

# Draft Initial Environmental Examination (Appendixes – Part 2 of 2)

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Project Number: 52362-001  
April 2019

## BAN: Spectra Solar Power Project

Prepared by ERM India Private Limited for Spectra Solar Park Limited and the Asian Development Bank.

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## **APPENDIX H    DC OFFICE CLEARANCE FOR CONVERSION FROM AGRICULTURAL LAND TO NON-AGRICULTURAL LAND**

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
জেলা প্রশাসকের কার্যালয়, মানিকগঞ্জ  
(রাজস্ব শাখা)

স্মারক নং-০৫,৩০,৫৬০০,৩০২,০১৮,০০৪,২০১৬-৪৩২

তারিখ : ০৩-০৪-২০১৬ খ্রিঃ

বিষয় : ৩৫ মেঃওঃ সোলার পাওয়ার প্লান্ট নির্মাণের লক্ষ্যে মানিকগঞ্জ জেলার শিবালয়া উপজেলার আওতাভুক্ত বরুরিয়া মৌজায় ১৪১.৭৪০ একর জমি অকৃষি জমি হিসেবে ছাড়পত্র প্রদান।

সূত্র : ০১। অত্রাফিসের স্মারক নং-০৫,৩০,৫৬০০,৩০২,১৮,০১৭,১৩-৩৮৩(সং) তারিখ : ২২-০৩-২০১৬ খ্রিঃ  
০২। সহকারী কমিশনার(ভূমি), শিবালয়া এর ০৩-০৪-২০১৬ খ্রিঃ তারিখের ৩৩৫(সং) নং স্মারক।

উপর্যুক্ত বিষয়ে সূত্রের পরিপ্রেক্ষিতে জানানো যাচ্ছে যে, ব্যবস্থাপনা পরিচালক, স্পেক্ট্রা ইঞ্জিনিয়ার্স লিঃ কর্তৃক ৩৫ মেঃওঃ সোলার পাওয়ার প্লান্ট নির্মাণের লক্ষ্যে আবেদনিত শিবালয়া উপজেলাধীন বরুরিয়া মৌজায় ১৪১.৭৪০ একর জমি অকৃষি জমি হিসেবে ছাড়পত্র পাওয়ার আবেদন করেন। এপ্রেক্ষিতে ১নং সূত্রের স্মারকে সহকারী কমিশনার(ভূমি), শিবালয়া এর নিকট প্রতিবেদন চাওয়া হয়। সহকারী কমিশনার(ভূমি), শিবালয়া ২নং সূত্রের স্মারকে প্রতিবেদন দাখিল করেছেন। প্রতিবেদন পর্যালোচনায় দেখা যায় ১৪১.৭৪০ একর জমি এস,এ এন্ড টি এ্যাট এর ১৯৫০ সনের ১০৭ ও ১০৮ দ্বারা মোতাবেক অকৃষি হিসেবে ব্যবহার ভিত্তিক ভূমি উন্নয়ন কর আদায় করা হয়েছে যা জেলা প্রশাসক মহোদয় অনুমোদন প্রদান করেছেন।

০২। বর্ণিত অবস্থায়, আবেদিত ১৪১.৭৪০ একর জমি অকৃষি হিসেবে নির্দেশক্রমে ছাড়পত্র প্রদান করা হলো।

জনাব খান মোঃ আফতাবউদ্দিন  
ব্যবস্থাপনা পরিচালক  
স্পেক্ট্রা ইঞ্জিনিয়ার্স লিঃ

অনুলিপি : সদয় অবগতির জন্য।

০১। সহকারী কমিশনার(ভূমি)  
শিবালয়া, মানিকগঞ্জ।

(সাবরীন চৌধুরী)  
রেভিনিউ ডেপুটি কালেক্টর  
মানিকগঞ্জ  
ফোন নং ৭১৩২৪৩

Subject: Clearance of 141.740 acre land as non-agricultural land at Boruria Mouja, Shivalaya Upozila for construction of proposed 35 MW Solar Park by Spectra Solar Power Limited.

Revenue Deputy Collector, Manikganj  
Dt: 03/04/2016

১০৮

৭৪২  
০৭/০৬/১৬

৩৪২  
০৭/০৬/১৬

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
উপজেলা ভূমি অফিস  
শিবালয়, মানিকগঞ্জ।

পত্র নম্বর : উ : ভূ : অ : শিবা/২০১৬- ৬০৬

তারিখ : ০১/০৬/২০১৬ খ্রিঃ।

বিষয় : ৩৫ মেঃ ওঃ সোলার পাওয়ার প্র্যান্ট নির্মাণের লক্ষ্যে মানিকগঞ্জ জেলার শিবালয় উপজেলার বরুগিয়া মৌজার অকৃষি জমি হিসেবে খাজনা প্রদানের জমি সমূহের তালিকা প্রেরণ প্রসঙ্গে।

সূত্র : জেলা প্রশাসক মানিকগঞ্জ মহোদয়ের কার্যালয়ের মৌখিক নির্দেশ।

উপর্যুক্ত বিষয় ও সূত্রস্থ স্মারকের প্রেক্ষিতে জানানো যাচ্ছে যে, অত্র উপজেলাবীন ইউনিয়ন ভূমি সহকারী কর্মকর্তা আক্ষয়্য হতে দেয় প্রতিবেদন এ দেখা যায় যে, তৎপ্রতি ইঞ্জিনিয়ার্স লিঃ কর্তৃক বরুগিয়া মৌজার ১৪১.৭৪ একর ভূমির ভূমি উন্নয়ন কর অকৃষি জমি হিসেবে আদায় করা হয়েছে। আদায়কৃত দাগ সমূহের তালিকা “ছক” আকারে প্রস্তুত করে মহোদয়ের সদয় অবগতি ও পরবর্তী প্রয়োজনীয় ব্যবস্থা গ্রহণের জন্য প্রেরণ করা হ'ল।

ক্রমিক নং	মৌজার নাম	খতিয়ান নং	দাগ নং	শ্রেণী	পরিমাণ (একরে)	মন্তব্য
১	বরুগিয়া	২৪	১০৪৮	শাল	০.১৩	
২		"	১৩৯৫	"	০.১৩	
৩		"	১৫১৬	"	০.০৭	
৪		"	১৫২০	"	০.০৮	
৫		"	১৫৬৪	"	০.২৫	
৬		"	২১৮৪	"	০.২৪	
৭		৩১৭	২৭২৩	"	০.১২	
৮		"	২৭৭২	"	০.১৭	
৯		১৮১	৭১১	"	০.১৬	
১০		"	২২৭০	"	০.৬১	
১১		৯২	২২১১	"	০.৬০	
১২		"	৪৫৬	"	০.৬৮	
১৩		"	৪৫২	"	০.৬৪	
১৪		"	৪৪০	"	০.২২	

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১০	৮	৪৭০	"	০.০৭
১১	১২০	২২০৪	"	০.০৭
১২	"	২২১০	"	০.১০
১৩	"	২২১৭	"	০.০৭
১৪	"	২৪৮০	"	০.১৪
১৫	১৮২	২১৮০	"	০.২২
১৬	"	২১৮০	"	০.২০
১৭	"	২৪৮৮	"	০.২০
১৮	"	২৭২২	"	০.০৮
১৯	"	১২০৭	"	০.১০
২০	"	২১২৩	"	০.১০
২১	"	৭৮০	"	০.১০
২২	"	১০৬০	"	০.১৮
২৩	"	২১৪০	"	০.০৮
২৪	"	২১৪০	"	০.০০
২৫	"	২১৪০	"	০.০৮
২৬	"	২২২৭	"	০.২০
২৭	"	২২৩৮	"	০.১৮
২৮	"	২০৭০	"	০.১৮
২৯	"	২২৭৪	"	০.২২
৩০	"	২৭০২	"	০.০১
৩১	"	২৭০০	"	০.১২
৩২	"	২২২২	"	০.১০
৩৩	৪৪	২৭০৪	"	০.২৮
৩৪	"	২৭২০	"	০.২০
৩৫	"	৭১৭	"	০.১২
৩৬	"	৮০৬	"	০.০৮
৩৭	"	৭১৬	"	০.১২
৩৮	"	২২১১	"	০.১৪
৩৯	"	২৭২০	"	০.৪৮
৪০	১০৪	২২১২	"	০.০৮
৪১	১০৮	২২১৬	"	০.২৭
৪২	"	২২২৮	"	০.১০
৪৩	"	০১	"	০.২৪
৪৪	১৪৮	০১	"	০.১১
৪৫	"	০৪০	"	০.০৪
৪৬	"	৪০০	"	০.২৪
৪৭	৭৭	৬০৮	"	০.৪৪
৪৮	"	১০২	"	০.২৮
৪৯	"	৪৩০	"	০.৪২
৫০	"	৪৩১	"	০.৪০
৫১	"	৪৩২	"	০.৪২
৫২	"	৪৩০	"	০.০৬

১৬১

৫৬		..	৪৯৪	..	০.২০	
৫৭		..	৫১৮	..	০.১৬	
৫৮		..	৫৭৬	..	০.২৪	
৫৯		..	৫৭৯	..	০.২৭	
৬০		..	৬৬১	..	০.৪০	
৬১		..	৬৭৪	..	০.১৮	
৬২		..	৬৮৪	..	০.২৬	
৬৩		..	৬৮৬	..	০.১৬	
৬৪		..	২২৬৭	..	০.৭২	
৬৫		..	১৪২	..	০.২২	
৬৬		..	৬০২	..	০.৭০	
৬৭		..	৬৫২	..	০.৪০	
৬৮		..	৬৫৪	..	০.৪৪	
৬৯		..	৬৬৬	..	০.০০	
৭০		..	৫০৮	..	০.০৮	
৭১		..	৫০৭	..	০.২১	
৭২		..	৫২২	..	০.২১	
৭৩		..	৬০০	..	০.৬৬	
৭৪		..	৬৪০	..	০.২১	
৭৫		..	৬৯৯	..	০.৪০	
৭৬		১১৫	২১৯৬	..	০.১৫	
৭৭		..	২২৪৮	..	০.২০	
৭৮		১২৬	১১৫৬	..	০.১০	
৭৯		..	১২৭৪	..	০.২০	
৮০		..	২৪৭৬	..	০.৪০	
৮১		..	৫৬০	..	০.২৭	
৮২		..	১১৪৪	..	০.২৫	
৮৩		১০৬	৫৮৪	..	০.১০	
৮৪		..	৬৬৯	..	০.১৬	
৮৫		৩৭	৭০০	..	০.৪০	
৮৬		..	৭৪৪	..	০.১০	
৮৭		১৯২	২০২৬	বাড়ী	০.৫৪	
৮৮		..	২০২৭	..	০.০৫	
৮৯		..	২০২০	..	০.০৬	
৯০		১৯০	২৫০০	মালা	০.২৪	
৯১		..	২৫০১	..	০.০৭	
৯২		..	২৬০১	..	০.২৪	
৯৩		১১৮	৮৫৪	..	০.১৮	
৯৪		..	৫৪৮	..	০.০৫	
৯৫			১৮২	..	০.১৮	
৯৬			১৮৪	..	০.২৭	
৯৭			৮৫৬	..	০.১০	

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১৭/১২/১৯



১০৮			৫০০	"	০.১৪
১০৯			৪৬৪	"	০.২০
১০০		০২	৫৪০	"	০.০১
১০১			২১৯৮	"	০.২৪
১০২		২২	৫৪৭	"	০.০১
১০৩			৫৮৬	"	০.২২
১০৪			২১	"	০.০৮
১০৫		১৯৯	৫২৯	"	০.৬৬
১০৬			৭২১	"	০.০৬
১০৭		১০৯	২৯৪	খাড়া	০.১৯
১০৮		৪০	৬৪৭	নাল	০.২৭
১০৯			১২০	"	০.২৮
১১০			৭৫৭	"	০.১৮
১১১			৭৬২	"	০.১৫
১১২			৭৭৫	"	০.২০
১১৩			১৫৪৫	"	০.০৭
১১৪			১৫৭০	"	০.৪০
১১৫			২২০১	"	০.১৬
১১৬			২২০২	"	০.০৮
১১৭			২৭০৪	"	০.২২
১১৮			২৭৬৫	"	০.০২
১১৯			২৭৪০	"	০.২০
১২০			২৭৪৭	"	০.০৬
১২১			৭৬০	"	০.৭০
১২২			৭০২	"	০.৬০
১২৩			৩০৭৮	"	০.১৭
১২৪			৩০৯১	"	০.২০
১২৫			৩১০৯	"	০.৮১
১২৬			৩১১২	"	০.২৪
১২৭			৭০১	"	০.৪৬
১২৮			৭০০	"	০.৪৬
১২৯			৬৯০	"	০.১৮
১৩০			৭২৫	"	০.২১
১৩১			৭২৭	"	০.০৬
১৩২		৪৯	৪৯৮	"	০.১৪
১৩৩			৫৮১	"	০.৪৮
১৩৪			৫৯৮	"	০.২০
১৩৫			৫৯৭	"	০.০৮
১৩৬			৫৭০	"	০.২১
১৩৭			৪২৪	"	০.১৭
১৩৮			৫৪২	"	০.২৮

১৬৩

১০০	৭৯	২২৯৯	"	০.১৪
১৪০		২০০০	"	০.১০
১৪১		২২৬৪	"	০.১৪
১৪২		৪৫০	"	০.০১
১৪৩	৬৪	২৬৯৪	"	০.২৭
১৪৪		২৬৯৯	"	০.২৬
১৪৫		৩০৭৭	"	০.০৯
১৪৬		৩০৯২	"	০.০৭
১৪৭		৩১০৮	"	০.৪১
১৪৮		৩১১১	"	০.১২
১৪৯		২১১৬	"	০.০০
১৫০		২১৮০	"	০.২৪
১৫১		২৬৫১	"	০.২৫
১৫২		২৬৬৯	"	০.০৮
১৫৩		২২০৮	"	০.২৮
১৫৪		২৭৫৭	"	০.১৮
১৫৫		২৭৫৪	"	০.২৪
১৫৬		২০০২	"	০.১৫
১৫৭		২০১৭	"	০.২৫
১৫৮		২০৭৭	"	০.০৯
১৫৯		২০৮৪	"	০.০৬
১৬০		২০৮৯	"	০.১২
১৬১		২৪০০	"	০.০৮
১৬২		২৪১০	"	০.৫১
১৬৩		২৫২১	"	০.২৫
১৬৪		২৫৯৮	"	০.২৭
১৬৫		২৬১৪	"	০.২৮
১৬৬		২৬০০	"	০.১৬
১৬৭		৩৮০	"	০.২৫
১৬৮		৫৭০	"	০.২৮
১৬৯		৪৯৭	"	০.০৮
১৭০		৫৪৯	"	০.১০
১৭১		৫৮০	"	০.২৪
১৭২		৫৯৯	"	০.১৭
১৭৩		৬১৬	"	০.১০
১৭৪		৬০০	"	০.০৯
১৭৫		২৪৭০	"	০.২০
১৭৬		২৪৯১	"	০.০৫
১৭৭		২০৬৯	"	০.১৯
১৭৮		২০৭৫	"	০.২৪
১৭৯		২০৭৯	"	০.১৮



৫২৩		২২১৭	০.৪৮
৫২৪		২২২৬	০.০৫
৫২৫	৭০৫/১	২২৪	০.১৮
৫২৬		৪৩৯	০.১৯
৫২৭		৪৫২	০.১৭
৫২৮		৪৫১	০.২৭
৫২৯		৬৩৪	০.০৬
৫৩০		১৯৮	০.০৭
৫৩১		৫৪০	০.২৭
৫৩২	৮৬৮	১২৩৭	০.২৯
৫৩৩		১২৯৪	০.২৩
৫৩৪		১২৯৫	০.১২
৫৩৫		১৩৪৭	০.৪০
৫৩৬	৮২২	৭৬৬	০.০৫
৫৩৭		৭৬৭	০.০৫
৫৩৮		২৬৮০	০.৩১
৫৩৯		২৭৫৫	০.২৬
৫৪০		২৭৫৬	০.২৬
৫৪১		৭৯৬	০.১৮
৫৪২		৭৯৮	০.২০
৫৪৩		৫৫১	০.৬১
৫৪৪		৫৫৮	০.৫৯
৫৪৫		৭০৩	০.০৮
৫৪৬	৮১৭	৫০৪	০.২৭
৫৪৭		৫৩১	০.২৩
৫৪৮		৭৪৫	০.১৭
৫৪৯	৮১৬	২১২৩	০.২৭
৫৫০		২৪০৪	০.২২
৫৫১	৮২৫	২২৭৯	০.৭৯
৫৫২	৮৬৭	২২৭৮	০.১৭
৫৫৩		৮৫৯	০.১৩
৫৫৪		৮৬০	০.১৪
৫৫৫		১৪৫৫	০.০৯
৫৫৬	৮৭৬	৭৪৯	০.৩১
৫৫৭		২৪০	০.৪০
			১৪১.৭৪

✓ সত্যতা প্রমাণ (অনুমতি) ফর্ম।  
অতিরিক্ত জেলা প্রশাসক(রাঃ), মানিকগঞ্জ।

(০৫ নং সাক্ষরিত প্রমাণ)  
কানুনগো  
উপজেলা পরিষদ  
শিবালি, মানিকগঞ্জ।

## **APPENDIX I      DC OFFICE CLEARANCE LETTER FOR LAND FILLING**

গণপ্রজাতন্ত্রী বাংলাদেশ সরকার  
জেলা প্রশাসকের কার্যালয়, মানিকগঞ্জ  
(রাজস্ব শাখা)  
www.manikganj.gov.bd

নং-০৫.৩০.৫৬০০.৩০২.৩০.০১১.২০১৬-৬৬২৩)

৩৭ বৈশাখ, ১৪২৫  
তারিখঃ  
৬০ এপ্রিল, ২০১৮

বিষয়ঃ ৩৫ মেগাওয়াট সোলার পাওয়ার প্রাক্ট নির্মাণের লক্ষ্যে মানিকগঞ্জ জেলার শিবালয় উপজেলার আওতাভুক্ত বরুরিয়া মৌজায় ১৪১.৭৪০ একর জমি স্পেক্ট্রা সোলার পার্ক লিঃ জন্মা বুলগেটের মাধ্যমে ড্রেজিং বালি দ্বারা ভরাটের অনুমতি প্রসঙ্গে।

সূত্রঃ ব্যবস্থাপনা পরিচালক, স্পেক্ট্রা সোলার পার্ক লিঃ এর আবেদনের স্মারক নং- এসএসপিএল/জেপ্রশা/২০১৮/০২  
তারিখঃ ২২/০৪/২০১৮

উপর্যুক্ত বিষয় ও সূত্রোক্ত স্মারকের আলোকে জানানো যাচ্ছে যে, অত্রফিস পেকে ২৯ জানুয়ারি, ২০১৮ তারিখে ০৫.৩০.৫৬০০.৩০২.০.০১১.০০৪.২০১৬-৪৩২ নং স্মারকে শিবালয় উপজেলাধীন বরুরিয়া মৌজায় ১৪১.৭৪০ একর জমি স্পেক্ট্রা সোলার পার্ক লিমিটেড এর অনুকূলে শর্ত সাপেক্ষে ক্রয়ের অনুমতি প্রদান করা হয়েছে। বর্তমানে উক্ত ১৪১.৭৪০ একর জমি বুলগেটের মাধ্যমে বালি/মাটি দ্বারা ভরাটের অনুমতি প্রার্থনা করা হয়।

এমতাবস্থায়, শিবালয় উপজেলাধীন বরুরিয়া মৌজায় স্পেক্ট্রা সোলার পার্ক লিমিটেডকে ১৪১.৭৪০ একর জমি সরকারি জমি হতে বালি/ মাটি উত্তোলন না করার শর্তে বালু ভরাটের নির্দেশক্রমে অনুমতি প্রদান করা হলো।

ব্যবস্থাপনা পরিচালক  
স্পেক্ট্রা সোলার পার্ক লিঃ।  
হাউজ নং-১৭, রোড নং-১০৬  
ব্লক-এজ জলশায়ী-১  
ঢাকা-১২১২।

(সাবরিনা শারমিন)  
রেজিনিউ ডেপুটি কালেক্টর  
মানিকগঞ্জ।  
ফোনঃ ৭৭১০২৪৩

অনুলিপিঃ

৩। উপজেলা নির্বাহী অফিসার  
শিবালয়।  
সহকারী কমিশনার (ভূমি)  
শিবালয়।

Land filling Clearance of 141.740 acre land for construction of proposed 35 MW Solar Park by Spectra Solar Power Limited at at Boruria Mouja, Shivalaya Upazila

Deputy Collector (Revenue), Manikganj  
Dt: 30/04/2018

## **APPENDIX J    SALE DEED COPY**

[illegible]



[illegible]



পাঁচ

টিকা

ট ৬৫২২৫৩৮৫

(৪৭,০৭০৮)

২৭ ফেব্রুয়ারি ২০১৯

২৭ ফেব্রুয়ারি ২০১৯

২৭ ফেব্রুয়ারি ২০১৯

(খ) নাম : মোঃ আনহার আলী  
 পিতার নাম : মরহুম আরশেদ আলী  
 মাতার নাম : মরহুমা আরশা বেগম  
 বয়স/জন্ম তারিখ : ১২/০৮/১৯৬০ ইং  
 ধর্ম : ইসলাম  
 পেশা : কৃষিকার্মী  
 জাতীয়তা : বাংলাদেশী  
 জাতীয় পরিচয় পত্র নং : ৫৬১৭৮১১০২০৭০১

স্থায়ী ঠিকানাঃ

গ্রাম/রোড	১ বকরিয়া	গ্রাম/রোড	১ বকরিয়া
ডাকঘর	১ নালী	ডাকঘর	১ নালী
থানা/উপজেলা	১ শিবসং	থানা/উপজেলা	১ শিবসং
জেলা/শহর	১ মানিকগঞ্জ	জেলা/শহর	১ মানিকগঞ্জ

বর্তমান ঠিকানাঃ

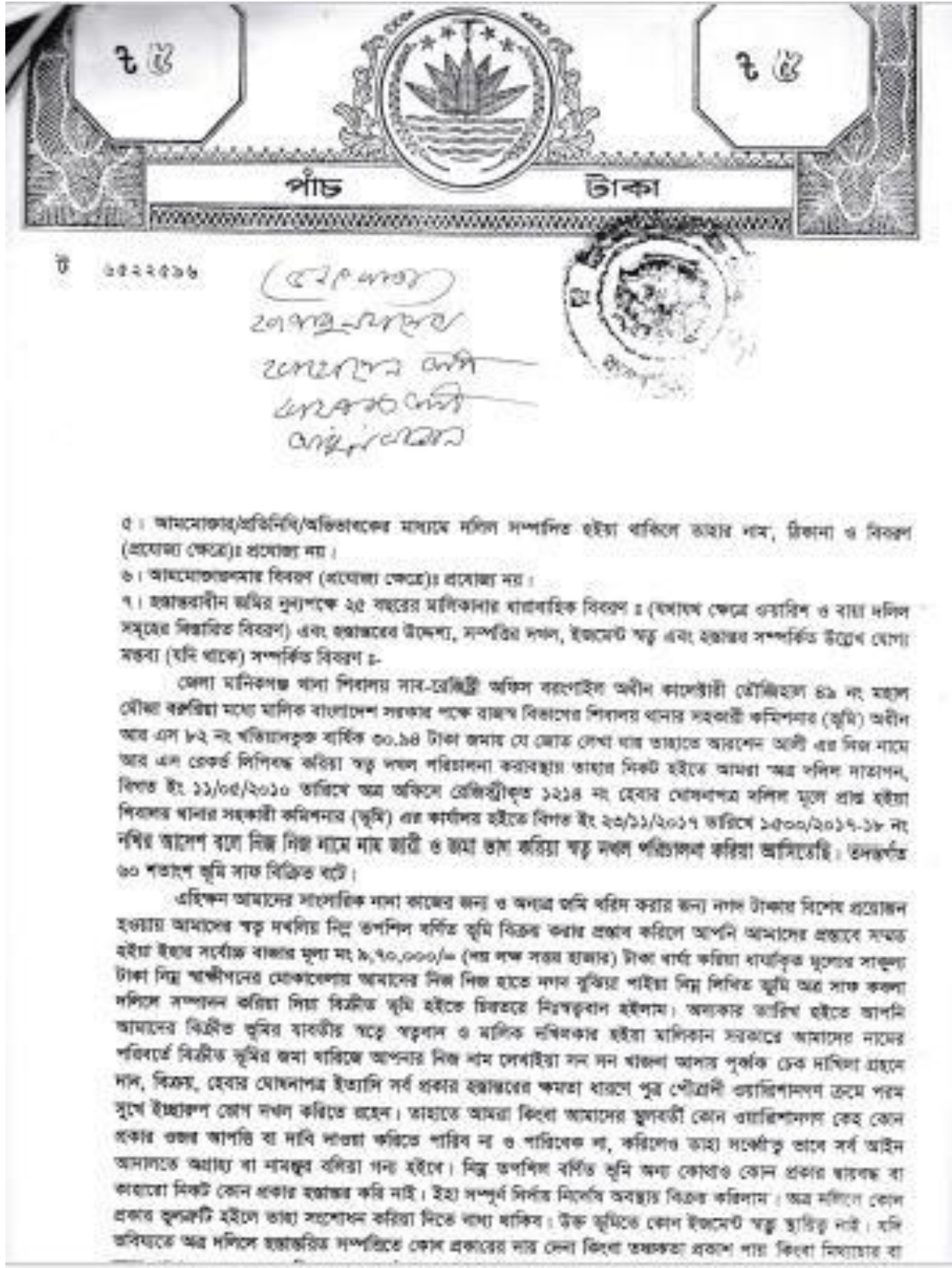
(গ) নাম : মোঃ আঃ মল্লিক  
 পিতার নাম : মরহুম আরশেদ আলী  
 মাতার নাম : মরহুমা আরশা বেগম  
 বয়স/জন্ম তারিখ : ১০/০৮/১৯৬২ ইং  
 ধর্ম : ইসলাম  
 পেশা : কৃষিকার্মী  
 জাতীয়তা : বাংলাদেশী  
 জাতীয় পরিচয় পত্র নং : ৫৬১৭৮১১০২০৭০৪

স্থায়ী ঠিকানাঃ

গ্রাম/রোড	১ বকরিয়া	গ্রাম/রোড	১ বকরিয়া
ডাকঘর	১ নালী	ডাকঘর	১ নালী
থানা/উপজেলা	১ শিবসং	থানা/উপজেলা	১ শিবসং
জেলা/শহর	১ মানিকগঞ্জ	জেলা/শহর	১ মানিকগঞ্জ

বর্তমান ঠিকানাঃ





## গণপ্রজাতন্ত্রী বাংলাদেশ সরকার

শ্রীমতি সুলতানা হাছানা

প্রত্যয়ন করা যাইতেছে যে,

০১। অত্র বাজার মূল্য তালিকায় ধারাবাহিক ভাবে (১-৭) = ৭ মোট পৃষ্ঠা রহিয়াছে।

০২। অত্র বাজার মূল্য তালিকা " সম্পত্তির সর্বনিম্ন বাজার মূল্য নির্ধারণ বিধিমালা এবং সংশ্লিষ্ট বিধিমালা ২০১৫ এর বিধি ৫ অনুসরণ ক্রমে প্রস্তুত করা হইয়াছে।

০৩। ২০১৫ ও ২০১৬ সনে যে সকল শ্রেণীর সম্পত্তির সাফ কবলা দলিল রেজিস্ট্রী হয় নাই বা অস্বাভাবিক মূল্যে রেজিস্ট্রী হইয়াছে সে ক্ষেত্রে বিধি ৫ এর উপবিধি ৪ (গ) অনুসরণ ক্রমে পূর্ববর্তী বছরের অর্থাৎ ২০১৫ ও ২০১৬ সনের বাজার মূল্যই ২০১৭ ও ২০১৬ সনের জন্য কার্যকর করা হইয়াছে যা "/" চিহ্ন দ্বারা চিহ্নিত রহিয়াছে।

দ্রষ্টব্য (১) ১ লা জানুয়ারী ২০১৫ হইতে ৩১ শে অক্টোবর ২০১৬ পর্যন্ত রেজিস্ট্রীকৃত সাফ কবলা দলিলের ভিত্তিতে সম্পত্তির বাজার মূল্য নির্ধারণ করা হইল।

বাজার মূল্য তালিকা প্রস্তুত কারক

শ্রীমতি সুলতানা হাছানা

হোসেন আরা আক্তার

মোহাম্মদ, সাব-রেজিস্ট্রারের কার্যালয়

বরংগাইল, শিবালয়, মানিকগঞ্জ।

২৪/১১/১৬

বাজার মূল্য তালিকা যাচাইকারক

শ্রীমতি সুলতানা হাছানা

মোঃ আব্দুল হাই

সহকারী

সাব-রেজিস্ট্রারের কার্যালয়,

বরংগাইল, শিবালয়, মানিকগঞ্জ।

২৪/১১/১৬

সম্পত্তির " সর্ব নিম্ন বাজার মূল্য নির্ধারণ বিধিমালা ২০১৫ এবং এন, আর, ও নং- ৩২৫ আইন/২০১৫ অনুযায়ী বাজার মূল্য নির্ধারণ কমিটির নিকট বরংগাইল সাব-রেজিস্ট্রারী অফিসের অধিক্ষেত্রে আওতাভুক্ত ব্যক্তি মালিকানাধীন সম্পত্তির বাজার মূল্য তালিকা উপস্থাপন করা হইল।

Xalam

(বিলকিস আরা)

সাব-রেজিস্ট্রার, বরংগাইল

শিবালয়, মানিকগঞ্জ

ও সদস্য সচিব

সম্পত্তির বাজার মূল্য নির্ধারণ কমিটি/২০১৬

২৪/১১/১৬

(মাইকেল মহিউদ্দীন আব্দুল্লাহ)

সাব-রেজিস্ট্রার, বিওর, মানিকগঞ্জ।

ও সদস্য

সম্পত্তির বাজার মূল্য

নির্ধারণ কমিটি- ২০১৬ ইং।

(বিলকিস আরা)

সাব-রেজিস্ট্রার, বরংগাইল, শিবালয় মানিকগঞ্জ।

ও সদস্য সচিব

সম্পত্তির বাজার মূল্য

নির্ধারণ কমিটি- ২০১৬ ইং।

(মোঃ শাহাদাৎ হোসেন ভূঞা)

জেলা রেজিস্ট্রার, মানিকগঞ্জ,

ও সভাপতি

সম্পত্তির বাজার মূল্য

নির্ধারণ কমিটি- ২০১৬ইং।

সংস্করণ নং: ১০০০

জন্ম: ১৯৮৫

মানিকগঞ্জ:









কট ৬০০১৯৪৪

৬৮(বি)+৪  
২-২০০/-  
২-২০০/-  
৭৯-২৫০/-

মোঃ আব্দুল হান্নান

০৭/০৭/১৭

বিশেষ, সাধারণ বা অপ্রত্যাহার যোগ্য Power of Attorney বা আম-মোক্তারনামা  
[(বিধি-৭(১), ৮(১) বা ৯(১) দ্রষ্টব্য)]

১। রেজিস্ট্রী অফিসের নামঃ সাব-রেজিস্ট্রারের কার্যালয়, বরংগাইল, শিবালয়, মানিকগঞ্জ।

২। দলিলের সার সংক্ষেপঃ

দলিলের প্রকৃতি	মোক্তার নাম	জে এল নং	ইউনিয়ন	উপজেলা	জেলা
অপ্রত্যাহারযোগ্য আম-মোক্তারনামা	বক্রিয়া	আর এস ১৮১ নং	আরুয়া	শিবালয়	মানিকগঞ্জ।
হস্তান্তরিত সম্পত্তির পরিমান	শ্রেণী	মূল্য (অংকে ও কথায়)			
২২ শতাংশ মাত্র।	নাল	পঞ্চাশমূল্য ব্যতীত।			

৩। সম্পাদনের তারিখঃ ইংরেজী দিবস...০.৫...মাস...০.৭....., সন ২০১৭।

বাংলা দিবস...২২...মাস...০.৬....., সন ১৪২৪।

“দেশপ্রেমের শপথ নিন, দুর্নীতিকে বিদায় দিন”

## APPENDIX K LAND RATE

# ২০১৫ সনের জন্য প্রযোজ্য বরংগাইল সাব-রেজিস্ট্রী অফিসের অধিক্ষেত্রের মৌজা ওয়ারী শ্রেণীভিত্তিক গড়মূল্য তালিকা।

Land rate of 2015 for every Mouza at Boroigail Sub-Registry office.



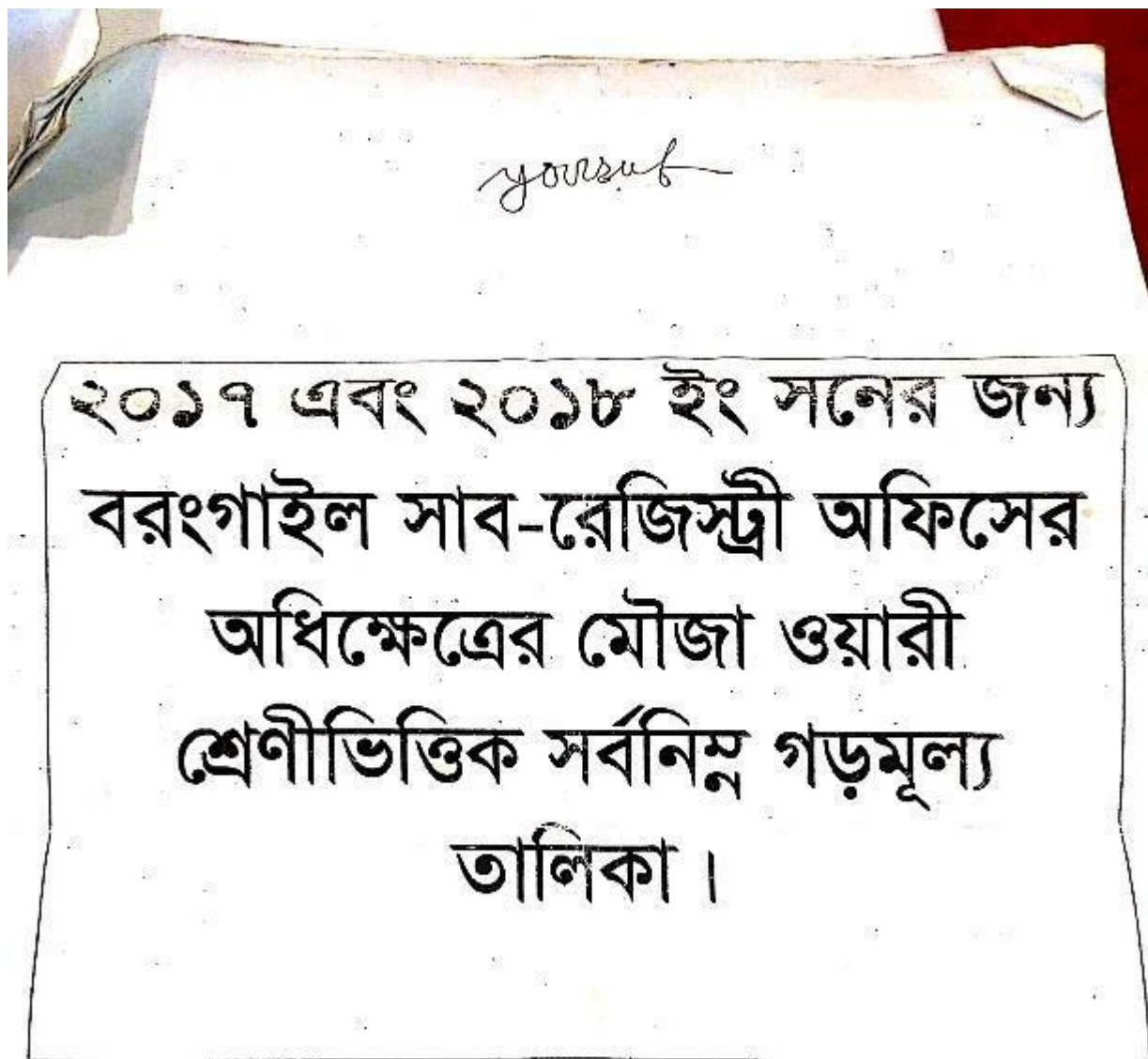
শ্রেণী ভেদে শতাংশ প্রতি জমির গড় মূল্য						
ক্র.এস নং আর এস	মৌজার নাম	চান্দিনা	বাড়ী	নাল	ভোঁবা	মন্তব্য
১৫১	দক্ষিণ কাশাদহ		১০,০০০/-*	১৩,০০০/-*	৩,০০০/-*	
১৫২	কোকাদি		১০,০০০/-*	৮,৩৩৩.৩৪/*	৩,০০০/-*	
১৫৩	রিশাদি		৪৫,০০০/-*	৪২,৩৫২/-	২,০০০/-*	
১৫৪	পূর্ব আরপাড়া		২৫,০০০/-*	২০,৯৭৫.৬১/*	৪,০০০/-*	
১৫৫	মাধবদিয়া		২,০০০/-*	৮,৯৬৮/-	৭০০/-*	
১৫৬	পাইপাড়া		১২,০০০/-*	১৩,৪৩৪.৮৫/*	২,০০০/-*	
১৫৭	ইছাইল		২০,০০০/-*	২০,৫৪৩/-	১০,০০০/-*	
১৫৮	পশ্চিম আরপাড়া		৫,০০০/-*	৮,২৭৩/-	২,০০০/-*	
১৫৯	বোয়ালীপাড়া		৫৭,৫৬০.৯৭/*	১৫,৮২১/-*	৩,০০০/-*	
১৬০	বড় বোয়ালী		১৯,২০০/-*	২১,৬৯৬/-	৩,০০০/-*	
১৬১	শিবালয়	২,৬৬,৬৬৬.৬৬*	১,৮৮,৫৫১.৮৬/*	১,২৯,০২৩/-	২৫,০০০/*	
১৬২	আরিচা		৩,০০০/-*	২,৫০০/-*	১,৫০০/-*	
১৬৩	ছোট আনুলিয়া		১৭,৬৫২.২৬/-*	১৮,৫৯৬.২৯/*	২,০০০/-*	
১৬৪	ছোট বোয়ালী		৫২,৬৬৬.৬৭/*	৬০,৭১৩.১৭/*	৪,০০০/-*	
১৬৫	বড় আনুলিয়া		৭,১১১.১১/-*	২০,০৯৭/-	২,০০০/*	
১৬৬	ছোট কালীগঙ্গা		৮,০০০/-*	৫,০০০/-*	২,০০০/-*	
১৬৭	অন্যায়পুর		৯,০২৩.২৬/-*	১৯,৪৩০/-	২,০০০/-*	
১৬৮	চরকান্দি		৯,০৯০.৯১/-*	৯,৩৯৭/-	২,০০০/-*	
১৬৯	দাসকান্দি		৫,০০০/-*	১০,৯৩৮/-	৩,০০০/-*	
১৭০	নরজনা					নদীগর্ভে
১৭১	ছোট নরজনা					নদীগর্ভে
১৭২	এলানবৈশাটোল					নদীগর্ভে
১৭৩	মুতরাবাড়ী		১৫,০০০/-*	৩৪,৪৭৩.৬৯/*	৭,০০০/-*	
১৭৪	পশ্চিম কাফুরা		৫,০০০/-*	১৫,০৫৫.৫৬/*	১,৫০০/-*	
১৭৫	বড় কালীগঙ্গা		৩৩,০৩৬/-	২২,২১৪/-	৩,০০০/-*	
১৭৬	পূর্ব কাফুরা		১৭,৬৬৬.৬৬/*	৭০,৬৫৯.৫৮/	২,০০০/-*	
১৭৭	ছোট মুতরাবাড়ী		১৫,০০০/-*	১০,০০০/-*	৮,০০০/-*	
১৭৮	নালী	৭০,০০০/-*	৩৯,৮৫৪.১৫/*	১২,০৭৫.৫০/*	৮,০০০/-*	
১৭৯	ত্রিলোচনপাতি		২০,০০০/-*	১০,৩৪৪.৮৩/*	৪,০০০/-*	
১৮০	তেঘরী		১৫,০০০/-*	৮,০০০/-*	৬,০০০/-*	
১৮১	বরুরিয়া		২৬,২৮০/-	১৫,৬৮০/-	৪,০০০/-*	
১৮২	গোবিন্দপুর					নদীগর্ভে
১৮৩	শালদাহ					নদীগর্ভে
১৮৪	গবিনাথপুর					নদীগর্ভে
১৮৫	মরিচাখোলা					নদীগর্ভে
১৮৬	কাচাদিয়া					নদীগর্ভে
১৮৭	বিগ ভৈরব					নদীগর্ভে
১৮৮	শিয়ুলিয়া					নদীগর্ভে

-১৬২



## LAND CLASSIFICATION AND LAND RATE

SL.NO	MOUZA	CHANDINA	BARI	NAL	DOBA	REMARKS
161	SHIVALAYA	26666666	188551.86	129023	25000	-
173	DHATURABARI		15000	34473.69	7000	
178	NALI	70000	39854.15	12075.50	8000	
179	TRILOCHANPATTY		20000	10344.83	4000	
180	TEGHARI		15000	8000	6000	
181	BORURIA		26280	15680	4000	



Land rate of 2017 and 2018 for every Mouza at Boroigail Sub-Registry office.

ক্র.সং.	মৌজার নাম	চান্দিনা	বারী	নেল	ডোবা	নদীগর্ভে
১৭১	ছোট নরজানা					নদীগর্ভে
১৭২	এলান বৈলতৈল					নদীগর্ভে
১৭৩	ধুতরাবাড়ী		৪৬,৯০২.৬৫/-	৩৪,৭৮৩.৪০/-	৭,০০০/-*	
১৭৪	পশ্চিম কাফুরা		৫,০০০/-*	১৫,০৫৫.৫৬/-*	১,৫০০/-*	
১৭৫	বড় কালী গঙ্গা		৩৫,২৭৭.৭৮/-	২৩,৫২১.৪৫/-	৩,০০০/-*	
১৭৬	পূর্ব কাফুরা		১৭,৬৬৬.৬৬/-*	৭,৬৫৯.৫৮/-*	২,০০০/-*	সংশোধিত
১৭৭	ছোট ধুতরাবাড়ী		১৫,০০০/-*	১০,০০০/-*	৮,০০০/-*	
১৭৮	নালী	৭০,০০০/-*	৪৪,৯৪৬.৬৮/-	২০,০২৬.১৪/-	৮,০০০/-*	
১৭৯	ত্রিলোচনপট্ট		২০,০০০/-*	১০,৩৪৪.৮৩/-*	৪,০০০/-*	
১৮০	ভেঘরী		২৩,৮০০.৮৮/-	৯,৮৬৮.৮৪/-	৬,০০০/-*	
১৮১	বরুরিয়া		২৭,৬৮৭.৫০/-	১৬,০৫৪.৮৩/-	৪,০০০/-*	
১৮২	গোবিন্দপুর					নদীগর্ভে
১৮৩	শালদাহ					নদীগর্ভে
১৮৪	গবিনাথপুর					নদীগর্ভে
১৮৫	মরিচাখোলা					নদীগর্ভে
১৮৬	কাচাদিয়া					নদীগর্ভে
১৮৭	বিল ভৈরব					নদীগর্ভে
১৮৮	শিমুলিয়া					নদীগর্ভে
১৮৯	কুষ্টিয়া		৫,০০০/-*	৪,০০০/-*	৩,০০০/-*	
১৯০	দক্ষিণ শালজানা		১৪,৯০৫.২৬/-	১৪,৮১২.৬০/-	৬,০০০/-*	
১৯১	ধীংপুর		৩৩,২৪৯.৩২/-*	২৩,৭১৫/-*	৪,০০০/-*	
১৯২	ঘোনাপাড়া		৯,৩৩৩.৩৪/-*	১২,৮৮৩.২৩/-	৪,০০০/-*	
১৯৩	আকরা		১৬,৮৬৪.৮৭/-*	১৮,১৮৬.৫০/-	৫,০০০/-*	
১৯৪	জগৎদিয়া		৪,০০০/-*	৩,০০০/-*	২,০০০/-*	
১৯৫	ছোট কোকরন্দ		৫,১৮৫.১৯/-*	৫,০০০/-*	২,৭০০/-*	
১৯৬	বড় কোকরন্দ		৪,০০০/-*	৭,১৪২.৮৬/-*	নাই	
১৯৭	বাউলী কান্দা	১৪,০০০/-*	২৫,৬১৮/-	১৫,৩৩৪/-*	৮,০০০/-*	
১৯৮	ছোট পাচুরিয়া					নদীগর্ভে
১৯৯	বাঘুটিয়া					নদীগর্ভে
২০০	চন্দ্রপ্রভাব					নদীগর্ভে
২০১	মহিন্দাপুর					নদীগর্ভে

#### LAND CLASSIFICATION AND LAND RATE

SL.NO	MOUZA	CHANDINA	BARI	NAL	DOBA	REMARKS
173	DHATURABARI		46902.65	34743.40	7000	
178	NALI	70000	44946.68	20026.14	8000	
179	TRILOCHANPATTY		20000	10344.83	4000	
180	TEGHARI		23800.89	9868.84	6000	
181	BORURIA		27687.50	16054.83	4000	

## **APPENDIX L    LETTER OF INTENT (LOI) FROM BPDB**







বাংলাদেশ বিদ্যুৎ উন্নয়ন বোর্ড  
Bangladesh Power Development Board

“শেখ হাসিনার উদ্দেশ্য,  
যেই যাবে বিদ্যুৎ”  
Central Secretariat  
BPDB, WAPDA Building  
(1<sup>st</sup> Floor), Motijheel C/A  
Dhaka-1000  
Phone- 9554209

Memo No- 27.11.0000.101.14.013.17-2523

Dated: 29-08-2017

Consortium of Spectra Engineers Limited  
House: 17, Road: 106, Block: CEN (F), Gulshan-2  
Dhaka-1212, Bangladesh.  
Telephone: +880-2-8816192, Fax: +880-2-8819932  
Email: info@spectragroup.com.bd

and

Shunfeng Investment Limited  
Portion A, 10/F, World Wide House  
No.19 Des Voeux Road Central, Hong Kong  
Telephone: 852-23638086  
Email: info@sfcegroup.com

**Sub: Letter of Intent (LOI) for the development of Grid Connected Solar PV Power Plant of 35 MW Capacity at Paturia, Shibalong, Manikganj, Bangladesh.**

**Ref: 27.00.0000.071.14.049.2017.239 dated: 16/05/2017**

Dear Sir

**A. REFERENCE**

This Letter of Intent, hereinafter referred to as the “LOI” is being issued to the addressee, pursuant to approval received from the Power Division, Ministry of Power, Energy and Mineral Resources (MPEMR), Bangladesh Secretariat, Dhaka vide memo referred above for the development of the project identified below (the “Project”) under the special act, 2010 (Revised 2015) for enhancement of power & energy (বিদ্যুৎ ও জ্বালানীর দ্রুত সরবরাহ বৃদ্ধি (বিশেষ বিধান) আইন, ২০১০(সংশোধিত ২০১৫)) on the terms described in this LOI.

**B. AUTHORIZATION**

The Government of People's Republic of Bangladesh represented by the Power Division, Ministry of Power, Energy and Mineral Resources, hereinafter referred to as the “GOB” accords its approval on the Levelized Tariff of US \$ 0.1390/kWh on “No Electricity, No Payment” basis (Considering Discount factor 12%, Plant factor 18.5% and 1 USD = Tk. 80 ) to Consortium of Spectra Engineers Limited and Shunfeng Investment Limited hereinafter referred to as the “Sponsor” and grants its permission to design, finance, insure, construct, own, commission, operate and maintain (the “Project”) a 35 MW Grid Connected Solar PV based power generating facility at Paturia, Shibalong, Manikganj, Bangladesh hereinafter referred to as the “Facility”.

The Facility will have a net electric power generating capacity of 35 MW . Net Energy Output from the Facility will be purchased on “No Electricity, No Payment” basis under the Power Purchase Agreement, hereinafter referred to as the “PPA”. The Company formed by the Sponsor shall be solely responsible for the financing, development and completion of the Project and development of the necessary related facilities under the following terms & conditions, as measured from the date of issuance of this LOI and from the Project Effective Date:

1. Plant Capacity : 35 MW Grid Connected Solar PV Power Plant.

2. Project Sponsor : Consortium of Spectra Engineers Limited and Shunfeng Investment Limited.
3. Project Site Location : Paturia, Shibaloy, Manikganj, Bangladesh.
4. Consortium Members & Shareholding
  - Lead Member : Spectra Engineers Limited : 80%
  - Operating Member : Shunfeng Investment Limited : 20%
5. Project Land : Land should be non-agricultural. The Sponsor shall be responsible for the arrangement of proposed land for the project.
6. Plant Type : Solar PV
7. Plant Condition : Brand New
8. Evacuation Voltage : 33 kV
9. Operating Voltage Range : +10% to -20%
10. Operating Frequency Range : 48.50 Hz to 51.5 Hz (continuous operation)
11. Interconnection Line : Before commissioning of Barangail, Manikganj 132/33 kV grid substation, power generated from Solar Power Plant will be evacuated through 33 kV double circuit line to bus-bar of Paturia 33/11 kV substation (by one circuit) and tapping another circuit with existing 33kv line near Gheor 33/11 kV substation. The Company shall responsible for construction, operation & maintenance of both circuit of 33 kV interconnection line .  
  
The Company shall also construct 33 kV double circuit line from the Facility upto Barangail, Manikganj 132/33 kV grid substation (to be constructed by PGCB) prior to commissioning of Barangail , Manikganj 132/33 kV grid substation for power evacuation .The Company shall responsible for operation & maintenance of the said 33 kV double circuit interconnection line . The Sponsor shall be responsible for construction of 2 nos 33 kV GIS bay (including all equipment) at Barangail 132/33 kV gird substation.  
  
The sponsor is responsible to arrange the land, Rights of Way (ROW) and required compensation for Rights of Way (ROW) for above mentioned interconnection lines. All drawings, design and specifications related to power evacuation shall be approved by BPDB/PGCB Ltd. /REB .
12. Required Commercial Operation Date (RCOD) : Within 12 months from the date of signing of Project Agreements.
13. Contract Period : 20 Years
14. Project Effective Date : The date on which last of the Project Agreements is executed

**C. FORMATION OF COMPANY**

The Sponsor shall form a "Company" comprising the equity shareholding as mentioned above for the purpose of this Project, which will be a special purpose vehicle i.e. a public/private limited company incorporated in the Joint Stock Companies, Bangladesh. The Project Agreements shall be executed by that "Company" which will be responsible to design, finance, insure, build, own, operate and maintain the Project. After the incorporation of the "Company", the rights and obligations of the Sponsor hereunder will be assigned to the "Company".

**D. FINANCING OF THE PROJECT**

Consortium of Spectra Engineers Limited and Shunfeng Investment Limited shall be responsible for financing the Project.

**E. NO LIABILITY FOR REVIEW**

No review, examination, evaluation or approval by BPDB of any document, instrument, drawing, specifications or design proposed or delivered by the Sponsor or the Company in connection with the delivering of its Proposal or BPDB's evaluation thereof or the issuance of this LOI shall relieve the Sponsor or the Company from any obligation or liability that it would otherwise have had for its negligence in the preparation of such document, instrument, drawing, specification or design or failure to comply with applicable laws of Bangladesh or to satisfy the Company's obligations under this LOI, the Project Agreements, or the other documents comprising the Security Package (as defined in the IA) with respect thereto, nor shall BPDB be liable to the Sponsor or the Company or any other person by reason of its review, examination, evaluation or approval of any document, instrument, drawing, specification, or design.

**F. PROPOSAL SECURITY**

The Sponsor shall be required to submit the Bank Guarantee as Proposal Security at the rate of USD 5,000.00 per MW for 35 MW upon acceptance of LOI.

**G. VALIDITY OF THE PROPOSAL AND THE PROPOSAL SECURITY**

The validity of the Proposal and Proposal Security shall have to be extended for an additional period of three (3) Months or more until such time as the Project Agreements are executed.

**H. GOVERNING LAW**

This Letter of Intent shall be governed by and construed in accordance with the Laws of Bangladesh.


**I. ACCEPTANCE OF LETTER OF INTENT (LOI)**

You are requested to communicate your acceptance (not acknowledgement) of this LOI within 7 (seven) days from the issuance of this LOI. If the Sponsor fails to submit the required amount of Proposal Security upon acceptance of LOI, BPDB shall have the right to terminate the LOI.

**J. TERMINATION OF LOI**

1. The Company formed by the Sponsor will sign the Implementation Agreement ("IA") and the Power Purchase Agreement ("PPA"), (collectively, the "Project Agreements") with the GOB and BPDB respectively on the date to be notified by BPDB, failure to which, BPDB shall reserves the right to terminate this LOI by written notification to the Sponsor & forfeit the Proposal Security. The Sponsor will collect the Project Agreements from the Office of the IPP Cell-3, BPDB, Dhaka upon the acceptance of LOI.

2. The Sponsor shall submit the Bank Guarantee as Proposal Security at the rate of USD 5,000.00 per MW for 35 MW as per BPDB's standard format. The validity of the Bank Guarantee shall continue till the Project Effective Date. If the Company fails to sign the Project Agreements within 7 (seven) Days following the notification of BPDB, BPDB shall have the right to terminate the LOI as well as to forfeit the Proposal Security.
3. The Company formed by the Sponsor will provide the Performance Security Deposit at the rate of USD 18,000.00 per MW for 35 MW only as per BPDB's standard format, Certificate of Incorporation (along with Memorandum and Articles of Association) for newly formed "Company" in Bangladesh no later than two (2) days prior to the date of signing of the Project Agreements, failure to which, BPDB shall reserves the right to terminate this LOI by written notification to the Sponsor.
4. The Sponsor will provide (i) the unconditional acceptance of LOI within seven (7) days (ii) unconditional Bank Guarantee as Proposal Security within fifteen (15) days (iii) initialed Project Agreements within thirty (30) days and (iv) documents of land along with Mouza map, RS Dag No. and RS Khatian No. (Site description will be part of the PPA) as per submitted Proposal within thirty (30) days from the issuance of this LOI. If the Sponsor fails to furnish (i) the acceptance of LOI and the Proposal Security within stipulated time as mentioned above, BPDB shall reserve the right to terminate this LOI. If the Sponsor fails to furnish (i) initialed Project Agreements and ii) documents of land along with Mouza map, RS Dag No., RS Khatian No. within stipulated time as mentioned above, BPDB shall reserve the right to terminate this LOI and forfeit the Proposal Security.
5. The Sponsor shall extend the Proposal validity & the Proposal Security validity at least 7 (seven) days prior to the expiration of the Proposal validity and Proposal Security validity, failure to which, BPDB shall have the right to forfeit the Proposal Security.
6. Upon termination of LOI, neither the Sponsor nor the Company shall have any claim for compensation or damages against BPDB or any other Governmental agency on any grounds whatsoever.

  
**Md. Mahbubur Rahman**  
 Director  
 Cell-3 BPDB, Dhaka.

By Order  
  
 (Mina Masud Uzzamn)  
 Secretary

Bangladesh Power Development Board  
 Dated: 29-08-2017.

Memo No- 27.11.0000.101.14.013.17-2523

**Copy to:**

1. Member, Administration/Finance/Generation/Distribution/P&D/Company Affairs, BPDB, Dhaka.
2. Chief Engineer, Generation/ Private Generation (IPP/PPP)/ P&D, BPDB, Dhaka.
3. Controller of Accounts & Finance, BPDB, Dhaka.
4. Director, IPP Cell-3/System Planning/ Finance/Contract and Consultant Administration /Directorate of Renewable Energy and Research & Development, BPDB, Dhaka.
5. C S O to Chairman, BPDB, Dhaka.
6. P S to Secretary, Power Division, Ministry of Power, Energy & Mineral Resources, Bangladesh Secretariat, Dhaka.
7. Office copy .

(Pranob Kumar Ghosh)  
 Assistant Secretary (Dev.)  
 Central Secretariat  
 BPDB, Dhaka.

## **APPENDIX M THE STATE ACQUISITION AND TENANCY ACT, 1950**



## THE STATE ACQUISITION AND TENANCY ACT, 1950

### Section 107: Settlement of fair and equitable rents

107. (1) After a table of rent-rates has been prepared and confirmed under this Chapter, the Revenue-officer shall proceed to settle, according to the provisions of the preceding sections, the fair and equitable rents of all tenants in the area to which the table of rent-rates applies and to prepare the settlement rent-roll as directed under clause (b) of sub-section (1) of section 99.

(2) For the purpose of settling such fair and equitable rents and preparing the settlement rent-roll, the Revenue-officer shall be guided by the rent-rates entered in the table of rent-rates so prepared and confirmed:

Provided that a Revenue-officer shall not be bound to apply the said rates to any particular case or area if he considers, for reasons to be recorded in writing, that the application of such rates to such case or area would be unfair or inequitable.

(3) Where any non-agricultural land is comprised in a tenancy which includes land other than non-agricultural land, or when the classification of land has partly changed from agricultural to non-agricultural, the Revenue-officer shall,-

- (i) divide the tenancy so as to constitute separate tenancies for the non-agricultural land and the agricultural land,
- (ii) apportion the existing rent between the tenancies so constituted,
- (iii) estimate fair and equitable rents for the agricultural and non-agricultural land in accordance with the provisions of this Chapter, and
- (iv) make such consequential changes in the record-of-rights as may be necessary.

### Section 108: Preliminary publication and amendment of settlement rent-roll

108. (1) When a settlement rent-roll has been prepared, the Revenue-officer shall cause a draft of it to be published in the prescribed manner and for the prescribed period and shall receive and consider any objection made to an entry therein or omission therefrom during the period of publication and shall dispose of such objections according to such rules as the Government may make.

(2) The Revenue-officer may, of his own motion or on application of any party aggrieved, at any time before a settlement rent-roll is submitted to the confirming authority under section 109, revise any rent entered therein:

Provided that no such entries shall be revised until reasonable notice has been given to the tenant concerned to appear and be heard in the matter.

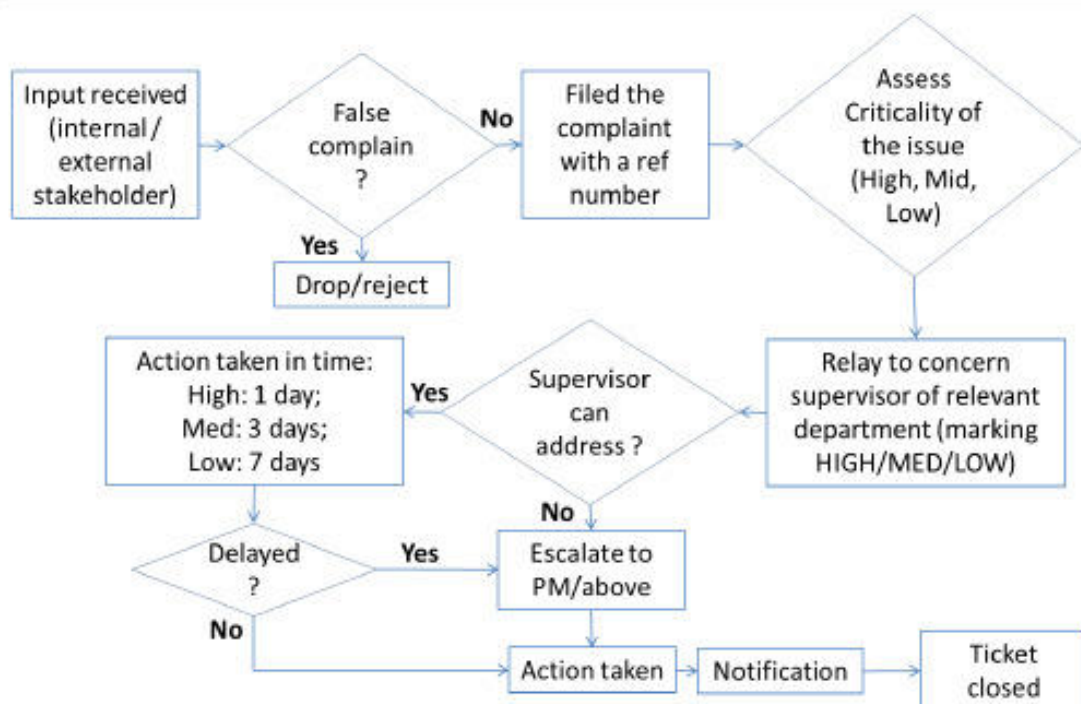
## **APPENDIX N    GRIEVANCE REDRESS MECHANISM/ GUIDELINE OF SSPL**

## Grievance Redress Mechanism/Guideline

### Objective of this document

To provide a basic guideline to people/ any affected person (both internal & external) to be able to lodge/share any complain in connection to the site, work environment, surroundings etc.

### Basic flowchart



### Key points:

- Complain may be received over phone/email/letter/verbally at the complain desk. Full identity needs to be disclosed while placing the complain. For critical sophisticated issues, it can be addressed to company HR.
- Grievance Redress form is to be maintained/follow.

SSPL-QM/POLICY – 0053

Revision no: 00

- Site complain desk should be visible to people. At office for internal stakeholders separate book should be maintained.
- People awareness should be created on this methodology.
- Equality should be displayed during process irrespective of religion, cast, origin, gender, job grade, sub-contract workers.
- Category of Grievances
  - **Criticality LOW:** Minor, straightforward issues may only need screening before proceeding to the next step (resolution options and response). Review of minor issues, especially those related to a complainant's request for information, can generally be handled easily by providing information on the spot, or referring the person to the designated representative from the project team.
  - **Criticality MID:** Less clear, more problematic, or repetitive issues, or group complaints may need a more detailed review prior to action. Staff involved in handling grievances may need to seek advice internally, and in some cases turn to outside parties to help in the validation process, especially in cases of damage claims.
  - **Criticality HIGH:** Complex issues with multiple parties may need investigation can be organized internally, or the company may designate third-party experts to investigate when impartiality is important or when complex technical matters are involved. If an extensive investigation is found to be necessary, it shall be initiated swiftly before circumstances change or the conflict escalates further.

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## **APPENDIX T**

## **FLOOD LIKELIHOOD ASSESSMENT**



**Spectra Solar Park Limited**

# **Environmental & Social Impact Assessment of 35 MW Solar Power Project in Manikganj District of Bangladesh**

**Flood Likelihood Assessment**

24 February 2019

Project No.: 0495823

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				Name	Date	
1.0	0	Vijay Penagonda, Shubhankar Khare	Aniket Jalgaonkar	Nitya Shah	24.02.2019	Draft Report



---

## Signature Page

24 February 2019

# Environmental & Social Impact Assessment of 35 MW Solar Power Project in Manikganj District of Bangladesh

## Flood Likelihood Assessment

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Partner

---

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## Acronyms and Abbreviations

Name	Description
amsl	Above Mean Sea Level
ASTER	Advanced Spaceborne Thermal Emission and Reflection Radiometer
BWDB	Bangladesh Water Development Board
DDM	Department of Disaster Management
DEM	Digital Elevation Model
D.L.	Danger Level
ESA	European Space Agency
FFWC	Flood Forecasting and Warning Centre
GDEM	Global Digital Elevation Model
ICIMOD	International Centre for Integrated Mountain Development
JAXA	Japan Aerospace Exploration Agency
LANDSAT	Land Satellite
R.L.	Reference Level
PV	Photovoltaics
PWD	Public Works Department, denotes survey datum
USGS	United States Geological Survey

## 1. INTRODUCTION

ERM India Private Limited (hereafter referred to as 'ERM') has been commissioned by Spectra Solar (hereafter referred to as "Spectra" or the "Client") to undertake a Rapid Environmental and Social Risk Assessment (hereafter referred to as the "assignment") for a proposed Greenfield 35 MW PV Solar Plant in Manikganj District, Bangladesh (hereafter referred to as the "Project"). As part of the assignment, ERM undertook a rapid E&S site assessment and a flood likelihood assessment in the month of February 2019. This report presents the findings of the flood likelihood assessment process. This document presents the risks identified, against the applicable reference framework and the proposed way forward.

### 1.1 Scope of Work

The assessment methodology was designed to evaluate the potential of flooding caused due to the Site's development in the surrounding areas and covers the following elements;

- A visit of the property, including a visual survey of the drainage pattern in and around that area as identified from the maps;
- Collection of relevant information for the subject Site and surrounding area. This included site area maps and identification of land-use.
- Discussions with the local population to understand the historical flood levels in this area;
- Collection of historical rainfall data (Daily rainfall data, from the Meteorological Department) and available information on the existing natural drainage system in the area;
- A review of readily available records and documents on hydrology of the area, to assist in determining surface water drainage patterns for the subject property and adjacent areas;
- Recommendations for undertaking further assessments in case of potential flood risks for the Site.

ERM's findings are based on professional judgement and application of engineering principles, and are provided to Spectra to render informed decisions to be made for the development and activities in the Site.

### 1.2 Limitations

#### 1.2.1 Scope of Activity

The report is based upon the application of engineering principles and professional judgement to certain facts with resultant subjective interpretations. Professional judgements expressed herein are based on the currently available facts within the limits of the existing data, scope of work, budget and schedule. We make no warranties, express or implied, including, without limitation, warranties as to merchantability or fitness for a particular purpose. In addition, the information provided to the Client in this report is not to be construed as legal advice.

#### 1.2.2 Limitations of Use of This Report

ERM is not engaged in such studies and reporting for the purposes of advertising, sales promotion, or endorsement of any Client's interests, including raising investment capital, recommending investment decisions, or other publicity purposes. Client acknowledges that this report has been prepared for the exclusive use of the Client and agrees that ERM's reports or correspondence will not be used or reproduced in full or in part for such purposes, and may not be used or relied upon in any prospectus or offering circular. Client also agrees that none of its advertising, sales promotion, or other publicity matter containing information obtained from this assessment and report will mention or imply the name of ERM.



Nothing contained in this report shall be construed as a warranty or affirmation by ERM that Site and property described in the report are suitable collateral for any loan or that acquisition of such property by any lender through foreclosure proceedings or otherwise will not expose the lender to potential liability.

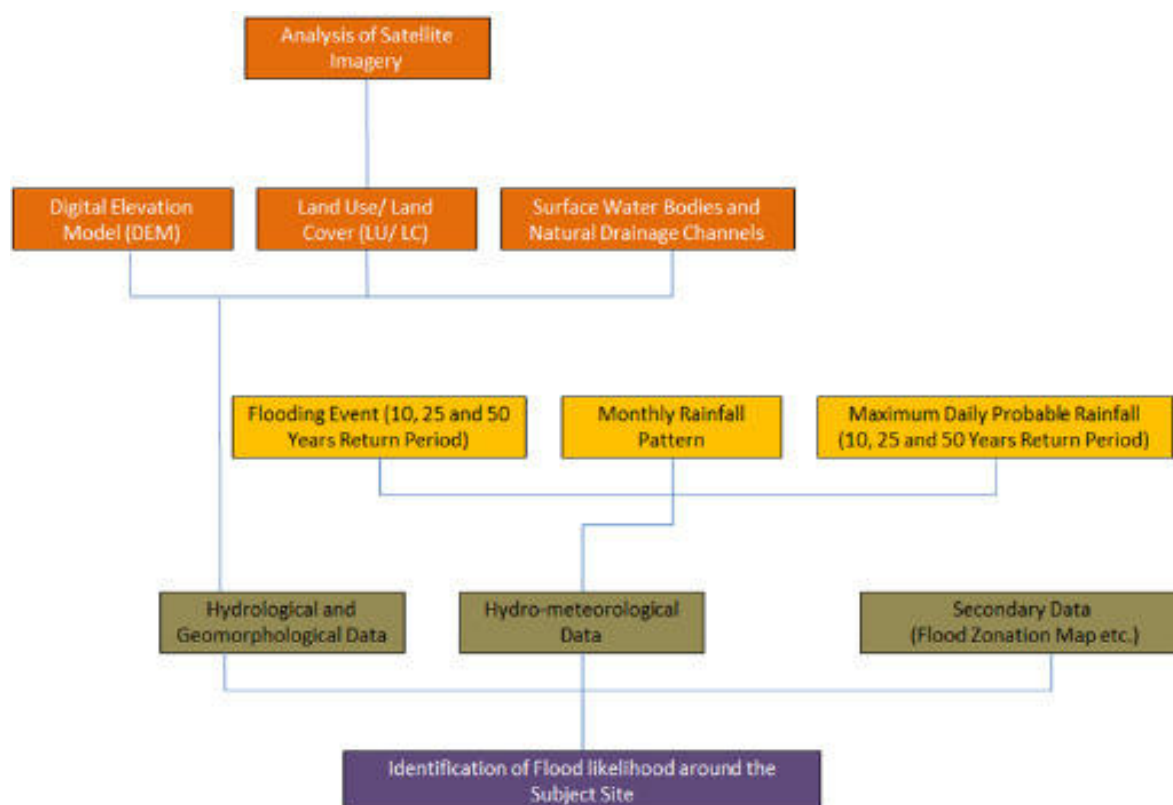
### 1.3 Structure of Report

The remainder of the report is structured as follows:

- Section 2: Hydrological and Geomorphological Data;
- Section 3: Hydro-meteorological Data;
- Section 4: Secondary Data: Flood, Waterlogging, and Inundation;
- Section 5: Likelihood of a Flooding Event; and
- Section 6: Conclusions and Recommendations.

Figure 1.1 shows the detailed structure of the report.

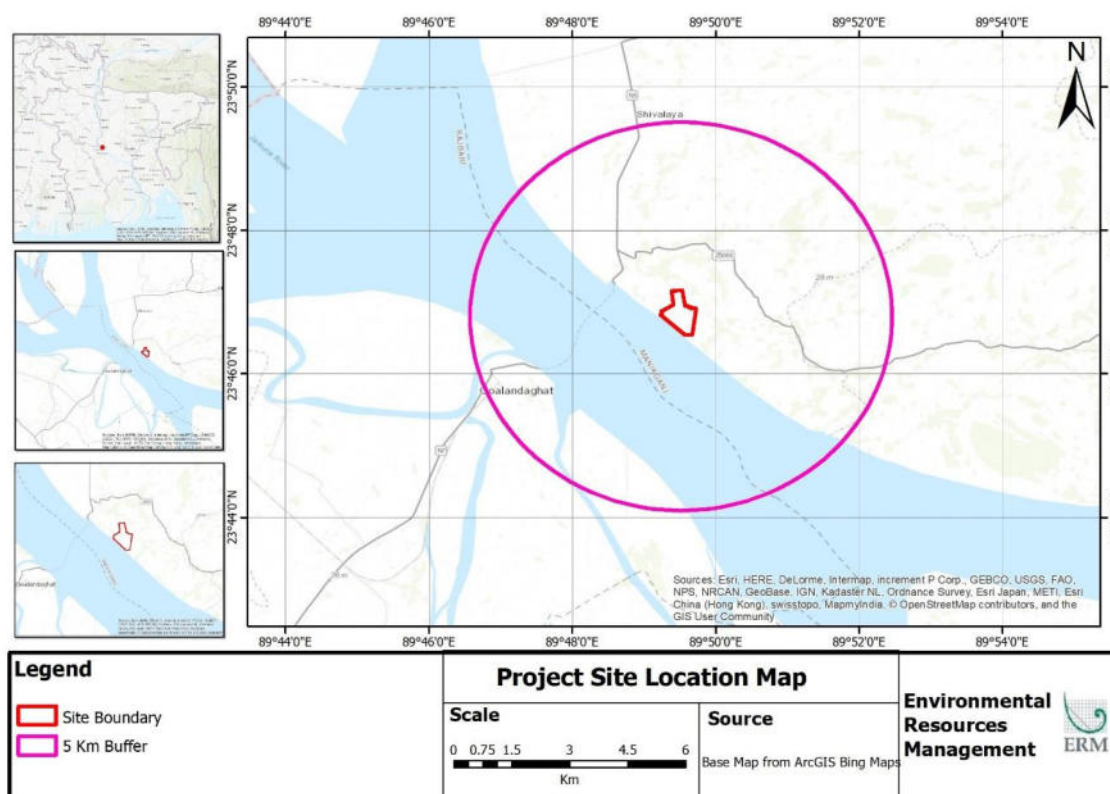
**Figure 1.1 Detailed Structure of the Report**



## 2. HYDROLOGICAL AND GEOMORPHOLOGICAL DATA

The proposed Site (89°49'30.87"E, 23°46'48.20"N), spread over an area admeasuring ~ 140 acres (54 hectares), is located in Dorikandi village, Shibalay upazilla, in Manikganj district of the Dhaka division in Bangladesh. The Site is located ~88 km west of Dhaka and 31 km southwest of Manikganj (nearest town) on the left bank of Padma River. The subject property can be accessed via the Dhaka-Paturia highway. The Site location map is presented in **Figure 2.1**.

**Figure 2.1 Site Location Map**



### 2.1 Study area and Site Setting

The study area (5 km around the Site) was identified to have mixed land use primarily in form of agricultural and water bodies, followed by vegetated land parcels. The core zone (2 km radius) around the Site is largely occupied by river channel of the Padma River. Padma River located at ~50 m southwest from the Site and a distributary of Brahmaputra River (aka Jamuna River) named Ichamati River (aka Ichamoti) flows through the study area in the north to south-eastern vector ~270 m east of Site. Surface runoff from the Site and surrounding areas is likely to drain into the Ichamati River. Ichamati River merges with Padma River approximately 11 km southeast and downstream from the Site. **Table 2.1** presents the listing of properties adjacent to the Solar Park.

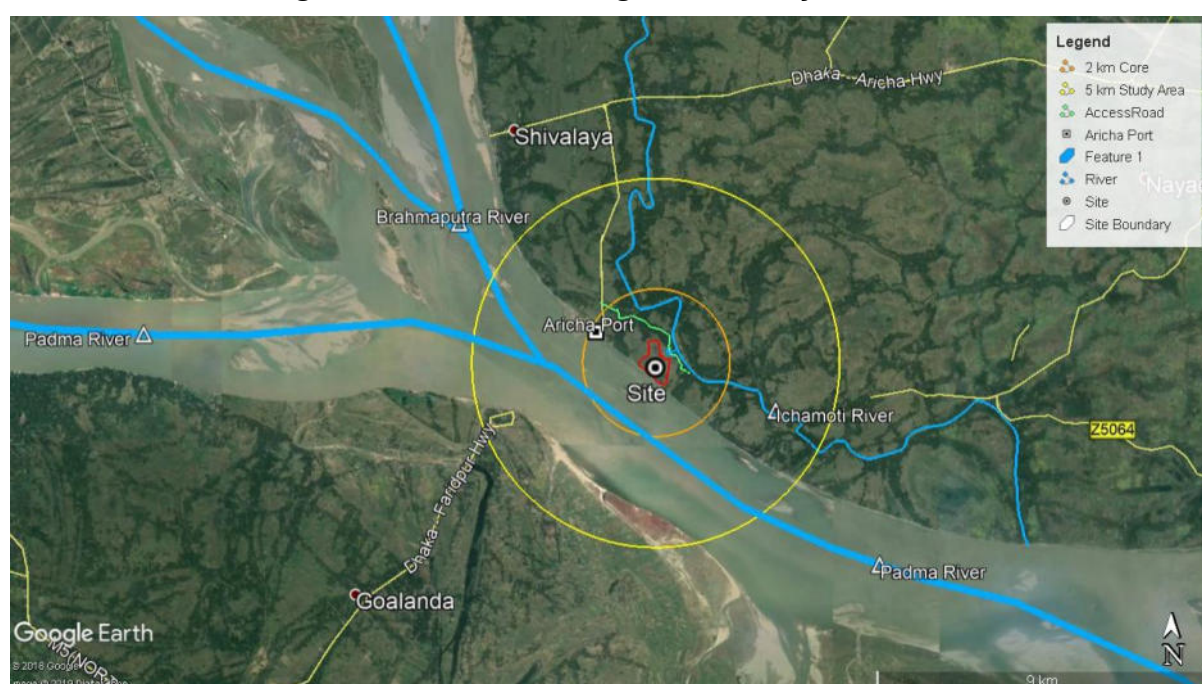
**Table 2.1 Surrounding land features of the Site**

Direction w.r.t. Site	Feature
North	Cultivated agricultural land and vegetated land with sparse settlements beyond which to the north is the Ichamati River (~900 m).
East	Cultivated agricultural land and vegetated land with sparse settlements. An access road that connects the Site with Dhaka-Paturia highway is located ~120 m east of the Site. Further east is the Ichamati River (~270 m) beyond which are largely agricultural

Direction w.r.t. Site	Feature
	land parcels with sparse settlements. Aricha Ghat (Paturia Ferry Terminal) which is among the busiest ferry ports in Bangladesh is located ~1.4 km northwest from Site.
West	Located immediately west is the Padma River at ~50 m which stretches over 3.25 km wide. Padma River passes along the entire western and south-western boundary of the Site.
South	Cultivated agricultural land followed by Padma River (~150 m).

Based on review of satellite imagery and consultations with local agencies, major flood control structures such as barrages, dams, reservoirs were not reported/observed within the study area and upstream of the Site up to 50 km. Refer to **Figure 2.2** for map showing the various features in the Site surrounding.

**Figure 2.2 Site Setting and Nearby Features**



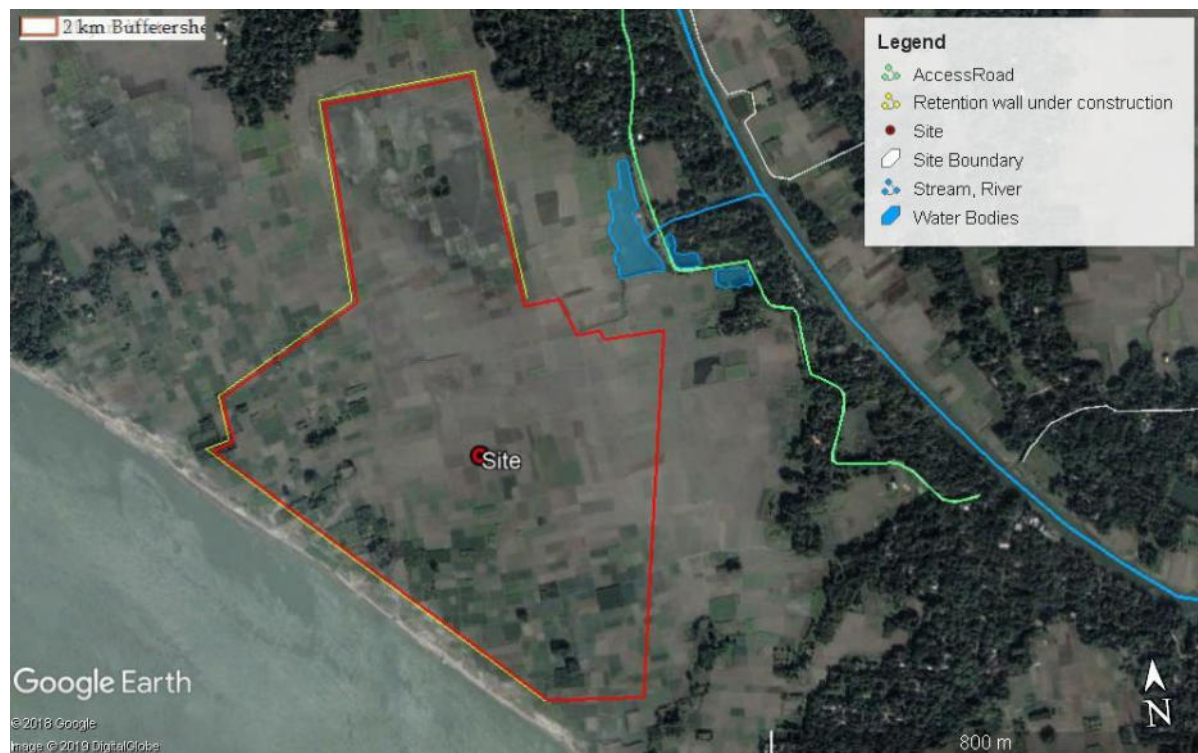
## 2.2 Site Description

The Site is located in a rural setting surrounded primarily by agricultural land on the north, east and south-eastern sides and by Padma River along the west and south-western side. Based on review of satellite imagery, Site and surrounding area was historically low lying areas used for agricultural purpose. At the time of field visit, backfilling was completed for the entire Site area. Areas immediately adjoining the Site along northwest, north, northeast, east, and southeast were used for cultivating three (3) crops (largely rice, mustard, non-seasonal rice).

According to the Site representative of Spectra Solar, all of 140 acres have been acquired and confirmed for development at the Site. Backfilling had been completed across the entire Site clearly demarcating the Site boundary. Retention wall was under construction along the Site boundary on the west (facing the river), northwest, and north at the time of field visit as depicted in **Figure 2.3**. As per the Client, retention wall will be constructed along the periphery of the entire Site. Coordinates of the Site boundary was provided by the Site representative which is presented in **Figure 2.3**.



**Figure 2.3 Site Map**



Site is located on a land parcel bound on one side by Padma River (at ~50 m west / southwest) and by Ichamati River on the other (at ~270 m east).

At a broad scale, the study area is drained by Padma River flowing in northwest to southeast direction. East-central portion of the Site was naturally the lowest level in the area at ~0 – 2 m amsl (above mean sea level) and hence was historically a sink prone to waterlogging for several months (3 to 6 months) of the year. This was confirmed based on review of satellite imagery and corroborated through community consultations. Surplus water from Site and immediate surroundings is drained by Ichamati River through a natural drainage channel located east of the Site as shown in Figure 2.3.

However, at the time of field visit, Site was backfilled with sand sourced from the river bed and neighbouring land parcels. As per information shared by Site personnel, Site level has been raised up to an elevation of 9.406 m, which is with reference to the Danger Level (DL) of Padma River.



**Figure 2.4 Field Images showing Key Features near the Site**



Backfill Site area, prepared for construction phase



Relative elevation difference between raised surface level of Site and natural ground level



Padma River as seen from the western boundary of the Site



Retention wall (boundary wall) under construction along the western boundary of Site

**Figure 2.5 Field Images showing Key Features near the Site**



Artificial Pond located next to the access road of the Site



Canal channel which drains Site area into Ichamati River



Pond created from dredging next to Site during backfilling stage



Ichamati River located east of the Site

### 2.3 Topography and Drainage of the Watershed/Catchment

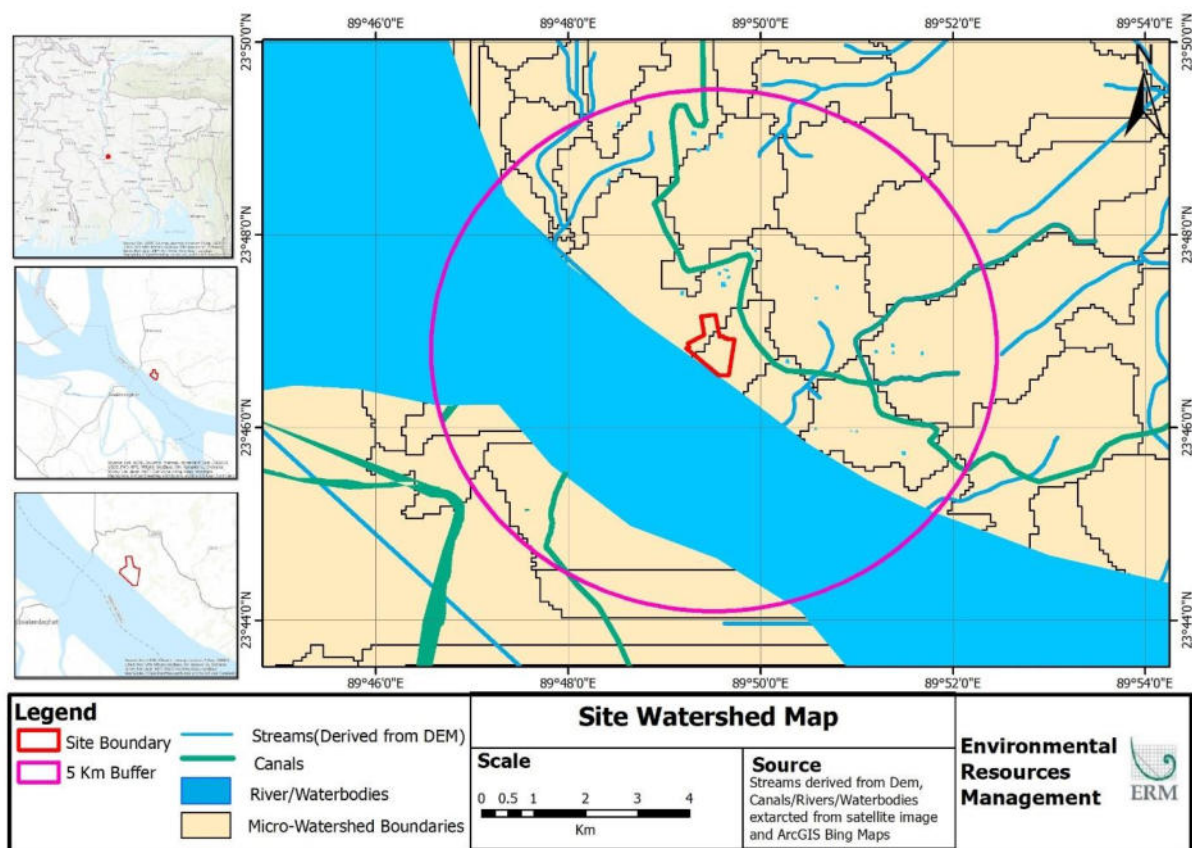
Based on the Digital Elevation Model developed for the Site from USGS ASTER GDEM data set, LANDSAT and Google Earth Imagery available and the Site visits undertaken, ERM identified key topographic features in the study area such as topographic highs and lows, natural drainage network and delineated the catchment area of the micro-watershed in which the Site is located. An ASTER GDEM having a 30 m resolution was used for detailed mapping of the micro watershed in which the Site is located.

The micro-watershed within which the Site is located was delineated based on the topography and drainage pattern. The micro-watershed area admeasures ~7.6 km<sup>2</sup>, predominantly occupied by Padma River as presented in **Figure 2.6**. The Site is located close to the edge of the catchment<sup>1</sup>, almost along the river bank. The natural drainage of the micro-watershed is from north to south and southeast, while within the Site area is from west to northeast direction. The ground slope leads the drainage from the Site area to natural drainage channel, low lying areas located in east of the Site and ultimately to the Padma River in the downstream. Though, the Padma river is located adjacent the Site (southwest to the Site), the gradient is towards northeast of the Site due to presence of levee.

<sup>1</sup> Catchment is a topographically defined area, draining surface water to a single outlet point. It may frequently include an area of tributary streams and flow paths as well as the main stream.

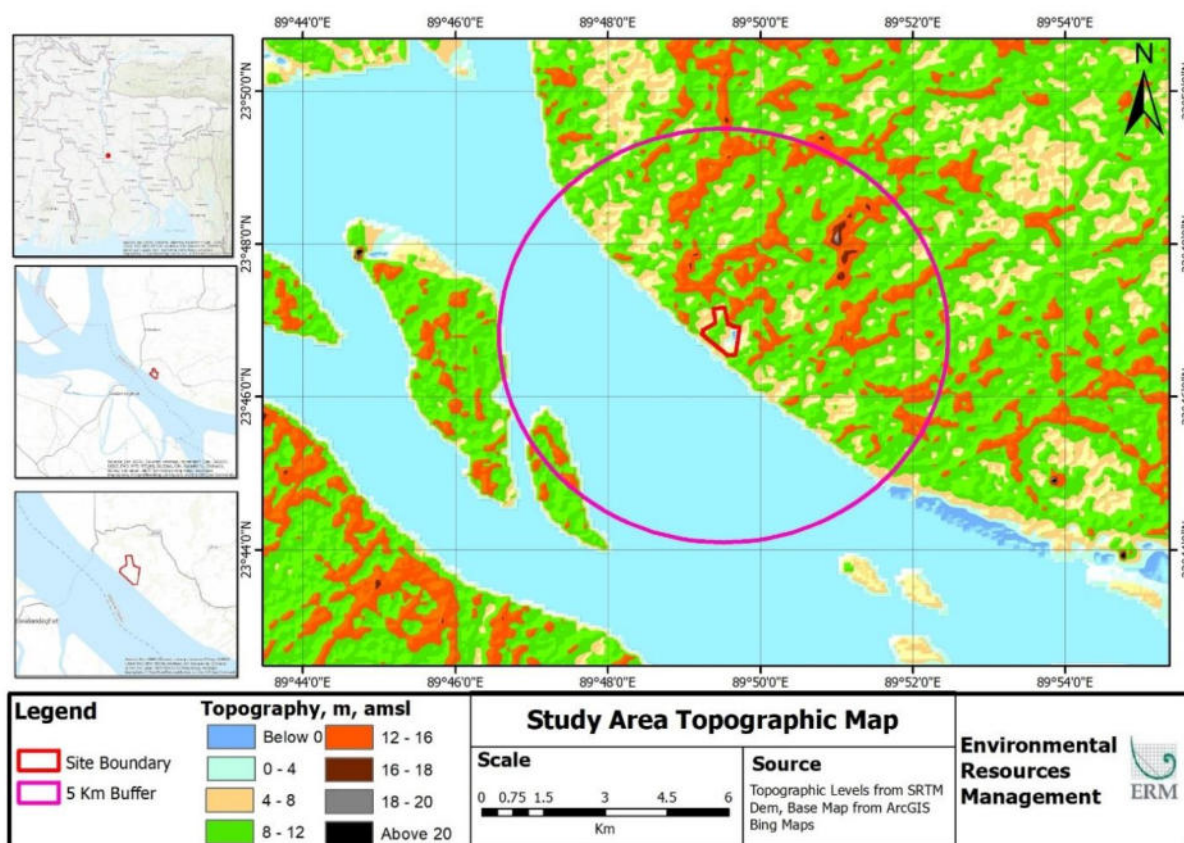


**Figure 2.6 Catchment Area of Micro-watershed within which the Site is Located**



The digital elevation model (DEM) of the area is presented in **Figure 2.7**. The ground elevation was observed to vary from 12 – 16 m in isolated patches within the study area, followed by areas with elevation ranging between 08 – 12m and 4 – 8 m amsl. Continuous gradient was not observed in the study area. Most of the Site area falls in the 4 – 10 m amsl elevation. East-southeast portion of the Site being the lowest point varying between sub-zero – 4 m amsl.

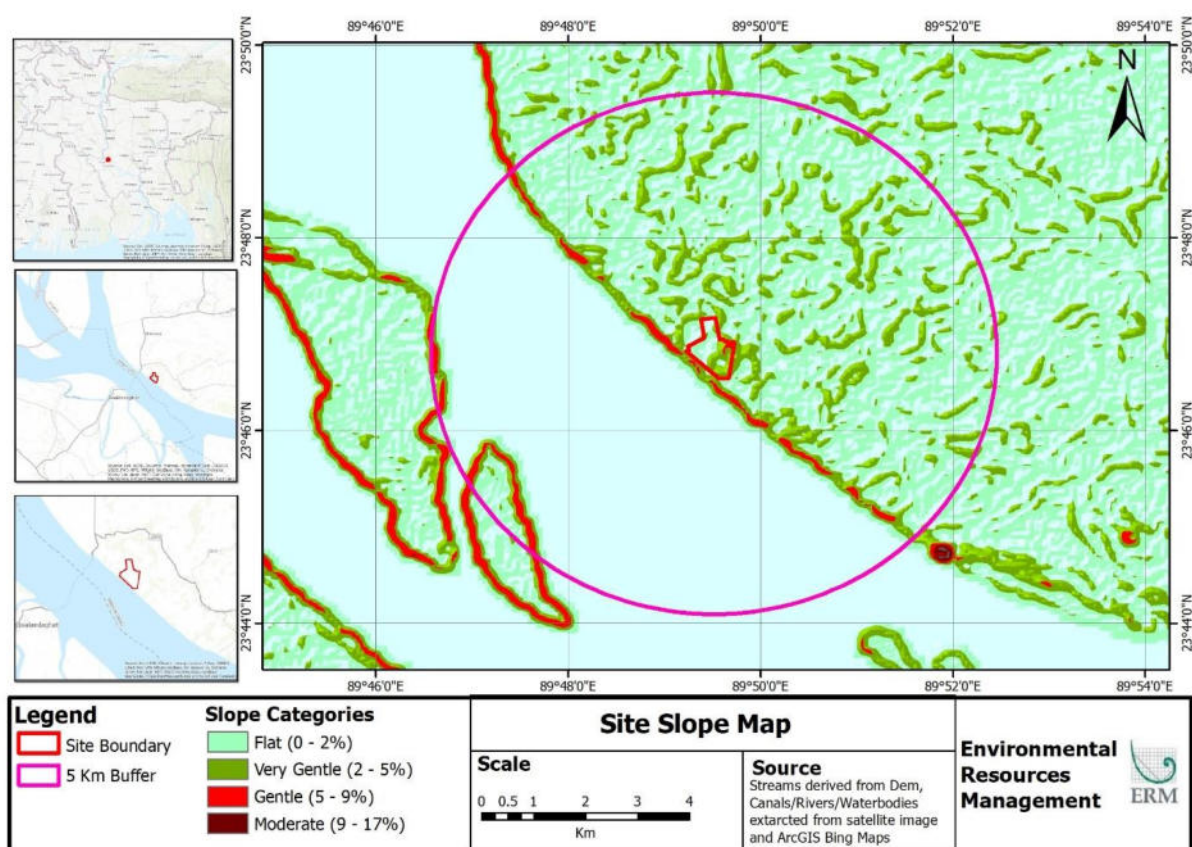
**Figure 2.7 Digital Elevation Model (DEM) of Study Area**



### 2.3.1 Slope Map

As per the slope map, the study area is largely flat to very gently sloping (0 – 5% slope) with scattered pockets of gentle slopes. The Site and its immediate surroundings were observed to have near level to very gentle slopes with slopes varying between 0 – 5%, while banks of the river adjacent to the Site was observed to be under gentle slope (5 – 9%). Based on the topography and slope maps, the Site area appears to have pockets of 'low lying areas' with potential for water logging and flooding during rainy season which may be attributed to near level slopes. The average slope of the catchment was evaluated to be ~4.6 m/km, while the general slope of the catchment was observed to be from north to south, and west to east at Site level. Low elevation areas such as flat and very gentle slopes are indicative of low lying areas which are prone to flooding and water logging due to gradual evacuation of run-off water during a storm event. The Slope map is presented in **Figure 2.8**.

**Figure 2.8 Slope Map of the Site Area and the Catchment**



Abrupt slope changes were not observed at the Site and nearby areas.

## 2.4 Surface Water Bodies and Natural Drainage Channels within the Catchment

Key surface water bodies and natural drainage channels within the region include Padma River, Jamuna River, Dhaleshwari River, Kaliganga River, and Ichamati River. Padma River and Jamuna River merge near Aricha Port. The Site is located on the left bank of the Padma River ~5 km downstream from the confluence point. Dhaleshwari and Kaliganga Rivers are distributaries of Jamuna River which are located > 20 km NE from the Site. Ichamati River is a distributary of Jamuna River which passes through the study area.

### 2.4.1 Padma River

The Padma is the second longest river of Bangladesh (Hossain et al., 2005). It is the main distributary of the Ganga, which originates in the Gangotri glacier of the Himalayan. The part of the Ganga in Bangladesh is known as the Padma which enters Bangladesh from India (Murshidabad district) at Shibganj Upazila (Manakosha and Durlavpur unions) of Chapai Nawabganj district. Its length in Bangladesh is 366 kilometers (Hossain et al., 2005<sup>2</sup>). The Padma is joined by the mighty Jamuna (Lower Brahmaputra) and the resulting combination flows with the name Padma further east, to Chandpur. At this point, the widest river in Bangladesh, the Meghna, merges with the Padma, continuing as the Meghna to the south, before finally discharging in the Bay of Bengal.

Padma River channel extends over 3.25 km wide area near the Site and has clearly defined banks on both sides of the river. Submergence area of the river channel varies depending on the season.

<sup>2</sup> Hossain MA and Haque MA (2005). Fish species composition in the River Padma near Rajshahi. Journal of Life Earth Science 1(1):35-42



Based on satellite imagery, the river is observed to show considerable erosion and siltation which in turn alter the water course within the river channel on a frequent basis. Owing to combined flow from both Padma and Jamuna rivers, Padma experiences frequent flooding and is known to have caused some of the most prominent floods in Bangladesh in the past, both in terms of scale and magnitude.

**Figure 2.9 Field Images of Padma River**

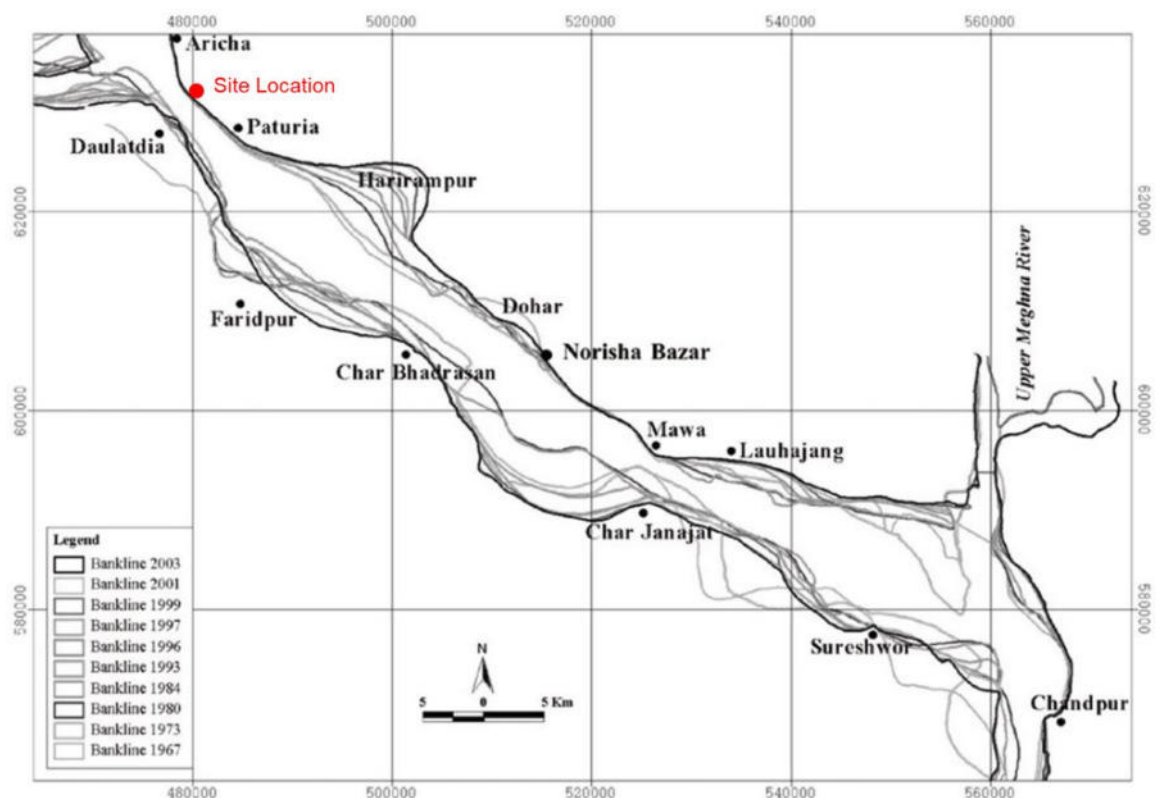


Padma River as viewed from southern boundary of Site

River gauge located near Paturia Ferry Terminal

The Site is located on the left bank of Padma River, south to the Paturia Ferry terminal (approximately one km). Being located at the bank of the river and morphologically at riverine lands are prone to erosion/accretion, which alter the flow direction and intensity of the storm water. Based on the research articles, Padma River banks are prone to large scale erosion. However, the patch of the bank, where the Site is located is less prone compared to other areas of the bank (**Figure 2.10**).

**Figure 2.10 Historical Bank Positions of Padma River**



Source: Amreen et. al., 2012<sup>3</sup>

## 2.4.2 Ichamati River

Ichamati River at Manikganj is a distributary of The Brahmaputra River (aka Jamuna), which originates ~ 14 km north and upstream from the Site and discharges into river Padma, ~10.5 km southeast and downstream from the Site. It meanders through a total length of ~21 km before merging with Padma River. The River is perennial in nature with an average water level of ~5.5 m during monsoon and ~1 m during pre-monsoon period. Ichamati River is located ~270 m east of the Site at the nearest point. Surplus surface runoff from the Site and surrounding area drain into this river. High water level in Ichamati is likely to cause backflow, inundation and waterlogging near Site and surround area.

**Figure 2.11 Field Images of Ichamati River**



Ichamati River showing make-shift bamboo bridge crossing



Ichamati River showing erosion caused during high water level

## 2.5 Geomorphology

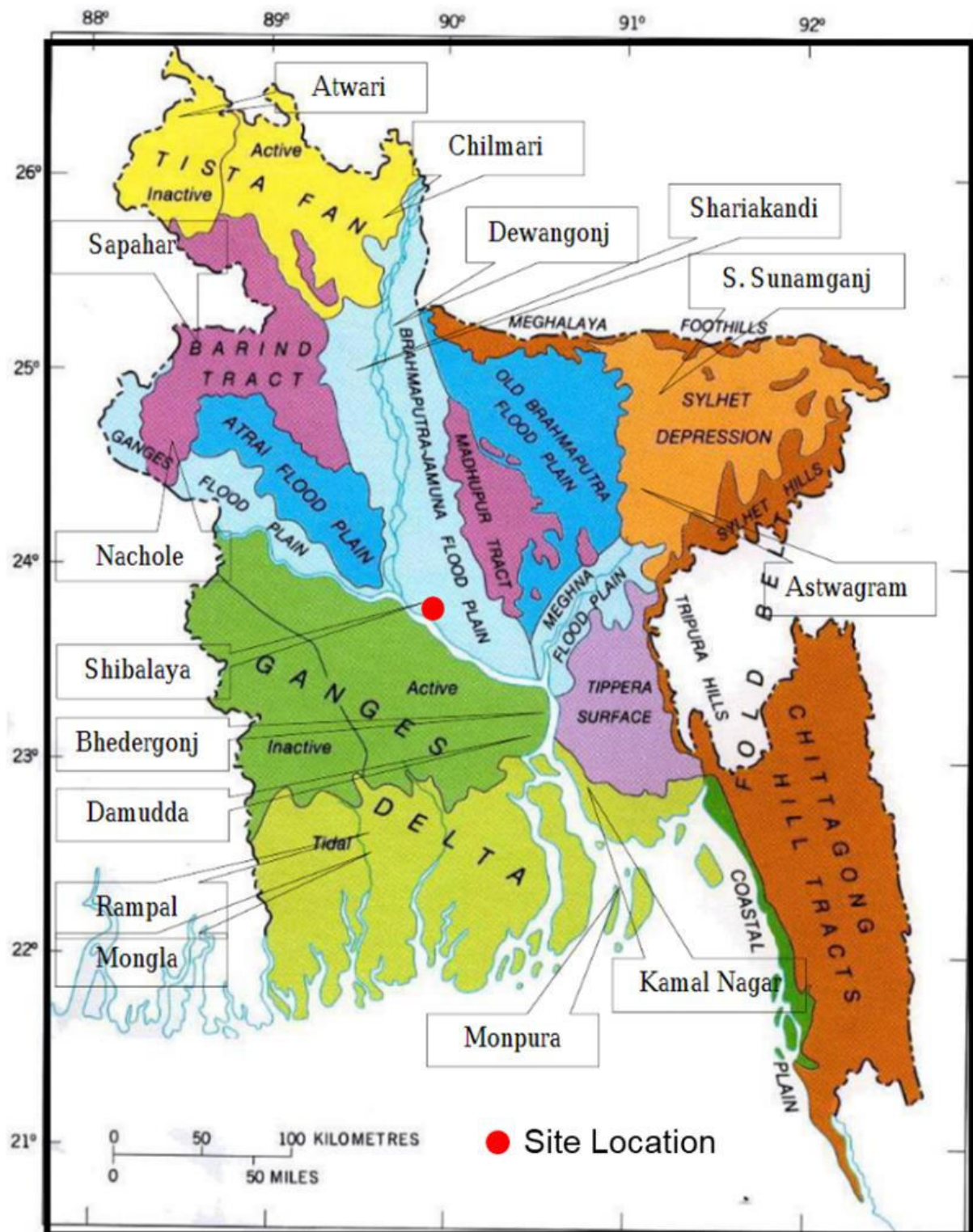
Geomorphic features integrated with geology and lithology controls the occurrence, movement and quality of groundwater and surface water. Geomorphological map for Bangladesh was available from secondary source for review (**Figure 2.12**). The flood plains of the Ganges, the Atrai, the Brahmaputra-Jamuna, the Old Brahmaputra, and the Meghna rivers cover approximately 40% of Bangladesh's landform. The Ganges flood plain extends from the western border of the country, south of the Barind Tract, as far East where it merges with the Jamuna flood plain. Landform of the flood plain is characterized by natural levees distributed in a mottled pattern which forms shallow depressions and small ridges. The elevation of the major part of the flood plain ranges from 3 to 5 meters above the mean sea-level and covers the central, north and north-eastern part of the country. The present study area falls under Brahmaputra Jamuna Flood Plain. The Brahmaputra-Jamuna flood plain is located between the Barind and Madhupur Tracts, elevation of this surface is 29 m in the north and about 6 m in the south, the study area is located at lower reaches of this flood plains.

This kind of geomorphological setup is likely to be conducive for drainage and infiltration and may scale-down peak run-off and discharge (and therefore flood likelihood) of storm water during high intensity rainfall events in the natural levee areas. However, floodplain areas may be prone to water logging and localized inundation owing to slowly permeable silty clay.

<sup>3</sup> Amreen Shajahan, Yousuf Reja (2012). Riverbank Erosion and Sustainable Planning Guidelines for Bangladesh with Emphasis on Padma River. Journal of Habitat Engineering and Design. ISSN 2186-6503. Vol 4, Number 2, 145-156.



**Figure 2.12 Geomorphology of the Catchment**



Source: Centre for Water and Environment<sup>4</sup>

<sup>4</sup> Zahid, Anwar & Hydro, Environmental &, Geologist. (2015). THE EFFICIENCY OF EXISTING WATSAN TECHNOLOGIES IN SELECTED HARD-TO-REACH AREAS OF BANGLADESH.

[https://www.researchgate.net/publication/320593295\\_THE\\_EFFICIENCY\\_OF\\_EXISTING\\_WATSAN\\_TECHNOLOGIES\\_IN\\_SELECTED\\_HARD-TO-REACH\\_AREAS\\_OF\\_BANGLADESH](https://www.researchgate.net/publication/320593295_THE_EFFICIENCY_OF_EXISTING_WATSAN_TECHNOLOGIES_IN_SELECTED_HARD-TO-REACH_AREAS_OF_BANGLADESH)

### 3. HYDRO-METEOROLOGY

The climate of Bangladesh in general is characterized as subtropical monsoon climate, with wide seasonal variation in rainfall, and moderately warm temperature and high humidity. Four (4) distinct seasons are observed in Bangladesh viz. Pre-Monsoon (MAM), Monsoon (JJAS), Post-Monsoon (ON), and Winter (DJF).

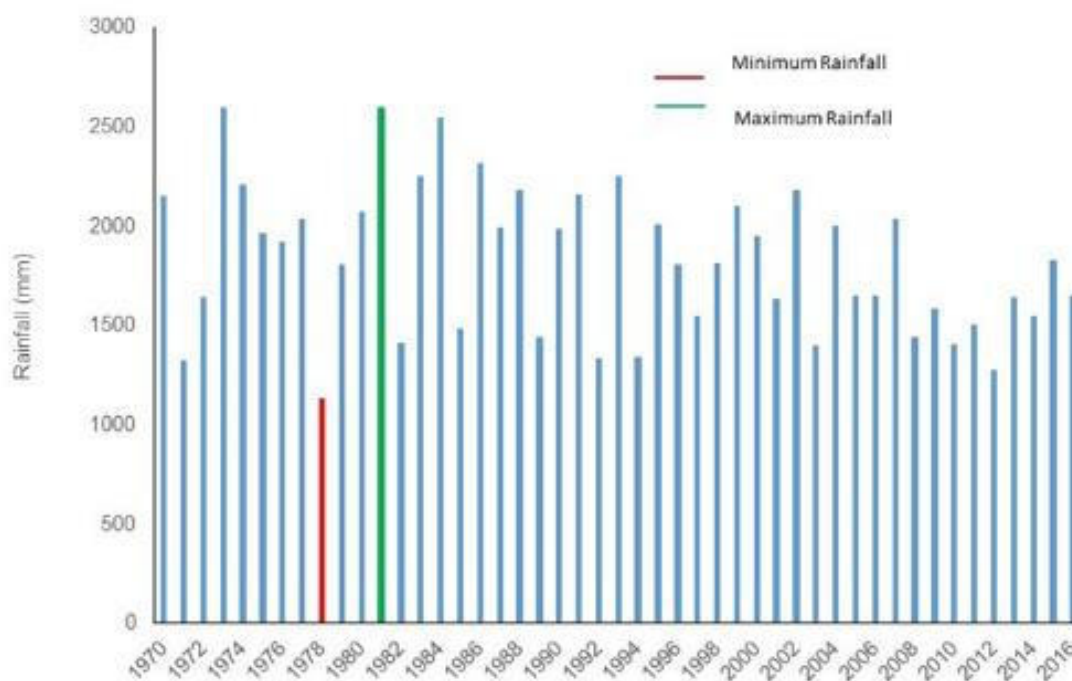
#### 3.1 Rainfall

South-West monsoon is considered to be the most predominant and important climatic feature in Bangladesh and more than 71% of the annual rainfall is received during monsoon season. Hence, variations in monsoon (may be in terms of onset, intensity, or quantity) has major impact on water resources, agriculture and economy of the country.

The long term data for annual rainfall<sup>5</sup> indicates that the average annual rainfall in Bangladesh during 1901-2015 was 2,429mm. The lowest annual rainfall of 1,687mm was received in year 1972 and maximum rainfall was received in year 3,152mm in year 1922. Maximum one day rainfall of 590mm was recorded in year 2001 at Sandwip weather station.

The nearest weather station from Site location is at Faridpur (~19km SSE). The secondary data sources for rainfall at Faridpur<sup>6</sup> indicated that the average annual rainfall for period of 1970-2016 was 1,827mm. The highest annual rainfall of 2,599mm was recorded in year 1981, whereas the lowest annual rainfall of 1,130mm was received in year 1978 (refer to **Figure 3.1**). The highest 24 hour rainfall recorded at Faridpur was 370mm in 1986<sup>7</sup>. The data available for 1981-2010 indicated that on an average there are 114 rainy days, including 63 days of light rain, 24 days of moderate rain, and 12 days of heavy to very heavy rain<sup>3</sup>.

**Figure 3.1 Rainfall at Faridpur Weather Station (1970-2016)**



Source: <https://www.kaggle.com/redikod/historical-rainfall-data-in-bangladesh>

<sup>5</sup> [http://sdwebx.worldbank.org/climateportal/index.cfm?page=country\\_historical\\_climate&ThisCCCode=BGD](http://sdwebx.worldbank.org/climateportal/index.cfm?page=country_historical_climate&ThisCCCode=BGD)

<sup>6</sup> <https://www.kaggle.com/redikod/historical-rainfall-data-in-bangladesh>

<sup>7</sup> MET Report Climate of Bangladesh 2016, Mossammat Ayesha Khatun et al.

**Table 3.1** provides the values for probable maximum daily rainfall with a return period of 2, 5, 10, 25, 50 and 100 years at Faridpur<sup>4</sup>.

**Table 3.1 Probable Daily Rainfall at Faridpur**

Return Period (year)	Probable Daily Rainfall (mm)		
	Gumbel	LP-II	LN
2	130	118	120
5	197	176	178
10	241	229	226
25	297	316	299
50	339	399	363
100	380	501	434

Source: Floods in Bangladesh: History dynamics and rethinking the role of the Himalayas  
(<https://collections.unu.edu/eserv/UNU:2465/pdf9789280811216.pdf>)

### 3.2 Flood in Manikganj District

According to the Department of Disaster Management (Ministry of Disaster Management and Relief), flooding is the most common single hazard and phenomenon in Bangladesh. Floods are an annual phenomena, with the most severe ones occurring during the months of July and August. Four (4) types of flood experienced in Bangladesh 1) Flash flood; 2) River flood; 3) Rain-fed flood; and 4) Coastal flood. Flood Affected Area map for the north eastern Bangladesh is presented in **Figure 3.2**.

**Figure 3.2 Flood Affected Area of Dhaka Division**



Source: Department of Disaster Management (DDM, Bangladesh)

Based on a 'Flood Affected Area' map of Bangladesh prepared by the Department of Disaster Management (DDM), study area is observed to be located in an area identified to be at risk of "River/Monsoon Flood Area". River flood is a common phenomenon in the region caused by bank overflow. Approximately 80% of the total river flow occurs in the 5 months of monsoon from June to October (Flood Response Preparedness Plan of Bangladesh, June 2014).



## 4. FLOODING, WATER LOGGING, AND INUNDATION

In order to understand the flood likelihood in the study area and its potential impact on operations at the Site, ERM has considered the following potential areas of concern:

- Flooding from Padma River
- Waterlogging, and inundation at Site and surrounding area
- Flooding from Ichamati River
- Riverbank erosion and sedimentation

In order to evaluate the areas of concern, ERM has reviewed flood likelihood from following perspective:

1. Historical Flood Events
2. Based on Graphical Models from Secondary Sources
3. Based on Padma River Water Level
4. Historical Satellite Imagery
5. Community Consultations
6. Field Observations

### 4.2 Historical Flood Events

During monsoons, the Jamuna and Padma rivers attain their peak discharges which consequently lead to higher flooding as well as drainage congestion during the period.

As per Annual Flood Report 2017 prepared by Bangladesh Water Development Board (BWDB), there have been 58 instances of flooding across Padma and Jamuna basin since the year 1954. Among these, floods during 1988, 1998, 2004, 2007, and 2017 were considered major events with extensive impact and widespread land submergence. Details of floods in Padma and Jamuna basins are presented in **Table 4.1**.

**Table 4.1 Details of Major Floods in Padma and Jamuna Basins**

Year	Basin	Flood Duration (Days)
1998	Padma and Jamuna	65
2003	Padma	39
2004	Padma and Jamuna	55
2007	Padma and Jamuna	21
2017	Padma and Jamuna	29
1998	Padma and Jamuna	65

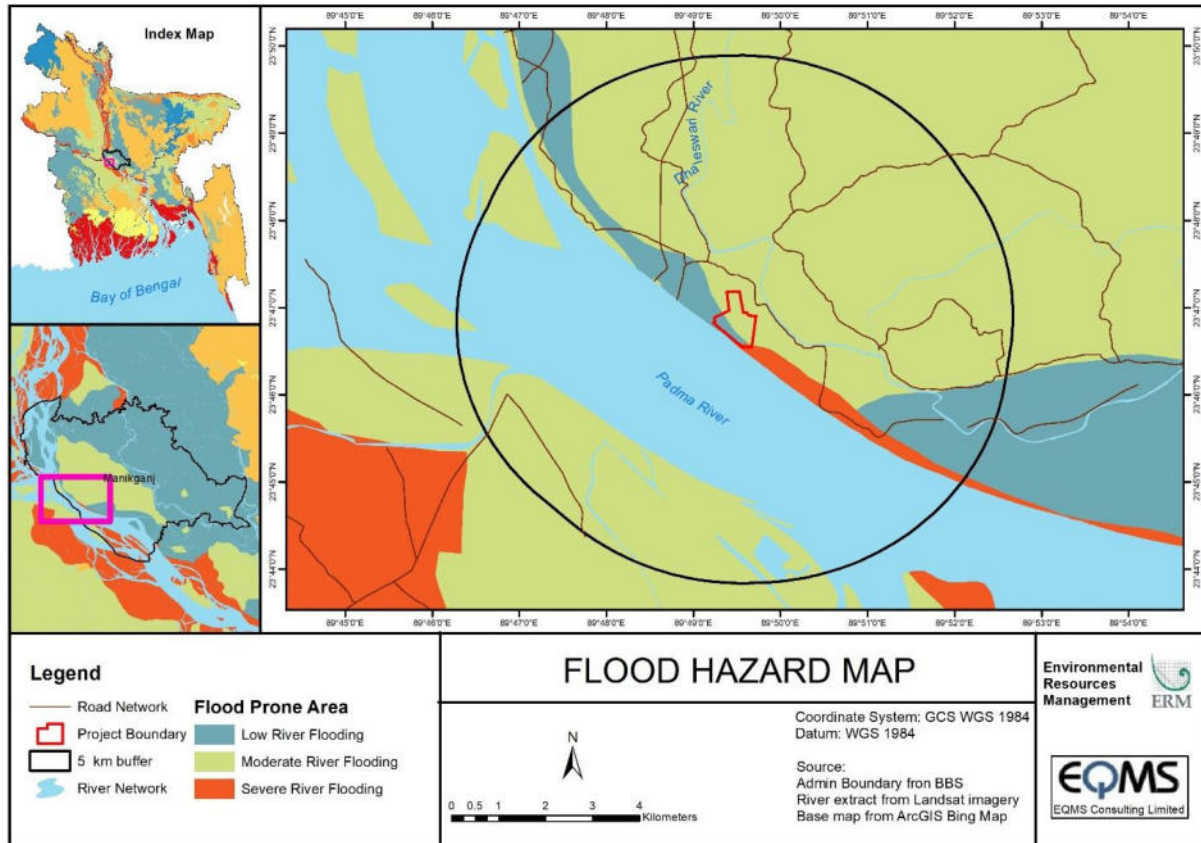
Source: Flood and Riverbank Erosion Risk Management Investment Program, 2014, and Annual Flood Report 2017, prepared by BWDB

### 4.3 Flood Review based on Graphical Models

ERM reviewed publicly available flood hazard maps and flood affected area maps of Manikganj area to understand the hazard level attributed by concerned governing agencies to the area. Flood hazard map indicating study area is presented in **Figure 4.1**.

As observed from **Figure 4.1**, study area is categorized largely as “Moderate” river flooding risk with areas along the left river bank at “Severe” river flooding hazard. Further, most of the Site falls in the moderate river flooding hazard, whereas south-eastern portion of the Site is likely to be exposed severe river flooding hazard.

**Figure 4.1 Flood Hazard Map of Study Area**



The International Centre for Integrated Mountain Development (ICIMOD) has prepared flood inundation maps in view of the floods and landslides that monsoon of 2017 had triggered in Bangladesh. According to ICIMOD, flood and inundation maps have been prepared using Advanced Land Observing Satellite 2 and Sentinel-1 satellite images made available by the Japan Aerospace Exploration Agency (JAXA) and the European Space Agency (ESA).

**Figure 4.2 Flood and Inundation Map of 2017 (July)**



Source: The International Centre for Integrated Mountain Development (ICIMOD)

<http://geoapps.icimod.org/BDFlood2017/>

Based on flood map of July 2017 presented in **Figure 4.2**, northern portion of the Site was observed to be inundated. However, Site was not observed to have been affected by flood water from the river in July 2017.

**Figure 4.3 Flood and Inundation Map of 2017 (August)**



Source: The International Centre for Integrated Mountain Development (ICIMOD)

<http://geoapps.icimod.org/BDFlood2017/>

Based on flood map of August 2017 presented in **Figure 4.3**, southern portion of the Site was observed to be submerged by flood water from the river as a result of river bank overtopping.

#### 4.4 Flood Review based on River Water Level

According to secondary sources, probability of flood in a year for the Padma River is about 60% with an average duration of floods extending up to 23 days. According to Bangladesh Water Development Board (BWDB), occurrence of flood is indicated when the water level of river exceeds its “danger



level” which has already been defined and established for every monitoring station. As per BWDB, occurrence of flood has not been defined in relation to the safe carrying capacity of the river channel. Therefore, although data pertaining to both discharge and water levels of the concerned rivers were collected, information presented in this section is focused on river water level only. Nearest river water level monitoring stations from the Site and their respective danger levels are presented in **Table 4.2**.

**Table 4.2 Water Level Monitoring Stations near the Site**

Station Name	Approximate Distance from Site (in km)	Danger Level as per BWDB (in m PWD*)
Aricha (Padma River)	~1.5 (upstream)	9.4
Faridpur (Padma River)	~ 7 (downstream)	9.59
Goalondo (Padma River)	~3.4 (opposite river bank)	8.65

\*PWD: Public Works Department (denotes survey datum)

Source: Flood Forecasting and Warning Centre (FFWC) and BWDB

**Figure 4.4 Approximate Location of nearest River Water Level Gauging Stations**



**Note:** Locations of gauging stations are indicative only based on the name of village/town where the gauges are supposedly installed. Only Aricha gauging point was physically visited by ERM. Exact location of the other gauges was not available.

Maximum water levels at all three nearest monitoring stations were collected to understand the relative variations between the recorded levels at individual stations as presented in **Table 4.3**.

**Table 4.3 Water Levels at Nearest Gauging Stations**

Year	Maximum Water Level (m-pwd)		
	Aricha	Goalondo	Faridpur
2011	9.6	8.86	5.45
2012	9.84	9.17	4.58
2013	9.7	8.97	4.89
2014	9.58	8.92	4.89
2015	9.45	9.09	5.15
2016	9.97	9.66	4.75
2017	10.16	9.71	5.22
<b>Max</b>	<b>10.16</b>	<b>9.71</b>	<b>5.45</b>
<b>Average</b>	<b>9.76</b>	<b>9.20</b>	<b>4.99</b>

Source: Annual Flood Reports 2011 to 2017, prepared by BWDB

Considering the large width of the river, varying flow conditions in the river and flooding pattern along right and left bank, and since the Site is located on the left bank of the river, Aricha station has been considered as nearest reference station for review of water level. River water level and discharge data was collected from Bangladesh Water Development Board for Aricha station. Yearly highest water level data between the years 1968 and 2018 are presented in **Figure 4.5**.

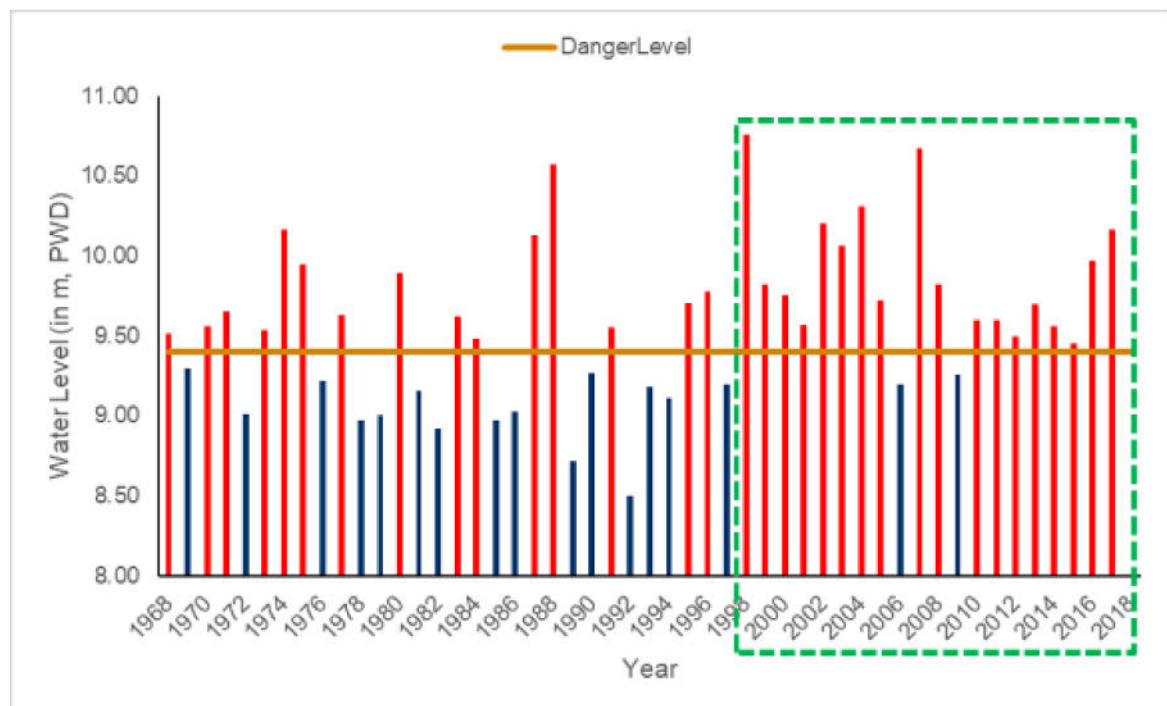
As per Site representatives, final surface level at the Site (R.L.) after completion of backfilling and compaction is 9.406 m, PWD. This has been considered based on the danger level of the Padma River at Aricha station. Site has planned and designed peripheral retention wall (for soil erosion prevention) to be up to surface level of the Site. Design of the retention wall/boundary wall was available for review. Since Site level has been planned relative to the danger level of the river, water level data of the river was analysed to assess the adequacy of backfilling and need for flood prevention measures (if any).

As observed from Figure 4.6, danger level of Padma River (9.4 m, PWD) has been surpassed almost on alternate years since 1968. Furthermore, frequency of such exceedances has increased over the past 20 years (since 1998) to every year. Since year 2000, six (6) years recorded levels higher than 10 m, PWD with an average maximum water level of 9.76 m over the past 7 years. Highest water level recorded at Aricha station was 10.76 m, PWD in the year 1998. Although this level was considered a 100-year return period event, river water level reached 10.67 m, PWD in the year 2007.

Based on review of historical water levels of Padma River, likelihood of flooding in the study area and at Site due to swelling of Padma River may be considered as "High".



**Figure 4.5 Yearly Highest Water Level at Aricha (1968 - 2018)**



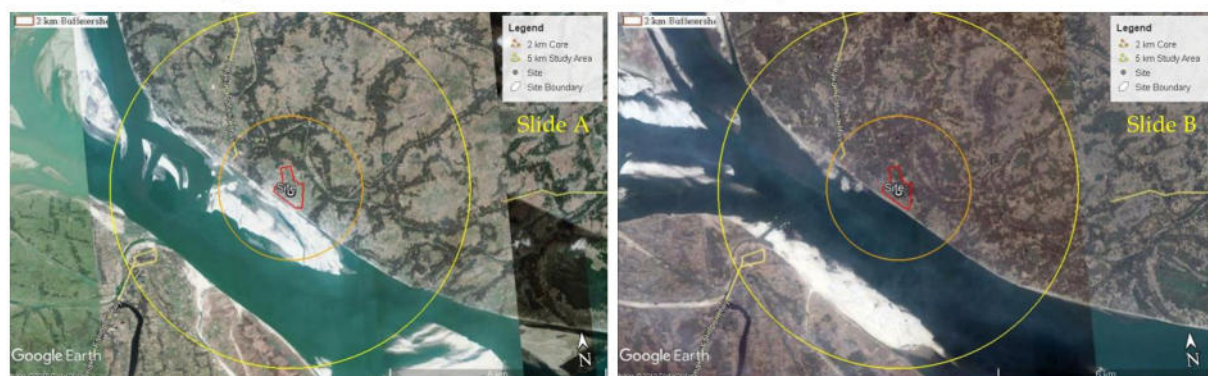
Red bars in the chart indicate years which had recorded water level higher than danger level. Dotted green box in the chart indicates period over which river water level has exceeded danger level at higher frequency relative to long-term data

Source: BWDB

#### 4.5 Analysis of Historical Satellite Imagery

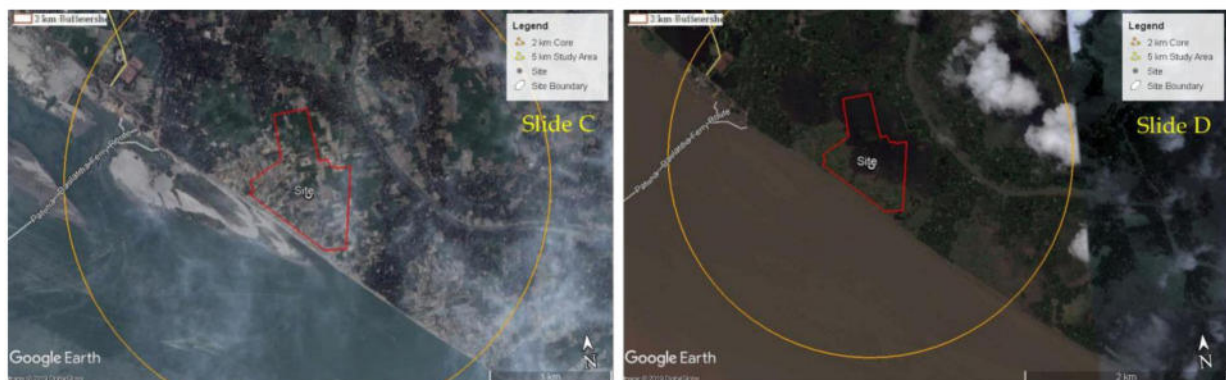
ERM analysed the historical satellite imagery of the Site and its surrounding area to identify any events of flooding or inundations. Historical satellite images of the Site and surrounding area is presented in **Figure 4.6** and **Figure 4.7**.

**Figure 4.6 Historical Satellite Imagery – Pre-monsoon**



**Slide A: Dated March 2007.** Pre-monsoon water level exposing sediment accretion along the left bank of Padma River near the Site; **Slide B: Dated May 2013.** Pre-monsoon water level exposing sediment accretion along the right bank of Padma River. Sediment mound along the left bank is likely to have been eroded over time resulting in slight change in river course. Indicative of high level of erosion and sedimentation in the river channel.

**Figure 4.7 Historical Satellite Imagery – Monsoon**



**Slide C: Dated June 2016.** Pre-monsoon water level exposing sediment accretion along the left bank of Padma River near the Site; **Slide D: Dated October 2016.** Monsoon water level showing flooding on the left bank due to swelling of Padma River. Significant portion of the Site along the southwest was submerged in flood water. Flooding in Ichamati River may be observed along with flooding of large expanses of land downstream from the Site.

Only limited historical satellite imagery was available for the study area for review. Based on review of available satellite images, waterlogging and inundation at the Site was not observed. However, images from monsoon period were not available to review extent of waterlogging and inundation at the Site.

Based on review of historical satellite imagery of study area, likelihood of flooding in the study area and at Site due to swelling of Padma River may be considered as “High”.

#### 4.6 Flooding, Inundation, and Waterlogging based on Community Consultation

During field visit, ERM team along with Site representative engaged with land owners/caretakers, residents and farmers in the neighbouring areas surrounding the Site to understand flood, inundation and waterlogging scenario in the area based on their personal experiences with such instances. Total of seven (7) consultations were completed to cover all areas surrounding the Site as depicted in **Figure 4.8**. Information shared by the communities are presented in Table 4.4.

**Figure 4.8 Community Consultations during Field Recon**





**Table 4.4 Information Collected during Community Consultation**

Profile of Community Member		
C1: Resident of Manikanj. Borewell contractor. 30+ years of drilling experience near the Site. 2 <sup>nd</sup> member: Resident since 3 generations	<ul style="list-style-type: none"> <li>Reported flooding from the river in the past. Highest water level experienced was ~1.5 m in 1998.</li> <li>Sediment carried from flood water is deposited in the area.</li> <li>Prior to November 2018, area including the Site used to get flooded every alternate year. Lakshmipura village located east of the Site ~700m was reported to be inundated.</li> </ul>	<ul style="list-style-type: none"> <li>Water logging reported on an annual basis for 3 to 4 months.</li> <li>Flood duration: 3 days</li> </ul>
C2: Retired ferry operator. Resident of Noyakandi for 60+ years.	<ul style="list-style-type: none"> <li>Area including the Site reported to be impacted in 1988, 1998, 2004, 2007 and several years after that.</li> </ul>	<ul style="list-style-type: none"> <li>Houses in settlements were inundated for 15 days</li> </ul>
C3: Caretaker of land since 2007 and resident of Tilochandputti village since 40+ years.	<ul style="list-style-type: none"> <li>Only during major flooding event, water from river overflowed onto the land for brief period up to a depth of 2 – 3 inches.</li> <li>Drainage in this area is good.</li> </ul>	<ul style="list-style-type: none"> <li>Site and surrounding area reported to remain waterlogged for 5 to 6 months every year.</li> <li>Depth of inundation: 6 inches to 0.3 m</li> </ul>
C4: Land owner, farmer, and resident of Baroria village.	<ul style="list-style-type: none"> <li>Highest flood water level in the area was ~3.65 m in 1988, ~2.88 m in 1998, and ~1 m in 2004.</li> <li>Duration of flood: 20 days in 2007</li> </ul>	<ul style="list-style-type: none"> <li>Area waterlogged for 3 to 4 months in a year.</li> <li>Inundation caused by rainfall up to 0.6m in 2018.</li> <li>Duration of inundation/waterlogging: 15 days</li> <li>Runoff from this land used to drain through the Site area.</li> <li>This area is likely to be impacted in future from extended periods of waterlogging due to poor drainage post development at Site.</li> </ul>
C4: Land owner, farmer, and resident of Baroria village.	<ul style="list-style-type: none"> <li>Highest flood water level in the area was ~3.65 m in 1988, ~2.88 m in 1998, and ~1 m in 2004.</li> <li>Duration of flood: 20 days in 2007</li> </ul>	<ul style="list-style-type: none"> <li>Area waterlogged for 3 to 4 months in a year.</li> <li>Inundation caused by rainfall up to 0.6m in 2018.</li> <li>Duration of inundation/waterlogging: 15 days</li> <li>Runoff from this land used to drain through the Site area.</li> <li>This area is likely to be impacted in future from extended periods of waterlogging due to poor drainage post development at Site.</li> </ul>
C5: Resident of Tilochandputti village since 4 generations. Lost land during riots. Accommodation provided by Prime Minister's Office.	<ul style="list-style-type: none"> <li>Flooding in 1988: ~6.7 m deep</li> <li>Flooding in 1998: ~4.8 m deep</li> <li>Flooding in 20016: ~3.6 m deep</li> </ul>	<ul style="list-style-type: none"> <li>Area around the village inundated and waterlogged every year.</li> <li>Proclaimed as the lowest area around the Site.</li> </ul>

### Profile of Community Member

C6: Resident of Dorikandi village. Lost his land and homestead in Noyakandi to flood and sand erosion and moved to Dorikandi.	<ul style="list-style-type: none"> <li>■ Paturia-Harirampur road (access road to the Site) was completely submerged during 1988 flood.</li> <li>■ Canal downstream of Site had overflowed flooding settlements up to 0.6 m deep.</li> </ul>	■ Inundation and waterlogging not reported.
C7: Resident of Dorikandi.	<ul style="list-style-type: none"> <li>■ Flooding in Padma River and Ichamati River are largely synchronous. High water level in Ichamati River causes backflow in the canal that drains Site area.</li> </ul>	

## 4.7 Field Observations

During field visit, flooding, inundation, and waterlogging related concerns at the Site and surrounding areas was not evident. However, ERM observed prominent indicators of river bank erosion along the south western boundary of the Site as presented in **Figure 4.9**.

As may be observed from **Figure 4.9**, changing water level in the river channel during various high flow conditions has left distinctive layers of eroded surface. It is important to note that the highest water level as observed from erosion was almost up to the Site level. Since information related to the flooding event that caused erosion at Site level is not available, spill over of flood water from left bank of Padma River on to the Site cannot be ruled out.

Also, overall natural gradient at Site and surrounding area is from northwest to east-southeast. Historically, Site was the lowest area which would be inundated before the surplus runoff from the area drained into Ichamati River in the east. Further, Ichamati River is located at a relatively higher elevation than the Site area's natural surface. Hence Site and surrounding areas form a trough between Padma River on the west and Ichamati River on the east as depicted in the Figure 4.10.

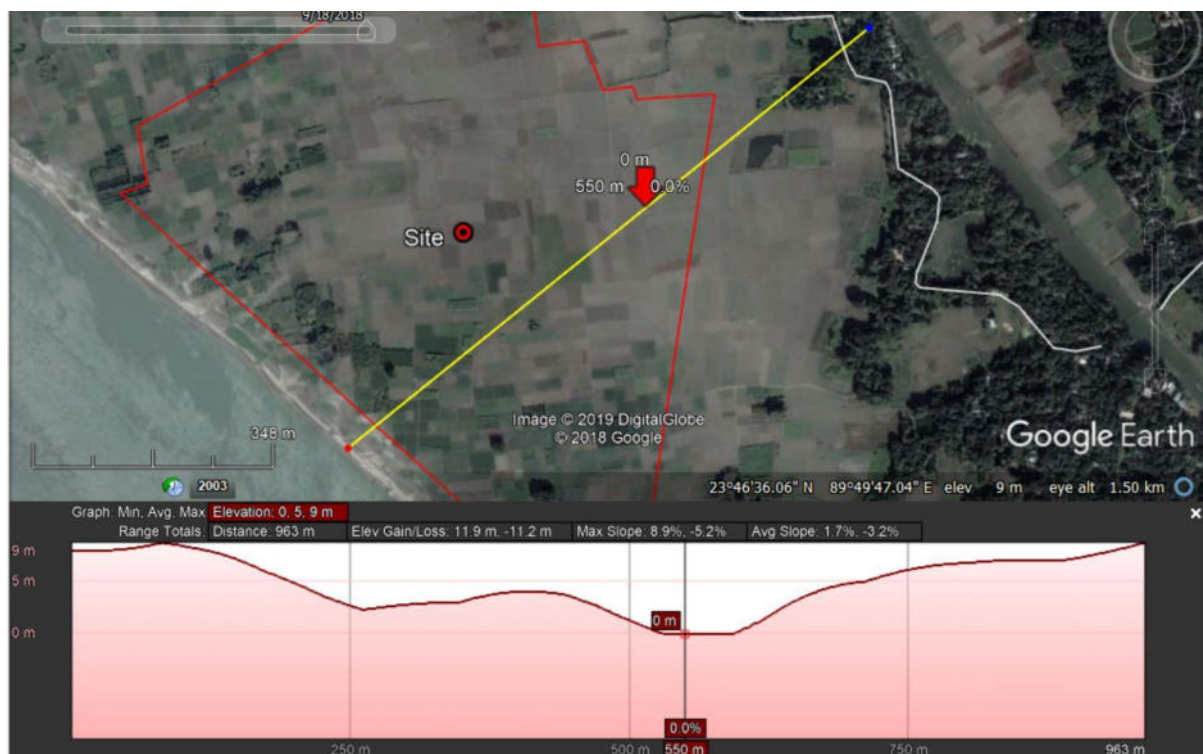


**Figure 4.9 River Bank Erosion along South-western Boundary of Site**



**Slide A:** Arrows indicate erosion caused by varying water level during past flooding events; **Slide B:** Soil along the left bank of river adjacent to the Site's south-western boundary rendered unstable by past floods and is likely to be eroded in subsequent floods from Padma River

**Figure 4.10 Elevation Profile of Site and Surrounding Area**



## 4.8 Public Infrastructure and Key Utilities at the Site

### 4.8.1 Key Utilities at the Site

Based on consultations with the Site representative of the Client, information related to PV mounting design was available for review. As per the design, solar panels would be mounted on a steel structure that would stand ~1.5m above surface level of Site. Considering that the historical maximum flood level in the area was 10.76 m, PWD, solar panels mounted over the steel structure would be located above the maximum flood level.

Details pertaining to planned levels of associated panels and switch stations were not available for review.

### 4.8.2 Public Infrastructure

Paturia- Harirampur road is the arterial 2-lane road that connects the Site with the Paturia-Dhaka highway. The Site is connected to Paturia Ferry Terminal and Dhaka through this access road which is used by the local community to access their fields and homestead areas. During the Site visit, the team observed pedestrians, two wheelers (bicycles and motor cycles), electric rickshaws, and four wheelers using the path. However, occasionally tractors may be driven on these routes owing to lack of alternate path. According to a local civil contractor engaged in Site development work, movement on this access road has never been disrupted owing to flooding in the area.

## 5. LIKELIHOOD OF A FLOODING EVENT

Based on the above-mentioned findings, a likelihood analysis of potential flooding event in and around the Site has been undertaken. The same has been presented in the **Table 5.1** below.

**Table 5.1 Likelihood of Flood Evaluation**

Attributes	Likelihood		
	High	Medium	Low
<b><u>Site Setting</u></b> <ul style="list-style-type: none"> <li>Site is located in a rural setting surrounded primarily by agricultural land, water bodies, and vegetated land;</li> <li>The study area is drained by Padma River flowing in northwest to southeast direction. Padma River is located ~50 m southwest of the Site;</li> <li>A distributary of Brahmaputra River named Ichamati River is located ~270m east from Site. Site and surrounding areas drain into this river;</li> <li>Major flood control structures such as barrages, dams, reservoirs are not observed within the study area and upstream of Site (up to 50 km)</li> </ul>			
<b><u>Hydro-meteorological Data</u></b> <ul style="list-style-type: none"> <li>Long-term average annual rainfall for the region is 1,827 mm. Rainfall trend shows a steady decline in annual rainfall over time;</li> <li>The heaviest recorded rainfall at any station in the Rangpur district in 24 hours was 370 mm in 1986. The high intensity rainfall events are more likely to occur in the months of July to August.</li> <li>Maximum daily probable rainfall for 25, 50, and 100 year return periods in the Manikganj region are 297mm, 339 mm, and 380 mm respectively;</li> <li>Rainfall intensity in the region has limited bearing on the flow in Padma River as the catchment of Padma River (Ganges and Brahmaputra combined) extends over a very large area.</li> </ul>			
<b><u>Hydrological and Geomorphological Data</u></b> <b><u>Catchment Analysis</u></b> <ul style="list-style-type: none"> <li>No abrupt slope changes were observed at the Site and nearby areas. Gentle slopes are likely to hinder rapid evacuation of the flood water during a storm event. the Site area appears to have pockets of 'low lying areas' with potential for water logging and flooding during rainy season which may be attributed to near level slopes;</li> <li>Though, the Padma river is located adjacent the Site (southwest to the Site), the gradient is towards northeast of the Site due to presence of levee.</li> <li>Most of the Site area falls in the 4 – 10 m amsl elevation. East-southeast portion of the Site being the lowest point varying between sub-zero – 4 m amsl;</li> <li>Geomorphological information indicates landform of the flood plain is characterized by natural levees distributed in a mottled pattern which forms shallow depressions and small ridges. floodplain areas may be prone to water logging and localized inundation owing to slowly permeable silty clay.</li> </ul>			
<b><u>Surface water bodies and Natural drainage channels</u></b>			

Attributes	Likelihood		
	High	Medium	Low
<ul style="list-style-type: none"> <li>The region and study area have been demarcated as areas prone to River /Monsoon Flood Area;</li> <li>River floods have been experienced in the region over 58 instances since the year 1954; Duration of floods during major flood events varied between 29 days to 65 days;</li> <li>Based on flood hazard map developed by BWDB, study area is categorized largely as at “Moderate” river flooding risk; whereas areas lying along the left river bank including southern portion of Site are at “Severe” river flooding hazard;</li> <li>Based on the maps prepared by ICIMOD, the Site is located in an area reported as inundated during 2017 monsoon;</li> <li>Probability of flood in a year from Padma River is 60% with average duration of floods extending up to 23 days;</li> <li>Frequency of river water level exceeding danger level (9.4 m, PWD) has increased over the past 20 years (since 1998) to every year. Since year 2000, six (6) years recorded water levels higher than 10 m, PWD with an average maximum water level of 9.76 m over the past 7 years;</li> <li>Though level of 10.76m in 1998 was considered a 100-year return period event, river water level reached 10.67 m, PWD in the year 2007;</li> <li>Based on review of historical satellite imagery, most of the Site area was observed to be submerged during 2016 flooding event;</li> </ul>			
<b><u>Public Infrastructure</u></b> <ul style="list-style-type: none"> <li>Paturia-Harirampur road is the arterial 2-lane road that connects the Site with the Paturia-Dhaka highway.</li> <li>As per local contractor associated with Site, movement on this access road has never been disrupted owing to flooding in the area.</li> <li>As per local residents, Paturia-Harirampur road (access road to the Site) was completely submerged during 1988 flood.</li> </ul>			

Based on the observations from the above-mentioned table, it appears that the overall likelihood of flooding event and its impact in and around the Site may be considered as 'High'.



## 6. CONCLUSIONS AND RECOMMENDATIONS

### 6.1 Conclusions

Based on the observations from the above-mentioned table, it appears that the overall likelihood of flooding event and its impact in and around the Site can be considered to be 'High'. The main high probability attributes are as follows:

- Padma River is located ~50 m southwest of the Site;
- A distributary of Brahmaputra River named Ichamati River is located ~270m east from Site. Site and surrounding areas drain into this river;
- Major flood control structures such as barrages, dams, reservoirs are not observed within the study area and upstream of Site (up to 50 km);
- The region and study area have been demarcated as areas prone to River /Monsoon Flood Area;
- River floods have been experienced in the region over 58 instances since the year 1954; Duration of floods during major flood events varied between 29 days to 65 days;
- Based on flood hazard map developed by BWDB, study area is categorized largely as at "Moderate" river flooding risk; whereas areas lying along the left river bank including southern portion of Site are at "Severe" river flooding hazard;
- Based on the maps prepared by ICIMOD, the Site is located in an area reported as inundated during 2017 monsoon.
- Probability of flood in a year from Padma River is 60% with average duration of floods extending up to 23 days;
- Frequency of river water level exceeding danger level (9.4 m, PWD) has increased over the past 20 years (since 1998) to every year. Since year 2000, six (6) years recorded water levels higher than 10 m, PWD with an average maximum water level of 9.76 m over the past 7 years;
- Though flood water level of 10.76m in 1998 was considered a 100-year return period event, river water level reached 10.67 m, PWD in the year 2007;
- Based on review of historical satellite imagery, most of the Site area was observed to be submerged during 2016 flooding event;

Considering the above mentioned attributes, current Site level of 9.406 m, PWD is likely to be at risk of flooding from Padma River at high frequency. In such a scenario, Site may experience inundation with depths of 0.1 m or higher depending on the magnitude of flooding. However, solar panels mounted on steel structures (1.5 m above Site surface level of 9.406 m, PWD) are designed to be located above 100 year return period flood of up to 10.76m, PWD.

Further, river bank erosion may pose considerable risk to the retention wall/boundary wall over time.

Additionally, raised level of the Site is likely to create a barrier to natural drainage of surface runoff from areas northwest of the Site (agricultural land parcels between the Site and Padma River) and/or flood water from the river. This is likely to increase extent and duration of inundation and/or waterlogging in these agricultural land parcels in the future.

### 6.2 Recommendations

Based on the broad level assessment, following measures are recommended to protect the assets at Site from identified 'high probability attributes' and to prevent/mitigate their impact on the Site:

- Plan and design flood prevention / mitigation structures to raise the level of all key electrical units and equipments above the 100 year flood level of 10.76m, PWD;

- Enhance structural stability of the river bank along the west and south-western boundary of the Site and provide robust erosion protection to withstand flood water;
- Create large and deep storm water detention ponds along the north, north east, and north-western boundary of the Site to create a sink for surface runoff which may get inundated upstream from Site to minimize impact of development at Site on neighbouring land;
- Create a divergence pathway for the surface runoff to bypass the Site to downstream areas by scientifically designing a conduit through the Site or along the periphery of the Site;

### 6.2.1 Recommendations for Further Studies

- Undertake a detailed flood risk assessment (FRA) to visualize inundation at Site under various river water level scenario using regional flood plain modelling, and plan mitigation measures accordingly. Due consideration must be given to extreme river / stream flow scenario, varying climate condition, and potential impact from breach of river bank along the Site boundary;
- Undertake a detailed flood risk assessment (FRA) to visualize inundation in agricultural land parcels upstream of Site under various precipitation conditions using modelling in order to understand potential impacts of flooding on neighbouring communities, if any, due to development at Site.

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