that are near the project, there may be some additional dust and noise during construction. There could also be impacts to transportation once the road is complete (i.e. additional traffic).	Construction impacts relating to: • Air Quality and Greenhouse Gas; • Noise and Vibration; • Transportation. Operation impacts relating to: • Transportation.	Minor	Current mitigation measures are sufficient. No additional mitigation measures required.
Small Port	• 1st Berth has been completed - 100-m long jetty berth accommodates 13,000 DWT multi-purpose vessels (approx. 400 TEU) with estimated berth capacity of 330,000 ton per year • New Enlarged Port Capability for Panamax vessel 60,000 DWT(under construction and will be commercial operated by Y2020) Total berth capacity of approx. 14 million ton per year General cargo : 250-m long jetty berth, estimated capacity of 2 million ton per year Container: 700-m long jetty berth, estimated capacity of 12 million ton per year As the port will be located near the ocean and far from the Project (over 10 km), the cumulative impacts will be insignificant.	None	Negligible	N/A

<table>
<tr><th>Project Name</th><th>Summary of Project and Potential Impacts</th><th>Anticipated Cumulative Impact Types</th><th>Impact Significance</th><th>Additional Mitigation Measures</th></tr>
<tr><td>Initial Industrial Estate</td><td>The “Initial Industrial Estate or IIE”, as a sub-Project, is defined by Myandawei Industrial Estate Company Limited as consisting of the following components:
• Land with finished level grade by plot
• 24 hours safety &security
• Flood Control
• Heath Centre
• Fire Fighting System
• Environment Monitoring System
• Green Area
Construction and operation of the above components of the IIE will have no significant cumulative impacts with the Project.</td><td>None</td><td>Negligible</td><td>N/A</td></tr>
<tr><td>Initial Phase Power Plant
Boil-off Gas and Temporary Power Plants</td><td>• Mobile Unit of Gas Generator Power Plant flexible to demand
• Up to 450 MW Combined Cycle Gas Turbines (CCGT) Power Plant available upon demand

The Initial Phase Power Plant (#5 on Figure 6.6) and Boil-off Gas Power Plant (#10 on Figure 6.6) are located far from the Project (over 10 km), and thus will have no significant cumulative impacts with the Project.

The Temporary Power Plant (#11 on Figure 6.6) is located within 5 km from the Project. It is possible that there would be some potential cumulative impacts to air quality, greenhouse gases, and noise during both construction and operation. Additionally, the Temporary Power Plant may produce waste, which would need to be disposed of within the same waste management network the Project would utilise. There would also be some potential social cumulative impacts, including economy and livelihoods, transportation, infrastructure and services, and occupational health and safety.

Given that the Project is several km away, the above cumulative impacts are expected to be minor.</td><td>Construction impacts relating to:
• Air Quality and Greenhouse Gas;
• Noise and Vibration;
• Transportation.

Operation impacts relating to:
• Air Quality and Greenhouse Gas;
• Noise and Vibration;
• Economy and Livelihoods;
• Transportation;
• Infrastructure and Services;
• Occupational Health and Safety.</td><td>Minor</td><td>Current mitigation measures are sufficient. No additional mitigation measures required.</td></tr>
</table>

Project Name	Summary of Project and Potential Impacts	Anticipated Cumulative Impact Types	Impact Significance	Additional Mitigation Measures
Initial Township	Initial Township will be located within 5 km of the Project (#12 on ***Figure 6.6***), and consist of the following components: • Workforce Apartment, Service Apartment and Retail Shop is ready to develop upon demand • The township's population capacity is up to 200,000 residents Given the proximity to the Project, there are some potential cumulative impacts. During construction, there could be some additional air quality and noise impacts. Additionally, during operation, the large influx of population could have several environmental and socio-economic cumulative impacts, including impacts to waste/hazardous waste, community health and safety, demographic pattern, economy and livelihoods, transportation, infrastructure and services, and occupational health and safety. Due to the potentially large increase in population, the impacts from the Initial Township are significant. However, as the contributions to these impacts from the Project are negligible to minor, the cumulative impacts are considered minor.	Construction impacts relating to: • Air Quality and Greenhouse Gas; • Noise and Vibration; • Transportation. Operation impacts relating to: • Waste; • Community health and safety; • Demographic pattern; • Economy and livelihoods; • Transportation; • Infrastructure and services; • Occupational health and safety.	Minor	Current mitigation measures are sufficient. No additional mitigation measures required.
Small Reservoir (Pa Yain Byu Reservoir)	• PaYainByu Reservoir at the capacity of 7.7 million cu.m. able to serve the industrial water for the maximum demand of 36,000 cu.m./day • Centralized water treatment plant (i.e, this Project) and sustainable water supply with distribution network management. The primary impact from the reservoir (#15 on ***Figure 6.6***) is the potential increased risk of flooding in the area. However, this is a direct impact due to the reservoir itself, and is not cumulative with the water treatment plant (i.e., the water treatment plant has no contribution to the increased flooding risk of the	None	Negligible	N/A

Project Name	Summary of Project and Potential Impacts	Anticipated Cumulative Impact Types	Impact Significance	Additional Mitigation Measures
	reservoir). The direct impacts from the reservoir are outside of the scope of this IEE, and have been assessed separately in the Initial Environmental Examination on Pa Yain Byu Reservoir for the Small Water Reservoir Project. They were also summarized in ***Section 6.13*** Cumulative impacts with the water treatment plant are negligible.			
Telecommunications Landline	Telecommunications Landline will consist of landline and high-speed internet including the basic telephone (IP Phone), CCTV, Virtual Private Network (VPN), video conference, etc; Construction related impacts would be similar for the other linear infrastructure being developed by the Project and therefore cumulative impacts can be looked at in this context. Operational impacts for the transmission line would be negligible.	Construction impacts relating to: • Air Quality and Greenhouse Gas; • Noise and Vibration; • Transportation.	Minor	Current mitigation measures are sufficient. No additional mitigation measures required.
LNG Terminal	Little information available at this stage. Will consist primarily of an LNG receiving and re-gasification terminal Typical impacts from LNG terminal would include • Navigation (both marine and onshore) • Marine (dredging, etc.) • Air Quality and GHG As the LNG terminal (#9 on ***Figure 6.6***) will be located near the ocean and far from the Project (over 10 km), the cumulative impacts will be insignificant.	None	Negligible	N/A

7 ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

Through a systematic assessment, the IEE has identified a number of significant environmental and social impacts which may potentially result from the construction and operation of the Project. In order to manage and mitigate these impacts, a range of measures have been developed to reduce the overall residual impacts to acceptable levels and as low as reasonably practicable. Implementing and tracking the effect of these management and mitigation measures is an essential element to ensuring that the assessed residual impact levels are confirmed.

The key objectives of this Environmental Management Plan (EMP) are to:

- Collate the various mitigation and management measures developed throughout the IEE;
- Define monitoring requirements to determine the efficacy of all mitigation and management measures; and
- Provide clarity to all stakeholders as to what impacts have been identified, how they will be mitigated and managed, and through what means.

7.2 GOVERNING PARAMETERS

Specific emission limit values and environmental quality standards are defined primarily in Myanmar's National Environmental Quality (Emission) Guidelines. These Guidelines, as well as all relevant legislation and governing parameters, were presented in ***Chapter 3*** of this IEE.

7.3 DESCRIPTION OF PROPOSED MITIGATION MEASURES

This section outlines the mitigation measures that are to be employed to reduce the likelihood of impacts and/or to limit the extent of impact if one does occur. In addition, environmental monitoring measures will be undertaken to assess whether the mitigation measures are effective and if performance meets IEE commitments.

Key environmental and social impacts have been identified and reported in ***Chapter 6*** of this IEE. A summary of mitigation measures identified for the construction and operation phases of the Project is presented in ***Table 7.1***. This table also identifies location, implementation schedule, reporting requirements, and responsible party for implementing the mitigation measures. The Project Proponent will be responsible for ensuring that the mitigation measures in the EMP are implemented throughout the life span of the Project.

Table 7.1 Summary of Mitigation Measures

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
Construction Phase						
Air Quality	Potential impacts to air quality and dust from the Project may occur due to the following activities: • Site preparation activities of WTP and water supply pipeline in WTP area including site clearing and grubbing, excavation and filling, and construction of access road; and • Vehicle movement on dirt road.	• Water spraying of or covering all exposed areas, access roads and stockpiles; • Cleaning wheels and the lower body parts of trucks at all exits of the construction site; • Watering the main haul road regularly to suppress dust emissions during truck movement; • Prohibiting the burning of waste or vegetation on site; • Maintaining and checking the construction equipment regularly; • Switching off engines when idling; and • Vehicle / equipment exhausts observed to be emitting significant black smoke from their exhausts will be serviced/ replaced. • During transportation by trucks, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport to prevent dust emissions. • Limit maximum speed on unpaved roads to 30 km/h and within the Project boundary to 20 km/h. • The height from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emission arising during materials handling; • Use of the grievance mechanism (refer to ***Chapter 8***) will be utilised to record complains from affected stakeholders such that nuisance air quality impacts can be identified and rectification measures implemented. • Contractual provisions to be included with all material suppliers (e.g. quarries and haulage contractors) to ensure that the above management measures are implemented throughout the supply chain.	Project Site and Relevant Areas Surrounding Project Transportation Route	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent.
Greenhouse Gas	During construction, the Project will involve the movement of equipment in the construction areas such as crane, trucks and etc., which will contribute to GHG emissions from the combustion of fuel.	• Implement the same mitigation measures to minimize impacts to Air Quality (***above***). • Develop and implement preventive maintenance plan for machines, and engines to ensure combustion efficiency. • Develop vehicle maintenance plan.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Noise	Increased noise from construction equipment.	• Hours of general construction activity will be restricted to avoid sensitive periods of the day and also to avoid night working. Prohibit carrying out piling work before 07.00 am and after 05.00 pm. • Limit noisy construction works from 07.00 am to 6.00 pm Monday to Saturday (construction work activities may be done on Sunday when necessary). • Planting of buffer trees and shrubs where appropriate; • Locating noisy equipment as far as possible from NSRs and ensure that the orientation is the optimum for low noise. • Respond to noise-related complaints, and make modifications or other agreement with complainant where possible and appropriate. • Inform the public and in particular the nearest sensitive receptors about the Project and potential construction-related consequences. The information should include Project schedule, specific time and date that noise/vibration-generating activity will occur. • Transportation of materials/personnel should be carefully undertaken during construction phase. • Ensure that all Contractors on site have effectively controlled noise levels from equipment. Effective noise controls include: regular inspection and maintenance of all vehicles and construction equipment working onsite, installation of sound suppressive devices (such as mufflers) on all mechanical plants as necessary, where practicable, vehicles and machinery that are used intermittently should not be left idling for long periods of time. • No employee should be exposed to a noise level greater than 85 dB(A) for a duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140	Project Site and Relevant Areas Surrounding Project Transportation Route	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		dB(C).				
Surface Water Quality	Potential for impacts to surface water due to sediment-laden runoff.	• Install silt trap to treat surface run-off from bunded areas prior to discharge to the stormwater system; • Exposed soil surfaces should be protected by paving or fill material as soon as possible to reduce the potential of soil erosion and subsequent sedimentation; • Open stockpiles of construction materials or construction wastes on-site should be covered with tarpaulin or similar fabric during rainstorms; • Use methods for minimising sediment runoff, as appropriate to the conditions on-site, including wheel cleaning facilities; • Provision of channels, earth bunds or sand bag barriers on site to direct stormwater to silt removal facilities; • Provide measures to reduce the ingress of site drainage into excavations. If trenches have to be excavated during the wet season, excavate and backfill them in short sections wherever practicable. Discharge any water pumped out from trenches or foundation excavations into storm drains via silt removal facilities; • Provide measures to prevent the washing away of construction materials, soil, silt or debris into any drainage system of open stockpiles of construction materials; and • Surface run-off from bunded areas should pass through oil/water separators prior to discharge to the stormwater system.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Wastewater discharge and runoff during the construction phase may lead to contamination of freshwater sources if not managed appropriately.	• Implement adequate sanitary facilities, (one toilet for every 25 workers up to the first 100, and one for every 50 thereafter) will be provided for the construction workforce; • Liquid effluents arising from construction activities will be treated to the applicable Myanmar or IFC guideline prior to discharge; • Oil-contaminated water, if any, will be collected and handled by local licensed wastewater sub-contractors (if available, to be determined at a later stage).	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	During the construction phase, waste materials, if not stored and disposed of appropriately, have the potential to cause surface water contamination through direct release or from contaminated stormwater runoff.	• Implement the same mitigation measures to minimize impacts to Waste Management (below); • Provide training to labourers for waste disposal in designated areas and use of sanitation facilities; • Implement proper storage of the construction materials and wastes to minimise the potential damage or contamination of the materials; • Implement construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period; • Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance); • Store wastes in closed containers away from direct sunlight, wind and rain; • Store waste systematically to allow inspection between containers to monitor leaks or spills; • Ensure that storage areas have impermeable floors and containment, of capacity to accommodate 110% of the volume of the largest waste container; and • Waste to be disposed of properly, as follows: o Non-hazardous waste will be collected and transported to a proposed landfill area within the Industrial Estate of the DSEZ. o Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Surface water contamination may occur during the construction phase due to accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants or fuel from heavy equipment, and improper chemical/fuel storage.	• Implement measures specified for Accidental Spills and Leaks for Unplanned Events.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
Soils and Groundwater	Loss of topsoil resources during construction.	• Delineation of clearance boundaries to limit the areas to be cleared; • Scheduling clearance activities (if possible) to avoid extreme weather events such as heavy rainfall, extreme dry and high winds; • Revegetation areas with temporary land use, conducting progressive rehabilitation; • Demarcate routes for movement of heavy vehicles to minimise disturbance of exposed soils and compaction of sub-surface layers; • Reuse topsoil as much as possible within rehabilitation activities; • Control erosion through diversion drains, sediment fences, and sediment retention basins; and • Where topsoil is to be stored for later use in rehabilitation activities, the following basic principles are to be applied: o Stockpiles to be separated into topsoil and sub-soil and be located at least 50 m from any surface water source or groundwater well; o To the extent possible, stockpiles are to be located in areas surrounded by natural wind barriers to minimise the potential for wind erosion; o Stockpile storage areas are to be prepared in advance of the removal of topsoil as much as possible; and o Topsoil heights are to be restricted in height to 2 m above ground level to minimise wind erosion, and they are only to be partially compacted on the upper layer in order to promote aeration, maintain soil vertical structures, reduce runoff and encourage infiltration.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Terrestrial and Aquatic Biodiversity	Temporary and/or permanent loss of habitat due to land clearing and construction activities.	• The design and layout plan will be prepared to minimise tree cutting and protected area disturbance where possible. The Project owner shall be directly responsible for dissemination to its staff and workers of all rules, regulations and information concerning these restrictions, as well as the punishment that can expected if any staff or worker or other person associated with the Project violate rules and regulations; • The planned clearance area for the construction works shall be clearly identified and marked to avoid accidental clearing; and • Project will utilize or upgrade existing roads where possible to minimize unnecessary clearing requirements.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Disturbance and displacement of resident fauna due to noise, light and/or vibration as a result of construction activities (excavation, blasting, clearing, spoil disposal, camps, plant and vehicle movement).	• Construction vehicles and machinery will be maintained in accordance with industry standard to minimise unnecessary noise generation; • Arrangement of transportation schedules will aim to avoid peak hours of road usage to minimise heavy traffic through habitat areas; • For construction areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible; and • Commitment will be made to raise awareness of the construction work force and make arrangements for restriction of poaching.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Barrier to movement and habitat fragmentation.	• The Project shall implement landscaping and re-vegetation after completion of construction in suitable areas to establish a suitable riparian corridor; • In-stream works will be carried out in low-flow conditions where possible; and • The water pipeline will not be fenced.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	The construction associated with the Project will generate newly disturbed forest edges around the margins of the reservoir, along access roads, the transmission line and at the infrastructure locations.	• Dust suppression techniques will be utilised during construction, to control the dispersion of dust created by clearing lands at the construction sites; • The Project shall implement landscaping and re-vegetation after completion of construction using native species where possible; • To avoid/minimize releasing sediment load into the river, erosion control measures will be implemented and maintained e.g. using silt fence and temporary re-vegetation to minimize sediment transport from steep slope releasing to the river and smaller waterways; and • Weed and pest management measures should be implemented to avoid introduction of	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		weeds to natural and modified habitat areas.				
	Degradation of habitat through: • Introduction of alien species and competition with native communities; and • Accidental release of hazardous substances stored or used during construction phases.	• Construction and domestic waste will be appropriately stored and disposed of to avoid attracting native and alien species to the construction areas; • For areas in direct runoff path to a watercourse, sediment and erosion control devices will be installed and maintained until vegetation replanting can occur to stabilise disturbed surfaces; • Oil, chemical and solid waste will be stored, and handled and disposed of by standard procedure; • Weed and pest management measures should be implemented to avoid introduction of weeds to natural and modified habitat areas; • Speed limits to maximum of 20 km/hr for construction vehicles will be enforced to limit noise and dust generation; • Construction materials and chemicals will be appropriately secured and locked down during flood season to avoid accidental release to the natural environment; • Engineering works will be designed to comply with the agreed water quality standards; • Water quality monitoring will be carried out as specified in Surface Water section (***above***); and • Emergency response plan and procedures will be prepared and implemented for the construction activities of the Project. This will include emergency drills and education of Project workers.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Fauna mortality due to movement of vehicles, machinery strikes or falling debris during the activities of the Project.	• Speed limits to maximum of 20 km/hr for construction vehicles will be enforced to minimise potential for fauna strike; • Commitment will be made to raise awareness of values of natural habitat areas to construction work force and arrangements will be made for restriction of poaching and forest product collection; • Hunting wild animals will be strictly prohibited to apply for all staff; and • Fishing and using of illegal fishing gear anywhere along the reservoir will be prohibited.	Project Site and Relevant Areas Surrounding Project Transportation Route	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Waste Management	Impacts from Solid Waste Generation, Storage and Disposal on the Existing Waste Management Network.	• All waste collection and storage measures as detailed within ***Section 6.13*** (Unplanned Events) will be implemented; • A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the construction phase for all of the waste streams identified; • Education of all workers on site shall be undertaken to avoid, reduce and reuse wastes generated; • The waste management plan should be implemented and monitored. The plan should set out procedures for appropriately managing and disposing of hazardous materials and other forms of waste; • Waste disposal facilities shall be sited and signposted throughout the construction site; • Waste clean-up measures are to be undertaken on at least a fortnightly basis to collect any waste or unused materials from the construction site. All waste collected should be managed and disposed of in accordance with the accepted best practice for waste collection and disposal; • Contractors employed to manage the waste should clearly identify within their bidding documents how the collected waste will be managed. All end points for collected waste are to be inspected and audited and noted to be developed such that all waste is able to be disposed of in an environmental responsible manner; and • Monitoring of appointed waste contractors using chain-of custody documentation for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Social Impact Assessment	Employment Opportunities and opportunities for local business	• Develop and implement a local content plan. The plan should establish measures to facilitate local recruitment and procurement. This should include targets so that performance can be tracked and evaluated. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting	EPC Contractor and Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		villagers; • Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project. This should include a skills audit to determine what skills will be required by the Project and what skills are available within the local villagers. This will need to be undertaken as early as possible so that a training program can be developed and implemented and villagers are able to meaningfully contribute to the Project; • Inform local villagers of job opportunities in a timely manner. Ensure that the advertising process is locally and culturally appropriate; • Inform local businesses of contracting opportunities in a timely manner. Ensure that the process is locally and culturally appropriate; • Inform local villagers in Wat Chaung Village and Khamaung Chaung Village and relevant agencies, about the Project location, and the changes in access to the site, as early as possible. Continue to engage with stakeholders throughout construction and operation of the Project; and • Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.			to regulatory authorities as required.	
	Potential impacts on existing water users	• Manage the Project's water use so that there is sufficient flow in the river to maintain existing/ current village uses as well as biodiversity values; and • Continue to engage with Project stakeholders throughout construction and operation of the Project. Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Community disturbance and potential safety hazard due to road traffic	• Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project area villages – e.g. through the training of workers that have been sourced from the local villages; • Establish amenities at the camp to help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers. This includes recreation facilities and health care infrastructure; • Establish a workforce code of conduct. Include in the code specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers; • Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases; • Vector management procedures, including measures to reduce the presence of vector habitat and consideration of whether pesticides will be utilized to reduce the presence of vectors onsite; • Provision of onsite health care facility, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities; • Develop and implement emergency management procedures should a health issue escalate and require a rapid response. This should be done in conjunction with local health care providers; and • Explore opportunities to invest in local health infrastructure and services. This includes potential education programs focused on disease transmission and symptoms in conjunction with relevant local stakeholders (e.g. local health care providers).	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
	Potential impacts associated with Infrastructure and services	• Provide appropriate amenities at the workforce accommodation camp – e.g. recreational opportunities. This will help reduce the need for workers to utilize local infrastructure and services; • Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. The traffic management plan should be	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as	EPC Contractor and Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		developed in consultation with local stakeholders. Stakeholders should be notified about traffic routes in advance of the Project commencing and, where known, periods of increased traffic volumes. Where possible, traffic movements should be coordinated with key stakeholders so as to limit disruptions to local activities; • Develop and implement community health management procedures, occupational health and safety procedures and emergency response procedures in consultation with relevant stakeholders (e.g. local health practitioners). These plans will ensure that appropriate and adequate health care services are provided onsite and at the accommodation camp to address/ manage worker illnesses and injuries; and • Develop and implement a grievance mechanism.			required.	
	Health and safety of construction workforce	• Provide appropriate PPE for all staff; • Ensure staff and contractors are aware of the hazards associated with their role, and appropriate measures to manage the hazards; • Encourage staff and contractors to report incidents when they occur. Investigate any reported incidents that occur onsite to determine the root cause and establish improved management; • Provide MSDSs for all chemicals used onsite, as well as appropriate storage facilities and handling procedures (based on the MSDSs); • Provide training for all staff and contractors working with chemicals (based on the MSDSs). This can help reduce the potential for incidents; • Provide eye wash and shower stations at chemical storage facilities; • Track weather conditions to ensure PPE is appropriate for the conditions and that potential inclement weather events can be managed appropriately; • Develop and implement emergency management procedures in conjunction with local health care providers; • Coordinate with local and central hospitals in case of emergency or critical illness/injury; and • Ensure that contractors working on the Project implement the above measures.	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Traffic	Potential impacts associated with congestion and road traffic accidents due to an increase in road traffic during construction phase.	• Traffic signs will be installed on all roads throughout construction areas depicting speed limits; • Development and implementation of a waste management plan. The plan should set out procedures for appropriately managing and disposing of hazardous materials and other forms of waste; and • Road safety initiatives to minimise risks to other road users such as the following: o Emphasizing safety aspects among drivers, particularly with regard to the recommended driving speed of 20 km/hr on access roads within the Project site; o Ensuring that only licensed drivers are employed by the Project; o Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure; o Coordination with emergency responders to ensure that appropriate first aid is provided in the event of accidents. o Fatigue management; o Ensuring all employees complete training prior to driving any Project vehicle. The content of the training should be tailored to the employee's role; and o Exploring opportunities to work with local stakeholders to increase awareness within local villages about the hazards associated with traffic.	Project Site and Relevant Areas Surrounding Project Transportation Route	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Cultural Heritage	Soil excavation could result in damage to the cultural heritage sites. The other construction activities are unlikely to contribute to impacts on cultural heritage.	• Develop and implement of a Chance Find Procedure in order to minimise impacts to undocumented archaeological sites; • Cultural heritage training (e.g. as part of the site induction process) of all workers including Project management, construction staff and contract staff. The objective of training is to familiarise staff with the Chance Finds Procedure so that it is effectively	Project Site and Relevant Areas Surrounding Project	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		implemented; and • Grievance mechanism in place to identify and manage stakeholder issues and concerns (if any) regarding cultural heritage.				
	Dust from transportation of materials and workers to the Project site could impact the local cultural heritage, in particular the cultural heritage sites in Wat Chaung Village.	• Implement management measures described in the Traffic Section above; and • Implement a grievance mechanism to identify and manage stakeholder issues and concerns (if any) regarding cultural heritage.	Project Site and Relevant Areas Surrounding Project Transportation Route	Throughout Construction	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	EPC Contractor and Project Proponent
Operation Phase						
Air Quality	Potential emission from vehicle transportation and odor nuisance from handling of sludge.	• Maintain vehicle and equipment according to manufacturers' specifications. • Switching off engines when idling. • Vehicle / equipment exhausts observed to be emitting significant black smoke from their exhausts will be serviced/ replaced. • Clean Project area and in the surrounding area on a daily basis to prevent dust. • During transportation by trucks, materials should not be loaded to a level higher than the side and tail boards, and should be dampened or covered before transport to prevent dust emissions. • The height from which materials are dropped should be reduced to a practical minimum height to control fugitive dust emission arising during materials handling; • Collect and handling sludge in appropriate containers. • Regularly de-sludge the lagoon as accumulated sludge contributes to bad odour. • Use of the grievance mechanism (refer to ***Chapter 8***) will be utilised to record complains from affected stakeholders.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
Greenhouse Gas	Potential impacts on climatic condition due to GHG emissions.	• Implement the same mitigation measures to minimize impacts to Air Quality (above). • Develop energy efficiency programs to promote using less energy and electricity.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
Noise	There are no significant sources of noise associated with the operational phase of the proposed Project. There may be minor noise from operation of WTP and pumping station.	• No Mitigation Measures required	N/A	N/A	N/A	N/A
Surface Water Quality	Potential for impacts to surface water due to wastewater discharges during plant operation.	• Implement adequate sanitary facilities for onsite personnel; • Liquid effluents arising from operations will be treated to the applicable EQG guideline prior to discharge; • Design drainage pipes and culverts for the controlled release of storm flows. • Wastewater collected from canteen kitchens, including that from basins, sinks and floor drains, should be discharged into sanitary sewers via grease traps. The sanitary sewer should then be treated prior to discharge or reuse as greywater; • The sewage from the entire plant area will be collected and treated in a sewage treatment plant (STP). No untreated sewage will be directly discharged into the Reservoir or Dawei River near the site, or disposed of on land, for the duration of the project life cycle; • The stormwater drainage system will be periodically inspected for blockages and cleaned at least once before the monsoon season each year; and • Operating personnel will be trained to visually inspect discharged water quality for oil and grease traces (that will be visible on the surface) periodically and take appropriate corrective actions.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
	If wastes are not stored and disposed of appropriately, they have the potential to cause impacts to surface water quality through leakage or rainfall runoff.	• Implement the same mitigation measures to minimize impacts to Waste Management (below); • Provide training to all staff for waste disposal in designated areas and use of sanitation facilities;	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting	Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		• Segregate hazardous and non-hazardous waste and provide appropriate containers for the type of waste type (e.g. enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance); • Store wastes in closed containers away from direct sunlight, wind and rain; • Store waste systematically to allow inspection between containers to monitor leaks or spills; and • Ensure that storage areas have impermeable floors and containment, of capacity to accommodate 110% of the volume of the largest waste container.			to regulatory authorities as required.	
	During the operation phase, the physical footprint of the water treatment plant will increase the impermeable area of the Project site, resulting in changed hydrological characteristics, such as reduced water infiltration to the soil, which could create additional surface run-off (and increase the flow velocity of this run-off), as well as reducing infiltration into subsurface aquifers.	• Ensure that drainage channels have enough capacity to accommodate the increased rainfall runoff from the Project's impervious surface.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
	Surface water contamination may occur during the operation phase due to accidental leaks or spills of chemicals or hazardous materials such as oils, lubricants or fuel from heavy equipment, and improper chemical/fuel storage.	• Implement measures specified for Accidental Spills and Leaks for Unplanned Events.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
Soils and Groundwater	Potential for soil erosion from altered hydrology due to an increase in impervious surfaces in the Project area.	• Ensure that the drainage channel has enough capacity to accommodate the increased rainfall runoff from the Project's impervious surfaces.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
Terrestrial and Aquatic Biodiversity	Disturbance to fauna behaviour due to noise, light and/or vibration in operational and maintenance activities.	• Vehicles and machinery will be maintained in accordance with industry standard to minimise unnecessary noise generation; • For areas requiring night-time lighting, lights will be used only where necessary and will be directed toward the subject area and away from habitat areas where possible; and • Speed limits to maximum of 20 km/hr for vehicles will be enforced to minimise potential for fauna strike.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
	Mortality of individual fauna species as a result of vehicle or machinery strike	• Commitment will be made to raise awareness of values of natural habitat areas and arrangements will be made for restriction of poaching and forest product collection; • Hunting wild animals will be strictly prohibited to apply for all staff; and • Fishing and using of illegal fishing gear will be prohibited.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
Waste Management	Impacts from Solid Waste Generation, Storage and Disposal on the Existing Waste Management Network during Operation and Maintenance.	• All waste collection and storage measures as detailed within ***Section 6.13*** (Unplanned Events) will be implemented; • A waste management plan is to be developed which includes specific requirements to manage, avoid, reduce and reuse waste during the operation phase for all of the waste streams identified; • Education of all workers on site shall be undertaken to avoid, reduce and reuse wastes generated; • The waste management plan should be implemented and monitored. The plan should set out procedures for appropriately managing and disposing of hazardous materials and other forms of waste; • Waste disposal facilities shall be sited and signposted throughout the site; • Waste clean-up measures are to be undertaken on at least a fortnightly basis to collect any waste or unused materials from the Project site. All waste collected should be managed and disposed of in accordance with the required regulations; • Waste to be disposed of properly, as follows:	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		○ Non-hazardous waste will be collected and transported to a proposed landfill area within the Industrial Estate of the DSEZ. ○ Hazardous waste will be collected and initially stored on site, after which it will be transported to the storage within the Industrial Estate of the DSEZ. • Contractors employed to manage the waste should clearly identify within their bidding documents how the collected waste will be managed. All end points for collected waste are to be inspected and audited and noted to be developed such that all waste is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations; and • Monitoring of appointed waste contractors using chain-of custody documentation for the disposal of waste to ensure that it is able to be disposed of in an environmental responsible manner and in accordance with all prevailing regulations.				
Social Impact Assessment	Employment Opportunities and opportunities for local business	• Develop and implement a local content plan. The plan should establish measures to facilitate local recruitment and procurement. This should include targets so that performance can be tracked and evaluated. Development of the plan should involve consultation with relevant stakeholders, including government authorities and local villagers; • Review opportunities to establish a skills training program with an aim of training interested local villagers to contribute to the Project. This should include a skills audit to determine what skills will be required by the Project and what skills are available within the local villagers. This will need to be undertaken as early as possible so that a training program can be developed and implemented and villagers are able to meaningfully contribute to the Project; • Inform local villagers of job opportunities in a timely manner. Ensure that the advertising process is locally and culturally appropriate; • Inform local businesses of contracting opportunities in a timely manner. Ensure that the process is locally and culturally appropriate; • Inform local villagers in Wat Chaung Village and Khamaung Chaung Village and relevant agencies, about the Project location, and the changes in access to the site, as early as possible. Continue to engage with stakeholders throughout construction and operation of the Project; and • Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
	Potential impacts on existing water users	• Manage the Project's water use so that there is sufficient flow in the river to maintain existing/ current village uses as well as biodiversity values; and • Continue to engage with Project stakeholders throughout construction and operation of the Project. Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
	Community disturbance and potential safety hazard due to road traffic	• Training for all workers on the transmission routes and common symptoms of communicable diseases. This can help reduce the potential for workers to unknowingly transmit communicable diseases. This may also help to increase knowledge within Project area villages – e.g. through the training of workers that have been sourced from the local villages; • Establish amenities at the camp to help minimize the interaction between the workforce (particularly temporary construction workers) and local villagers. This includes recreation facilities and health care infrastructure; • Establish a workforce code of conduct. Include in the code specific measures that target anti-social behaviour, such as becoming involved with commercial sex workers; • Undertake pre-employment screening to ensure fitness for work. It is important that the pre-screening process does not result in discrimination, but instead is used as a tool to minimize the transmission of communicable diseases; • Vector management procedures, including measures to reduce the presence of vector habitat and consideration of whether pesticides will be utilized to reduce the presence of vectors onsite;	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		• Provision of onsite health care facility, to ensure that basic medical attention and first aid treatment can be sought during the hours that the work is being undertaken at the Project site. This will also help reduce the potential pressure on local health care facilities; • Develop and implement emergency management procedures should a health issue escalate and require a rapid response. This should be done in conjunction with local health care providers; and • Explore opportunities to invest in local health infrastructure and services. This includes potential education programs focused on disease transmission and symptoms in conjunction with relevant local stakeholders (e.g. local health care providers).				
	Potential impacts associated with Infrastructure and services	• Provide appropriate amenities at the workforce accommodation camp – e.g. recreational opportunities. This will help reduce the need for workers to utilize local infrastructure and services; • Develop and implement a traffic management plan to minimize the impact experienced by road users as a result of the Project. The traffic management plan should be developed in consultation with local stakeholders. Stakeholders should be notified about traffic routes in advance of the Project commencing and, where known, periods of increased traffic volumes. Where possible, traffic movements should be coordinated with key stakeholders so as to limit disruptions to local activities; • Develop and implement community health management procedures, occupational health and safety procedures and emergency response procedures in consultation with relevant stakeholders (e.g. local health practitioners). These plans will ensure that appropriate and adequate health care services are provided onsite and at the accommodation camp to address/ manage worker illnesses and injuries; and • Develop and implement a grievance mechanism.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent
	Health and safety of construction workforce	• Provide appropriate PPE for all staff; • Ensure staff and contractors are aware of the hazards associated with their role, and appropriate measures to manage the hazards; • Encourage staff and contractors to report incidents when they occur. Investigate any reported incidents that occur onsite to determine the root cause and establish improved management; • Provide MSDSs for all chemicals used onsite, as well as appropriate storage facilities and handling procedures (based on the MSDSs); • Provide training for all staff and contractors working with chemicals (based on the MSDSs). This can help reduce the potential for incidents; • Provide eye wash and shower stations at chemical storage facilities; • Track weather conditions to ensure PPE is appropriate for the conditions and that potential inclement weather events can be managed appropriately; • Develop and implement emergency management procedures in conjunction with local health care providers; • Coordinate with local and central hospitals in case of emergency or critical illness/injury; and • Ensure that contractors working on the Project implement the above measures.	Project Site and Relevant Areas Surrounding Project	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent

Traffic	Potential impacts associated with congestion and road traffic accidents due to an increase in road trafficduring operation phase.	• Development and implementation of a waste management plan. The plan should set out procedures for appropriately managing and disposing of hazardous materials and other forms of waste; and
		• Road safety initiatives to minimise risks to other road users such as the following:
		  o Emphasizing safety aspects among drivers, particularly with regard to the recommended driving speed of 20 km/hr on access roads within the Project site;
		  o Ensuring that only licensed drivers are employed by the Project;
		  o Regular maintenance of vehicles and use of manufacturer approved parts to minimize potentially serious accidents caused by equipment malfunction or premature failure;
		  o Coordination with emergency responders to ensure that appropriate first aid is
			Project Site and Relevant Areas Surrounding Project
			Transportation Route
				Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent

Environmental/Social/Health Aspect	Impact Summary	Mitigation Measures	Location	Implementation Schedule	Reporting Requirements	Responsible Party
		provided in the event of accidents. o Fatigue management; and o Ensuring all employees complete training prior to driving any Project vehicle. The content of the training should be tailored to the employee's role.				
Cultural Heritage	Dust from transportation of materials and workers to the Project site could impact the local cultural heritage, in particular the cultural heritage sites in Wat Chaung Village.	• Implement management measures described in the Traffic Section above; and • Implement a grievance mechanism to identify and manage stakeholder issues and concerns (if any) regarding cultural heritage.	Project Site and Relevant Areas Surrounding Project Transportation Route	Throughout Operation	Relevant Records maintained. Monthly internal reports to top management and reporting to regulatory authorities as required.	Project Proponent

7.4 MONITORING PROGRAMME

Monitoring will be required in order to demonstrate compliance with legal limits and the Proponent's Project requirements, and will also provide verification of the overall design and effectiveness of the implemented control measures.

Key objectives of monitoring are to:

- Confirm effectiveness of management and mitigation measures;
- Ensure compliance with Applicable Standards (i.e. Myanmar's EQG) and the Project Proponent's objectives;
- Monitoring the status of, and impacts on, identified sensitive receptors;
- Provide an early warning that any of the control measures or practices are failing to achieve their desired performance and ensure changes can be implemented to remedy these practices;
- Determine whether environmental and social changes are attributable to Project activities, or as a result of other activities or natural variation; and
- Provide a basis for continual review and improvements to Project design and execution.

Details of the environmental monitoring programme for the construction and operation phases are presented in ***Table 7.2.***

7.4.1 Reporting Mechanism for Environmental and Social Monitoring Programme

A robust reporting system will provide the Project with the necessary feedback mechanisms to ensure quality and timely implementation of the works. The reporting system will ensure regular flow of information from the Project site to the Project headquarters and, as necessary, to regulatory authorities. The reporting system will provide a mechanism to ensure that the measures proposed in the Project's EMP are implemented.

Prior to the commencement of the construction activities, the Project Proponent will finalise the format and frequency for reporting on the status and progress of environmental and social monitoring.

It is recommended that the report shall be submitted to the relevant authorities on a regular basis during construction and operation. Frequency will be agreed with relevant authorities. However, it is recommended that the Project Proponent shall submit the report to the relevant authorities on six-monthly basis during construction, and annually during operation.

Table 7.2 Environmental and Social Monitoring Programme (Construction and Operation Phase)

Environmental/Social/Health Aspect	Parameters to be Monitored	Monitoring Locations	Duration and Frequency	Responsible Party	Cost
Construction Phase					
General	General compliance with mitigation measures presented in the EMP	Project activity areas and construction workers camp	Daily for each construction phase	EPC Contractor	(EPC contractor cost)
	Internal audit of EPC Contractor, ensuring they comply with all measures within this EMP	As per Monitoring Locations within this table	Once monthly	Project Proponent	Capex Cost
	External audit of Project Proponent by Relevant Authorities, ensuring they comply with all measures within this EMP	As per Monitoring Locations within this table	Every 6 months	Relevant Authorities	N/A
Air Quality	The environmental monitoring parameters for air quality during the construction phase are : • NO_2 • SO_2 • PM10 and PM2.5 • CO • Wind Speed and Wind Direction	Wat Chaung Village (ASR1)	Monitoring 24 hours, every 6 months for each construction phase	EPC Contractor	(EPC contractor cost estimated at 3,000USD / year)
Noise	The environmental monitoring parameters for noise during the construction phase are : • Leq 1 hr • Leq Daytime, 07:00 am –10:00 pm • Leq Night time, 10:00pm – 07:00 am	Wat Chaung Village (NSR1)	Monitoring 48 hours, every 6 months for each construction phase	EPC Contractor	EPC Contractor Cost (3,000 USD / time)
Surface Water	As per Section 1.2 of Myanmar's Environmental Quality Guidelines, "Site Runoff and Wastewater Discharges (construction phase)": • Biological Oxygen Demand, Chemical Oxygen Demand, Oil and Grease, pH, Total Coliform Bacteria, Total Nitrogen, Total Phosphorus, Total Suspended Solids As per Section 1.2 of Myanmar's Environmental Quality Guidelines, "Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)": • 5-day Biochemical Oxygen Demand, Ammonia, Arsenic, Cadmium, Chemical Oxygen Demand, Chlorine (total residual), Chromium (hexavalent), Chromium (total), Copper, Cyanide (free), Cyanide (total), Fluoride, Heavy metals (total),	Same locations as for environmental baseline sampling	Every 6 months	EPC Contractor	EPC Contractor Cost (2500 USD / time)

Environmental/Social/Health Aspect	Parameters to be Monitored	Monitoring Locations	Duration and Frequency	Responsible Party	Cost
	Iron, Lead, Mercury, Nickel, Oil and grease, pH, Phenols, Selenium, Silver, Sulphide, Temperature Increase, Total Coliform Bacteria, Total Phosphorus, Total Suspended Solids, Zinc				
Soils	• pH, salinity, NH4+, total P, heavy metals, oil & grease • Additional parameters to be sampled based upon the likely chemical compositions of the material.	Construction site or laydown area or spill area	In the event of any leakage or spillage of hazardous substances, oil, or toxic chemicals	EPC Contractor	EPC Contractor Cost (2500 USD / time)
Social Impact Assessment	Occupational Health and Safety • Number of near-misses • Number of incidents • Number of occupational diseases • Number of dangerous occurrences	Project activity areas and construction workers camp	As defined in H&S Plan	EPC Contractor	EPC Contractor Cost (included in Capex cost)
	Public concerns • Number of people lodging grievances/ complaints • Number of grievances/ complaints • Type of grievances/ complaints • Number of local people employed • Number of local businesses used (contributing to the project) • Number of incidents requiring medical attention	Neighbouring communities around the Project activity areas	Continuous	EPC Contractor	EPC Contractor Cost (included in Capex cost)
Traffic	• Number of accidents • Number of incidents • Number of injuries • Number of complaints	Access Road connecting site	Based on occurrence	EPC Contractor	EPC Contractor Cost (included in Capex cost)
Cultural Heritage	• Number of people lodging grievances/ complaints • Number of grievances/ complaints	Neighbouring communities around the Project activity areas	Continuous	EPC Contractor	EPC Contractor Cost (included in Capex cost)
Operation Phase					
General	General compliance with mitigation measures presented in the EMP	Project activity areas	Daily	Project Proponent	Included in operation and maintenance

Environmental/Social/Health Aspect	Parameters to be Monitored	Monitoring Locations	Duration and Frequency	Responsible Party	Cost
					(O&M) cost
	External audit of Project Proponent by Relevant Authorities, ensuring they comply with all measures within this EMP	As per Monitoring Locations within this table	Once a year	Relevant Authorities	
Surface Water	As per Section 1.2 of Myanmar's Environmental Quality Guidelines, "Wastewater, Storm Water Runoff, Effluent and Sanitary Discharges (general application)": • 5-day Biochemical Oxygen Demand, Ammonia, Arsenic, Cadmium, Chemical Oxygen Demand, Chlorine (total residual), Chromium (hexavalent), Chromium (total), Copper, Cyanide (free), Cyanide (total), Fluoride, Heavy metals (total), Iron, Lead, Mercury, Nickel, Oil and grease, pH, Phenols, Selenium, Silver, Sulphide, Temperature Increase, Total Coliform Bacteria, Total Phosphorus, Total Suspended Solids, Zinc	Same locations as for environmental baseline sampling	Every 6 months	Project Proponent	Included in operation and maintenance (O&M) cost (2500 USD / time)
Soils	• pH, salinity, NH4+, total P, heavy metals, oil & grease • Additional parameters to be sampled based upon the likely chemical compositions of the material	Construction site or laydown area or spill area	In the event of any leakage or spillage of hazardous substances, oil, or toxic chemicals	Project Proponent	O&M Cost (2500 USD / time)
Social Impact Assessment	Occupational Health and Safety • Number of near-misses • Number of incidents • Number of occupational diseases • Number of dangerous occurrences	Project activity areas	As defined in H&S Plan	Project Proponent	Included in operation and maintenance (O&M) cost
	Public concerns • Number of people lodging grievances/ complaints • Number of grievances/ complaints • Type of grievances/ complaints • Number of local people employed • Number of local businesses used (contributing to the project) • Number of incidents requiring medical attention	Neighbouring communities around the Project activity areas	Continuous	Project Proponent	Included in operation and maintenance (O&M) cost
Traffic	• Number of accidents • Number of incidents • Number of injuries • Number of complaints	Access Road	Based on occurrence	Project Proponent	Included in operation and maintenance (O&M) cost
Cultural Heritage	• Number of people lodging grievances/ complaints • Number of grievances/ complaints	Neighbouring communities around	Continuous	Project Proponent	Included in operation

Environmental/Social/Health Aspect	Parameters to be Monitored	Monitoring Locations	Duration and Frequency	Responsible Party	Cost
		the Project activity areas			and maintenance (O&M) cost

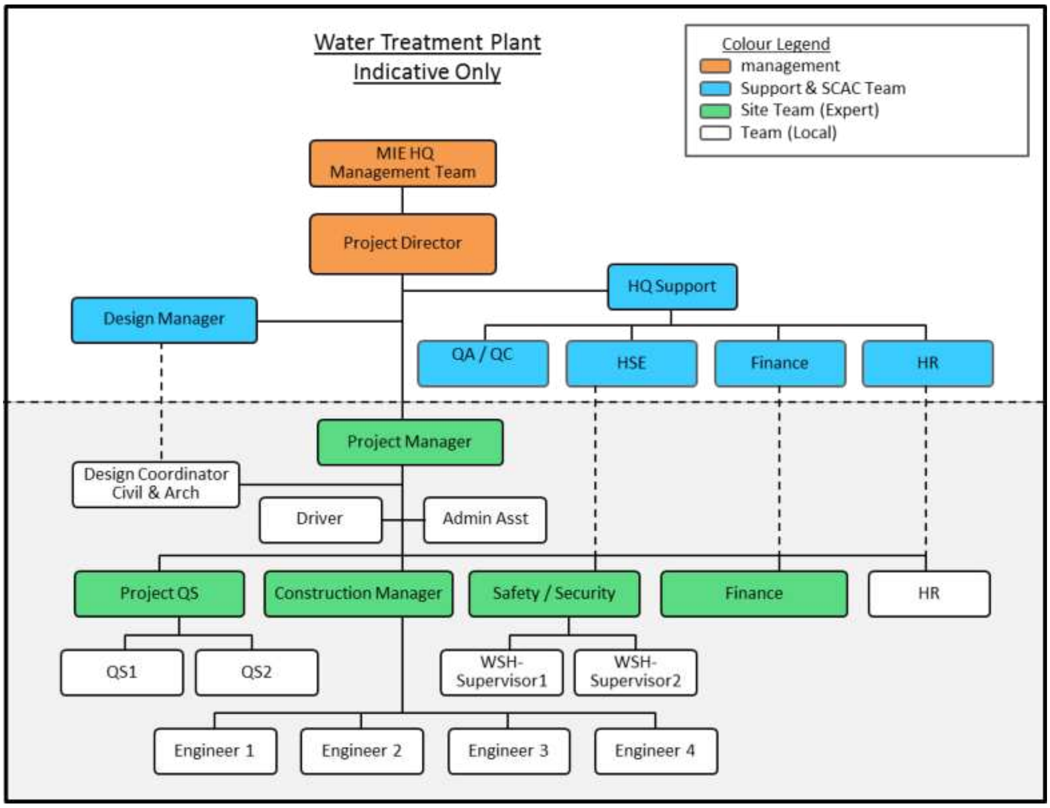
7.5 EMERGENCY PLAN

The Project Proponent is in the process of developing their emergency response plan (ERP) for the Project. Once completed, the ERP will be implemented across all Project activities during construction and operation phases.

7.6 CAPACITY DEVELOPMENT AND TRAINING

It shall be noted that MIE is planning to develop in-house capacity to support the implementation of the mitigation measures and monitoring programme throughout the Project phases. The indicative organisation chart is presented in ***Figure 7.1*** below.

Figure 7.1 Indicative Organisation Chart



7.6.1 Construction Phase

Prior to commencement of major civil works at site, a suitably qualified in-house/ external expert will be appointed by the Project Proponent to develop and deliver a training programme on implementation of the EMP, monitoring and reporting will be conducted in line with the applicable reference framework for the Project. The training will include the following topics:

- Environment, Health and Safety Policy of the EPC contractor;
- Environment and fundamentals of environmental pollution in relation to the Project;
- EHS management plans prepared by the EPC Contractor;
- Do's and Don'ts for the construction workers;
- Safety procedures and guidelines;
- Internal reporting and response system;

- Hazardous chemicals and waste handling;

In addition, specific training will be provided to the team involved in environmental and social monitoring and reporting, which will include:

- Applicable environmental and social guidelines and standards;
- Sampling site selection guidelines in line with environmental monitoring plan;
- Sample collection, storage, transportation and analysis procedures;
- Solid and hazardous waste management;
- Quality assurance and quality control;
- Environmental monitoring report preparation

The training will help in capacity building and implementation of the EMP during the construction phase of the Project. It will also help in ensuring internal and external monitoring and verification of the environmental and social performance of the Project. The timeframe for reporting and verification during the construction phase will be agreed between the Project Proponent and the relevant authorities.

7.6.2 Operation Phase

Prior to the commencement of the Plant operation, a suitably qualified in-house/ external environmental expert will be engaged by the Project Proponent to develop and deliver a training program on operation phase for environmental and social monitoring and reporting. The topics will be mostly same as that during the construction phase. However, it will also include the following modules, which are specific to the operation phase:

- Hazardous chemicals and waste management;
- Occupational health and safety programs;

The training will help in capacity building and implementation of the EMP during the operation phase of the Project. It will also help in ensuring internal and external monitoring and verification of the environmental and social performance of the Project. The timeframe for reporting and verification during the operation phase will be agreed between the Project Proponent and the relevant authorities.

7.7 PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

Impacts and issues identified from concerns raised during public consultation have been considered during the preparation of the EMP, and incorporated into mitigation measures as appropriate (***Table 7.3***).

Table 7.3 Additional Mitigation Measures Determined from Concerns and Recommendations from the Public Consultation Meeting

Concerns and Recommendations	Relevant Mitigation Measures
Most of the villages indicated that they would like to benefit from the employment opportunities that will be created by the Project	• Develop and implement a local content plan. The plan should establish measures to facilitate local recruitment and procurement. This should include targets so that performance can be tracked and evaluated. Development of the plan should

	involve consultation with relevant stakeholders, including government authorities and local villagers;
Villagers would like to better understand how the construction of the water treatment plant may affect their plantations	• Inform local villagers in Wat Chaung Village and Khamaung Chaung Village and relevant agencies, about the Project location, and the changes in access to the site, as early as possible. Continue to engage with stakeholders throughout construction and operation of the Project; and • Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.
There is concern that use of water from the reservoir will create shortages around the Project site, including shortages for nearby villages	• Manage the Project's water use so that there is sufficient flow in the river to maintain existing/ current village uses as well as biodiversity values; and • Continue to engage with Project stakeholders throughout construction and operation of the Project. Provide a grievance mechanism for stakeholders to help identify and manage issues and concerns early.

Details on public consultation and disclosure activities carried out for the Project, as well as ongoing and planned future consultation activities, are provided in ***Chapter8***.

8 STAKEHOLDER ENGAGEMENT

This Chapter describes the stakeholder engagement activities undertaken during the development of the IEE. These include key issues raised by stakeholders and how each of these issues has been addressed in the IEE.

8.1 INTRODUCTION

ERM is committed to undertaking a process that delivers an inclusive and continuous dialogue with the Project stakeholders. This includes:

- Providing relevant information to stakeholders in a timely manner;
- Facilitating two-way discussions to cover stakeholder issues and priorities as well as concerns and needs of the Project;
- Ensuring engagement is in a language and format that is understandable and accessible to local stakeholders, including vulnerable groups, and is culturally appropriate;
- Feeding stakeholder issues, concerns and priorities into Project decision-making processes, and demonstrating how decisions may have changed as a result; and
- Providing a mechanism for grievances to be raised and resolved.

It should be noted that the Project stakeholders have been engaged previously by the Project Proponent as part of the broader DSEZ development.

8.2 STAKEHOLDER IDENTIFICATION

The first step in establishing a dialogue is identifying the Project stakeholders. Stakeholders are persons or groups who are directly or indirectly affected by a project, and those who may have interests in and/ or the ability to influence a project's outcomes (either positively or negatively).

By identifying the Project stakeholders early, ERM was able to tailor the engagement approach to meet the needs and expectations of the stakeholders – e.g. address the issues of most concern to stakeholders during meetings.

A range of stakeholders were identified that may be impacted by the Project or have an interest in or ability to influence the outcome of the Project. ***Table 8.1*** provides the list of Project stakeholders that were identified during the mapping exercise. This includes villagers located in close proximity to the Project site and/ or its associated facilities.

Table 8.1 *List of Project Stakeholders*

Stakeholder group	Stakeholder*
Union government	Chairman of Dawei Special Economic Zone Management Committee Secretary of Chairman of Dawei Special Economic Zone Management Committee Deputy Director of the Environmental Conservation Department (ECD), Ministry of Environmental Conservation and Forestry (MOECAF)
Region government (Tanintharyi)	Chief Minister
District government (Dawei)	Provincial Governor
Township government (Yebyu)	Head of Township Administration General Administration Department (GAD) Department of Livestock Breeding and Veterinary Department of Rural Development Affairs Department of Agriculture Department of Irrigation Department Chairman of Township Development Supporting Committee Administrative Officer (Ya Laing, Pu Gaw Zun) Captain of Chemistry
Villages and potentially affected persons	Village Tract Leaders Villagers from Wat Chaung Village and Khamaung Chaung Village (i.e. the local villages) Healthcare workers that service the local villages Community based organisations Vulnerable groups (e.g. landless, poor, female headed households) within the local villages Non-governmental organisations (i.e. Dawei Research Association (DRA)) Local media

*Note: No indigenous groups were identified as being located within the Project area. This was confirmed during a site visit through discussions with stakeholders.

8.3 SUMMARY OF STAKEHOLDER ENGAGEMENT ACTIVITIES

Project stakeholders have been engaged at a number of locations during development of the IEE. The focus of the engagement activities has been to:

- Introduce the Project and provide ongoing updates as the design of the Project is further refined;
- Provide an overview of the likely impacts and proposed management measures;
- Gather stakeholder insights and input, including feedback on the identified impacts and proposed management measures; and
- Respond to key issues raised by stakeholders.

Table 8.2 provides an overview of the stakeholder engagement activities that have been undertaken as part of the IEE, including pre-engagement meetings with representatives from government, NGOs, and village leaders, as well as public meetings in Wat Chaung Village and Khamaung Chaung Village. In terms of the public meetings, a total of 20 people attended from Yebyu Township, 48 people from Khamaung Chaung Village and 38 people from Wat Chaung Village.

Table 8.2 Summary of Engagement Activities

Method of engagement	Purpose	Stakeholders	Date
Notification Letter	• Disclose Project information, including the current status of the Project and associated studies	Chairman of Dawei Special Economic Zone Management Committee	15 February 2016
		Chief minister of region government (Tanintharyi)	15 February 2016
Notification Letter and Pre-engagement meeting	• Disclose Project information, including the current status of the Project and associated studies • Provide an overview of the proposed Project consultation process • Gather stakeholder feedback	Secretary of Dawei Special Economic Zone Management Committee	25 February 2016
		Deputy Director of ECD, MOECAF	25 February 2016
		Provincial Governor, Dawei District	25 February 2016
		Founder and Chairman of DRA	25 February 2016
		Township Administrator, Yebyu Township	26 February 2016
		Head of Khamaung Chaung Village	25 February 2016
		Head of Wat Chaung Village	26 February 2016
Public meeting	• Disclose Project information • Present the outcomes of the impact assessment process, including management measures • Respond to key issues raised in pre-engagement meetings • Gather stakeholder feedback	Yebyu Township General Administration Department	16 March 2016
		Khamaung Chaung Villagers	16 March 2016
		Wat Chaung Villagers	17 March 2016

In addition to the activities described in ***Table 8.2*** key informant interviews, focus group discussions and a household survey were undertaken to collect primary data for the social and cultural heritage baselines (***Chapter 5***). As part of the data collection process, stakeholders were asked about their views and concerns relating to the Project. This information has been analysed and fed into development of the IEE.

8.3.1 Engagement materials

In preparing for the engagement activities, consideration was given to the following:

- Local community sensitivities and structures to ensure that the engagement approach aligns with cultural norms;
- Community representation. When inviting village members to meetings, consideration was given ensuring that a cross section of the village was represented, including women and other vulnerable groups;
- Potential language barriers. Engagement activities were conducted in Myanmar (i.e. the local language); and

- Literacy rates. Literacy rates vary by village, as a result, where possible consultation was conducted using face-to-face communication.

To help guide the engagement process, and ensure a consistent message was being delivered, a presentation was prepared in advance of each engagement activity. The presentations were initially prepared in English and then translated to Myanmar for the local audience. Copies of the presentations can be found in ***Annex D***. Photos from the engagement meetings can be found in ***Annex E***.

8.4 SUMMARY OF KEY STAKEHOLDER FEEDBACK

Stakeholders were encouraged to ask questions and raise concerns throughout the engagement process. For those stakeholders not comfortable speaking up or who identified concerns after the stakeholder meetings, alternative methods for raising issues were provided. This included:

- A questionnaire. Immediately following the meetings in March 2016, a questionnaire was distributed to attendees. The purpose was to elicit feedback, specifically on the predicted impacts, proposed management measures, and preferences regarding future engagement. A copy of the questionnaire and the results are contained in ***Annex F***; and
- Local contact details. A local telephone number was provided on which a representative from the Project Proponent could be reached. However, given previous engagement activities in the area, MIE, as the Concessionaire, has an established relationship with local stakeholders, and local stakeholders are aware of how to contact MIE if they have concerns.

A range of issues and concerns were raised by stakeholders, which are summarised in ***Table 8.3***. ***Table 8.3*** also indicates where in the IEE the issues identified have been addressed. The issues and concerns captured during the stakeholder engagement activities have been incorporated into development of the IEE. The information has been used to inform the impact identification and assessment process as well as the identification of management measures and monitoring activities.

Table 8.3 Summary of Stakeholder Feedback

Date	Issues Raised	Stakeholders	Response Provided	Chapter
February 2016	Employment: The Project will generate employment and economic opportunities. Stakeholders were interested in access to these opportunities.	Provincial Governor of Dawei District	There will be some job opportunities available but this will depend on the skills required by the Project and skills available in the local villages.	6.9.2
	Solid waste: There is concern that the Project will generate solid waste during construction and operation that will be disposed within the local area as no landfill exists in the local area.	Secretary of Dawei Special Economic Zone Management Committee	Construction waste will be collected and transported to a landfill within the DSEZ. During the operation phase, waste will continue to be collected and transported a landfill area in the DSEZ. There are plans to construct a landfill within the DSEZ to manage DSEZ waste (and minimise any impact on local infrastructure).	6.8
	Water use: There is concern that taking water from the reservoir will create a shortage for nearby villages.	Dawei Research Association (DRA)	The Pa Yain Byu reservoir contains enough water for the first phases of the WTP. If and when the industrial estate develops as planned, and additional water is needed, the water could be taken from Ta Laing Gya.	6.9.3
	Infrastructure: There is concern that the Project will include the construction of a dam.	Dawei Research Association (DRA)	If and when the industrial estate develops as planned and additional water is needed, water could be taken from Ta Laing Gya and a weir might be necessary.	4.6
	Displacement/ resettlement: Villagers would like to better understand how construction of the Project may affect their plantations.	Township Administrator, Yebyu Township	It is not expected that there will need to be further resettlement/ compensation for the first phases of the Project. If there is any economic displacement due to the Project, compensation will be calculated and discussed by the DSEZ Compensation Committee.	6.9
March 2016	Water use: There is concern that use of water from the reservoir will create shortages for nearby villages.	Wat Chaung Villagers	The Pa Yain Byu reservoir contains enough water for the first phases of the water treatment plant. If and when the industrial estate develops as planned, and additional water is needed, the water could be taken from Ta Laing Gya. The studies indicate that there will be sufficient flow to meet current needs - both community and biodiversity needs.	6.9.3
	Displacement/ resettlement: Villagers would like to better understand how construction of the WTP may affect their plantations.	Secretary of Dawei Special Economic Zone Management Committee, Yebyu Township GAD	It is not expected that there will need to be further resettlement/ compensation for the first phases of the Project. If there is any economic displacement due to the Project, compensation will be calculated and discussed by the DSEZ Compensation Committee.	6.9
	Employment: The Project will generate employment and economic opportunities. Stakeholders were interested in accessing these opportunities.	Department of Labor Yebyu Township General Administration Department, Khamaung Chaung Village, and Wat Chaung Village	There will be some job opportunities available but this will depend on the skills required by the Project and the skills available in the local villages.	6.9.2

Date	Issues Raised	Stakeholders	Response Provided	Chapter
	Management: There were inquiries about management of impacts – e.g. who is responsible for handling negative impacts?	Wat Chaung Village	The mitigation measures will be monitored by a third party as well as relevant Government authorities (e.g. Dawei SEZ Management Committee and MOECAF) in order to ensure that the management measures are implemented effectively. In addition, a grievance mechanism will be available to all stakeholders. If you have an issue or concern, there will be an opportunity to raise it with MIE through the grievance mechanism.	7.2
	Traffic: There is concern that there will be an increase in traffic movements, which presents potential health and safety risks.	Wat Chaung Village	A traffic management plan will be implemented. It will include requirements to bus workers between the camp and the site to reduce the number of vehicle movements generated by the Project.	6.10
	Displacement/ resettlement: Villagers would like to better understand how the installation of the water pipeline may affect their plantations.	Wat Chaung Village	The water pipeline will extend for 480 m – from the permanent RWPS to the WTP site. The routing is designated by MIE. The pipeline will be buried to minimise any impacts.	4.6
	Air quality: Construction activities, including transportation, may generate dust. This may occur at the Project site as well as along access roads – potentially impacting air quality.	Wat Chaung Village	A variety of techniques will be used to minimize dust during construction, including spraying of exposed areas (such as roads) and covering dusty materials and equipment.	6.2

Key issues raised by stakeholders included:

- Employment. Most of the villages indicated that they would like to benefit from the employment opportunities that will be created by the Project, more than they are already benefiting from MIE's activities in the area;
- Displacement/ resettlement: Villagers would like to better understand how the Project construction may affect their plantations; and
- Water use: There is concern that use of water from the reservoir will create shortages around the Project site, including shortages for nearby villages.

During discussions, fresh in the minds of many stakeholders was construction and operation of the Pa Yain Byu Reservoir. In particular, villagers from Wat Chaung Village, as they are located closest to the Project site, indicated that their land has been flooded as a result of the Pa Yain Byu reservoir and associated weir – and as a result their land is no longer viable during the wet season. This concern has been fed into the design of the Project - due to the water pipeline on site it is not anticipated that there will be any significant flooding and drainage management issues.

8.5 FUTURE STAKEHOLDER ENGAGEMENT ACTIVITIES

Engagement will continue to occur throughout construction and operation of the Project. It will be guided by a stakeholder engagement plan (SEP). However, it should be noted that the SEP is outside the Scope of this IEE Study. The SEP will be developed by the Project Proponent prior commencing construction activities and the objectives of the SEP are to ensure:

- Stakeholders continue to be provided relevant Project information in a timely manner;
- Stakeholders continue to have an opportunity to share their views and concerns about the Project;
- Stakeholder expectations are managed. This includes expectations associated with benefits that are likely to be generated by the Project;
- Positive working relationships are built and maintained with stakeholders over time; and
- Engagement continues to be transparent, inclusive and appropriate. This includes being accessible to vulnerable groups and involves considering issues such as language and illiteracy rates when engagement materials are developed – e.g. where possible include visual examples as well as text.

The SEP will include:

- An engagement action plan (***Section 8.5.1***);
- Indicators against which the SEP can be monitored and evaluated over time;
- A stakeholder database to track engagement activities; and
- A grievance mechanism to receive and respond to concerns raised by stakeholders (***Section 8.5.3***).

8.5.1 Action Plan

The SEP will include an action plan that sets out the engagement activities that will be undertaken during construction. The action plan will be revisited prior to the end of construction so that an action plan can be designed specific to the operation phase.

An initial action plan is provided in ***Table 8.4.*** The focus will be on:

- Ensuring stakeholders are kept up to date on progress of the Project;
- Gaining input during the development and implementation of key management plans, including the traffic management plan, and the community health management plan; and
- Managing stakeholder expectations, particularly regarding the benefits that will be generated by the Project. This includes direct benefits (e.g. employment).

As part of the action plan, engagement on key issues (e.g. employment opportunities) will need to continue. In addition, the action plan should consider opportunities to engage interested stakeholders in monitoring activities (e.g. dust emissions), which may occur during construction and operation.

Table 8.4 Stakeholder Action Plan for Construction

Stakeholder group	Actions	Timing
Union government	Progress updates via email or telephone	Bi-monthly*
	Progress updates via a face-to-face meeting	Quarterly
Region government	Progress updates via email or telephone	Monthly
	Progress updates via a face-to-face meeting	Quarterly
Township government	Progress updates via email or telephone	Monthly
	Progress updates via a face-to-face meeting	Quarterly
	Seek input on relevant management plans	As required
	Notification in advance of transportation of heavy machinery	As required
Villagers	Progress updates via information distributed to the village tract leaders	Monthly
	Seek input on relevant management plans	As required
	Notification in advance of undertaking noisy activities (e.g. pile driving)	As required
	Notification in advance of transportation of heavy machinery	As required

* Bi-monthly means once every two months.

In terms of government, this includes: Chairman of Dawei Special Economic Zone Management Committee, Secretary of Chairman of Dawei Special Economic Zone Management Committee, Deputy Director of Environmental Conservation Department (ECD), and Yebyu GAD. In terms of villages, this includes: Khamaung Chaung Village and Wat Chaung Village.

8.5.2 *Stakeholder Database*

Implementation of the SEP will be supported by a stakeholder database. The stakeholder database will track the following information:

- The stakeholder – i.e. an organisation or individual;
- A contact person's name and position or title;
- Contact details (address, telephone, email, website);
- The main interests/issues/ concerns of the organisation as they may relate to the Project; and
- Details of engagement activities – i.e. date, location, attendees and key issues raised – and responses/actions agreed.

The database will help ensure that issues and concerns are captured and can be fed into decision-making process and that commitments that are made are met.

8.5.3 *Grievance Mechanism*

A grievance mechanism will be established as part of the SEP to ensure that grievances are promptly heard, analysed and, to the extent possible, resolved.

The aim is to resolve disagreements or stakeholder issues/ concerns before they evolve into grievances through ongoing engagement. This includes informal negotiations and discussions.

In instances, where ongoing engagement is not sufficient, and grievances arise, stakeholders will have the opportunity to lodge a grievance.

A variety of methods will be available through which stakeholders can lodge grievances. This will include:

- Face-to-face meetings with the Project nominated person;
- Written communication (e.g. email, letter) directed to the Project nominated person; and
- Telephone call placed to the Project nominated person.

It is anticipated that the Project Proponent will be the first point of contact for villagers to raise grievances (and other issues and concerns).

In all instances, grievances will be logged using the template contained in ***Annex G***. This will ensure a consistent approach is taken to collecting data (associated with the grievance). If a written grievance is received, a follow-up phone call or meeting may be required to ensure that the grievance is understood and sufficient information has been obtained from the complainant.

Grievances will be forwarded to and reviewed by the Project nominated person, who will determine if:

- The grievance is not valid (e.g. does not relate to the Project). If it is decided that a grievance is not valid, the grievance will be dismissed and advice of the decision and the reasons for dismissal will be provided to the complainant in writing (and in person if required);

- The grievance is a minor issue (e.g. a request for information or clarification). A response will be provided in writing (and in person if required); and
- The grievance is a major issue (e.g. repetitive or sensitive issue, related to compensation, group complaints). Major issues will involve investigation prior to a response being developed. The Communities Team General Manager will need to sign-off on responses for all grievances considered to be major (***Table 8.5***).

Table 8.5 ***Grievance Management Process***

Step 1.	**Receive grievance** Record the grievance in the stakeholder database.
Step 2.	**Acknowledge the grievance** Respond to the complainant indicating that the grievance will be reviewed. This should occur within 48 hours of receiving the grievance.
Step 3.	**Determine validity of the grievance** For grievances determined not to be valid provide response to the complainant. For all other grievances, undertake an investigation.
Step 4.	**Investigate the grievance** This may require a site visit – e.g. to investigate property damage – and/or an internal review – e.g. to confirm management processes are being followed as required.
Step 5.	**Respond to the stakeholder** Identify corrective actions (or steps to be taken in response to the grievance). Agree corrective actions with complainant. Confirm agreement in writing – signed by MIE and complainant. If compensation has been agreed, pay compensation.
Step 6.	**Close-out the grievance** Record final outcome in the stakeholder database and close-out grievance.

All grievances will be recorded in the stakeholder database. This will include a summary of the grievance, the resolution or agreement on proposed actions (between the Project and the complainant), and monitoring of actions taken in response to the grievance. In addition, the grievance log will be stored in the database.

A grievance management procedure will be developed that sets out the grievance management process and provides further detail on the steps involved.

All grievances will be reported monthly to the Dawei Special Economic Zone Management Committee, including those that have been deemed to be invalid. This will include an overview of the grievance and the response provided by the Project.

The grievance mechanism will address all grievances raised by stakeholders impacted or affected by the Project. A separate grievance mechanism will be developed to address internal grievances relating to employment matters.

8.5.4 Monitoring and Evaluation

A key part of the SEP will be establishing indicators against which performance can be monitored and evaluated over time. At a minimum the SEP should be reviewed at the conclusion of the construction phase and revised prior to the operation phase (and potential future expansion). The outcomes will be used to update and refine the SEP. ***Table 8.6*** provides a list of indicators for assessing performance.

Table 8.6 Draft Stakeholder Action Plan

Objective	Performance Indicators
Stakeholders are provided information about the Project in a timely manner	• Frequency in which timely and accurate Project information is distributed to stakeholders • Stakeholder feedback received regarding information dissemination • Number and type of grievances lodged by stakeholder members
Stakeholders have an opportunity to share their views and concerns	• Number and type of engagement opportunities provided • Percentage of stakeholders taking part in engagement opportunities (throughout the year) • Frequency in which stakeholders receive feedback on how their input is used • Number and type of grievances lodged by stakeholders
Positive working relationships are built and maintained over time	• Number and type of grievances lodged by stakeholders • Number of satisfactorily closed out grievances • Stakeholder willingness to engage with the Project • Percentage of stakeholders taking part in engagement efforts • Frequency in which stakeholders receive feedback on how their input has been used
Engagement continues to be transparent, inclusive and appropriate	• Frequency in which timely and accurate Project information is distributed to stakeholders • Stakeholder feedback received about the engagement activities • Representation of vulnerable groups in engagement activities • Number and type of grievances lodged by community members • Timely resolution of grievances lodged by community members • Number of satisfactorily closed out grievances

9 CONCLUSION AND RECOMMENDATIONS

This Initial Environmental Examination (IEE) report has been prepared based on the technical information provided by the Project Proponent, existing studies and reports relevant to the Project, baseline environmental monitoring and the stakeholder engagement.

Through this process an IEE has been conducted of the potential environmental and social impacts attributable the Project. Qualitative and quantitative (where possible) assessments of impacts have been presented, significance of each potential impact has been identified, and mitigation measures to minimise and reduce the impacts have been recommended. Cumulative environmental impacts have also been assessed taking into account the 9 sub-projects being developed for the Dawei Special Economic Zone (DSEZ).

The IEE of the Project ascertains that the Project is unlikely to cause any significant environmental and social impacts. Many of the impacts are localised and short-term or temporary in nature and can be readily addressed by some embedded control measures in the engineering design of the Project as well as additional mitigation measures as suggested in the Projects Environmental Management Plan (EMP).

The EMP has been prepared as part of this report to manage and mitigate such impacts, a range of measures have been developed to reduce the overall impacts to acceptable levels and as low as reasonably practicable.

The effective implementation of the EMP and adherence with the Myanmar National Environmental Quality (Emission) (NEQ) guidelines will assist in minimising the environmental and social impacts to acceptable levels.

10 REFERENCES

Adapted from http://danishwater.dk/wp-content/uploads/2013/09/Ministry-of-Agriculture-and-Irrigation-Department-of-Water-Resources-Utilization-Sustainable-Development-and-Management-of-Groundwater-in-Myanmar.pdf. Retrieved on 28 January 2015

Adshead, S. A. M, T'ang China: The Rise of the East in World History, New York, 2004.

Chesworth, Ward. Encyclopedia of Soil Science. pp. 22-24, 2001.

Climate Data Org, Climate Myingyan. Retrieved from: http://en.climate-data.org/location/318/, 2015.

Danish Water Services http://danishwater.dk/wp-content/uploads/2013/09/Ministry-of-Agriculture-and-Irrigation-Department-of-Water-Resources-Utilization-Sustainable-Development-and-Management-of-Groundwater-in-Myanmar.pdf. Retrieved on 28 January 2015.

FHWA Online: http://www.fhwa.dot.gov/environment/noise/highway/hcn03.htm

Fifth National Report to the United Nations Convention on Biological Diversity, Ministry of Environmental Convention and Forestry, 2014.

FTA Transit Noise and Vibration Impact Assessment. U.S. Department of Transportation, Federal Transit Administration, Office of Planning and Environment 1200 New Jersey Avenue, S.E. Washington, DC 20590, 2006.

Global Water Partnership on the ground: IWRM Promotion & Implementation in Myanmar, GWP strategy launch@ the World Water Day 2014 Celebration United Nations University, Tokyo Japan 21 March 2014. Presentation available in http://www.slideshare.net/fullscreen/globalwaterpartnership/gwp-on-the-ground-myanmar-case-21mar2014tokyo/3, Retrieved on 27 January 2015

Geological map based on the recently published Myanmar Geosciences Society Geological map of Myanmar (MGS, 2013) http://www.maneyonline.com/action/showImage?doi=10.1179/1743275814Y.0000000049&iName=master.img-001.jpg&w=425&h=713

MIED, Environmental and Social Impact Assessment of Dawei SEZ Initial Industrial Estate Project, United Analyst and Engineering Consultant, December 2015.

Moore, Elizabeth, 'The Sacred Geography of Dawei: Buddhism in peninsular Myanmar (Burma).' Contemporary Buddhism: An Interdisciplinary Journal, 14 (2). pp. 298-319, 2013.

Myanmar's National Environmental Quality (Emission) (NEQ) Guidelines, 2015.

N. J. Gardiner*, L. J. Robb and M. P. Searle, REVIEW - The metallogenic provinces of Myanmar, Applied Earth Science (Trans. Inst. Min. Metall. B), VOL 123 NO 1, 2014.

NOAA Screening Quick Reference Table, 1999

Osman Akan, A, Urban Stormwater Hydrology (1993). Retrieved from http://books.google.co.th/books?id=ZyJtRojkDg0C&pg=PA6&lpg=PA6&dq=design+ponds+return+period+duration+rainfall&source=web&ots=-U4jCFGjeK&sig=dLhEjM42jFuFitaIl3VXcTUSRtI&hl=en&sa=X&oi=book_result&resnum=5&ct=result

PCD ,Open Burning Control Program (2012). Retrieved from http://infofile.pcd.go.th/air/BurningRegulations6.pdf?CFID=14824663&CFTOKEN=12598037

Rainfall/Precipitation in Mergui, Tanintharyi, Myanmar. Retrieved from http://www.tanintharyi.climatemps.com/precipitation.php

Phisut Technology Co., Ltd. Initial Environmental Examination on Pa Yain Byu Reservoir for the Small Reservoir Project in Dawei District, the Republic of the Union of Myanmar, 2015.

Scoping Study for Water Treatment Plant Project, Initial Development Phase of Dawei Special Economic Zone (DSEZ), Myanmar, February 2016

Smith B. D., Hobbs L. Status of Irrawaddy dolphins Orcaella Brevirostris in the upper reaches of the Ayeyarwady River, Myanmar, The Raffles Bulletin of Zoology, Supplement No. 10, 2002.

Surface Water Quality Standards from the Notification of the National Environmental Board, No. 8, B.E. 2537 (1994), issued under the Enhancement and Conservation of National Environmental Quality Act B.E.2535 (1992) , published in the Royal Government Gazette, Vol. 111, Part 16, dated February 24, B.E.2537 (1994).

U Win Kyaw, WWD, 2014 Myanmar 19 March 2014 and http://www.a-a-r-s.org/ws-eowm/download/Plenary3/Myanmar.pdf

USEPA (1995), Compilation of Air Pollutant Emission Factors (AP-42) Volume 1: Stationary Point and Area Sources, Fifth Edition, January 1995

Web Reference 1. http://kyawlinnzaw.weebly.com/uploads/4/5/1/3/4513060/stra_correlation.pdf

Web Reference 2. http://www.fao.org/docrep/008/ae546e/ae546e04.htm

Web Reference 3. http://www.fao.org/nr/water/espim/country/myanmar/print1.stm

Web Reference 4. http://www.modins.net/myanmarinfo/state_division/taninthayi.htm

Web Reference 5. https://www.quandl.com/data/WORLDBANK/MMR_EN_ATM_CO2E_KT-Myanmar-CO2-emissions-kt, accessed 30 March 2015.

WHO, Air quality guidelines for Europe. WHO regional publications, European series No. 23. World Health Organization, 1997

WHO, Drinking Water Standard, 1993.

WRI (2015) GHG Protocol Tool for Stationary Combustion. Version 4.7, World Resource Institute.

WWF, 2016. WWF EcoRegions Southern Asia: Western Myanmar into Bangladesh. Myanmar Coastal Rain Forests (IMO132) http://www.worldwildlife.org/ecoregions/im0132

Annex A

Treated Water Standard for Use in Initial Industrial Estate

Specification	Commitment
Water Quality for Industrial Use	
pH range	5-9
Minimum Dissolved Oxygen (DO) (maximum)	2.0 milligram per litre
BOD (maximum)	4.0 milligram per litre
Total coliform bacteria (maximum)	20,000 MPN per 100 millilitre
Fecal coliform bacteria (maximum)	4,000 MPN per 100 millilitre
NO_3 (maximum)	45.0 mg/l
NH_3 (maximum)	0.5 milligram per litre
Phenols (maximum)	1.0 mg/l
Copper (Cu) (maximum)	1.0 mg/l
Nickel (Ni) (maximum)	0.1 milligram per litre
Manganese (Mn) (maximum)	1.0 milligram per litre
Zinc (Zn) (maximum)	1.5 mg/l
Cadmium (Cd) - as $CaCO_3$ less than 100 milligram per litre	0.005 milligram per litre
Cadmium (Cd) - as $CaCO_3$ over 100 milligram per litre	0.05 milligram per litre
Hexavalent Chromium (maximum)	0.05 milligram per litre
Lead (Pb) (maximum)	0.05 milligram per litre
Mercury (Total Hg) (maximum)	0.002 milligram per litre
Arsenic (As) (maximum)	0.05 mg/l
Cyanide (maximum)	0.2 mg/l
Radioactivity - Alpha (maximum)	0.1 Becquerel per litre
Radioactivity - Beta (maximum)	1.0 Becquerel per litre
Total organochlorine pesticides (maximum)	0.05 milligram per litre
DDT (maximum)	1.0 microgram per litre
Alpha - BHC (maximum)	0.02 microgram per litre
Dieldrin (maximum)	0.1 microgram per litre
Aldrin (maximum)	0.1 microgram per litre
Heptachor & Heptachloropoxide (maximum)	0.5 µg/l
Water Quality for Consumption Use	
Color	15 Pt-Co
Taste	Not undesirable
Odor	Not undesirable
Turbidity (maximum)	5 NTU
pH range	6.5 - 8.5
Total dissolved solids (maximum)	1,000 mg/l
Iron (Fe) (maximum)	0.5 mg/l
Manganese (Mn) (maximum)	0.3 mg/l
Copper (Cu) (maximum)	2.0 milligram per litre
Zinc (Zn) (maximum)	5.0 mg/l
Total hardness as $CaCO_3$ (maximum)	300 milligram per litre
Sulphate (SO4) (maximum)	250 milligram per litre
Chloride (Cl) (maximum)	250 mg/l
Fluoride (Fl) (maximum)	1.0 milligram per litre
Nitrate (NO_3) (maximum)	50 milligram per litre
Mercury (Total Hg) (maximum)	0.001 milligram per litre
Lead (Pb) (maximum)	0.05 mg/l
Arsenic (As) (maximum)	0.05 mg/l
Selenium (Se) (maximum)	0.01 milligram per litre
Chromium (maximum)	0.05 milligram per litre
Cyanide (maximum)	0.2 mg/l

Specification	Commitment
Cadmium (Cd) (maximum)	0.003 mg/l
Barium (Ba) (maximum)	1.0 mg/l
Total coliform bacteria (maximum)	< 0.01 MPN/ 100 cm^3
E. coli (maximum)	0
Staphylococcus aureus (maximum)	0
Salmonella (maximum)	0
Clostridium perfringens (maximum)	0

Annex B

Dawei WTP Physical Environmental Baseline Survey

CHAPTER I PHYSICAL ENVIRONMENT BASELINE

1.1 Outline

The summary of physical environmental survey is shown in Table 1.1-1, and sampling points for environmental survey are shown in Figure 1.1-1.

Table 1.1-1 Summary of Physical Environmental Survey

Air Quality & Meteorology	Parameter	1) Nitrogen dioxide, 2) CO, 3) particulate Matter PM10, 4) Particulate Matter PM 2.5, 5) Sulphur Dioxide, 6) Wind Speed, and 7) Wind Direction
	Period	1 point for one time within survey period (three days)
	Location	Near residential area
Noise Level	Parameter	LAeq (A-weighted loudness equivalent)
	Period	One time at 1location within two days
	Location	Near residential area
Water Quality	Parameter	1)pH, 2) Ordour, 3)Colour, 4) Temperature, 5) DO, 6) Turbidity, 7)Flow measurement, 8)Total hardness, 9)Alkalinity, 10)BOD, 11)COD, 12)TOC, 13)TSS, 14)Turbidity, 15)EC, 16) Oil & Grease, and 17)Total coliform bacteria
	Period	One time at 4 location
	Location	Reservoir, river and stream

Source: SEM Survey Team, 2016

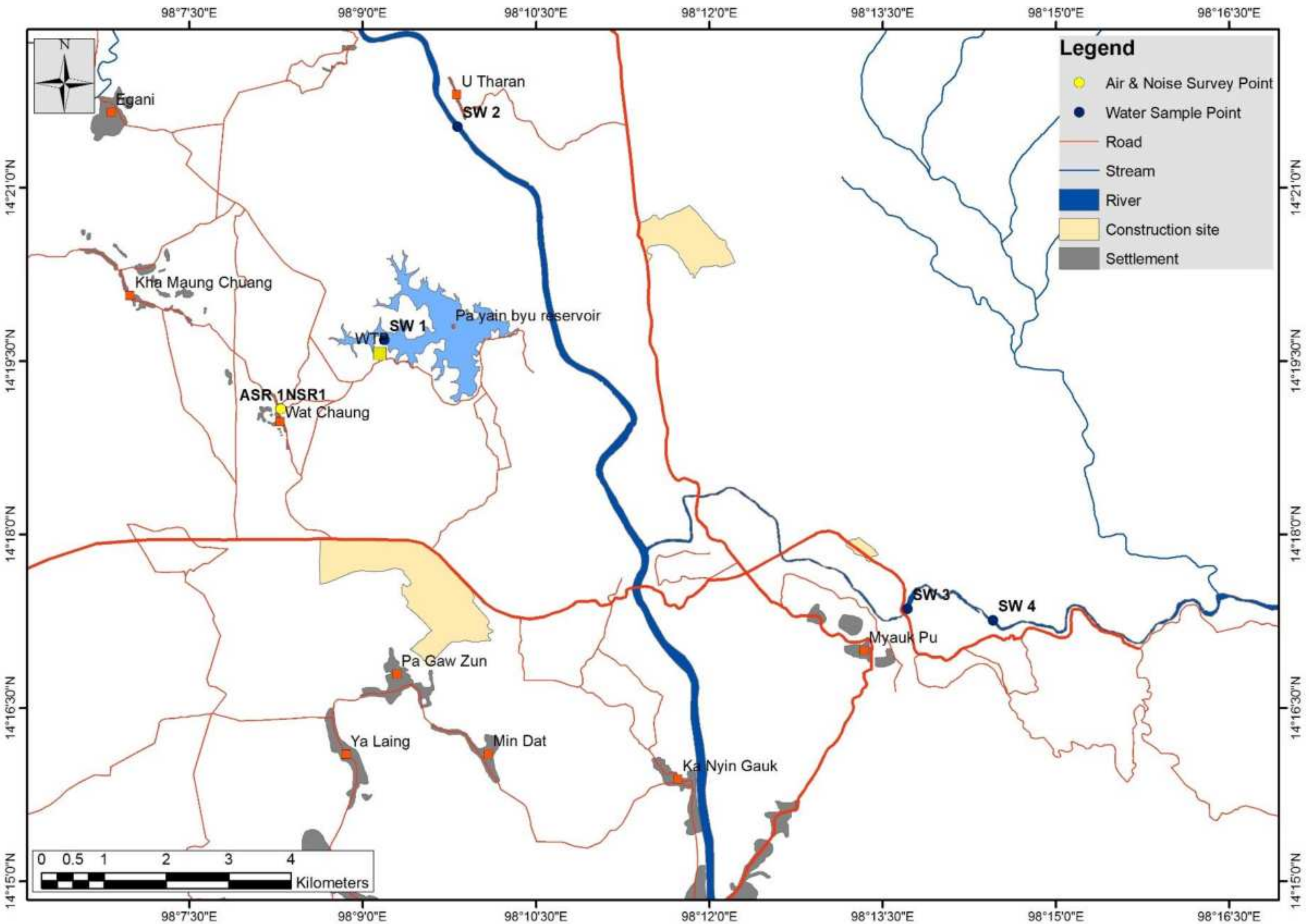


Figure 1.1-1 **Location map of water, air and noise quality survey**

1.2 Air Quality

1.2.1 Survey Item

Myanmar National Environmental Quality (Emission) Guidelines were announced on 29th December, 2015 and guideline values for air pollution level are shown in Table 1.2-1.

Table 1.2-1 Myanmar National Environmental Quality Guideline values for survey parameters of air quality

No	Parameter	Averaging Period	Guideline Value	Units
1.	Nitrogen dioxide	1-hour	200	$\mu g/m^3$
2.	CO	-	-	$\mu g/m^3$
3.	Particulate matter PM_{10} [a]	24-hours	50	$\mu g/m^3$
4.	Particulate matter $PM_{2.5}$ [b]	24-hours	25	$\mu g/m^3$
5.	Sulphur dioxide	24-hour	20	$\mu g/m^3$

Remark: [a] PM_{10} = Particulate matter 10 micrometers or less in diameter
[b] $PM_{2.5}$ = Particulate matter 2.5 micrometers or less in diameter

1.2.2 Survey Location

The location of air quality monitoring survey in detail is shown in Figure 1.2-1. The detail of sampling point is described as Table 1.2-2.

Table 1.2-2 Sampling location for air quality survey

Sampling Points	Coordination	Description of Sampling Point
ASR 1	14º 19' 05.1" N 98º 08' 17.5" E	On playground, East of Wat Chaung Village, Yebyu Township, Tanintharyi Region

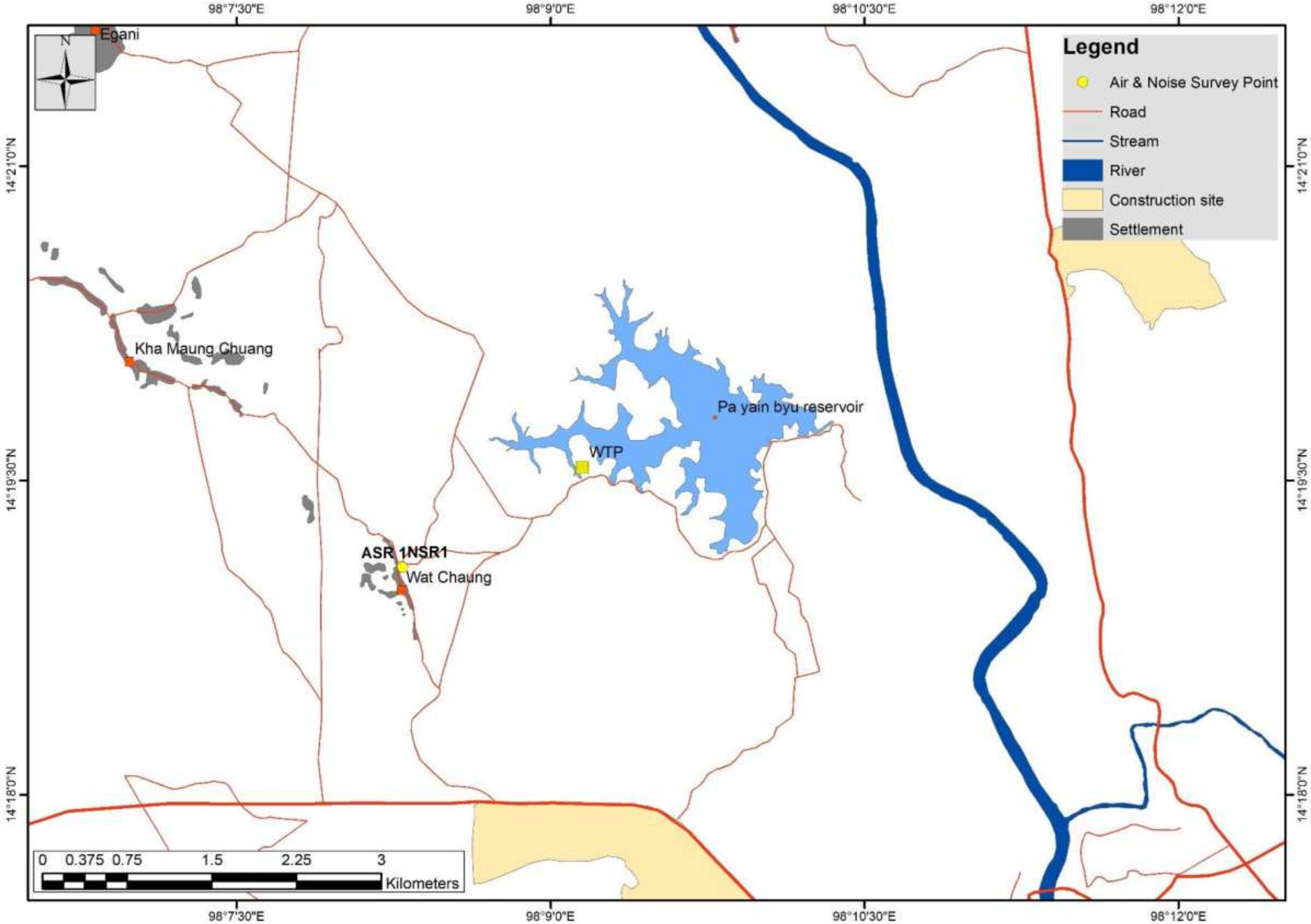


Figure 1.2-1 Location map of air and noise quality survey

ASR 1

ASR 1 was surveyed on the playground at east of Wat Chaung Village, which is generally elongated from north to south, Yebyu Township, Tanintharyi Region. The location is generally flat terrain covered with oil palm plantation in the east and village in the west of the monitoring location. The possible emitted pollution source might be come from village. The location of ASR 1 is shown in Figure 1.2-2.

Figure 1.2-2 Air quality monitoring survey at ASR 1

1.2.3 Survey Period

Air quality survey was conducted for 72 hours (three days) consecutively for baseline data. The sampling duration is as shown in Table 1.2-3.

Table 1.2-3 Sampling Duration for Air Quality Survey

Point	Period
ASR 1	January 25th – 29th, 2016 (72 hours)

1.2.4 Survey Method

Methodology

Sampling and analysis of ambient air pollutants were conducted by referring to the recommendation of United States Environmental Protection Agency (U.S. EPA). The Haz-Scanner EPAS Wireless Environmental Perimeter Air Station was used to collect Ambient Air Monitoring data.

Table 1.2-4 Sampling and Analysis Method for Air Quality

No.	Parameter	Analysis Method
1	Nitrogen dioxide (NO2)	On site reading
2	Carbon monoxide (CO)	On site reading
3	Particulate matter 10 (PM10)	On site reading
4	Particulate matter 2.5 (PM2.5)	On site reading

5	Sulphur dioxide (SO2)	On site reading
6	Wind Speed	On site reading
7	Wind Direction	On site reading

1.2.5 Survey Result

Nitrogen dioxide (NO_2)

Ambient NO_2 level was presented in Table 1.2-5. The NO_2 levels found lower than the standard within three consecutive days. It indicated the area had few emission sources and it was certainly to say the measured data were ambient level in the area.

Table 1.2-5 Hourly Nitrogen Dioxide (NO_2) Level

Unit: µg/m3

Date/Time	**26th - 27th, Jan 2016**	**27th - 28th, Jan 2016**	**28th - 29th, Jan 2016**
10:00-11:00	110.37	3.76	3.76
11:00-12:00	26.03	6.02	4.20
12:00-13:00	100.06	9.16	15.18
13:00-14:00	67.86	26.09	37.38
14:00-15:00	61.99	33.83	39.07
15:00-16:00	61.80	56.76	67.79
16:00-17:00	76.92	89.74	85.04
17:00-18:00	111.91	112.91	116.71
18:00-19:00	100.94	131.54	131.07
19:00-20:00	92.75	112.73	139.92
20:00-21:00	72.56	89.74	123.17
21:00-22:00	72.40	85.60	107.24
22:00-23:00	66.26	84.38	90.84
23:00-00:00	56.19	89.84	70.68
00:00-01:00	62.15	82.15	77.29
01:00-02:00	58.82	67.60	65.57
02:00-03:00	81.24	66.51	60.39
03:00-04:00	74.88	65.91	64.78
04:00-05:00	49.32	61.24	61.21
05:00-06:00	63.56	62.12	54.22
06:00-07:00	66.73	61.15	52.49
07:00-08:00	39.45	56.66	54.31
08:00-09:00	21.57	10.07	8.50
09:00-10:00	4.30	3.76	3.76
Guideline Value (1 hr.)	**200**	**200**	**200**

Carbon monoxide

There is no guideline value for carbon monoxide in Myanmar National Environmental Quality (Emission). Hourly ambient CO level was presented in Table 1.2-6.

Table 1.2-6 Hourly Carbon Monoxide (CO) Level

Unit: µg/m3

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
10:00-11:00	104.18	91.12	80.96
11:00-12:00	132.17	96.50	91.10
12:00-13:00	142.63	150.36	150.14
13:00-14:00	158.32	179.52	185.67
14:00-15:00	188.60	204.66	221.70
15:00-16:00	223.49	244.32	240.61
16:00-17:00	250.51	300.83	288.87
17:00-18:00	264.06	365.03	345.08
18:00-19:00	273.06	334.48	303.43
19:00-20:00	327.81	565.89	493.37
20:00-21:00	84.38	293.99	243.17
21:00-22:00	267.26	216.01	258.79
22:00-23:00	166.00	191.93	219.53
23:00-00:00	158.41	198.74	161.58
00:00-01:00	137.93	191.14	201.62
01:00-02:00	141.69	190.63	191.62
02:00-03:00	129.18	134.86	177.28
03:00-04:00	186.13	143.94	147.73
04:00-05:00	98.63	147.41	307.71
05:00-06:00	126.26	115.64	393.51
06:00-07:00	219.11	134.71	451.76
07:00-08:00	19.83	79.51	66.96
08:00-09:00	91.23	95.89	75.00
09:00-10:00	82.76	83.24	19.90
Guideline Value (1 hr.)	**-**	**-**	**-**

Particulate Matter 10 (PM10)

Ambient PM10 level was presented in Table 1.2-7. The particulate matter 10 found lower than the environmental guideline value (24 hr.) of Myanmar. It indicated the area has few particulate in environment.

Table 1.2-7 24 hour Particulate Matter 10 (PM 10) Level

Unit: µg/m3

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
24 hr.	30.37	36.15	39.03
Guideline Value (24 hr.)	50	50	50

Particulate Matter 2.5 (PM2.5)

Ambient PM2.5 level was presented in Table 1.2-8. The particulate matter 2.5 found lower than the environmental guideline value (24 hr.) of Myanmar. It indicated the area has few particulates in environment.

Table 1.2-8 24 hour Particulate Matter 2.5 (PM 2.5) Level

Unit: µg/m3

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
24 hr.	7.64	10.57	10.34
Guideline Value (24 hr.)	25	25	25

Sulphur dioxide

Ambient SO_2 level was presented in Table 1.2-9. The SO_2 levels were lower than the environmental standard (24 hr.). It indicated the area had few emission sources and it was certainly to say the measured data were baseline level in the area.

Table 1.2-9 Sulphur Dioxide Level

Unit: µg/m3

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
24 hr.	4.45	6.87	17.55
Guideline Value (24 hr.)	20	20	20

Wind Speed and Wind Direction

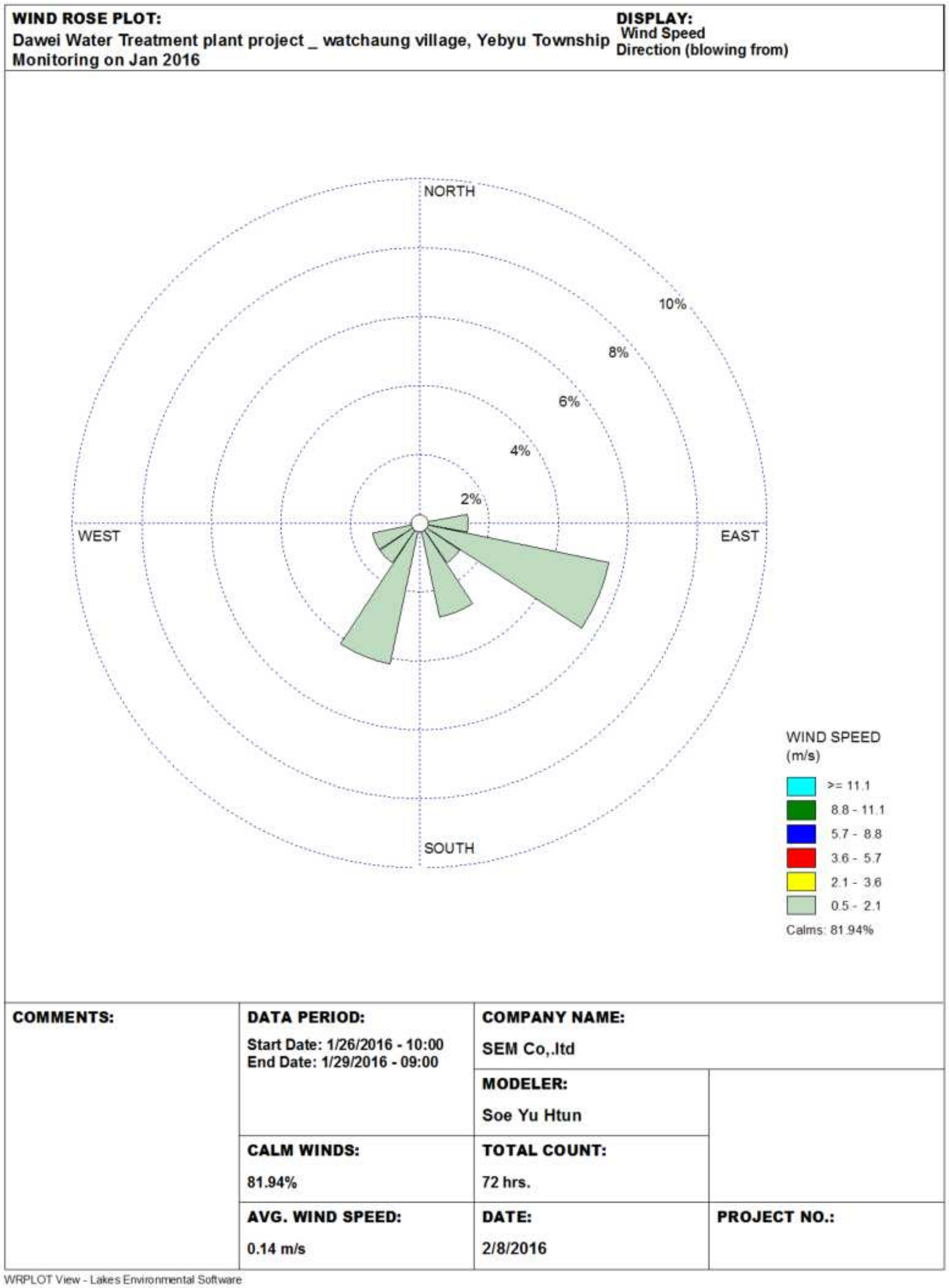


Figure 1.2-3 Wind speed and direction diagram at ASR 1

Table 1.2-10 Hourly wind direction at ASR 1

Unit: Degree

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
10:00-11:00	118.70	122.30	257.45
11:00-12:00	90.50	114.73	129.95
12:00-13:00	120.78	146.77	193.75
13:00-14:00	236.92	148.27	210.30
14:00-15:00	298.98	150.37	211.43
15:00-16:00	239.85	139.30	218.57
16:00-17:00	153.13	184.87	198.30
17:00-18:00	292.65	184.32	164.75
18:00-19:00	309.53	132.43	121.71
19:00-20:00	269.55	127.00	94.21
20:00-21:00	313.72	52.15	98.28
21:00-22:00	309.70	22.82	257.22
22:00-23:00	232.30	19.77	331.05
23:00-00:00	212.20	13.05	331.00
00:00-01:00	219.63	108.25	331.93
01:00-02:00	186.08	272.00	332.00
02:00-03:00	178.35	267.22	332.00
03:00-04:00	122.45	269.30	332.00
04:00-05:00	141.50	281.00	332.22
05:00-06:00	268.55	281.00	330.15
06:00-07:00	160.72	280.35	330.00
07:00-08:00	285.75	278.83	311.57
08:00-09:00	170.63	293.53	208.28
09:00-10:00	110.22	278.97	154.95

Table 1.2-11 Hourly wind speed at ASR 1

Unit: kph

Date/Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016	28th - 29th, Jan 2016
10:00-11:00	2.88	2.27	0.96
11:00-12:00	5.92	3.03	1.97
12:00-13:00	3.14	1.88	1.21
13:00-14:00	1.81	1.57	2.97
14:00-15:00	1.55	2.22	2.98
15:00-16:00	0.42	0.93	2.83
16:00-17:00	0.64	0.62	2.35
17:00-18:00	0.01	0.02	0.19
18:00-19:00	0.00	0.00	0.00
19:00-20:00	0.00	0.00	0.00
20:00-21:00	0.00	0.00	0.00
21:00-22:00	0.04	0.00	0.00
22:00-23:00	0.00	0.00	0.00
23:00-00:00	0.00	0.00	0.00
00:00-01:00	0.00	0.00	0.00
01:00-02:00	0.01	0.00	0.00
02:00-03:00	0.00	0.00	0.00
03:00-04:00	0.00	0.00	0.00
04:00-05:00	0.81	0.00	0.00
05:00-06:00	0.00	0.00	0.00
06:00-07:00	0.00	0.00	0.00
07:00-08:00	0.00	0.00	0.00
08:00-09:00	0.05	0.26	0.11
09:00-10:00	0.67	0.78	0.22

1.3 Noise Level

1.3.1 Survey Item

Myanmar National Environmental Quality (Emission) Guidelines were announced on 29th December, 2015 and guideline value for noise level is as shown in Table 1.3-1.

Table 1.3-1 Guideline Value of Noise Level

Receptor	One Hour LAeq [a]		Unit
	Daytime 07:00 – 22:00 (10:00 – 22:00 for Public holidays)	Nighttime 22:00 – 07:00 (22:00 – 10:00 for Public holidays)	
Residential, Institutional, Educational	55	45	dBA

Remark: a LAeq = Equivalent continuous sound level in decibels

1.3.2 Survey Location

The location of noise quality monitoring point in detail is shown below. The detail of each sampling point is described as Table 1.3-2.

Table 1.3-2 Sampling Location for Noise Quality Survey

Sampling Points	Coordination	Description of Sampling Point
NSR 1	14º 19' 05.3" N 98º 08' 17.3" E	On the playground, Wat Chaung Village, Yebyu Township, Tanintharyi Region

NSR 1

The location of noise monitoring survey receptor was sited nearly as same as the location of air quality monitoring survey receptor, on the playground at east of Wat Chaung Village, Yebyu Township, Tanintharyi Region. The location was fared about 40 m from the settlement. The dominant noise pollution source might be come from settlement and windy condition in all the time.

Figure 1.3-1 Sound level monitoring survey at NSR 1

1.3.3 Survey Period

Noise level survey was conducted on 48 hours consecutively. The measurement duration was as shown in Table 1.3-3.

Table 1.3-3 Sampling Duration for Noise Level Survey

Point	Period
ASR1	January 25^{th} – 28^{th}, 2016 (48 hours)

1.3.4 Survey Method

Measurement of environmental sound level was conducted by referring to the recommendation of International Organization for Standardization (ISO), ISO 1996-1:2003 and ISO 1996-2:2007.
The instrumentation used for noise quality is shown in Table 1.3-4.

Table 1.3-4 Instrumentation for Noise Level Survey

Instrumentation	Description
Sound Level Meter	Sound Level Meter with SD Card, Model SL-4023SD

1.3.5 Survey Result

Noise level (LAeq) was presented in Table 1.3-5. The noise level within the 48 hours found higher than the noise quality of Myanmar National Environmental Quality (Emission) guideline as shown in Table 1.3-5.

Table 1.3-5 A-weighted loudness Equivalent (LAeq) Level

Unit: dBA

	NSR 1 26^{th} – 27^{th} 2016		NSR 1 27^{th} – 28^{th} 2016	
	Day time	Night time	Day time	Night time
	49	61	45	60
Env. Standard	55	45	55	45

Remark: Shaded area is higher than the standard.

Table1.3-6 Hourly LAeq value in noise monitoring stations

Unit: dBA

Time	26th - 27th, Jan 2016	27th - 28th, Jan 2016
06:00 - 07:00	52	58
07:00 - 08:00	43	43
08:00 - 09:00	48	48
09:00 - 10:00	38	39
10:00 - 11:00	39	39
11:00 -12:00	46	34
12:00 - 13:00	41	30
13:00 - 14:00	51	33
14:00 - 15:00	37	38
15:00 - 16:00	50	33
16:00 - 17:00	46	37
17:00 - 18:00	49	62
18:00 - 19:00	52	52
19:00 - 20:00	60	55
20:00 - 21:00	63	60
21:00 - 22:00	63	61
Day 1hr. Laeq (dBA)	**49**	**45**
22:00 - 23:00	62	61
23:00 - 24:00	62	57
00:00 - 01:00	61	55
01:00 - 02:00	60	62
02:00 - 03:00	61	63
03:00 - 04:00	60	62
04:00 - 05:00	60	61
05:00 - 06:00	59	58
Night 1hr. Laeq (dBA)	**61**	**60**

1.4 Water Quality

1.4.1 Survey Item

Parameters for water quality survey are determined so as to cover the parameters of existing environmental standards of Myanmar.

Table 1.4-1 Survey Parameters for Water Quality Survey

No.	Parameter	Unit	Myanmar Environmental Guideline Value
1	Temperature	°C	-
2	pH	-	6 – 9
3	Dissolved Oxygen	mg/l	-
4	Electrical Conductivity (EC)	µS/cm	-
5	Turbidity		-
6	Total Hardness as CaCO3	mg/l	-
7	Alkalinity	mg/l	-
8	BOD (5 days)	mg/l	50
9	COD	mg/l	250
10	TOC	mg/l	-
11	Total Suspended Solids (TSS)	mg/l	50
12	Oil & Grease	mg/l	10
13	Total Coliform Bacteria	100 ml	400
14	Colour		-

Source: General Application; Wastewater, Storm water runoff, Effluent and sanitary discharges (Myanmar National Environmental Guidelines (2015, Dec 29th))

1.4.2 Survey Locations

The locations of water samples and surveys are shown in Table 1.4-2 and Figure 1.4-1. The detail of each sampling points are described as below.

Table 1.4-2 Sampling and survey points of surface water quality survey

Category	Sampling Point	Coordinates	Description of Sampling Point
Surface Water	SW 1	14° 19' 40.9" N 98° 09’ 11.3” E	Near pump station of WTP in future at Pa yain byu reservoir, about 2.07 km northeast of Wat Chaung Village and western part of reservoir, Pu Gaw Zun Village Track, Yebyu Township, Tanintharyi Region.
Surface Water	SW 2	14° 21’ 31.7” N 98° 09’ 49.3 E	At upstream of the project site of Dawei River, near south of U Tharan Village, Yebyu Township, Tanintharyi Region.
Surface Water	SW 3	14° 17’ 21.3” N 98° 13’ 42.8” E	At Ta Laing Gya Stream (Downstream of Ta Laing Gya Weir), about 940 m northeast of Myauk Pu Village, Yebyu Township, Tanintharyi Region.
Surface Water	SW 4	14° 17’ 15.4” N 98° 14’ 27.4” E	At Ta Laing Gya Stream (Upstream of Ta Laing Gya Weir), about 2.04 km east of Myauk Pu Village, Yebyu Township, Tanintharyi Region.

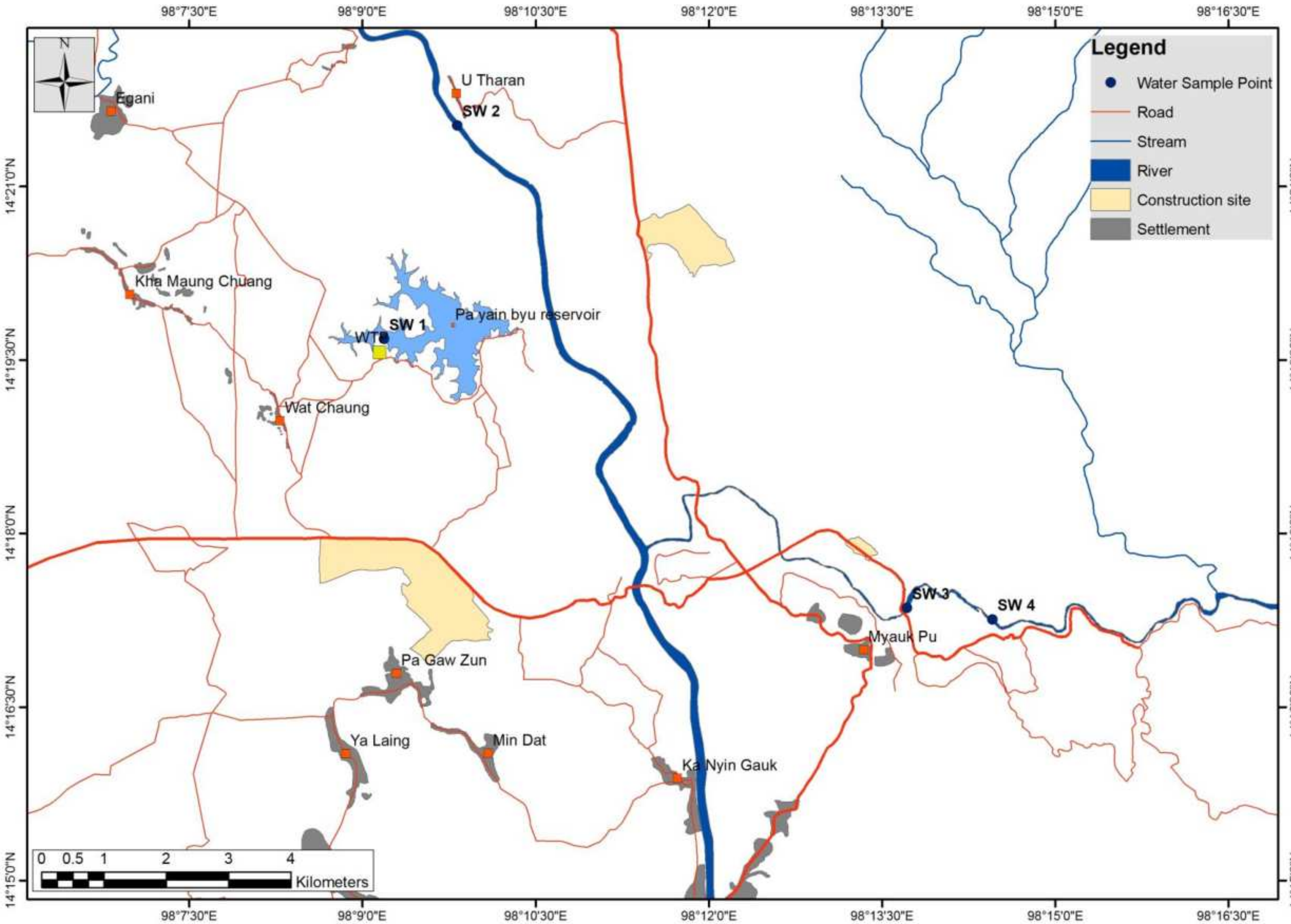


Figure 1.4-1 Location map of surface water quality survey

SW 1

SW 1 was surveyed and collected near pump station of water treatment plant (WTP) at Pa Yain Byu reservoir and it was situated about 2.07 km northeast of Wat Chaung Village, Yebyu Township, Tanintharyi Region. The survey location is generally flat terrain covering with oil palm trees on land. The reservoir is about 9.30 square kilometer in area (measured in Google Map) and the sampling point is located in the western part of the reservoir. The turbidity is slightly high. The survey activities of SW 1 is shown in Figure 1.4-2.

Figure 1.4-2 Water quality survey at SW 1

SW 2

The surface water of SW 2 was collected and measured at upstream of the project site of Dawei River and near south of U Thara Village, Yebyu Township, Tanintharyi Region. The Dawei River is generally running from north to south with the speed of 0.90 m/s at the depth of 3.0 m of river in measurement. According to the river survey, the width of river is about 85 m and the depth of river is ranged from 0.0 m to 4.0 m by the hand-held GPS and water sounder surveys respectively. The topography of river is generally flat region covering with plantation on both banks of river and the draining of river is end at the Adman Sea. Due to connecting to the sea, the tide effects the river especially in downs stream of the river. The river and water quality survey at SW 2 is shown in Figure 1.4-3.

Figure 1.4-3 Water quality survey at SW 2

SW 3

SW 3 was surveyed at Ta Laing Gya River, about 940 m northeast of Myauk Pu Village, Yebyu Township, Tanintharyi Region. The tributaries of river is begun at the Tanintharyi Range, which is running from north to south, and the river is draining from east to west till to Dawei River. The width of river is about 15.0 m ranging in depth of 0.0 m to 1.30 m at sampling point of this season. The transparency of water is fairly high though, the people nearby river utilized for some plantation and washing. The filed activities survey at SW 3 is shown in Figure 1.4-4.

Figure 1.4-4 Water quality survey at SW 3

SW 4

SW 4 was surveyed at Ta Laing Gya River, about 2.04 km east of Myauk Pu Village, Yebyu Township, Tanintharyi Region. The river at the location is draining from southeast to northwest direction with high transparency. The area on both banks of river are covered with the plantation. The water quality survey at SW 4 is as shown in Figure 1.4-5.

Figure 1.4-5 Water quality survey at SW 4

1.4.3 Survey Period

The sampling and measuring of the surface water were conducted on 28^{th} January, 2016.

1.4.4 Survey Method

Water samples were taken by Alpha horizontal water sampler and collected in plastic and sterilized glass sample containers. All sampling was in strict accordance with recognized standard procedures. The parameters as pH, temperature, dissolved oxygen (DO), electrical conductivity (EC), and total dissolved solid including the odor and color in visual analyzing were measured at each site concurrently with sample collection and. According to the Laboratory standard, some samples were preserved using the chemicals. All samples were kept in iced boxes and were transported to the laboratory within 24 hours.

Moreover, the river survey; the flow rate, width and depth of river, was also measured using Vale port Flow Meter equipment and depth sounder.

Table 1.4-3 Field Equipment for surface water quality survey

No.	Equipment	Manufacturer	Originate Country	Model/Serial No.
1	SMART TROLL@ MP _Multi parameter for water	In_Situ Inc.	USA	SN - 346054
2	Alpha Bottle (Water Sampler)	Wildlife Supply Company®	Indonesia	Wildco P/N-1120-G45
3	Vale port (Flow Meter Suspension Set)	Vale port Limited, UK	UK	Model – 001 SN-33041
4	Depth Sounder	Japan	Japan	FP211/1136160536

Table 1.4-4 Container and preservation method for water samples

No.	Parameter	Container	Sample Size (ml)	Preservation
1	pH, Total Suspended Solid, EC, Temperature	-	-	Analyzed immediately
2	Total Hardness as $CaCO_3$	Plastic bottle	100	H_2SO_4 to pH <2 and refrigerate
3	Alkalinity	Plastic bottle	200	Refrigerate
4	BOD	Plastic bottle	1000	Refrigerate
5	COD	Plastic bottle	100	H_2SO_4 to pH <2 and refrigerate
6	TOC	Glass bottle	100	H_2SO_4 to pH <2 and refrigerate
7	Turbidity	Plastic bottle	100	Refrigerate
8	Colour	Plastic bottle	500	Refrigerate
9	Oil & grease	Glass bottle	1000	H_2SO_4 to pH <2 and refrigerate
10	Total Coliform Bacteria	Sterilized Glass bottle	250	Refrigerate

The following table provides the test method for water quality.

Table 1.4-5 Analysis Method for Water Samples

No.	Item	Analysis Method
1	pH	SMART TROLL@MP _Multi parameter for water (pH sensor)
2	Dissolved oxygen (DO)	SMART TROLL@MP _Multi parameter for water (DO sensor)
3	EC	SMART TROLL@MP _Multi parameter for water (EC/TDS sensor)
4	Total Dissolve Solid	SMART TROLL@MP _Multi parameter for water (EC/TDS sensor)

1.4.5 Survey Result

Laboratories

Water samples were sent to the STS Green Laboratory in Thailand.

Water quality results are shown in following Table.

Table 1.4-6 In-Situ Measurement and laboratory analysis of Surface Water Quality

No.	Item/Sample Name	Unit	SW 1	SW 2	SW 3	SW 4
1	**Date /Time**	-	28.01.2016 07:00 am	28.01.2016 8:20 am	28.01.2016 10:00 am	28.01.2016 10:45 am
2	**Weather**	-	Slightly sunny	Sunny	Sunny	Sunny
3	**Transparency**	-	High	Low	High	High
4	**Ordour**	-	No	No	No	No
5	**Colour (Visual)**	-	Light	Buff (Sand)	Colourless	Colourless
6	**Flow rate/velocity**	m/s	-	0.90	-	-
7	**Water Depth**	m	0.30	3.30	0.30	0.30
8	**Temperature (water)**	°C	25.80	27.24	25.66	26.97
9	**pH**	-	6.56	6.10	6.65	6.52
10	**DO**	mg/l	6.80	8.50	8.90	8.50
11	**EC**	µs/cm	10.10	49.90	20.30	20.40
12	**TDS**	ppm	6.43	31.13	13.04	13.00

STS GREEN

STS GREEN CO., LTD.

3/23 Moo 5, Lat Sawai, Lam Luk Ka, Pathum Thani 12150, Thailand
Tel: +66 2153 7001-6 Fax: +66 2153 7007
E-mail: green@sts.co.th http://www.sts.co.th

TEST REPORT

Client	:	ERM Siam Co., Ltd.
Address	:	179 Bangkok City Tower, 24th Floor, South Sathorn Road, Tungmahamek, Sathorn, Bangkok, 10120
Project Name	:	DSEZ, WTP
Sample Type	:	Surface water
Sampling By	:	ERM Siam Co., Ltd.
Sampling Date	:	January 28, 2016
Work Request No.	:	061/16
Sample Received Date	:	January 28, 2016
Report No.	:	062/16
Reported Date	:	February 5, 2016

ID.No.	Sample Name	Parameters	Analytical Methods	Analytical Date	Results	Units	Sample Description
280116/19	**SW1**						
		pH	Electrometric Method (4500-H^+ B)	January 28, 2016	5.3	-	Yellow, Turbid
		Conductivity	Electrical Conductivity Method (2510 B)	January 29, 2016	14.5	µS/cm	Yellow, Turbid
		Turbidity	Nephelometric Method (2130 B)	January 29, 2016	9.91	NTU	Yellow, Turbid
		Alkalinity	Titration Method (2320 B)	February 2, 2016	3.6	mg/L as $CaCO_3$	Yellow, Turbid
		Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method (5210 B)	January 29- February 3, 2016	6.4	mg/L	Yellow, Turbid
		Chemical Oxygen Demand	Open Reflux Method (5220 B)	January 28, 2016	30.0	mg/L	Yellow, Turbid
		Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method (5520 B)	February 2, 2016	10.4	mg/L	Yellow, Turbid
		Total Hardness	EDTA Titrimetric Method (2340 C)	January 29, 2016	7.5	mg/L as $CaCO_3$	Yellow, Turbid
		Total Suspended Solids	Dried at 103-105 °C Method (2540 D)	February 3, 2016	6.0	mg/L	Yellow, Turbid
		Total Coliform Bacteria	Multiple-Tube Fermentation Technique Method (9221 B)	January 28-31, 2016	230	MPN/100 mL	Yellow, Turbid

Method : Standard Methods for Examination of Water and Wastewater 22nd Edition 2012 (AWWA, APHA, WEF)

Remarks : Reported results refer to submitted samples only. This analytical report will not be reproduced in part for such purposes.

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Chemist

February 5, 2016

Kasidit Y

(Mr. Kasidit Yasongkram)

Laboratory Supervisor

February 5, 2016

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TEST REPORT

Client	:	ERM Siam Co., Ltd.
Address	:	179 Bangkok City Tower, 24th Floor, South Sathorn Road, Tungmahamek, Sathorn, Bangkok, 10120
Project Name	:	DSEZ, WTP
Sample Type	:	Surface water
Sampling By	:	ERM Siam Co., Ltd.
Work Request No.	:	061/16
Report No.	:	062/16

Sampling Date	:	January 28, 2016
Sample Received Date	:	January 28, 2016
Reported Date	:	February 5, 2016

ID.No.	Sample Name	Parameters	Analytical Methods	Analytical Date	Results	Units	Sample Description
280116/20	SW2						
		pH	Electrometric Method (4500-H^+ B)	January 28, 2016	6.3	-	Brown, Turbid
		Conductivity	Electrical Conductivity Method (2510 B)	January 29, 2016	54.6	µS/cm	Brown, Turbid
		Turbidity	Nephelometric Method (2130 B)	January 29, 2016	3,967	NTU	Brown, Turbid
		Alkalinity	Titration Method (2320 B)	February 2, 2016	30.3	mg/L as $CaCO_3$	Brown, Turbid
		Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method (5210 B)	January 29-February 3, 2016	4.4	mg/L	Brown, Turbid
		Chemical Oxygen Demand	Open Reflux Method (5220 B)	January 28, 2016	11.0	mg/L	Brown, Turbid
		Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method (5520 B)	February 2, 2016	10.1	mg/L	Brown, Turbid
		Total Hardness	EDTA Titrimetric Method (2340 C)	January 29, 2016	90.2	mg/L as $CaCO_3$	Brown, Turbid
		Total Suspended Solids	Dried at 103-105 °C Method (2540 D)	February 3, 2016	4,105	mg/L	Brown, Turbid
		Total Coliform Bacteria	Multiple-Tube Fermentation Technique Method (9221 B)	January 28-31, 2016	2,400	MPN/100 mL	Brown, Turbid

Method : Standard Methods for Examination of Water and Wastewater 22nd Edition 2012 (AWWA, APHA, WEF)

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TEST REPORT

Client	: ERM Siam Co., Ltd.			
Address	: 179 Bangkok City Tower, 24th Floor, South Sathorn Road, Tungmahamek, Sathorn, Bangkok, 10120			
Project Name	: DSEZ, WTP			
Sample Type	: Surface water			
Sampling By	: ERM Siam Co., Ltd.	**Sampling Date**	:	January 28, 2016
Work Request No.	: 061/16	**Sample Received Date**	:	January 28, 2016
Report No.	: 062/16	**Reported Date**	:	February 5, 2016

ID.No.	Sample Name	Parameters	Analytical Methods	Analytical Date	Results	Units	Sample Description
280116/21	SW3						
		pH	Electrometric Method (4500-H^+ B)	January 28, 2016	6.2	-	Turbid, Sediment
		Conductivity	Electrical Conductivity Method (2510 B)	January 29, 2016	22.7	µS/cm	Turbid, Sediment
		Turbidity	Nephelometric Method (2130 B)	January 29, 2016	2.83	NTU	Turbid, Sediment
		Alkalinity	Titration Method (2320 B)	February 2, 2016	6.6	mg/L as $CaCO_3$	Turbid, Sediment
		Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method (5210 B)	January 29-February 3, 2016	3.8	mg/L	Turbid, Sediment
		Chemical Oxygen Demand	Open Reflux Method (5220 B)	January 28, 2016	11.0	mg/L	Turbid, Sediment
		Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method (5520 B)	February 2, 2016	8.7	mg/L	Turbid, Sediment
		Total Hardness	EDTA Titrimetric Method (2340 C)	January 29, 2016	10.0	mg/L as $CaCO_3$	Turbid, Sediment
		Total Suspended Solids	Dried at 103-105 °C Method (2540 D)	February 3, 2016	3.7	mg/L	Turbid, Sediment
		Total Coliform Bacteria	Multiple-Tube Fermentation Technique Method (9221 B)	January 28-31, 2016	330	MPN/100 mL	Turbid, Sediment

Method : Standard Methods for Examination of Water and Wastewater 22nd Edition 2012 (AWWA, APHA, WEF)

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TEST REPORT

Client	:	ERM Siam Co., Ltd.
Address	:	179 Bangkok City Tower, 24th Floor, South Sathorn Road, Tungmahamek, Sathorn, Bangkok, 10120
Project Name	:	DSEZ, WTP
Sample Type	:	Surface water
Sampling By	:	ERM Siam Co., Ltd.
Work Request No.	:	061/16
Report No.	:	062/16
Sampling Date	:	January 28, 2016
Sample Received Date	:	January 28, 2016
Reported Date	:	February 5, 2016

ID.No.	Sample Name	Parameters	Analytical Methods	Analytical Date	Results	Units	Sample Description
280116/22	SW4						
		pH	Electrometric Method (4500-H^+ B)	January 28, 2016	6.2	-	Turbid, Sediment
		Conductivity	Electrical Conductivity Method (2510 B)	January 29, 2016	22.7	µS/cm	Turbid, Sediment
		Turbidity	Nephelometric Method (2130 B)	January 29, 2016	3.02	NTU	Turbid, Sediment
		Alkalinity	Titration Method (2320 B)	February 2, 2016	6.7	mg/L as $CaCO_3$	Turbid, Sediment
		Biochemical Oxygen Demand	5-Day BOD Test, Azide Modification Method (5210 B)	January 29-February 3, 2016	0.1	mg/L	Turbid, Sediment
		Chemical Oxygen Demand	Open Reflux Method (5220 B)	January 28, 2016	<5.0	mg/L	Turbid, Sediment
		Oil & Grease	Liquid-Liquid, Partition-Gravimetric Method (5520 B)	February 2, 2016	5.6	mg/L	Turbid, Sediment
		Total Hardness	EDTA Titrimetric Method (2340 C)	January 29, 2016	10.3	mg/L as $CaCO_3$	Turbid, Sediment
		Total Suspended Solids	Dried at 103-105 °C Method (2540 D)	February 3, 2016	3.7	mg/L	Turbid, Sediment
		Total Coliform Bacteria	Multiple-Tube Fermentation Technique Method (9221 B)	January 28-31, 2016	490	MPN/100 mL	Turbid, Sediment

Method : Standard Methods for Examination of Water and Wastewater 22nd Edition 2012 (AWWA, APHA, WEF)

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February 5, 2016

LABORATORY ACCREDITATION
BLA-DSS

TESTING
No.0009

Analysis / Test Report

Report to : STS Green Co., Ltd.
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Project :
Location :
P/O :
Receipt No :

Lot ID: 166192
Date Received : Jan 29, 2016
Date Reported : Feb 18, 2016
Report Number : 658992-1 Rev. No.1

Reference Number	166192-1
Sampling Date	Jan 28, 2016
Project Name	DSEZ , WTP
Sample Description	SW 1
Condition of Sample	contained in one plastic bottle (client container) and three vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)
Date of Analysis	Jan 29, 2016

Analyte	Unit	LOD	LOQ	Result	Method
Water Testing					
Color *	Color unit	-	5	150	Based on APHA (2012), 2120 B
TOC *	mg/L	-	0.1	6.2	Based on APHA (2012), 5310 B

Note:
This Analysis test report is reissued to supersede report no. 658992-1, Date Reported : Feb 05, 2016

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LABORATORY ACCREDITATION
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Analysis / Test Report

TESTING
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Project :
Location :
P/O :
Receipt No :

Lot ID: 166192
Date Received : Jan 29, 2016
Date Reported : Feb 18, 2016
Report Number : 658992-1 Rev. No.1

Reference Number	166192-2
Sampling Date	Jan 28, 2016
Project Name	DSEZ , WTP
Sample Description	SW 2
Condition of Sample	contained in one plastic bottle (client container) and three vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)
Date of Analysis	Jan 29, 2016

Analyte	Unit	LOD	LOQ	Result	Method
Water Testing					
Color *	Color unit	-	5	30	Based on APHA (2012), 2120 B
TOC *	mg/L	-	0.1	41.3	Based on APHA (2012), 5310 B

Note:
This Analysis test report is reissued to supersede report no. 658992-1, Date Reported : Feb 05, 2016

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Analysis / Test Report

Report to : STS Green Co., Ltd.
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Project :
Location :
P/O :
Receipt No :

Lot ID: 166192
Date Received : Jan 29, 2016
Date Reported : Feb 18, 2016
Report Number : 658992-1 Rev. No.1

Reference Number	166192-3
Sampling Date	Jan 28, 2016
Project Name	DSEZ , WTP
Sample Description	SW 3
Condition of Sample	contained in one plastic bottle (client container) and three vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)
Date of Analysis	Jan 29, 2016

Analyte	Unit	LOD	LOQ	Result	Method
Water Testing					
Color *	Color unit	-	5	15	Based on APHA (2012), 2120 B
TOC *	mg/L	-	0.1	0.7	Based on APHA (2012), 5310 B

Note:
This Analysis test report is reissued to supersede report no. 658992-1, Date Reported : Feb 05, 2016

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Analysis / Test Report

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Project :
Location :
P/O :
Receipt No :

Lot ID: 166192
Date Received : Jan 29, 2016
Date Reported : Feb 18, 2016
Report Number : 658992-1 Rev. No.1

Reference Number 166192-4
Sampling Date Jan 28, 2016
Project Name DSEZ , WTP
Sample Description SW 4
Condition of Sample contained in one plastic bottle (client container) and three vials, sample containers comply to pretreatment - preservation standards (APHA, USEPA)
Date of Analysis Jan 29, 2016

Analyte	Unit	LOD	LOQ	Result	Method
Water Testing					
Color *	Color unit	-	5	15	Based on APHA (2012), 2120 B
TOC *	mg/L	-	0.1	0.7	Based on APHA (2012), 5310 B

Note:
This Analysis test report is reissued to supersede report no. 658992-1, Date Reported : Feb 05, 2016

Remark :
1. LOD : Limit of Detection
2. "<" : Lower than LOQ (Limit of Quantitation)
3. Analyte(s) marked * is/are not included in scope of Accreditation.

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Annex C

Checklist of Invasive Species

Annex C List of Invasive Species

Scientific Name	Common Name	Native Range	Distribution	Impacts
Acacia longifolia	Sallow wattle	Australia	Argentina, Brazil, Colombia, Dominican Republic, India, Israel, Italy, Java, Kenya, La Réunion, Mauritius, Myanmar, New Zealand, Portugal, South Africa, Spain, Sri Lanka, USA, Uruguay	Impacts include reduction in native biodiversity, ecosystem change, habitat alteration and changes in hydrology and fire regimes (le Maitre et al. 2002; van Wilgen et al. 2004, Marchante et al. 2003)
Acacia mangium	Hickory wattle	Australia (Queensland), Molluccan Islands, Papua New Guinea, Indonesia (Irian Jaya)	Mayotte, French Guiana, New Caledonia and other Pacific islands: American Samoa, Cook Islands, Federated States of Micronesia, Guam, Palau, Samoa, Solomon Islands (PIER, 2007). China, Indonesia, Lao PDR, Malaysia, Myanmar, Thailand, the Philippines and Vietnam, Bangladesh, Brazil, Cameroon, Costa Rica, Hawaii and Nepal (Royal Botanic Gardens, Kew, 2011)	Threat to indigenous flora
Aedes aegypti	Yellow fever mosquito	Africa	American Samoa, Anguilla, Antigua & Barbuda, Argentina, Aruba, Australia, Bahamas, Barbados, Belize, Brazil, Bolivia, British Virgin Islands, Cambodia, Cayman Islands, China, Colombia, Costa Rica, Cuba, Dominica, Dominican Republic, Ecuador, El Salvador, Fiji, French Guiana, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Hawaii, Honduras, India, Indonesia, Laos, Malaysia, Martinique, Mexico, Monsterrat, Myanmar, Netherlands Antilles, New Caledonia, Nicaragua, Niue, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Puerto Rico, St. Barthelemy, St. Kitts & Nevis, St. Lucia, St. Martin, St. Vincent & the Grenadines, Samoa, Singapore, Solomon Islands, Sri Lanka, Suriname, Thailand, Timor-Leste, Trinidad & Tobago, Tokelau, Tonga, Turks & Caicos Islands, Tuvalu, United States, Uruguay, Vanuatu, Venezuela, Vietnam, Virgin Islands, Wallis & Futuna. (Gubler 1998)	A. aegypti is the domestic vector of the yellow fever virus, caused epidemics of yellow fever in the Americas (before the 1940's) and recently in West Africa, and is responsible for 'urban yellow fever' - direct transmission of the virus between humans
Alternanthera philoxeroides	Alligator weed	South America	Asia, Australasia-Pacific, Europe, North America (Coventry et al. 2002; Julien et al. 1995; USDA-NRCS, 2004)	Gunasekera (1999) states that, "Alternanthera philoxeroides is considered to be one of the worst aquatic weeds in the world. The aquatic form of the plant has the potential to become a serious

				threat to waterways, agriculture and the environment. The terrestrial form grows into a dense mat with a massive underground rhizomatous root system. The canopy can smother most other herbaceous plant species."
Brontispa longissima Gestro	Coconut hispid beetle	Melanesia (PestNet 2002), Indonesia (Aru Islands, Maluku Province, Papua Province, formerly Irian Jaya) and Papua New Guinean including the Bismarck Archipelago (Aminath 2004)	Many islands in the Pacific Ocean including Vietnam, the Maldives and the Philippines	Attacks palm leaf fronds (as the name suggests) especially those of the coconut tree
Cardamine flexuosa	Woodland bittercress	Unclear due to its widespread distribution	North America, Australia and central Asia. Asian range includes: Bangladesh, Bhutan, India, Indonesia, Japan, Kashmir, Korea, Laos, Malaysia, Myanmar, Nepal, Pakistan, Philippines, Sikkim, Thailand and Vietnam (eFlora, 2010)	Flowers vigorously and forms dense understory root mats (South Georgia Newsletter, 2004). These could potentially alter successional processes and displace native plant species. C. flexuosa is also known as a common agricultural weed in paddy fields, crop gardens and orchards (Kudoh et al., 1993).
Chromolaena odorata	Bitter bush	South America and Central America	South Africa, India, China, Indonesia, East Timor and the Philippines	Forms dense stands preventing establishment of other species, both due to competition and allelopathic effects. When dry, C. odorata becomes a fuel which may promote wild bushfires (PIER 2003). C. odorata may also cause skin complaints and asthma in allergy-prone people. It is a major weed in plantations and croplands, including plantations of rubber, oil palm, forestry and coffee plants.
Clarias gariepinus	African sharptooth catfish	Pan-Africa, Jordan, Lebanon, Israel, Syria and Turkey	Parts of Africa, Europe and Asia	Threat to endemic aquatic fish, particularly in South Africa and India
Ctenopharyng odon idella	Grass carp	China, Russian Federation	Afghanistan, Algeria, Argentina, Albania, Algeria, Armenia, Azerbaijan, Bangladesh, Belarus, Belgium, Bhutan, Bolivia, Brazil, Brunei Darsm, Cambodia, Canada, Colombia, Cote d' Ivoire, Croatia, Cuba, Cyprus, Czech Republic, Denmark, Egypt, Ethiopia, Fiji, Finland, Guyana, Hawaii,	Known to completely eliminate aquatic plants in introduced habitats altering trophic structure and inflicting widespread detrimental effects on ecosystems. They may also feed selectively on softer plants thereby enhancing development of tougher plants. Grass carp remove macrophyte

			Honduras, Hong Kong, Hungary, India, Indonesia, Iraq, Islamic Republic of Iran, Israel, Italy, Jamaica, Japan, Kazakhstan, Kenya, Democratic People's Republic of Korea, Kyrgyzstan, Laos, Latvia, Malaysia, Mauritius, Mexico, Republic of Moldova, Mongolia, Morocco, Mozambique, Myanmar, Nepal, Netherlands, New Zealand, Nigeria, Pakistan, Panama, Peru, Philippines, Puerto Rico, La Réunion, Romania, Rwanda, Serbia and Montenegro, Singapore, Slovakia, Slovenia, South Africa, Sri Lanka, Sudan, Sweden, Taiwan, Tanzania, Thailand, Tunisia, Turkey, Turkmenistan, United Kingdom, Ukraine, United Arab Emirates, Uruguay, United States, Uzbekitsan, and Vietnam (FishBase, 2008).	cover, eliminate spawning substrate, disturb sediment and muddy waters, reduce water quality, increase nutrients in waters accelerating eutrophication, decrease oxygen levels, and promote alagal bloom. They compete with native invertebrates and fish for food and other important resources.
Cyprinus carpio	Carp	Europe in rivers around the Black Sea and the Aegean basin, especially the Danube. Prior to human influence the common carp was found in the Black, Caspian and Aral Sea drainages, east into Siberia and China and west as far as the Danube River (Balon 1995, in Aguirre & Poss, 2000).	Tropical, subtropical and temperate freshwaters throughout the world and today occurs on every continent except Antarctica	On every continent where it has been introduced it has reduced water quality and degraded aquatic habitats
Eichhornia crassipes	Water hyacinth	Amazon basin and the extensive lakes and marshes of the Pantanal region of western Brazil	Near worldwide distribution throughout the tropics and has spread to more than 50 countries on five continents	One of the world's worst weeds (Holm et al. 1977, in Room and Fernando 1992). People have spread it to most tropical and subtropical regions in the world where it forms thick mats that cover rice paddies, clog irrigation channels, impede navigation, halt fishing, sweep away buildings during floods and foster breeding by disease-transmitting mosquitoes (Carter 1950, Chow et al. 1955, Williams 1956, Kotalawala 1976, in Room and Fernando 1992).

Gambusia affinis	Mosquito fish	Southern USA and northern Mexico	Near pan-global distribution and is thought to be the most widely introduced freshwater fish in the world	Extremely aggressive and attack other fish, shredding fins and sometimes killing them. Selective predation by mosquito fish has also been shown to alter zooplankton, insect and crustacean communities (McDowall, 1990). Mosquito fish are potential hosts of helminth parasites, which have been transmitted to native fishes (FishBase, 2003).
Hypophthalmichthys nobilis	Bighead carp	China and Russia	Africa, Asia, Australasia-Pacific, North America, and South America	USGS-NAS (2005) reports that, "Because bighead carp are planktivorous and attain a large size, Laird and Page (1996) suggested these carp have the potential to deplete zooplankton populations. A decline in the availability of plankton can lead to reductions in populations of native species that rely on plankton for food, including all larval fishes, some adult fishes, and native mussels." H. nobilis is also a carrier of several different fish diseases that can be spread through its escape and introduction (FIGIS, 2005).
Imperata cylindrica	Cogon grass	Southeast Asia, Australia, China, Japan, the Philippines, and East Africa	Widely distributed in Africa, Australia, southern Asia, and the Pacific Islands	Increases in I. cylindrica concern ecologists because this species displaces native plant and animal species and alters fire regimes (Lippincott 1997 2000, in Brewer & Cralle 2003). Dense swards of I. cylindrica create an intense competitive environment for commercially important species (Bryson and Carter 1993, Kuusipalo et al. 1995, Premalal et al. 1995, Dozier et al. 1998).
Leucaena leucocephala	Leucaena	Mexico and Central America	Widely introduced across the tropics in the 1970s and 1980s and is now very widely cultivated throughout the tropics and subtropics	It is a weed of open, often coastal or riverine habitats, semi-natural, and other disturbed or ruderal sites and occasionally in agricultural land. It can form dense monospecific thickets which are reported to be replacing native forest in some areas and threatening endemic species of conservation concern in some areas. Dense thickets, even if not of immediate conservation concern can render extensive areas of disturbed ground unusuable and inaccessible.
Limnocharis flava	Sawah-lettuce	America (North Western Mexico,	Southeast Asia (Malaysia, Indonesia, Thailand, South Myanmar, Srilanka, India and Vietnam), and	Very invasive environmental weed of streams and wetlands. It has become a serious weed in rice

		Nicaragua, Costa Rica, Panama, Cuba, Haiti, Dominican Republic, Windward Islands, Colombia, Venezuela, Ecuador, West Indies, Peru and Brazil)	Australia	fields, irrigation canals and wetlands in South-East Asia (Waterhouse, 2003). Clumps of the weed provide a congenial breeding sites for disease-vectors, including mosquitoes, which encourages the spread of diseases such as Japan fever and dengue fever (Abhilash, 2004).
Oreochromis aureus	Blue tilapia	Cameroon, Chad, Egypt, Israel, Jordan, Mali, Niger, Nigeria, Saudi Arabia, Senegal	Antigua and Barbados, Bahamas, Brazil, China, Coasta Rica, Cote d'Ivoire, Cuba, Cyprus, Dominica, Dominican Republic, El Slavidor, French Polynesia, Guatemala, Gulf of Mexico, Haiti, Japan, Kuwait, Mexico, Myanmar, Neth Antilles, Nicaragua, Pakistan, Panama, Peru, Philippines, Puerto Rico, Russian Federation, Singapore, South Africa, Syrian Arab Republic, Taiwan, Thailand, Turkey, Uganda, United Arab Emirates, United States, Zambia	Competes with native fishes for food, spawning area, and space, and exhibits aggressive behavior. They have become the dominant species in many of their introduced ranges. Several introductions have correlated with and are believed to cause reductions in abundance of native fishes and even molluscs. Blue tilapia structure phytoplankton communities by their feeding preference of specific algae, having significant effects on the entire community ecology. Some reports maintain certain introduced areas have lost most and nearly all native fishes (McDonald, 1987; GSMFC, 2003; FishBase, 2007; Nico, 2007).
Oreochromis spp.	Tilapia	Africa and the Middle East	Introduced to the Far East in the 1940s for farming purposes. It was quickly disseminated by humans throughout Central and South America	Tilapia is usually farmed using semi-intensive farming, which generally has a greater impact on the environment than either small-scale subsistence operations or large commercial operations. The preferred form of culture is cage culture, which is the most risky in terms of environmental impact as it directly interfaces with the natural environment
Paratrechina longicornis	Crazy ant	Africa and Asia	Australasia-Pacific Region, Europe, North America, and South America	Its ability to invade a varying degree of habitats makes it serious threat. It occurs in large numbers in homes or outdoors. They forage long distances away from the nest, making them hard to find and subsequently make it difficult to control.
Poecilia reticulata	Guppy	Brazil, Guyana, Venezuela, and the Caribbean Islands	Asia, Australasia-Pacific, Europe, North America, and South America	Considered a hazard to native cyprinids and killifishes in the United States. It has been implicated in the decline of native fishes in Nevada and Wyoming, and of native damselflies in Hawaii. It is a known carrier of trematode parasites, which may affect native fish populations

				(Nico, 2001).
Prosopis spp.	Mesquite	Arid and semi-arid zones of the Americas, Africa and Asia	Africa (the Sahel region, Sudan, Ethiopia, Kenya, Namibia, South Africa, Eritrea), India, Australia, St Helena (Ascension), and Brazil	A declared weed over millions of square kilometres of arid and semiarid lands, where it drastically reduces the production of forage plants, threatening the livelihoods of ranchers (Pasiecznik 2001).
Rattus exulans	Pacific rat	Southeast Asia	India, Indonesia, Japan, Malaysia, Myanmar/Burma, Philippines, Taiwan, USA, Chile, Australia, New Zealand, Papua New Guinea, American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, Marshall Islands, Federated States of Micronesia, Nauru, New Caledonia, Niue, Northern Mariana Islands, Palau, Pitcairn, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuata, Wallis and Futuna, and US minor outlying islands. It has dispersed with humans across the western and central Pacific. They occur from the Asiatic mainland south to New Guinea and New Zealand, and east to the Hawai'ian Islands and Easter Island	Major agricultural pest and threat to flora and fauna
Solenopsis geminata	Fire ant	Present continuously from southeast USA to northern South America	Almost world-wide	Disrupt native communities and impose competitive pressure on native ants. Can have a large effect on vulnerable ecosystems
Tapinoma melanocephal um	Black-headed ant	It has not been established if this species is of African or Oriental origin	Australasia-Pacific, Europe, North America, and South America	Household Pest. It infests buildings in large numbers and has established in temperate locations. It has become established in heated greenhouses where it can become a problem, especially if it defends honeydew producing, plant pests against introduced biological control organisms. T. melanocephalum is capable of transporting pathogenic microbes in hospitals. Some people suffer a slight, red irritation of the skin following contact with this ant (Harris et al. 2005; Nickerson et al. 2003).
Trogoderma granarium	Khapra beetle	Established within an area broadly limited north by the 35° parallel, south by the Equator, west by West	Has been introduced into areas of similar climatic conditions elsewhere, especially the alternative route between India and Europe around Africa	No direct effects on the environment. The indirect effects however, are loss of stored grain and the effect of fumigation agents on the environment.

		Africa and east by Myanmar		
Ziziphus mauritiana	Ber	Central Asia	Tropical Africa to Afghanistan and China, and also through Malaysia, northern Australia, some Pacific archipelagoes such as the Philippines, and in parts of the Caribbean region	It forms impenetrable thickets which seriously hamper livestock management and reduces pasture production and accessibility (Land Protection, 2001). It is also likely to have significant environmental effects on tropical and subtropical woodlands and savannas. (Grice, pers.comm. 2002)

Annex D

Stakeholder Presentations

IEE Study for Water Treatment Plant Project, Initial Development Phase of Dawei Special Economic Zone (DSEZ) in Myanmar

Stakeholder Engagement Meeting

16-17th March, 2016

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Purpose and Objectives

The purpose of the meeting is to:

- Introduce the Project;
- Explain the Impact Assessment Process;
- Present the results of the Impact Assessment; and
- Gather feedback from stakeholders on the Project.

You can ask questions/ raise your concerns during this meeting or provide feedback at the end of the meeting.

Project Overview

- Myandawei Industrial Estate Holding Pte.Ltd. through its subsidiary, namely Myandawei Industrial Estate Co., Ltd. (MIE), as the Concessionaire, has signed a Small Water Reservoir Concession Agreement (CA) with the Dawei Special Economic Zone Management Committee (DSEZMC) for the Initial Phase Development of the Dawei Spacial Economic Zone (DSEZ).

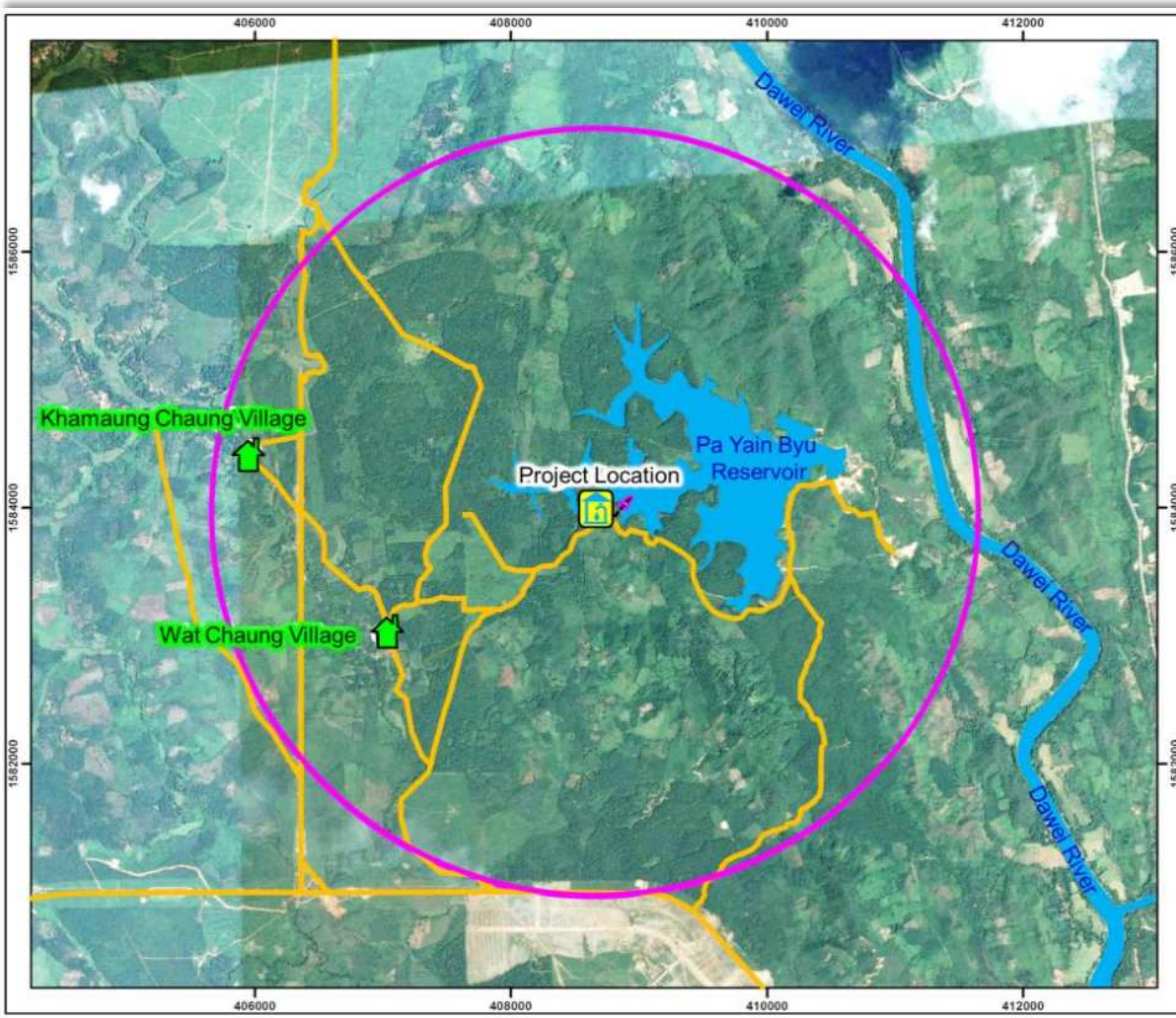
- A Water Treatment Plant (WTP) will be developed to supply industrial water to the Initial Development Phase of the Dawei Special Economic Zone (the Project). The proposed WTP will be located at the Small Water Reservoir (Pa Yain Byu).

- Environmental Resources Management (ERM) has been appointed by MIE to undertake the IEE study. The IEE is being conducted according to Myanmar regulation to understand potential environmental and social impacts of the Project

- The Scoping study has been completed. As part of the approval process for the Project, MIE is undertaking an Initial Environmental Examination (IEE) study.

Project Location

- 1.8 km northeast of Wat Chaung village
- 3.5 km east of Khamaung Chaung village



Project components & Tentative timeline

Typical example of
a Water Treatment Plant

Pa Yian Byu Reservoir

Project components:

- The Water Treatment Plant
- Raw Water Pumping Station
- Water Supply Pipeline

Public Consultation	Construction Phase 1	Commissioning	Operation
March 2016	September 2016	June 2017	August 2017

Tentative Timeline:

Example of Water Treatment Plant Facility

Impact Assessment Process

Screening/ Scoping → Baseline studies → Impact assessment → Management measures → Reporting

- The **baseline studies** are undertaken to establish an understanding of the existing environment.
- The **impact assessment** identifies what impacts are likely to occur as a result of the Project – i.e. how will the baseline change.
- The **management measures** are designed to minimise the likely negative impacts and enhance the positive benefits.
- The management measures will be **monitored** to ensure they are effective in minimising the impacts.

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Ambient Air Quality

The results of the ambient air quality monitoring for $PM_{2.5}$, PM_{10}, SO_2, and NO_2 are shown to be within the Myanmar National Environmental Guidelines..

- 20 µg/m^3 for $PM_{2.5}$;
- 50 µg/m^3 for PM_{10};
- 20 µg/m^3 for SO^2;
- 200 µg/m^3 for NO^2 ; and

The dominant wind direction during the time of monitoring was south to southeast. The wind speed throughout the monitoring period is considered low.

Survey Date	**26th – 29th January, 2016**
Location	Near residential area. Wat Chaung Village.

Noise level

During the daytime, the measured noise levels were found to be lower than the values in the Myanmar National Environmental Quality (Emission) Guidelines.

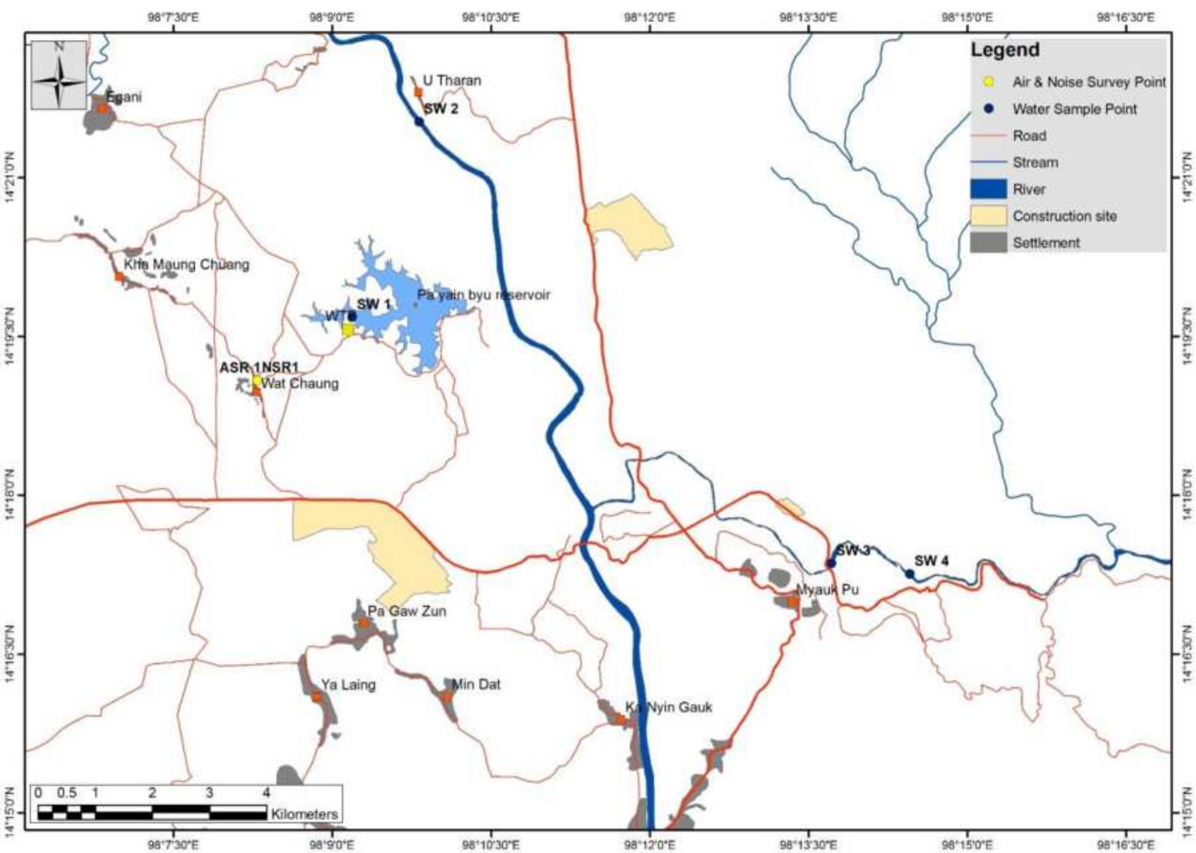
However, during the night time, measured noise levels were found to significantly exceed the Guidelines on both days that measurements were taken.

The increased noise levels in the evening are due to the use of diesel generators, which were observed during the site visits.

Period	Survey Results (dBA, One Hour LAeq)		Myanmar National Environmental Quality (Emission) Guidelines Value (Residential, Institutional, Educational)
	NSR 1 26th – 27th 2016	NSR 1 27th – 28th 2016	
Day Time	49	45	55
Night Time	**61**	**60**	45

Surface Water Quality

All parameters were within the compared Standard for "Medium clean fresh surface water resource", with the exception of BOD, which was exceeded at SW1, SW2, and SW3. High BOD levels indicate the presence of organic matter. Although this is most likely due to sewage discharged upstream, it could also be due to the presence of dead plant matter, algae, or animal droppings.



Survey Date	**28th January, 2016**
Location	Pa Yain Byu Reservoir, Dawei River, and Ta Lai Ya River

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Results of the Impact Assessment

Employment

Traffic

Air

Community Health and Safety

Soil and Ground Water

Noise

Water Use

Employment/ Economic

- Positive Impact: The project will create employment opportunities for the local communities.

  There will be some job opportunities available for villagers of the local communities based on Project needs and skills requirements.

- Mitigation measure:
  - To maximise employment for local communities, a local content plan will be developed to ensure jobs are offered to local communities first. Recruitment will be made on a Project needs and skills requirement basis.

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Traffic

- Impact: Transportation of personnel and equipment might cause traffic disruptions, impact local roads and increase risk of accidents.
- Mitigation measures:
  - Strictly enforce speed limit of 30 km/hour within village tracts or community areas.
  - Ensure all vehicles are in good operating condition and comply with Project safety standards.
  - Drivers must be fit to drive and have a valid driving license.

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Air Quality

Construction:

- Impact: Construction activities, including site clearing, may generate dust impacts.
- Mitigation measures:
  - A variety of techniques will be used to minimize dust during construction, including spraying of exposed areas (such as roads) and covering dusty materials and equipment.



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Noise

- Impacts: Noise will be generated during construction and operation as a result of construction activities(e.g. pile driving, foundation works)and operation of the generators.
- Mitigation measures:
  - Locating noisy equipment as far as possible from receptors.
  - Hours of general construction activity will be restricted to avoid sensitive periods of the day and also to avoid night work.

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Soil, Surface water and Groundwater Quality

- Impacts: Impacts may arise as a result of potential leaks or spills of oil, lubricants, fuels or chemicals and improper handling of effluent and waste.
- Mitigation Measures:
  - Waste will be properly disposed.
  - Chemicals and fuels will be properly stored and handled.
  - A site specific emergency response plan will be developed and implemented.

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Water Use

- Impacts: Project water withdrawal from the Pa Yain Byu Reservoir may have potential impacts related to existing water uses
- Mitigation Measures:
  - Reduction of intake flow to such a level that there is sufficient flow in the river to maintain resource use as well as biodiversity during annual mean low flow conditions.

Community Health and Safety

- Impact: An influx of workers may contribute to an increase in the transmission of communicable disease.

  An increase in traffic movements, the presence of the facility and the management of hazardous materials presents safety risks.

- Mitigation measures:
  - A range of management measures will be implemented. This includes a workforce camp, a workforce code of conduct, appropriate storage and disposal of hazardous materials.
  - In addition, an emergency response plan will be developed.

Contact Details

- Myandawei Industrial Estate Company Limited.

Dawei Special Economic Zone

Nabule Village, Dawei District, Tanintharyi Region,
The Republic of the Union of Myanmar.

Tel: 094985344

မြန်မာနိုင်ငံ၊ ထားဝယ်အထူးစီးပွားရေးဇုန်(DSEZ)၏ ကနဦးဖွံ့ဖြိုးရေးအဆင့် ရေသန့်စက်ရုံ စီမံကိန်းအား ကနဦးပတ်ဝန်းကျင်ဆန်းစစ်လေ့လာခြင်း (IEE)

လူထုတွေ့ဆုံညှိနှိုင်းအစည်းအဝေး

၂၀၁၆ခုနှစ်၊ မတ်လ ၁၆-၁၇ ရက်

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ရည်ရွယ်ချက်များ

တွေ့ဆုံပွဲ၏ ရည်ရွယ်ချက်သည်

- စီမံကိန်းအားမိတ်ဆက်ရန်
- ထိခိုက်မှု အကဲဖြတ်ဖြစ်စဉ်အား ရှင်းလင်းတင်ပြရန်
- ထိခိုက်မှုအကဲဖြတ်ခြင်း၏ ရလဒ်များကို တင်ပြရန်နှင့်
- စီမံကိန်းနှင့်ပတ်သက်၍ သက်ဆိုင်သူများမှ အကြံပြုချက်များကို ရယူစုဆောင်းရန်

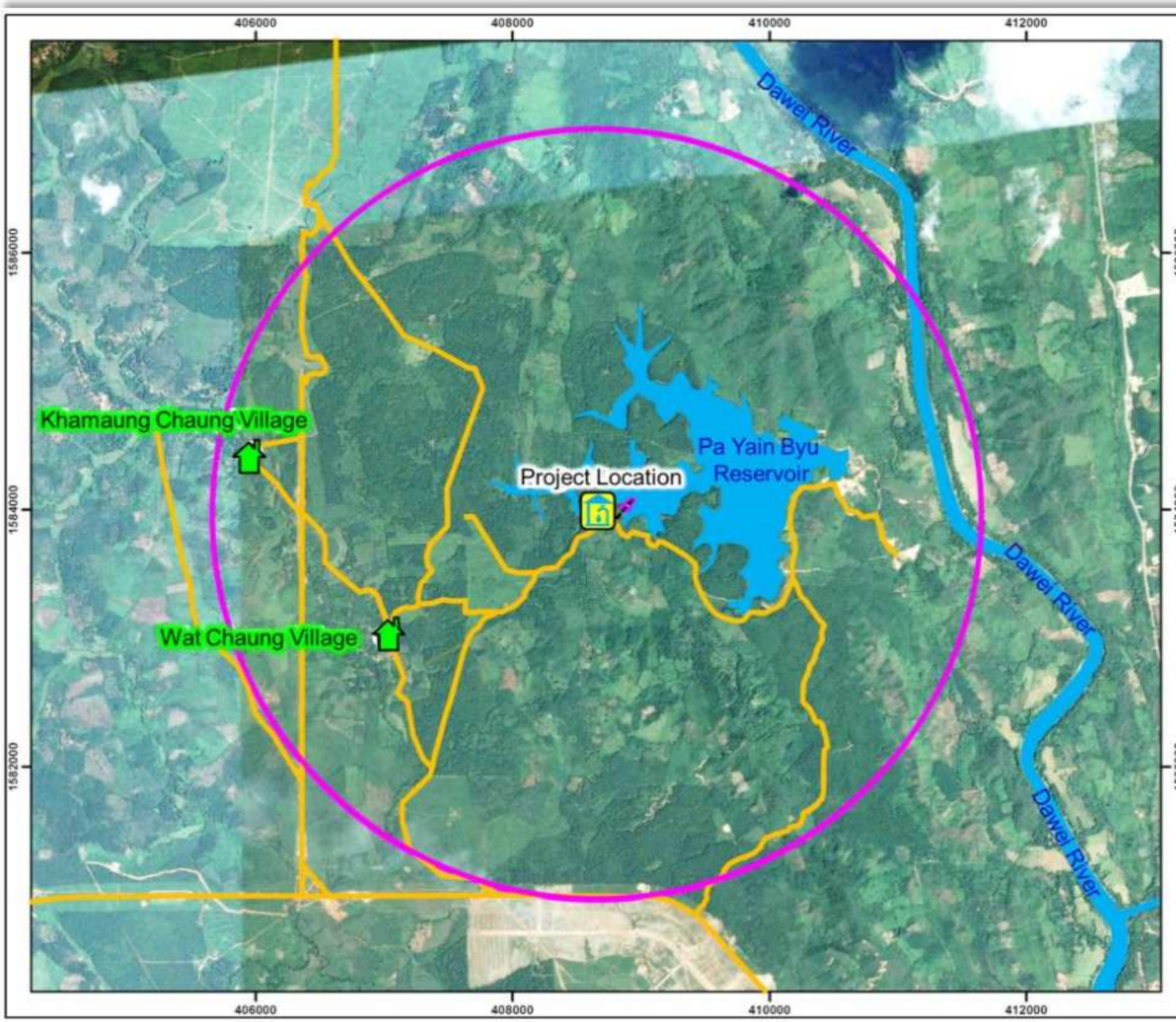
မေးခွန်းများ မေးစရာရှိပါက (သို့) စိတ်မရှင်းသော အကြောင်းအရာများ ရှိပါက ဤအစည်းအဝေးချိန်အတွင်း မေးမြန်းနိုင်ပါသည် (သို့) အစည်းအဝေးပြီးဆုံးချိန်တွင်လည်း အကြံပြုပြောဆိုနိုင်ပါသည်။

စီမံကိန်းခြုံငုံသုံးသပ်ချက်

- Myandawei Industrial Estate Holding Pte. Ltd. သည် ၄င်းကောင်း၏ လက်ခွဲဖြစ်သော Myandawei Industrial Estate Co., Ltd., မှတဆင့် ခွင့်ပြုမိန့် ကိုင်ဆောင်သူအဖြစ် မြန်မာနိုင်ငံရှိ ထားဝယ်အထူးစီးပွားရေးဇုံ၏ ကနဦးဖွံ့ဖြိုးရေးအဆင့်အတွက် ထားဝယ်အထူးစီးပွားရေးဇုံ စီမံခန့်ခွဲရေးကော်မတီနှင့် အသေးစားဆည် ခွင့်ပြုမိန့် သဘောတူညီချက် ရေးထိုးပြီးဖြစ်ပါသည်။
- ရေသန့်စက်ရုံကို ထားဝယ်အထူးစီးပွားရေးဇုံ(စီမံကိန်း)၏ ကနဦးဖွံ့ဖြိုးရေးအဆင့်အတွက် စက်ရုံသုံးရေ ပေးပို့နိုင်ရန် တည်ဆောက်သွားမည်ဖြစ်ပါသည်။ အဆိုပြုထားသော ရေသန့်စက်ရုံ (WTP) ကို အသေးစားဆည် (ဘုရားဖြူ) တွင် ထားရှိရန် အကြမ်းဖျင်း လျာထားပါသည်။
- Environmental Resources Management (ERM) ကို ကနဦးပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ်လေ့လာခြင်း (IEE) ဆောင်ရွက်နိုင်ရန် MIE အနေဖြင့် ခန့်အပ်ပေးထားပြီး ဖြစ်ပါသည်။ ကနဦးပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ်ခြင်းကို စီမံကိန်းကြောင့် ဖြစ်ပေါ်လာနိုင်သော ပတ်ဝန်းကျင်ဆိုင်ရာနှင့် လူမှုဝန်းကျင်ဆိုင်ရာ ထိခိုက်မှုများကို နားလည်သဘောပေါက်ရန် မြန်မာနိုင်ငံ၏ နည်းဥပဒေအရ ဆောင်ရွက်နေပါသည်။
- နယ်ပယ်တိုင်းတာသတ်မှတ်ခြင်း လေ့လာမှုကို ဆောင်ရွက်ပြီးဖြစ်ပါသည်။ စီမံကိန်းအား အတည်ပြုလုပ်ငန်းစဉ်၏ အစိတ်အပိုင်းအဖြစ် MIE သည် ကနဦးပတ်ဝန်းကျင်ဆိုင်ရာဆန်းစစ် လေ့လာခြင်း(IEE) ဆောင်ရွက်လျက်ရှိပါသည်။

စီမံကိန်းတည်နေရာ

- ဝက်ချောင်းကျေးရွာ၏ အရှေ့မြောက်ဘက် ၁.၈ကီလိုမီတာ အကွာ
- ခမောင်းချောင်းကျေးရွာ၏ အရှေ့ဘက် ၃.၅ ကီလိုမီတာ အကွာ



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စီမံကိန်း အစိတ်အပိုင်းများနှင့် အချိန်ကာလ

စီမံကိန်း အစိတ်အပိုင်းများ-

- ရေသန့်စက်ရုံ
- သဘာဝရေ စုပ်ဌာန
- ရေပေးပို့ ပိုက်လိုင်း

Public Consultation	Construction Phase 1	Commissioning	Operation	
March 2016	September 2016	June 2017	August 2017	အချိန်ကာလ

ရေသန့်စက်ရုံ၏ စံနမူနာပုံစံ

ထိခိုက်မှု အကဲဖြတ်ခြင်း ဖြစ်စဉ်

- စီစစ်ခြင်း/ နယ်ပယ်တိုင်းတာ သတ်မှတ်ခြင်း
- အခြေခံ အချက်အလက်များ လေ့လာခြင်း
- ထိခိုက်မှု အကဲဖြတ်ခြင်း
- စီမံခန့်ခွဲမှု အတိုင်းအတာများ
- အစီရင်ခံခြင်း

- အခြေခံအချက်အလက်များလေ့လာခြင်းကို လက်ရှိပတ်ဝန်းကျင်အနေအထားအား နားလည်သဘောပေါက်နိုင်ရန် ပြုလုပ်ပါသည်။
- ထိခိုက်မှု အကဲဖြတ်ခြင်းသည် စီမံကိန်း၏ရလဒ်တစ်ခုအနေဖြင့် ဖြစ်ပေါ်နိုင်သော ထိခိုက်မှုများကို ခွဲခြားသတ်မှတ်ပါသည်။ (အခြေခံအချက်အလက်များ ပြောင်းလဲလာပုံ)
- စီမံခန့်ခွဲမှု နည်းလမ်းများကို ဖြစ်ပေါ်နိုင်သော ဆိုးကျိုးများအားလျော့ချနိုင်ရန်နှင့် ကောင်းကျိုးများကို တိုးမြှင့်လုပ်ဆောင်နိုင်ရန် ပုံဖော်ထားပါသည်။.
- စီမံခန့်ခွဲမှု နည်းလမ်းများကို ထိခိုက်မှုအနည်းဆုံးအဖြစ်လျော့ချနိုင်ရန် စောင့်ကြပ်ကြည့်ရှုသွားမည်ဖြစ်ပါသည်။

ထိတွေ့ဝန်းကျင်ရှိလေထုအရည်အသွေး

$PM_{2.5}$, PM_{10}, SO_2, and NO_2 အတွက် ထိတွေ့ဝန်းကျင်ရှိလေထုအရည်အသွေး ဆန်းစစ်ခြင်းရလဒ်ကို မြန်မာအမျိုးသားပတ်ဝန်းကျင်ဆိုင်ရာ လမ်းညွှန်ချက်များ တွင်ဖော်ပြထားပါသည်။

- 20 µg/m^3 for $PM_{2.5}$
- 50 µg/m^3 for PM_{10}
- 20 µg/m^3 for SO_2
- 200 µg/m^3 for NO_2 နှင့်

စောင့်ကြည့်လေ့လာခြင်းအချိန်တွင် တိုက်ခတ်သော လေဦးတည်ချက်သည် တောင်မှ မြောက်သို့ တိုက်ခတ်ခဲ့ပါသည်။ စောင့်ကြည့်သည့်အချိန် တစ်လျှောက်လုံး လေတိုက်နှုန်းနည်းသည်ဟုဆိုနိုင်ပါသည်။

Survey Date : **26th – 29th January, 2016**

Location Near residential area. Wat Chaung Village

ဆူညံသံ အဆင့်

နေ့အချိန်တွင် တိုင်းတာသော ဆူညံနှုန်းသည် မြန်မာအမျိုးသား ပတ်ဝန်းကျင်ဆိုင်ရာ အရည်အသွေး (ထုတ်လွှတ်မှု) လမ်းညွှန်ချက်များတွင်ပါဝင်သော တန်ဖိုးထက် နည်းသည်ကို တွေ့ရပါသည်။

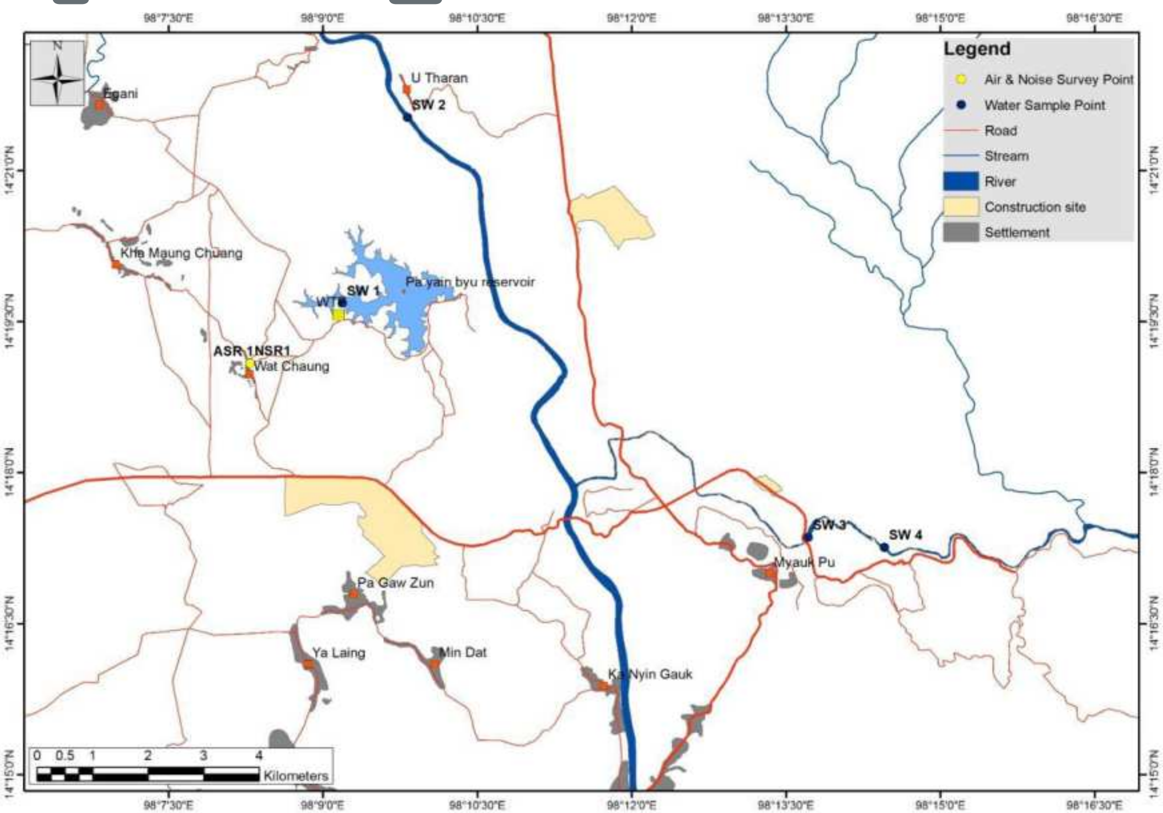
သို့သော်လည်း ညအချိန်တွင် တိုင်းတာသော ဆူညံနှုန်းသည် နှစ်ရက်စလုံး တိုင်းတာချက်များအရ သိသိသာသာ တိုးလာသည်ကို တွေ့ရပါသည်။

ညနေပိုင်းတွင် တိုးလာသော ဆူညံနှုန်းများသည် ကွင်းဆင်းလေ့လာချက်အရ တွေ့ရှိရသော ဒီဇယ်သုံး မီးအားပေးစက်များကြောင့် ဖြစ်သည်။

Period	Survey Results (dBA, One Hour LAeq)		Myanmar National Environmental Quality (Emission) Guidelines Value
	NSR 1 26th – 27th 2016	NSR 1 27th – 28th 2016	(Residential, Institutional, Educational)
Day Time	49	45	55
Night Time	**61**	**60**	45

မြေပေါ်ရေအရည်အသွေး

အတိုင်းအတာအားလုံးကို နမူနာကောက်ယူခဲ့သောနေရာ SW1၊ SW2နှင့် SW3 တို့တွင် BOD ကျော်လွန်သည်မှလွဲ၍ ပျဉ်းမျှ သန့်ရှင်းသော မြေပေါ်ရေ အရင်းအမြစ်အတွက် စံချိန်စံညွှန်းများနှင့် နှိုင်းယှဉ်လေ့လာခဲ့ပါသည်။ BOD အတိုင်းအတာမြင့်မားမှုသည် သက်ရှိကျွင်းကျန်ပစ္စည်း ပါဝင်နေကြောင်း ညွှန်ပြနေပါသည်။ ၎င်းသည် ချောင်းအထက်ပိုင်းတွင် မိလ္လာရေများ စွန့်ပစ်သောကြောင့် ဖြစ်ပေါ်လာသကဲ့သို့ အပင်သေများ၊ ရေညှိ သို့မဟုတ် တိရစ္ဆာန်အညစ်အကြေးများပါဝင်မှုကြောင့်လည်း ဖြစ်ပေါ်လာပါသည်။



လေ့လာရေးရက်စွဲ- ၂၈ရက်၊ ဇန်နဝါရီ၊ ၂၀၁၆ခုနှစ်

တည်နေရာ- ပယင်းဖြူရေလှောင်တမံ၊ ထားဝယ်မြစ်နှင့် တလိုင်းကျမြစ်

MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

ERM

ထိခိုက်မှုအကဲဖြတ်ခြင်း၏ ရလဒ်များ

Employment

Traffic

Air

Community Health and Safety

Soil and Ground Water

Noise

Water Use

အလုပ်ခန့်ထားမှု/စီးပွားရေး

- ကောင်းကျိုးများ- စီမံကိန်းသည် ဒေသခံအစုအဖွဲ့များအတွက် အလုပ်အကိုင်အခွင့်အလမ်းများဖန်တီးပေးသွားမည်ဖြစ်ပါသည်။

  စီမံကိန်းလိုအပ်ချက်များနှင့် ကျွမ်းကျင်မှုလိုအပ်ချက်များအရ ဒေသခံ အစုအဖွဲ့များ၏ ကျေးရွာသူ၊ ကျေးရွာသားများနှင့် သင့်လျော်သော အလုပ်အကိုင် အခွင့်အလမ်းများကို ဖြည့်ဆည်းဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။

- လျော့ချရေးနည်းလမ်းများ-
  - ဒေသခံအစုအဖွဲ့များအတွက် အလုပ်ခန့်ထားမှုမြှင့်တင်နိုင်ရန် ဒေသဖွံ့ဖြိုးရေးအစီအစဉ်အနေဖြင့် ဒေသခံအစုအဖွဲ့များအား အလုပ်ရရှိရေးကို အကောင်အထည်ဖော်ဆောင်ရွက်မည်ဖြစ်ပါသည်။ အလုပ်ခန့်ထားခြင်းကို စီမံကိန်းလိုအပ်ချက်များနှင့် ကျွမ်းကျင်မှုလိုအပ်ချက်များအပေါ် အခြေခံ၍ လုပ်ဆောင်သွားမည် ဖြစ်ပါသည်။

သယ်ယူပို့ဆောင်ရေး

- ထိခိုက်မှု- လူနှင့်ပစ္စည်းများသယ်ယူခြင်းသည် ယာဉ်သွားလာမှုရှုပ်ထွေးခြင်းများ၊ ဒေသတွင်းလမ်းများ ထိခိုက်ခြင်းနှင့် မတော်တဆထိခိုက်မှုများ များပြားခြင်းတို့ ဖြစ်ပေါ်လာနိုင်ပါသည်။
- လျော့ချရေးနည်းလမ်းများ-
  - ကျေးရွာအုပ်စုများနှင့် အစုအဖွဲ့ရေိယာများအတွင်း တစ်နာရီလျှင် ၃၀ ကီလိုမီတာ ကန့်သတ်ချက်ဖြင့် စည်းကမ်းတည်းကြပ်စေရန်၊
  - ယာဉ်များကို ကောင်းမွန်စွာလည်ပတ်စေပြီး စီမံကိန်းလုံခြုံရေးစံချိန်စံညွှန်းများအတိုင်း ပြုမူဆောင်ရွက်သွားရန်၊
  - ယာဉ်မောင်းများကို ယာဉ်စည်းကမ်း လမ်းစည်းကမ်းများနှင့်အညီ မောင်းနှင်စေပြီး တရားဝင်ယာဉ်မောင်းလိုင်စင်များ ထားရှိရန်

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လေထုအရည်အသွေး

တည်ဆောက်ခြင်း-

- ထိခိုက်မှု- စီမံကိန်းနေရာ ရှင်းလင်းခြင်းအပါအဝင် ဆောက်လုပ်ရေးလုပ်ငန်းများသည် အမှုန်ထိခိုက်သက်ရောက်မှုများ ဖြစ်ပေါ်နိုင်ပါသည်။
- လျှော့ချရေးနည်းလမ်းများ-
  - အမှုန်များကို လျှော့ချရန် အကာကွယ်မဲ့သောဧရိယာများ (လမ်းမများ)အား ရေဖျန်းခြင်းနှင့် အမှုန်ထသောပစ္စည်းများနှင့် ဆောက်လုပ်ရေးသုံးပစ္စည်းများအား ဖုံးအုပ်ခြင်းအပါအဝင် နည်းပညာအမျိုးမျိုးကို အသုံးပြုသွားမည်ဖြစ်ပါသည်။

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ဆူညံမှု

- ထိခိုက်မှုများ- အသံဆူညံမှုသည် တည်ဆောက်ခြင်းနှင့် ဆောက်လုပ်ရေးလုပ်ငန်းများ(စုပုံခြင်း၊ အခြေခံ အလုပ်များ) ၏ ရလဒ်တစ်ခုအဖြစ် လည်ပတ်ခြင်း နှင့် စွမ်းအားမြှင့်စက်များလည်ပတ်ခြင်း အတွင်း ဖြစ်ပေါ်နိုင်မည် ဖြစ်ပါသည်။
- လျော့ချရေးနည်းလမ်းများ-
  - ထိခိုက်နိုင်သောအဖွဲ့အစည်းမှ ဝေးနိုင်သမျှဝေးသောနေရာတွင် ဆူညံစေသောပစ္စည်းများအား ထားရှိခြင်း
  - အထွေထွေဆောက်လုပ်ရေးလုပ်ငန်းများ ဆောင်ရွက်ချိန်များကို အနှောင့်အယှက်ဖြစ်နိုင်သောနေ့ခင်းပိုင်းကာလနှင့် ညပိုင်းအလုပ်လုပ်ခြင်းတို့ကို ရှောင်ကြဉ်ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။



မြေဆီလွှာ၊ မြေပေါ်ရေနှင့် မြေအောက်ရေအရည်အသွေး

- ထိခိုက်မှုများ- ထိခိုက်မှုများသည် ဆီ၊ ချောဆီ၊ လောင်စာဆီ သို့မဟုတ် ဓာတုပစ္စည်းများ ဖိတ်လျှံခြင်း သို့ ယိုစိမ့်ခြင်းနှင့် ရေဆိုးရေညစ်များနှင့် အမှိုက်များ ကိုင်တွယ်ပုံမှားယွင်းခြင်းတို့မှ ဖြစ်ပေါ်နိုင်ပါသည်။
- လျော့ချရေးနည်းလမ်းများ-
  - အမှိုက်များကို စနစ်တကျစုပုံစွန့်ပစ်မည်ဖြစ်ပါသည်။
  - ဓာတုပစ္စည်းများနှင့်လောင်စာဆီများကို ကောင်းမွန်စွာသိုလှောင်ပြီး ကိုင်တွယ်အသုံးပြုသွားမည် ဖြစ်ပါသည်။
  - စီမံကိန်း၏ သီးသန့်အရေးပေါ် တုန့်ပြန်ရေး အစီအစဉ်ကို ရေးဆွဲအကောင်အထည်ဖော်ဆောင်ရွက်သွားမည်ဖြစ်ပါသည်။




ရေအသုံးပြုမှု

- ထိခိုက်မှုများ- ပယိုင်းဖြူအသေးစားဆည်မှ စီမံကိန်း ရေထုတ်ယူခြင်းသည် လက်ရှိရေအသုံးပြုမှုများနှင့်ပတ်သက်၍ ထိခိုက်မှုများ ဖြစ်ပေါ်လာနိုင်ပါသည်။
- လျော့ချရေးနည်းလမ်းများ-
  - နှစ်စဉ် ပျမ်းမျှ စီးဆင်းမှု နည်းသော အခြေအနေများအတွင်း ဇီဝမျိုးစုံမျိုးကွဲများကဲ့သို့သော သယံဇာတထိန်းသိမ်းရန် မြစ်အတွင်း လုံလောက်သောစီးဆင်းမှုရှိသော အဆင့်ထိသာ လျော့ချသုံးစွဲခြင်း

အစုအဖွဲ့ ကျန်းမာရေးနှင့် လုံခြုံမှု

- ထိခိုက်မှု- အလုပ်သမားများ ရောက်ရှိလာခြင်းသည် ကူးစက်နိုင်သောရောဂါများ ပြန့်နှံမှု တိုးပွားနိုင်ပါသည်။

  ယာဉ်သွားလာမှုများပြားခြင်း၊ အသုံးအဆောင်ပစ္စည်းများထားရှိခြင်းနှင့် ဘေးအန္တရာယ်ရှိသောပစ္စည်းများ စီမံခန့်ခွဲခြင်းသည် လုံခြုံရေးအတွက် အန္တရာယ်များ ဖြစ်ပေါ်နိုင်ပါသည်။

- လျော့ချရေးနည်းလမ်းများ-
  - စီမံခန့်ခွဲမှုနည်းလမ်းများ အစီအမံပြုလုပ်ခြင်းကို အကောင်အထည်ဖော်ဆောင်သွားမည် ဖြစ်ပါသည်။ ၎င်းတွင် အလုပ်သမား စခန်း၊ အလုပ်သမားအင်အား သင်္ကေတ၊ သင့်လျော်သောသိုလှောင်မှုနှင့် အန္တရာယ်ရှိသော ပစ္စည်းများစွန့်ပစ်ခြင်းတို့ ပါဝင်ပါသည်။
  - ထပ်မံ၍ အရေးပေါ် တုန့်ပြန်ရေး အစီအစဉ်ကို ဆောင်ရွက်သွားမည် ဖြစ်ပါသည်။

ဆက်သွယ်ရန်လိပ်စာအပြည့်အစုံ

- Myandawei Industrial Estate Company Limited.

ထားဝယ်အထူးစီးပွားရေးဇုံ
နဘူလည် ကျေးရွာ၊ ထားဝယ်ခရိုင်၊ တနင်္သာရီတိုင်းဒေသကြီး၊
ပြည်ထောင်စု သမ္မတမြန်မာနိုင်ငံတော်။

ဆက်သွယ်ရန်ဖုန်း-၀၉၄၉၈၅၃၄၄

MYANDAWEI INDUSTRIAL ESTATE COMPANY LIMITED

SEM MIE ERM

Annex E

Stakeholder Engagement Photographs

Stakeholder Consultation Meeting as part of
IEE Study for Water Treatment Plant Project,
Initial Development Phase of Dawei Special Economic Zone (DSEZ) in Myanmar

Date: 16 March 2016

Time: 09:20 – 10:20

Venue: Yebyu Township General Administrative Office, Dawei District, Myanmar

Attendees:

No.	Name	Occupation (Position)	Telephone no.
1	Mr. Weerawat Tachasuntarowaet	ASST.GM/ Aquathai Co.,Ltd.	089-2036977
2	Mr. Preecha Kawnkla	GM/ Aquathai Co.,Ltd.	089-2036973
3	Mr. Sawan Phottiwut	Environmental Engineering/ MIE/ITD	09-783600964
4	Mr. Kanitkorn Kitipong	Environmental Engineering/ MIE/ITD	-
5	Mr. Yingsak Maleewat	Consultant/ ERM - Siam	09-263341148
6	Mr. Vincent Lecat	Consultant/ ERM - Siam	09-262284853
7	U Than Oo	Officer/Department of Labour	09-43021471
8	Dr. Aye Min Htway	Vice Officer/Livestock Breeding and Veterinary Department	09-422205177
9	U Ko Ko Tun	Vice Officer /Department of Rural Development Affair	09-250062898
10	U Thet Khine	Vice Officer / Department of Agriculture	09-263996231
11	U Kyaw Naing	Vice Township Administrator/General Administrative Department	09-250244881
12	U Tun Tun Than	Vice Officer /Irrigation Department	09-263183072
13	U Aung Khine Soe	Deputy Director, ECD MOECAF	09-49305732
14	U Khin Maung Cho	Secretary, Dawei Special Economic Zone ("DSEZ")	09-8760149
15	U Hla Win Aung	Township Administrator/Yebyu	09-444019372
16	U Aung Tun Shwe	Supporting Committee / Quarter (D)	09-790290537
17	U Moe Thi	Administrative Officer/ Quarter (D)	09-788174942
18	U Win Myint	Officer/ Yebyu	09-782120047
19	U Be Ngwe	Officer/ Yebyu	-
20	U Soe Thein	Administrative Officer / Ya Laing	09-450993899
21	U Yee Swan	Administrative Officer / Pu Gaw Zun	09-788174860
22	U Win Shwe	Administrative Officer / Quarter (A)	09-450993678
23	U Phay Thein	Quarter (A), Yebyu	09-258132576
24	U Thein Aung	Administrative Officer / Quarter (B)	09-790559300
25	U Yay Po	Captain of Chemistry	09-422209257
26	U Hla Kyaw	Chairman of Supporting Comittee/ Quarter (A)	09-422209849
27	U Saw Maung Theim	Consultant/ SEM	-
28	Daw Nu Yin	Consultant/ SEM	09-421150138
29	Daw Poe Mon Mon Kyaw	Consultant/ SEM	09-795716869
30	Daw Myat Thitsar Naing	Consultant/ SEM	09-262851670

Agenda:

1. Opening speech delivered by U Hla Win Aung (Administrator, Yepyu Township General Administrative Officer)
2. Introduction of MIE, ERM and SEM representatives
3. Presentation of IEE Study for Water Treatment Plant Project by Daw Nu Yin (SEM representatives)
4. Questions and Answers

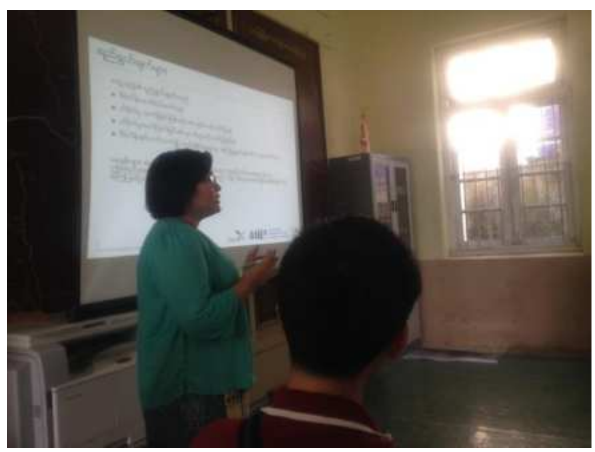
Meeting Minute:

Item	Key Discussion	Response
1	Introduction of MIE Representatives and the Water Treatment Plant Consultant (ERM) and Sub-Consultant (SEM)	-
2	SEM representative (Daw Nu Yin) presented the background and status to date of the IEE study and also the way forward. Please refer to the attached presentation for details.	-
3	Key Discussion	
3.1	U Khin Maung Cho (Secretary, Management Committee, DSEZ) raised the following questions: When will the construction start? How long will it last? What is the exact size of the Project area?	MIE provided the following response (with SEM translating into Myanmar): MIE replied that construction phase will start on September 2016 and will take approximately one year to construct. The planned project area is 4.13 Acre.
3.2	U Khin Maung Cho (Secretary, Management Committee, DSEZ) raised the following questions: Has MIE already paid compensation for the Project area? Has there been any calculation of the total water requirement for the entire DSEZ?	MIE provided the following response (with SEM translating into Myanmar): 1) Compensation has been paid for the land that will be used for the first phases of the Project. In the future, if compensations are necessary, this will be discussed by the compensation committee.* * It is to be noted that the resettlement and compensation for the WTP development is not part of the IEE Study's scope of work. The resettlement and compensation for DSEZ initial development phase will be covered under different contract/ projects. 2) The study has focused on the first phase of the Project and it is expected that

Item	Key Discussion	Response
		approx. 18,000m^3 per day will be needed. In next phases, additional water will be required but it will depend on the DSEZ development.
3.3	U Yee Swan (Village Tract Administrative Officer of Pu Gaw Zun) raised the following question: Who will be responsible for dealing with compensation and discussion about ownership?	MIE provided the following response (with SEM translating into Myanmar): MIE replied that all question relating to compensation will be dealt with by the compensation committee.
3.4	U Than Oo, Officer (Department of Labor) raised the following question: How many local jobs will the project generate?	U Khin Maung Cho (Secretary, Management Committee, DSEZ) discussed that there is a Management committee at DSEZ and there is a policy, assigned by One Stop Service Committee (OSSC) that the workable person can register to work. They will appoint people from the potentially relocated villages as a top priority. They will then look at prioritising people from the sixteen villages which are near DSEZ. Therefore they will appoint the workers from Yebyu Township, Longlon, and Dawei. He also reminded the assistance that the Management Committee will be involved in all recruitment.

Photo

Yebyu Township General Administrative Office, Dawei District, Myanmar



Presentation of IEE Study for Water Treatment Plant Project by Daw Nu Yin (SEM representatives)


U Hla Thein Aung (Township Administrator, Yebyu)


U Yee Swan, Administrative Officer (Pu Gaw Zun Village Tract)


U Than Oo, Officer (Department of Labor)


U Khin Maung Cho, Secretary, Dawei Special Economic Zone (“DSEZ”) Management Committee

Stakeholder Consultation Meeting as part of
IEE Study for Water Treatment Plant Project,
Initial Development Phase of Dawei Special Economic Zone (DSEZ) in Myanmar

Date: 16 March 2016

Time: 13:00 – 14.30

Venue: School in Khamaung Chaung Village, Dawei District, Tanintharyi Region, Myanmar

Attendees:

No.	Name	Occupation (Position)	Telephone no.
1	Mr. Weerawat Tachasuntarowaet	ASST.GM/ Aquathai Co.,Ltd.	089-2036977
2	Mr. Preecha Kawnkla	GM/ Aquathai Co.,Ltd.	089-2036973
3	Mr. Sawan Phottiwut	Environmental Engineering/ MIE/ITD	09-783600964
4	Mr. Kanitkorn Kitipong	Environmental Engineering/ MIE/ITD	-
5	Mr. Yingsak Maleewat	Consultant/ ERM - Siam	09-263341148
6	Mr. Vincent Lecat	Consultant/ ERM - Siam	09-262284853
7	U Thant Zin Aung	Youth group Green Generation	09-250273240
8	U Bo Bo Aung (Local NGOs)	Dawei Research Association (DRA)	09-8742455
9	U Soe Moe Aung	Reporter/ 7DAY NEWS Journal	09-422225171
10	U Tint Lwin	Senior Reporter/ Dawei Watch	09-422201144
11	U Phyo Zin Thura Aung	Local Reporter (Dawei), ELEVEN MEDIA GROUP Co., Ltd	09-421038480
12	U San Kyi	Khamaung Chaung Village	-
13	U Aung Moe	Village Leader of Khamaung Chaung Village	-
14	U Aung Tin Soe	Khamaung Chaung Village	09-970630407
15	U Ayin Than	Gardening	-
16	U Phay Thein	Gardening	-
17	U Sein Tin	Gardening	-
18	Daw Theingi	Gardening	09-49851734
19	Daw Myint Myint Sam	Gardening	-
20	Daw Kyin Mhwae	Gardening	-
21	Daw Sam Myint	Gardening	-
22	Daw Thinzar Tun	Gardening	-
23	Daw Tin Tin Moe	Gardening	-
24	U Aung Mya	Gardening	-
25	U Win Naing	Gardening	-
26	U Than Naing	Gardening	09-49750113
27	U Aung Shwe	Gardening	-
28	U Saw Tun	Gardening	09-49303387
29	Daw Thway Thway Sam	Gardening	09-49291097
30	U Kyaw Myint	Gardening	-
31	U Ye Aung	Gardening	-
32	U Than Soe	Gardening	-
33	U Moe Heain	Gardening	09-49852280
34	U Min Soe	Gardening	09-262790202
35	U Thaung Shwe	Gardening	09-97191045
36	U Zaw Heain	Gardening	09-971969187
37	U Maung Kyi	Gardening	-
38	U Kyaw Thein	Gardening	09-963147803

No.	Name	Occupation (Position)	Telephone no.
39	U Myint	Gardening	-
40	U Soe Thein	Gardening	-
41	Daw Win Thein	Gardening	-
42	Daw Thein Yu	Gardening	-
43	Daw Ho Than	Gardening	-
44	Daw Tin Win	Gardening	-
45	U Saw Maung Theim	Consultant/ SEM	-
46	Daw Nu Yin	Consultant/ SEM	09-421150138
47	Daw Poe Mon Mon Kyaw	Consultant/ SEM	09-795716869
48	Daw Myat Thitsar Naing	Consultant/ SEM	09-262851670

Agenda:

1. Opening speech delivered by U Aung Moe (Village Head, Khamaung Chaung)
2. Introduction of MIE, ERM and SEM representatives
3. Presentation of IEE Study for Water Treatment Plant Project by U Saw Maung Thein (SEM representatives)
4. Questions and Answers

Meeting Minute:

Item	Key Discussion	Response
1	Introduction of MIE Representatives and the Water Treatment Plant Consultant (ERM) and Sub-Consultant (SEM)	-
2	SEM representative (U Saw Maung Thein) presented the background and status to date of the WTP study and also the way forward. Please refer to the attached presentation for details.	-
3	Key Discussion	
3.1	U Aung Moe (Head of Khamaung Chaung Village) raised the following suggestions: On behalf of the villagers, U Aung Moe mentioned that they want job opportunities and fair salary for the villagers. Their main economy is plantation and if the Water Treatment Plant is going to construct around their area, they want to develop their job opportunities.	MIE provided the following response (with SEM translating into Myanmar): In appointing the labors, MIE replied that the project will create employment opportunities for the local people as priority, but based on project need and skills requirements.
3.2	U Saw Htun (Villager of Khamaung Chaung) raised the following suggestions: He mentioned that tree counting near the Water Treatment Plant has been made five years ago. If there is some compensation; the owners of the trees can't accept the list of trees made five years ago.	MIE provided the following response (with SEM translating into Myanmar): It is not expected that there will need to be further compensation for the first phases of the Project. But if there is any economical resettlement due to the Project, compensation will be calculated and discussed by the DSEZ compensation committee.* * It is to be noted that the resettlement and

Item	Key Discussion	Response
		compensation for the WTP development is not part of the IEE Study's scope of work. The resettlement and compensation for DSEZ initial development phase will be covered under different contract/ projects.
3.3	U Soe Thein, Administrative Officer (Ya Laing Village Tract) mentioned that local people want more job opportunities from water treatment plant which is near their village.	MIE provided the following response (with SEM translating into Myanmar): As per previously stated, the team replied that the project will create employment opportunities for the local people as priority, based on Project needs and skills requirements.
3.4	U Moe Hein (villager of Khamaung Chaung) raised the following questions: What is the basic salary of casual labor? He also mentioned that the casual labor's basic salary is between 4000 and 6000 kyats per day and they want the right salary for their work loads.	MIE provided the following response (with SEM translating into Myanmar): MIE will be responsible to determine the recruitment process and the basic salary for each position. However, it is understood that the basic salary will be discussed and agreed with the DSEZ Management Committee and shall be in compliance with Myanmar Regulatory requirements.

Photo:


School in Khamaung Chaung Village, Dawei District, Tanintharyi Region, Myanmar


Presentation of IEE Study for Water Treatment Plant Project by U Saw Maung Thein (SEM representatives)


U Aung Moe (Head of Khamaung Chaung Village)


U Soe Thein, Administrative Officer (Ya Laing Village Tract)


U Moe Hein (Villager of Khamaung Chaung)


U Saw Htun (Villager of Khamaung Chaung)

Stakeholder Consultation Meeting as part of
IEE Study for Water Treatment Plant Project,
Initial Development Phase of Dawei Special Economic Zone (DSEZ) in Myanmar

Date: 17 March 2016

Time: 09:20 – 11:00

Venue: School in Wat Chaung Village, Dawei District, Tanintharyi Region, Myanmar

Attendees:

No.	Name	Occupation (Position)	Telephone no.
1	Mr. Weerawat Tachasuntarowaet	ASST.GM/ Aquathai Co.,Ltd.	089-2036977
2	Mr. Preecha Kawnkla	GM/ Aquathai Co.,Ltd.	089-2036973
3	Mr. Sawan Phottiwut	Environmental Engineering/ MIE/ITD	09-783600964
4	Mr. Kanitkorn Kitipong	Environmental Engineering/ MIE/ITD	-
5	Mr. Yingsak Maleewat	Consultant/ ERM - Siam	09-263341148
6	Mr. Vincent Lecat	Consultant/ ERM - Siam	09-262284853
7	U Yee Swan	Village Tract Administrative Officer of Pu Gaw Zun	09-788174860 09-780126377
8	U Zaw	Village Leader of Wat Chaung Village	09-8725255
9	U Kyaw Aye	Gardener / Villager	09-49807004
10	U Tun Lwin	Gardener / Villager	-
11	U Kyi Thein	Gardener / Villager	-
12	U Myo Oo	Gardener / Villager	09-78012377
13	U Nyi Nyi	Gardener / Villager	-
14	U Myint Shwe	Gardener / Villager	-
15	U Soe Naing	Gardener / Villager	-
16	U Win Aye	Gardener / Villager	-
17	U Aung Nan Myint	Gardener / Villager	-
18	U Maung Myint	Gardener / Villager	-
19	U Kyi	Gardener / Villager	-
20	U Thinn Po	Gardener / Villager	-
21	U Maung Than	Gardener / Villager	-
22	U Kyaw Sein	Gardener / Villager	-
23	U Hla Shwe	Gardener / Villager	-
24	U Aye Ko	Gardener / Villager	-
25	U Hla Shein	Gardener / Villager	-
26	U Than Nyunt	Gardener / Villager	-
27	U Hla Win	Gardener / Villager	-
28	U Shwe Than	Gardener / Villager	-
29	Daw Thine May	Gardener / Villager	-
30	Daw Ni Ni Lwin	Gardener / Villager	-
31	Daw Khin Htay	Gardener / Villager	-
32	Daw Htay Htay Khine	Gardener / Villager	-
33	Daw Po Yee	Gardener / Villager	-
34	Daw Sam Myint	Gardener / Villager	-
35	Daw Aye Htet Soe	Gardener / Villager	-

No.	Name	Occupation (Position)	Telephone no.
36	U Thar Nge	Gardener / Villager	-
37	U Soe Lwin	Gardener / Villager	-
38	U Win Zaw	Gardener / Villager	-
39	U Nyaing Aye	Gardener / Villager	-
40	U Aung Ko	Gardener / Villager	-
41	U Chan Lin Soe	Gardener / Villager	-
42	Daw Hla Than	Gardener / Villager	-
43	Daw Mu	Gardener / Villager	-
44	Daw Ohnn Myint	Gardener / Villager	-
45	Daw Than Ain	Gardener / Villager	-
46	Daw Khin Win	Gardener / Villager	-
47	Daw Mya Sein	Gardener / Villager	-
48	Daw Ohnn Yee	Gardener / Villager	-
49	U Soe	Gardener / Villager	-
50	Daw Kyi	Gardener / Villager	-
51	Daw Aye Me Htay	Gardener / Villager	-
52	Daw Thida Win	Gardener / Villager	-
53	Daw Cho Myint	Gardener / Villager	-
54	U Soe Myint	Shopkeeper / Villager	-
55	U Saw Maung Theim	Consultant/ SEM	-
56	Daw Nu Yin	Consultant/ SEM	09-421150138
57	Daw Poe Mon Mon Kyaw	Consultant/ SEM	09-795716869
58	Daw Myat Thitsar Naing	Consultant/ SEM	09-262851670

Agenda:

1. Opening speech delivered by U Yee Swan (Administrative Officer, Pu Gaw Zun)
2. Introduction of MIE, ERM and SEM representatives
3. Presentation of IEE Study for Water Treatment Plant Project by U Saw Maung Thein (SEM representatives)
4. Questions and Answers

Meeting Minute:

Item	Key Discussion	Response
1	Introduction of MIE Representatives and the Water Treatment Plant Consultant (ERM) and Sub-Consultant (SEM)	-
2	SEM representative (U Saw Maung Thein) presented the background and status to date of the IEE study and also the way forward. Please refer to the attached presentation for details.	-

Item	Key Discussion	Response
3	Key Discussion	
3.1	U Naing Win (Thit To Htaut Village) raised the following questions: What will happen if there are impacts because of the Project? What about possible water shortage around the Water Treatment Plant (WTP)?	MIE provided the following response (with SEM translating into Myanmar): MIE confirmed that the mitigation measures presented today will be performed in order to avoid or reduce the impacts. Besides, the relevant government authorities and MIE will monitor the mitigation measures implementation. The Pa Yin Byu reservoir capacity is around 7,000,000 m^3 which will be enough to ensure implementation of the first phases of the Project. If additional impacts occur, additional mitigation or compensation will be discussed within MIE or the compensation committee.
3.2	Daw Thein Aye (Wat Chaung Village) mentioned that she has 0.5 acre of flooded land cause of reservoir near the WTP. She wants compensation of her land. She also wants MIE to take care of her difficulties.	MIE provided the following response (with SEM translating into Myanmar): MIE take note of that remark. If there are any impacts that have not been covered already or happened during construction or operation, stakeholders can inform MIE. Their grievance will be studied and passed onto the relevant services.
3.3	U Aung Nan Myint (Wat Chaung Village) discussed that tree counting and land measurement in his area were made between 2014 and 2015 and these are not allowed for plantation. So, he has difficulties about it. Furthermore, he worries about transportation and their economy cause of Pipe Line by WTP.	MIE provided the following response (with SEM translating into Myanmar): MIE replied that his concerned are noted but the IEE study focused on the first phases of the WTP Project and no pipeline has been included for the moment as it will depend on the future development of the DSEZ.
3.4	U Maung Than (Wat Chaung Village) suggested that if there is pipe line construction near their village in the future, they want the construction without affecting their transportation. Besides, there is a cemetery near the village and they don't want the cemetery to be affected.	Noted by MIE.
3.5	U Soe (Wat Chaung Village) discussed that they don't want any difficulties in transportation and they want job	MIE provided the following response (with SEM translating into Myanmar):

Item	Key Discussion	Response
	opportunities for their village. He wants to think for the villagers as top priority in appointing the employment.	MIE replied that the project will create employment opportunities for the local people in affected village as priority compliance with management committee at DSEZ, on a Project needs and skill requirement basis. Trainings will also be provided to employee for capacity building.
3.6	U Hla Shein (Wat Chaung Village) said that he does not understand why the noise level is higher in the night time given that there are no generators in the village.	ERM provided the following response (with SEM translating into Myanmar): ERM and SEM replied that during the noise monitoring that lasted 3 days, at least one generator was used by a family near the noise monitoring station. In addition some motor bikes passed near the noise measuring equipment at the night time and the survey team reported dogs barking most of the night. All these elements can have increase the noise level.
3.7	U Zaw, Village Head (Wat Chaung Village) raised concerns about potential impacts on air quality due to the Project.	ERM provided the following response (with SEM translating into Myanmar): ERM and SEM replied that the impacts on air quality have been studied and the potential impact is considered as minor during construction and negligible during operation. In addition, mitigation measures and monitoring programme is proposed and MIE will ensure the implementation of such measures.

Photo

School in Wat Chaung Village, Dawei District, Tanintharyi Region, Myanmar

Daw Thein Aye (Villager of Wat Chaung Village)

U Aung Nan Myint (Villager of Wat Chaung Village)

U Maung Than (Villager of Wat Chaung Village)

U Soe (Villager of Wat Chaung Village)

U Hla Shein (Villager of Wat Chaung Village)

U Zaw (Head of Wat Chaung Village)

U Naing Win (Villager of Thit To Htaut Village)

Annex F

Stakeholder Engagement Questionnaire

ထားဝယ်အထူးစီးပွားရေးဇုန်၏ ကနဦးဆောင်ရွက်မှုအဆင့်ဖြစ်သော ရေလှောင်ကန်အသေးစား စီမံကိန်း၏ ရေသန့်စင်စက်ရုံ စီမံကိန်း

Water Treatment Plant Project as part of the Initial Development Phase of

Dawei Special Economic Zone (DSEZ), Myanmar

၂၀၁၆၊မတ်လ သက်ဆိုင်သူများနှင့်စေ့စပ်ညှိနှိုင်းဆွေးနွေးပွဲမှကောက်နုတ်ချက်များ

Notes from the March 2016 Stakeholder Engagement Meetings

ဖြေကြားသူ၏အမည်: **Name of Participant:**	**နေ့စွဲ:** **Date:**
ရွာ/ကျေးရွာအုပ်စု **Village/ Village Tract**	**မြို့နယ်:** **Township:**
ခရိုင် **District**	**တိုင်းဒေသကြီး :** **Region:**

1. ယခုစီမံကိန်းသည် သင်နှင့်သင့်မိသားစုအတွက် အကျိုးသက်ရောက်မှု/ အကျိုးအမြတ် ရရှိမည်ဟုထင်ပါသလား။ ထင်လျှင် မည်သည့် အကျိုးသက်ရောက်မှု/ အကျိုးအမြတ် ဖြစ်ထွန်းမည်ဟုထင်ပါသလဲ။
   Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/benefits do you think will occur?

   ....

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2. စီမံကိန်းနှင့်ပတ်သတ်၍ထပ်၍မေးမြန်းစရာမေးခွန်းများ (သို့) စိုးရိမ်ပူပန်မှုများ ရှိပါသလား။ ရှိလျှင် မည်သည့်မေးခွန်း (သို့) စိုးရိမ်ပူပန်မှုများ ရှိပါသလဲ။
   Do you have any additional questions or concerns related to the Project?
   If so, what questions and/ or concerns do you have?

   ....

   ....

   ....

   ....

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   ....

3. စီမံကိန်းနှင့်ပတ်သတ်၍မည်သည့်အပိုင်းကိုပို၍သိချင်ပါသလဲ။

What aspects of the Project would you like to receive more information about?

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4. စီမံကိန်းနှင့်ပတ်သတ်သောသတင်းအချက်အလက်များကိုမည်သည့်နည်းဖြင့်သင်ရယူလိုသနည်း။

(ဥပမာ။ ။မျက်နှာစုံညီအစည်းအဝေး၊ ကျေးရွာခေါင်းဆောင်မှတဆင့်)

What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

....

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....

Public Consultation Meeting for Water Treatment Plant Project

1.

Name of Participant: Ko Myint Zaw Oo	**Date:16 March 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We expect development of both the village and the family.

2. Do you have any additional questions or concerns related to the Project?
If so, what questions and/ or concerns do you have?
I have no particular concerns about the Project.

3. What aspects of the Project would you like to receive more information about?

Nothing in particular.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

I have enough information now.

2.

Name of Participant: Ko Saw Htun	**Date:3 September 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Taninth aryi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No Answer

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

1. I approve the water treatment plant Project.
2. I want local to get the job opportunities as a priority.
3. I want to receive the fair compensation for loss of land.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

3.

Name of Participant: Ma Thein Yu	**Date:5 September 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you anticipate the Project to generate any impacts for you and your household?

We expect benefits due to the project. I would like to request to start the implementation of the project as fast as you can.

2. Do you have any additional questions or concerns related to the Project?

I am anxious as to know if compensation will be done fairly.

3. What aspects of the Project would you like to receive more information about?

No answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Face to face meeting.

4.

Name of Participant: Ko Nyan Shwe	Date:16 March 2015
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There will have benefits due to the project. Development of the village and family.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I have no particular concern.

3. What aspects of the Project would you like to receive more information about?

I have enough information.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

I have enough information.

5.

Name of Participant: Ma Myint Myint San	Date:16 March 2015
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We expect benefits for my family and village due to the project.

2. Do you have any additional questions or concerns related to the Project?

If so, what questions and/ or concerns do you have?

I have no particular concern.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

6.

Name of Participant: Ma Khin Wah	**Date:16 March 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There will be benefits for my family and village due to the project.

2. Do you have any additional questions or concerns related to the Project?
If so, what questions and/ or concerns do you have?

If the local population get job opportunities, we want daily wages to be 3600 kyats per day as a minimum wage. I want MIE to implement the project quickly.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

I want a public consultation meeting about the project after broadcasting the project information via Skynet programs (TV channel).

7.

Name of Participant: Unknown	**Date:16 March 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There will be benefits. But we want fair compensation for the farms which are near of the project.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

8.

Name of Participant: U Htin Than	**Date:16 March 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I am expecting employment opportunities.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

None.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

9.

Name of Participant: U Phay Than	**Date:16 March 2015**
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I don't expect anything.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Any way is good as long as we receive the information in time.

10.

Name of Participant: U Phay Than	Date:16 March 2015
Village/ Village Tract: Kha Maung Chaung Village/ YaLai Village	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I haven't anxiety.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

Public Consultation Meeting for Water Treatment Plant Project

1.

Name of Participant: Ko Naing Win	**Date:17 March 2015**
Village/ Village Tract: Thitto Htaunt Village/ Thitto Htaunt Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There will not be benefits due to the project. I can't accept water treatment plant. You are not going to manage the natural resources and solved the water shortage.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I have anxiety. I am worried about impacts of the Project.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

2.

Name of Participant: Ma Thida Aye	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We expect jobs to be created by the Project.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I have no concern.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Face-to-face meetings.

3.

Name of Participant: Ma San San Maw	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We hope to have job opportunities.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Face-to-face meetings.

4.

Name of Participant: Maung Chan Hein Soe	Date:17 March 2015
Village/ Village Tract: Pugawzun Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There will be water shortage during the dry season and other impacts on agriculture.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

I would like more information about the proposed project.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Face-to-face meetings.

5.

Name of Participant: Ma Thida Win	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I expect both positive impacts, like job opportunities and negative impacts.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?
No.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None in particular.

6.

Name of Participant: Ma Hla Than	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

Job Opportunities.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I am worried about my farm.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Face-to-face meetings

7.

Name of Participant: Ma Mya Sein	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

Probably both impacts and opportunities.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No concern.

3. What aspects of the Project would you like to receive more information about?

I would like to know more about potential impact on gardening.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

8.

Name of \Participant: Ma Thee Ain	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I hope there will be benefits.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No

3. What aspects of the Project would you like to receive more information about?

I would like to know more about noise impact.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Yes. Information via village leaders.

9.

Name of \Participant: Ma Ohn Yee	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There will be both impacts and benefit due to the project.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I am worried about impact during operation.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

10.

Name of \Participant: Ko Aung Ko	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I don't expect any benefits.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I have anxiety. We don't know where we are going to be relocated although we heard about relocation.

3. What aspects of the Project would you like to receive more information about?

I want to participate to any further study.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

I want to know via meeting, information board, journal, information sheets and village leaders.

11.

Name of \Participant: Ma Mee Mee	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I am not expecting anything from the Project.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Yes. Information via village leaders.

12.

Name of \Participant: Ma San Ain	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I am expecting benfits, but I am not sure what exactly.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

Nothing.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

13.

Name of \Participant: Ma Ohn Myint	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We are hoping to get advantages from the project.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

14.

Name of \Participant: Ma Than Ain	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No benefits expected.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

None.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No answer.

15.

Name of \Participant: Ma Khin Win	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We are expecting to receive benefits from the project.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

Nothing.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

16.

Name of \Participant: Ma Hla Mu	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No Answer.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No Answer.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

17.

Name of \Participant: Ma Htay Htay Khine	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No Answer.

2. Do you have any additional questions or concerns related to the Project?
If so, what questions and/ or concerns do you have?

No Answer.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

18.

Name of \Participant: Ma Ni Ni Lwin	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

Local Development, Transportation, Job Opportunities, better livelihood.

2. Do you have any additional questions or concerns related to the Project?
If so, what questions and/ or concerns do you have?

No.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Yes. Information via village leaders.

19.

Name of \Participant: Mg Aye Htet Soe	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We expect positive development for the community like job opportunities and increase in living condition, but also impacts.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I hope the village will benefit from the Project.

3. What aspects of the Project would you like to receive more information about?

None.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

20.

Name of \Participant: Mg Thar Nge	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

There are hoping to get positive impacts, especially regarding transport.

2. Do you have any additional questions or concerns related to the Project?
If so, what questions and/ or concerns do you have?
None in particular, but I hope I will know more about the Project.

3. What aspects of the Project would you like to receive more information about?

I would like to know all potential impacts to Wat Chaung Village.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

21.

Name of \Participant: Mg Soe Naing	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We believe that our village will develop after the project implementation. But you need to consider seriously the livelihood of the farmers.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I wonder which advantages we will get, and in particular electricity. We also want to receive fair compensation for land impacted.

3. What aspects of the Project would you like to receive more information about?

Impact on farmer livelihood.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

None.

22.

Name of \Participant: Mg Than Nyunt	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We are concern about impact on traffic and we hope you will prepare good mitigation measures.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No Answer.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

23.

Name of \Participant: U Hla She	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No answer.

2. Do you have any additional questions or concerns related to the Project?
If so, what questions and/ or concerns do you have?
I am concern about traffic, noise and air pollution.

3. What aspects of the Project would you like to receive more information about?

Potential benefits from the Project regarding distribution of water.

4. What is your preferred way of receiving information about the Project (e.g. face-to-

face meetings, information via village leaders)?

Face-to-face meeting.

24.

Name of \Participant: Unknown	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We expect benefits for both Myanmar and the local communities.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No answer.

3. What aspects of the Project would you like to receive more information about?

I want to know about the change to living standard and natural conservation.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Yes. I want to get the information in transparency.

25.

Name of \Participant: U Nyi Nyi	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I think there might be job opportunities, improve transportation and increase in living standards.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I am concerned we might have to be relocated because of the Project. Even if not from the WTP, it could be because of the wider DSEZ Project

3. What aspects of the Project would you like to receive more information about?

I want to know whether the project is within the area owned by local people or not.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Yes. Information from face-to-face meeting.

26.

Name of \Participant: U Kyaw Sein	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

My garden was flooded about 1.5 Acre. So I want to get the land compensation and tree compensation fairly.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No answer.

3. What aspects of the Project would you like to receive more information about?

No answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-

No answer.

27.

Name of \Participant: Ko Myint Shein	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I worry that this project will affect the village. I want benefit for all of us.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I hope we will receive fair compensation.

3. What aspects of the Project would you like to receive more information about?

Compensation and schedule.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

Yes. I want to receive information via village leaders.

28.

Name of \Participant: Ko Soe Lwin	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

I welcome the project and we will have the benefits due to the project. I also expect community development such as renovation of the bridge and construction of a road to acces gardens.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No Answer.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

29.

Name of \Participant: Ko Tun Lwin	**Date:17 March 2015**
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	**Township: Yebyu**
District : Dawei	**Region: Tanintharyi**

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

We will receive benefits from the project. Transportation, access to Water, Electricity.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

I am concern about restriction to the villagers' movements.

3. What aspects of the Project would you like to receive more information about?

I want to know more about compensation.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

30.

Name of \Participant: Ko Nyan Aye	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No Answer.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No Answer.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

31.

Name of \Participant: U Win Zaw	Date:17 March 2015
Village/ Village Tract: Wat Chaung Village/ Pugawzun Village Tract	Township: Yebyu
District : Dawei	Region: Tanintharyi

1. Do you expect the Project to generate any impacts/ benefits for you and your household? If yes, what impacts/ benefits do you think will occur?

No Answer.

2. Do you have any additional questions or concerns related to the Project? If so, what questions and/ or concerns do you have?

No Answer.

3. What aspects of the Project would you like to receive more information about?

No Answer.

4. What is your preferred way of receiving information about the Project (e.g. face-to-face meetings, information via village leaders)?

No Answer.

Annex G

Grievance Log

Grievance Log

PART 1 Contact and Details
Complaint number
Number: Date: Recorded by:
Complainant details
Name: Telephone number: Address: Preferred method of contact:
PART 2 Description of grievance(s)
Describe the grievance below.
PART 3 Proposed action(s)
Describe the proposed response.
Signatures
Recorder: Claimant: Date:

PART 4 Resolution
Describe the steps taken to resolve the grievance and the outcome.
Signatures
Complainant: Project representative: Date:

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