Addendum for

Environmental and Social Impacts and Mitigation Measures for In-situ Remediation options for Hooghly HW sites, West Bengal and Noor Mohammad Kunta, HW site, Andhra Pradesh

Under the World Bank aided Project on Capacity Building for Industrial Pollution Management of the MoEF, Govt. of India

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Environmental impact and Mitigation Measures for Proposed Upgradation of Chakundi HW site to TSDF site

HW sites / Parameters		Shivang Trexim and Sree Balaji Veneers Access Road (HW-1)	Access road south of Sarkar Bridge (HW-2)	Ashalatha Brickfield (HW-3)	Minu Computer Weigh bridge HW site	Zenith Timber Access Road HW site	Dankuni Coal Complex HW site	Pasupathi Seong Access Road HW site
Air Pollution	Option 1	Increased air pollution is anticipated during the remediation	Increased air pollution is anticipated during the remediation	Increased air pollution is anticipated during the remediation	Increased air pollution is anticipated during the remediation	Increased air pollution is anticipated during the remediation	Increased air pollution is anticipated during the remediation	Increased air pollution is anticipated during the remediation
	Option 2	Exposure to high air pollution during remediation will be comparatively minimum due to early completion of work since the distance of transportation of waste is less than 11 km	Exposure to high air pollution during remediation will be comparatively minimum due to early completion of work since the distance of transportation of waste is less than 5 km, also less fuel will be used to cover short distance	Exposure to high air pollution during remediation will be comparatively minimum due to early completion of work since the distance of transportation of waste is only 17 km, also less fuel will be used to cover short distance	Exposure to high air pollution during remediation will be comparatively minimum due to early completion of work since the distance of transportation of waste is only 11.5 km, also less fuel will be used to cover short distance	Exposure to high air pollution during remediation will be comparatively minimum due to early completion of work since the distance of transportation of waste is less than 11.7 km, also less fuel will be used to cover short distance	High air pollution is anticipated due to loading and unloading waste from other HW site as well as due to movement of vehicles and Machineries during site development and waste disposal	Exposure to high air pollution during remediation will be comparatively minimum due to early completion of work since the distance of transportation of waste is less than 12 km, also less fuel will be used to cover short distance
Surface and ground Water Pollution	Option 1	Containment of surface and groundwater pollution	- do -	- do -	Containment of surface and groundwater pollution	- do -	- do -	Containment of surface and groundwater water pollution
	Option 2	- do -	- do -	- do -	- do -	- do -	Due to upgradation of the existing site further contamination will be avoided	- do -
Soil or Land Pollution	Option 1	Soil or Land Pollution will be contained by excavation / remediation	- do -	- do -	Soil or Land Pollution will be contained by excavation / remediation	- do -	- do -	- do -
	Option 2	- do -	- do -	- do -	- do -	- do -	- do -	- do -
Noise Pollution	Option 1	Increased noise is anticipated during the remediation due to use of machinery and other vehicles	- do -	- do -	Increased noise is anticipated during the remediation due to use of machinery and other vehicles	- do -	Increased noise is anticipated during the remediation due to use of machinery and other vehicles	- do -
	Option 2	Exposure to high noise during remediation will be comparatively minimum due to early completion of work and transportation of waste to lesser distance	- do -	- do -	Exposure to high noise during remediation will be comparatively minimum due to early completion of work and transportation of waste to lesser distance	- do -	High exposure time for increased noise is anticipated due to site upgradation, more number of HW transport vehicles	- do -
Flora and Fauna	Option 1	No impact on flora and fauna	- do -	- do -	No impact on flora and fauna	- do -	- do -	- do -
	Option 2	No impact on flora and fauna	- do -	- do -	No impact on flora and fauna	- do -	Some small vegetation clearance may be required for site preparation	- do -
Accidental Risk	Option 1	High due to transportation of HW for long distance (150 to 200 km)	- do -	- do -	High due to transportation of HW for long distance (150 to 200 km)	- do -	- do -	- do -
	Option 2	Low due to short distance of transport (11 km)	Low due to short distance of transport (5 km)	Low due to short distance of transport (17 km)	Low due to short distance of transport (11.5 km)	Low due to short distance of transport (11.7 km)	Low due no transport is required	Low due to short distance of transport (12 km)

HW sites / Parameters		Shivang Trexim and Sree Balaji Veneers Access Road (HW-1)	Access road south of Sarkar Bridge (HW-2)	Ashalatha Brickfield (HW-3)	Minu Computer Weigh bridge HW site	Zenith Timber Access Road HW site	Dankuni Coal Complex HW site	Pasupathi Seong Access Road HW site
Spillage risk	Option 1	Risk of spilling of HW is high due to transportation to long distance	- do -	- do -	Risk of spilling of HW is high due to transportation to long distance	- do -	- do -	- do -
	Option 2	Risk will be low due to less distance (11 km)	- do -	- do -	Risk will be low due to less distance (11 km)	- do -	- do -	- do -
Exposure to Community	Option 1	Chances of exposure of HW to more population residing along the transport route	- do -	- do -	Exposure of HW to more community members residing along the transport route	- do -	- do -	- do -
	Option 2	Comparatively less due to less distance	- do -	- do -	Comparatively less due to short distance	- do -	- do -	- do -
Completion of project	Option 1	Require more time for completion	- do -	- do -	Require more time for completion	- do -	- do -	- do -
	Option 2	Require less time for completion as a result less travel	- do -	- do -	Require less time for completion	- do -	- do -	- do -
Traffic	Option 1	There will be a additional traffic from Hooghly to Halide section	Low	Low	Low	Low	Low	Low
	Option 2	No additional traffic from Hooghly to Halide but there will be a additional traffic from Baidaypatti to Dankuni	High	High	High	High	High	High
Livelihood	Option 1	No impact on livelihood	5 workers of Dhaba and one owner, 5 weigh bridge operators and one owner of weigh bridge will be impacted	100 contract workers + two supervisors + one accountant and the Owner of Ashalatha Brick unit	Nine workers at Dhaba + one owner + one small petty shop owner and Five weigh bridge operator and one owner of weighbridge will be impacted	Owner of Zenith timber will impacted	One guard will be impacted	3 Security guard working at the Pasupathi seong Industry + Two workers and one owner of Barbour shop+ Three workers in three Dhaba's and their Owner will be impacted
	Option 2	No impact on livelihood	- do -	- do -	No impact on livelihood	- do -	- do -	- do -
Agriculture activities	Option 1	No impact on Agriculture activity	- do -	- do -	No impact on Agriculture activity	- do -	- do -	- do -
	Option 2	No impact on Agriculture activity	- do -	- do -	No impact on Agriculture activity	- do -	- do -	- do -
Employment	Option 1	Employment opportunity will be generated as a result of remediation work	Employment opportunity will be generated as a result of remediation work	Employment opportunity will be generated as a result of remediation work	Employment opportunity will be generated as a result of remediation work	Employment opportunity will be generated as a result of remediation work	Employment opportunity will be generated as a result of remediation work	Employment opportunity will be generated as a result of remediation work
	Option 2	Employment opportunity will be generated as a result of remediation work but it will be less compared to option 1	Employment opportunity will be generated as a result of remediation work but it will be less compared to option 1	Employment opportunity will be generated as a result of remediation work but it will be less compared to option 1	Employment opportunity will be generated as a result of remediation work but it will be less compared to option 1	Employment opportunity will be generated as a result of remediation work but it will be less compared to option 1	More employment opportunity will be generated as a result of upgradation of existing site and HW dumping activity	Employment opportunity will be generated as a result of remediation work but it will be less compared to option 1

HW sites / Parameters		Shivang Trexim and Sree Balaji Veneers Access Road (HW-1)	Access road south of Sarkar Bridge (HW-2)	Ashalatha Brickfield (HW-3)	Minu Computer Weigh bridge HW site	Zenith Timber Access Road HW site	Dankuni Coal Complex HW site	Pasupathi Seong Access Road HW site
Cultural and Religious Properties	Option 1	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites
	Option 2	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites	No impact on cultural or religious sites
Water bodies	Option 1	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources
	Option 2	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	No impact on surface Water Resources	Near by surface water bodies may be impacted due to upgradation of existing site	No impact on surface Water Resources
Land acquisition	Option 1	NA	NA	NA	NA	NA	NA	NA
	Option 2	NA	NA	NA	NA	NA	Additional Land is required for upgrading the existing site	NA
Cost (in Rs. Crores)	Option 1	Total cost is 619.8 Lakhs	Total cost is 717.89 Lakhs	Total cost is 171.62 Lakhs	Total cost is 545.53 Lakhs	Total cost is 519.48 Lakhs	0.00	Total cost is 175.82 Lakhs
	Option 2	Cost is 310.46* Lakhs, which is only half of the option 1 cost and is more economical	Cost is 358.34* Lakhs, which is only less than half of the option 1 cost and is more economical	Cost is 88.82 * Lakhs, which is only half of the option 1 cost and is more economical	Cost is 275.36 * Lakhs, which is only half of the option 1 cost and is more economical	Cost is 257.69* Lakhs, which is only less than half of the option 1 cost and is more economical	0.00	Cost is 86.05* Lakhs, which is only less than half of the option 1 cost and is more economical

* **Does not include cost of**

Cost of Additional Land

Cost of Site development

Environmental and Social Management Plan

The major environmental and social impacts identified at the Hooghly HW sites and their detailed mitigation and monitoring prorgrmme adopted during different stages of the project are detailed in **Table 1**.

Table 1 Site-Specific Impacts during Remediation phase

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
Air and Noise	Movement of Vehicles, Excavating activities, Filling activities, transportation of waste. Land preparation, Operation of DG set and other machinery etc	Excavation of waste and soil activities will lead to dust pollution in working area. The operation of DG sets may lead to gaseous pollution apart from generating particulate matter. Loading and unloading of waste from stabilised site to Upgraded Chakundi site will lead to fugitive dust emission Transportation of stabilised from one point to other point may lead to spillage of waste on the route. Operation of machinery, vehicles and DG sets will lead to noise pollution in the working area.	Vehicles and machineries will have to be regularly maintained to conform to the emission standards stipulated under Central Pollution Control Board (CPCB). Provision of Personal Protective Equipments (PPE) to all workers during the site remediation. Compliance with vehicular exhaust emission certification for the entire machinery involved in remediation. Dust suppression at approach roads and working area with water sprinkling facilities. DG sets must have acoustic jackets and appropriate stack heights to meet the requirements of CPCB. Waste should be transported from source to final dumping place in specialized and covered vehicles. Contractor must obtain consent from West Bengal Pollution Control Boards before starting remediation work. To ensure the efficacy of the mitigation measures suggested, air quality monitoring should be carried out at least two times during remediation period. The SPM, RSPM, CO, SO2, and NOx levels will be monitored for air quality.
Soil	Excavation, Filling	Remediation of Hooghly sites and up-gradation of Chakundi site will require fresh soil to be used for filling. Hence large amount of fresh soil will be required for remediation. This soil, if brought from agricultural fields,	It will be assured by contractor that only high land areas will be selected for excavation of soil. Soil will be use only from soil depos notified by respective authorities.

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
		may lead to loss of productive soil and may develop low lying fields in nearby areas. Soil contamination due to leakage of oil and chemicals from vehicles and machinery. Contamination of soil by solid wastes and hazardous debris.	Soil will be excavated in consultation with farmers and agricultural department and all fertile soil will be stored at some place so that this soil will be replaced back in farms after completion of excavation activity. In case of any contamination of soil due to leakage or spillage, that soil will be immediately removed and replaced with fresh soil. To ensure the efficacy of the mitigation measures suggested, soil quality monitoring should be carried out at least two times during remediation period.
Ground Water	Remediation	There are chances that groundwater may contaminate due to percolation of water through disturbed hazardous waste sites mainly in rainy seasons. This may leads to contamination of ground water with heavy metals. During remediation on HW sites seepage of water through excavated hazardous material may further contaminate groundwater of area. Pressure on drinking water and for other domestic use due to influx of labour and other staff.	State pollution control board should ensure system to prevent ground and surface water contamination. It should be assured by contractor that all excavated HW will be placed at a safe place, so that it does not spread during the rainy season or due to floods. Contractor must give an assurance that all activities associated with remediation will be carried out under the supervision of an environmental specialist. Also contractor will assure that all this work will be done during non -monsoon season.

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
			The works sites will be properly fenced. The remediation sites will have signs notifying about the remediation works and hazards if any, to prevent accidental access of local people and livestock. Contractor will ensure supply of extra requirement of drinking water for influx population. To ensure the efficacy of the mitigation measures suggested, ground water quality monitoring shall be carried out at least twice during remediation. Drinking water parameters should be monitored to check the water quality during remediation process.
Surface Water	Remediation	During stabilised waste transport from HW sites, Waste might spread over a wide area due to flood and rain which may lead to contamination of other surface water resources in this area. Near by water bodies may be impacted due to additional land requirement	It should be assured by contractor that all excavated waste will be placed at a safe place, so that it does not spread during the rainy season or due to floods. Any temporary storage on site during excavation will be only permitted if impermeable and safe platforms are built and used. Impact on surface water should be kept minimum Contractor must give an assurance that all activities associated with remediation will be carried out under the supervision of an environmental specialist. Also contractor will assure that all this work will be done during non monsoon season.
Noise	Movement of Vehicles, Excavation, Land preparation, Operation	Health Impacts and disturbance in working.	The equipment used for remediation will strictly conform to CPCB noise standards. Vehicles and equipments used shall be fitted with exhaust silencers. During routine

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
	of DG set and other machinery etc		servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. The noise level from any machinery (measured at one metre from the edge of the equipment in free field) such as compactors, front end loaders, and cranes, shall not exceed 75 dB (A), as specified in the Environmental Protection Rules, 1986. Within 150m of the nearest habitation, noise creating activities will be stopped during the night time between 9:00 p.m. and 6:00 a.m. To protect workers from severe noise impacts, noise standards of industrial enterprises will be strictly enforced, and workers shall be provided with Personal Protective Equipment (PPE) such as earplugs. To ensure the efficacy of the mitigation measures suggested, noise level monitoring shall be carried out at least every month during remediation.
Flora and fauna	Remediation of site	Pressure on trees, vegetation and aquatic resources. Tree cutting.	There are chances that labourers and other staff engaged in remediation activities put a pressure on trees for fuel wood and temporary huts, vegetables and aquatic resources If there will be requirement of tree felling during remediation process, then permission for tree felling will be sought as per the guidelines of West Bengal State Government.
Wildlife	No wild life is found near the site	None	No mitigation measures is required

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
Aesthetics	Excavation of waste, site preparation and associated construction activities.	Visual and aesthetics loss	In order to develop HW sites in Hooghly good approach roads and plantation is required.
Traffic	Movement of Vehicles, Excavating activities, Filling activities, transportation of waste. Land preparation and construction activities	Increased traffic movements, dust	All vehicles should be checked for "Pollution Under Control" certificates and occasional spot testing of emission from vehicles should be carried out with the assistance of the local administration. Proper traffic management by local administration
Livelihood	Remediation/Closure of sites	• **Sarkar Wigh Bridge**: -Five workers at Dhaba (Makeshift Restaurant) earn about 100 Rs/day. -One owner of Dhaba who earns about 250 Rs/day. -Owner of Sarkar Weigh Bridge will also lose his income during remediation. Per day income of the owner is Rs 500. -Five weigh bridge operators will lose their income during remediation period. Per day income of these operators is Rs 100. • **Minu Computer Wigh Bridge** -Nine workers at Dhaba (Makeshift Restaurant) near Minu Computer Weigh Bridge who earn about 100 Rs/day	In case of loss of livelihood, compensation for the transition period will be provided to all affected persons. All persons listed as having income streams interrupted due to project activities will be compensated according to national and World Bank social safeguards policy guidelines. Remediation would be done without closing the brick making as there is sufficient space available with owner for relocating workers colony. In this case we have to construct new exit for movement of vehicles. As discussed with owner (Mr. Surya Narayan Nandi,), he has no problem with this options, and he will cooperate during remediation.

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
Livelihood (continued)		- One owner Dhaba will loose his income who earns about 500 Rs/day. -One Petty shop owner near the site will also loose his income, who earn 250 per day. -Five weigh bridge operators will lose their income during remediation period. Per day income of these operators is Rs 100. -Owner of Minu Weigh Bridge will also lose his income during remediation. Per day income of the owner is Rs 700 • **Zenith Timber.** - One owner of shop will loose his income who earns Rs 200 per day. - Two workers at this timber shop will also loose their income who earns Rs 100 per day. • **Ashalata Brick Klin** -Ashalata brick kiln is in operation since 1991. The working season is from May to November. During site visit there were about 20 families consisting of 100 workers present on site. The maximum workers during peak working time would be 150 (told by owner of Klin) or around 30 families. All these workers migrate	

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
		from Bihar and Jharkhand the neighbouring States and belong to SC or ST categories. Out of total workforce 50% is female. Per day income of these workers is Rs 100 to 125. -Apart from these brick workers there are two operators who will loose there income during the course of remediation. The income of this operators is Rs 200 per day. - One accountant of this klin will also loose his income. He earns Rs 100/day. -Also owner of this klin will loose his income during the course of remediation.. The owner earns more than Rs 2000 per day. • **Shivang Trexim** -This Industry is already closed and there is no person here who will his income. • **Chakundi** -One guard will loose his income in the course of remediation • **Pashupati Seong Industry** -Three Security guard working at the	

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
		Pasupathi Seong Industry will loose their income. Income of these security guards is Rs 100 per day. -Two workers at barber shop near this site will loose there income. These workers earn Rs 75 per day. -One owner of barber shop will also loose his income who earns Rs 100 per day. -Three owners in three dhabas near this site will loose their income. -Six workers in three Dhabas will lose their income.	
Shelters	Remediation/Closure of sites	There is no person at Hooghly site who will loose his shelter or accommodation.	
Agriculture activities	Remediation/Closure of sites	All sites are located in Industrial area; hence there are no agricultural farms in these locations. Though there are small ponds which are used for fish farming and developing other aquatics flora may be impacted due to remediation work.	
Employment	Remediation/Closure of sites	Some employment will be generated as a result of remediation of HW sites and upgradation of Chakundi sites work	No mitigation measure is required.
Infrastructure	Remediation/Closure of	As a result of remediation work lot of	No mitigation measure is required.

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
	sites.	temporary and permanent Infrastructure will be developed during remediation work.	
Cultural / Religious Properties	Remediation/Closure of sites	There is no religious site which will be impacted due to remediation activities as no site fall in the zone of impact.	Although there will be no direct impact on any religious or cultural site, though all constructions camps will be sited at a distance 500 m away from these cultural and religious structures and settlements as a mitigation measure. Construction machinery and equipment will also be sited 500m away from habitation.

Impacts and Mitigation Measures for Religious and Cultural Site at Hooghly

Impacts

- The Hooghly Hazardous Waste site is composed of seven individual sites grouped under the heading of Hooghly HW remediation. Based on preliminary surveys undertaken by ICT, the Ashalata Brickfield is the only one that was deemed at risk from the cultural perspective.
- The site is walled in on the western, southern and eastern sides and the northern edge of the property is bounded by agricultural land with no vehicular access
- All assumptions indicate that transport of hazardous materials will borrow the south/north Kolkata/Delhi main road to the transversal secondary road that leads to the gate of the brickfield located approximately 0.5 km. from the crossing.
- The Durga Temple, which is located at a distance of about 150m. from the Ashalata Brickfield gates is frequented by worshipers from a large radius, many of whom use the secondary road that will be used by the remediation contractor. The Temple is renowned for the curative powers of Durga and consultation with the Temple keeper, Ms. Nomita Douleh, revealed that approximately 25 to 30 people visit the Temple daily at any given time of the day and night. The road used by these worshipers to reach temple is very poor and there is no proper lighting facility on this road. At site visit time no more than 8 light posts were identified. These are about 4.5 m. tall and are fitted with small regular lamp bulbs of no more than 60 watts. Under such conditions, visibility at night fall is very poor especially in consideration of the fact that most visitors to the temple access it afoot or by bicycle.

Mitigation Measures

- The Durga Temple is the only venue likely to receive direct impact from project activities in Hooghly due to its proximity to the Ashalata Brickfield Hazardous Waste site. As such access and safety must be ensured.
- Excavation will take place within the central part of the property covering an area of approximately 400 m^2. Despite the fact that there is ample space for maneuvering trucks that will remove contaminated soil within the gated area of the Ashalata Brickfield.
- Following mitigation measures for vehicular flow are recommended.
    - Therefore the recommendations for this site are taken in consideration not only in terms of diminishing disruption to religious rituals but also in terms of safety and health hazards. They include:
    - paced relay of trucks to avoid congestion and queuing,
    - immediate removal of contaminated soil,
    - hermetic sealing of load containers,
    - enforcement of speed limits below 20 km/hr within 100 m. of the remediation site,
    - pause in works at midday prayer time for one hour estimated to take place between 12.30 or 13.30
    - include hedge planting along the northern property line of the mosque to delineate parking area as part of the foreseen landscaping activities of remediation

- Additionally and in order to mitigate potential risks associated with accessing the Durga Temple particular attention has been given to improving road lighting conditions in the matrix in order to ensure that visitors to the Temple, especially during winter hours, are clearly visible to truck drivers.

Additional Recommendations

The following are recommendations pertaining to measures to be taken with contractors in terms of information sharing, procedures and bidding documents.

- To ensure proper implementation of the mitigation measures it is essential that all landscaping and access improvement interventions be specified in the bidding documents pertaining to remediation contracting so as to allow bidders to include such costs in the relevant budget allocations.
- In addition to proper liability insurance coverage evidence, should submit an **emergency plan** that covers procedures in case of accidental spillage particularly during the transfer of hazardous waste between the remediation site and the Chakundi site.
- Furthermore it is equally important that the selected contractor should be informed about the PCR impacts and requested to conduct an induction program to all relevant staff prior to the commencement of activities that outlines, among other things, codes of conduct to ensure that mitigation measures are respected

Table 2 Physical Cultural Resources (PCR) Mitigation Measures Matrix[1]

Possible Impact	Mitigation Measure	Responsible Entity	Monitoring Indicator	Estimated Budget
Ashalata Brickfield				
Access to the Durga Temple impediments	Improve lighting along secondary road	Contractor with Road authorities?	Comparison with baseline consultation data	Integral part of agreement with contractor.
	Establish a truck dispatching program to avoid congestion	Contractor Site Supervisor	Reduction of road accidents	
Increased noise	Pace the relay of trucks to avoid queuing and idling engines	Contractor Site Supervisor	Number of grievances recorded	WBPCB
Air quality deterioration	a) Pace the relay of trucks to avoid queuing and idling engines b) Remove contaminated sludge immediately not allowing it to remain on site and dry out	Contractor Site Supervisor	Number of grievances recorded	WBPCB
Safety of worshipers	Establish a speed limit of no more than 20 km/hr within 500m. of the site clearly	WBPCB with Transport and Road authorities?	Reduction of road accidents	WBPCB

[1] The contractor should be informed about the PCR impacts and requested to conduct an induction program to all relevant staff prior to the commencement of activities that outlines, among other things, codes of conduct to ensure that mitigation measures are respected.

Possible Impact	Mitigation Measure	Responsible Entity	Monitoring Indicator	Estimated Budget
	indicated by relevant signs			
Health hazards	a) Hermetically seal the containers to prevent spills and leaks	Contractor Site Supervisor	Number of grievances recorded	WBPCB
	b) prepare an emergency response and spill plan	Contractor		Contractor Insurance
Chance finds during excavation and sludge removal	Comply with the Treasure Trove Act and report any finds to relevant authorities immediately[2]	Contractor Site Supervisor		WBPCB

[2] Revenue Officer of the district and any officer appointed by the provincial authorities to perform the functions of "Collector" under the Treasure Trove Act

Table 3 Environmental Monitoring Cost for Hooghly HW sites

Environmental Parameters, ***Hooghly site, West Bengal***	**Project Stage**	**Parameters**	**Location**	**Frequency**	**Standards**	**Approximate cost (Rs.)**	**Implementation**	**Supervision**
Air Quality	Remediation stage	SPM, RPM, NOx, SOx, CO	Four location	24 hr continuous, in three seasons except monsoon season. Considering remediation period of one year	Air quality standard by CPCB	6000X4X3X1 =72000	Contractor through approved monitoring agency	PIU, SC
	Post Remediation stage	SPM, RPM, NOx, SOx, CO	-do-	24 hr continuous, in three seasons except monsoon season for three years	-do-	6000X4X3X3=216000	PIU	PIU

Environmental Parameters, ***Hooghly site, West Bengal***	**Project Stage**	**Parameters**	**Location**	**Frequency**	**Standards**	**Approximate cost (Rs.)**	**Implementation**	**Supervision**
Surface Water Quality	Remediation stage	All the parameters for inland surface water quality standard for class-D will be tested for groundwater as per IS 10500:1991	Six locations	One samples on monsoon and other post monsoon in a year.	Water quality standard by CPCB	8000X8X2X1= 112000	Contractor through approved monitoring agency	PIU, SC
	Post Remediation stage	-do-	-do-	One samples on monsoon and other post monsoon in a year. For a period of three year	-do-	8000X8X2X3=384000	PIU	PIU
Ground Water Quality	Remediation stage	-do-	Twelve locations	One samples on monsoon and other post monsoon in a year.	-do-	8000X12X2x1=192000	PIU	PIU

Environmental Parameters, *Hooghly site, West Bengal*	**Project Stage**	**Parameters**	**Location**	**Frequency**	**Standards**	**Approximate cost (Rs.)**	**Implementation**	**Supervision**
	Post Remediation stage	-do-	-do-	One samples on monsoon and other post monsoon in a year. For a period of three year	-do-	8000X12X2X3=576000	PIU	PIU
Noise levels	Remediation stage	As per National Ambient Noise Standard as per Environmental Protection Act, 1986 amended 2002	Seven locations	24 hr monitoring in three seasons for one years	Noise level standard by CPCB	2000X3X7X1= 42000	Contractor through approved monitoring agency	PIU, SC
	Post Remediation stage	As per National Ambient Noise Standard as per Environmental Protection Act, 1986 amended 2002	-do-	24 hr monitoring in three seasons for three years	-do-	2000X7X2X1= 28000	PIU	PIU

Environmental Parameters, ***Hooghly site, West Bengal***	**Project Stage**	**Parameters**	**Location**	**Frequency**	**Standards**	**Approximate cost (Rs.)**	**Implementation**	**Supervision**
Soil	Remediation stage	As per the requirements of Agriculture soil	Twelve locations	Two samples in a year except monsoon season.	Soil Quality Standards for Agricultural soil with added parameter of type of contaminant prevalent in that area.	8000X14X2X1=222000	Contractor through approved monitoring agency	PIU, SC
	Post Remediation stage	As per the requirements of Agriculture soil	-do-	Two samples in a year except monsoon season. For Three years	-do-	8000X14X2X3=672000	PIU	PIU
Sub-Total Monitoring Cost (Rs.) Twenty Five Lac Sixteen Thousand only								**2516000.00**

Table 4 Social Management Plan (SMP) cost for Hooghly HW sites, West Bengal

S. No.	Component	Cost per day/month/year	Number of persons	No. of days/ months / years	Amount (Rs.)	US$*
A	**Social Safe guard Cost**					
1	Workshop	225000/ year	-	5 years	1125000.00	25000
Sub Total (A)					**1125000.00**	**25000**
B	**Compensation Cost**					
R1	Resettlement Compensation	Nil	Nil	Nil	0.00	0
R2	**Income Restoration** Total 191 workers will be compensated. **Sarkar Weigh bridge** - 5 operator at Sarkar Weigh bridge. - 1 owner of Wigh Bridge. - 5 workers of dhaba near weigh bridge. - 1 owner of this dhaba. **Minu Weigh Bridge** - 5 operators at Minu Weigh Bridge. - 1 owner of weigh bridge - 9 workers at Dhaba near minu weigh bridge. - 1 Owner of Dhaba. - 1 Petty shop owner.	100 /day	191	75 days	1432500.00	32000

	Zenith Timber - 1 owner of timber shop. - 2 workers of timber shop. **Ashalata Brick Klin** - 150 workers. - 2 Operators. - 1 Accountant. - 1 Owner. **Pashupati** - 3 security guard at Pasupathi seong industry - 2 workers at Barber shop near Pasupathi seong industry - 1 owner of Barber Shop.					
	- 11 owner of small enterpriners	100/day	11	150	165000.00	4000
R3	Owner of Ashalatha Brick industry	One time assistance by Mutual agreement			0.00	0
Sub total (B)					**1597500.00**	**36000**
Total (A+B)					**2722500.00**	**61000**

Table 16 Total ESMP cost for Hooghly MSW site

Cost Component	**Cost (Rs)**	**Cost (US $)**
Environmental Monitoring	**2516000**.00	46500
SMP Cost	**2722500**.00	61000
Total	**5238500.00**	**117000**

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Transportation of HW to TSDF site vis-a vis In-situ Remediation atNoor Mohammad Kunta HW site – A comparison

Option 1 : Excavation and transportation to TSDF (About 150 km distance)
Option 2 : In-situ remediation of NMK site

S.No	Environmental / Social Components	Option 1	Option 2
1	Air quality	Air pollution is anticipated due to excavation of soil and sediment from HW site	Increased air pollution is anticipated due to excavation, stabilisation of waste at NMK HW sites
2	Noise	Noise pollution is anticipated due to use of machineries for excavation of soil and sediment from HW site	Increased noise is anticipated due to movement of vehicles as well as due to operation of various machineries within NMK for long duration during stabilisation
3	Flora and Fauna	No impact on flora	Impact on vegetation is anticipated due to site clearance for setting up of site office and stabilisation facility
4	Wildlife	No wildlife. As such, no impact is anticipated	No wildlife. As such, no impact is anticipated
5	Traffic	There will be an additional traffic between NMK HW site and TSDF	No additional traffic, though localised short distance traffic will be more
6	Shelters	No loss of shelter	No loss of shelter
7	Agriculture activities	No impact on agriculture	No impact on agriculture)
8	Employment	Temporary Employment will be generated as a result of excavation. Also, the duration of employment opportunity will be less as a result of early completion of work	More employment opportunity is anticipated due to development of stabilisation site
9	Accidental Risk	Accidental risk will be more due to long transportation distance	Accidental risk will less due to short transportation distance
10	Spillage Risk	Spillage risk will be more due to long distance transportation	Spillage risk will be insignificant due no transport of waste
11	Use of Fuel	Use of fuel and associated air pollution will be more due to	Use of fuel and associated air pollution will be less due to

		long distance transportation	short distance transporation
12	Exposure to community	HW exposure to more community present along the transport pathway	Exposure to community is insignificant
13	Infrastructure	No improvement in any infra structure facility	Approach road will be well developed as a result of proposed up-gradation
14	Cost	Cost is high (Rs. 127.2 Crores) compared to option 2	Significantly low (Rs.83.9 Crores) when compared to option 1

Impact and Mitigation Measures for Noor Mohammad Kunta HW Site, Andhra Pradesh

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
Air	Dredging of sediments from NMK and Chillan lake. Sediments segregation activities. Loading and unloading activities. Operation of DG sets. Movement of vehicles.	Sediments excavation work from NMK and Chillan lake may release noxious gases in atmosphere. Higher concentrations of these gases are fatal. Beside this there may be some odour problem during excavation of sediments. Segregation of sediments into different size before stabilization may leads to dust and air pollution. The operation of DG sets may lead to gaseous pollution apart from generating particulate matter. Loading and unloading of soil and sediments may leads to fugitive dust pollution. In present case (In-situ treatment or Option-2) waste will be treated or stabilized locally hence no need of transportation of HW to TSDF site. Option-2 will leads to reduced air pollution as a result of less fuel consumption.	Vehicles and machineries will have to be regularly maintained to conform to the emission standards stipulated under Central Pollution Control Board (CPCB). Provision of Personal Protective Equipments (PPE) to all workers during the site remediation. Compliance with vehicular exhaust emission certification for the entire machinery involved in remediation. Dust suppression at approach roads and working area with water sprinkling facilities. DG sets must have acoustic jackets and appropriate stack heights to meet the requirements of CPCB. Contractor must obtain consent from Andhra Pradesh Pollution Control Board before starting remediation work. To ensure the efficacy of the mitigation measures suggested, air quality monitoring should be carried out at least two times during remediation period. The SPM, RSPM, CO, SO2, and NOx levels will be monitored for air quality.
Soil	Soil Excavation at hot spot 1 and 2, and Filling.	Remediation of Noor Mohammad Kunta will require fresh soil to be used for filling. Hence large amount of fresh soil will be required for remediation. This soil, if brought from agricultural fields, may lead to loss of productive soil and may develop low lying	It will be assured by contractor that only high land areas will be selected for excavation of soil. Soil will be use only from soil deposits notified by respective authorities. Soil will be excavated in consultation with farmers and agricultural department and all fertile soil will be stored at some place so that this soil will be replaced back in

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
		fields in nearby areas. Soil contamination due to leakage of oil and chemicals from vehicles and machinery. Contamination of soil by hazardous debris.	farms after completion of excavation activity. In case of any contamination of soil due to leakage or spillage, that soil will be immediately removed and replaced with fresh soil. To ensure the efficacy of the mitigation measures suggested, soil quality monitoring should be carried out at least two times during remediation period.
Ground Water	Sediments excavation & storage and stabilization activities. etc.	There are chances that groundwater may contaminate due to percolation of water through disturbed hazardous waste, especially in rainy seasons. This may leads to contamination of ground water with heavy metals. During remediation on HW site of Noor Mohammad Kunta seepage of water through excavated hazardous material may further contaminate groundwater of area. Pressure on Drinking water and for other domestic use due to influx of labour and other staff.	It should be assured by contractor that all excavated HW will be placed at a safe place, so that it does not spread during the rainy season or due to floods. Contractor must give an assurance that all activities associated with remediation will be carried out under the supervision of an environmental specialist. Also contractor will assure that all this work will be done during non -monsoon season. The works sites will be properly fenced. The remediation sites will have signs notifying about the remediation works and hazards if any, to prevent accidental access of local people and livestock. Contractor will ensure supply of extra requirement of

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
			drinking water for influx population. To ensure the efficacy of the mitigation measures suggested, ground water quality monitoring shall be carried out at least two times during remediation. Drinking water parameters should be monitored to check the water quality during remediation process.
Surface Water	Sediments excavation & storage and stabilization activities. etc.	During Sediments excavation & storage and stabilization activities, Hazardous waste may spread over a wide area due to flood and rain, which may lead to contamination of other surface water resources in this area.	It should be assured by contractor that all HW will be placed at a safe place, so that it does not spread during the rainy season or due to floods. Storage of sediments will only be permitted if impermeable and safe platforms are built and used. Contractor must give an assurance that all activities associated with remediation will be carried out under the supervision of an environmental specialist. Also contractor will assure that all this work will be done during non monsoon season.
Noise	Movement of Vehicles, Excavation, Land preparation, Operation of DG set and sediments stabilization activities. etc.	Additional machinery required for segregation of sediments and than stabilization process of these sediments will create noise which may impact birds residing in small trees within lake and in the periphery of lake. Health Impacts and disturbance in working.	The equipment used for remediation will strictly conform to CPCB noise standards. Vehicles and equipments used shall be fitted with exhaust silencers. During routine servicing operations, the effectiveness of exhaust silencers shall be checked and if found to be defective shall be replaced. The noise level from any machinery (measured at one metre from the edge of the equipment in free field) such as compactors, front end loaders, and cranes, shall not exceed 75 dB (A), as specified in the Environmental Protection Rules, 1986.

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
			Within 150m of the nearest habitation, noise creating activities will be stopped during the night time between 9:00 p.m. and 6:00 a.m. No noisy activities will be permitted around the silence zones, a distance of 100m from the sensitive receptors as hospitals, educational institutions etc. To protect workers from severe noise impacts, noise standards of industrial enterprises will be strictly enforced, and workers shall be provided with Personal Protective Equipment (PPE) such as earplugs. To ensure the efficacy of the mitigation measures suggested, noise level monitoring shall be carried out at least every month during remediation.
Flora and fauna	Remediation of site and sediments stabilization activities. etc.	Additional machinery required for segregation of sediments and than stabilization of these sediments will create noise which may impact birds residing in small trees and within lake and in the periphery of lake. Pressure on trees, vegetation and aquatic resources. Tree cutting. Increase pollution in Surface water.	Birds residing in small trees and bushes at Noor Mohammad Kunta HW site area may migrate during remediation phase. Municipality, with help of NGO's should develop a rehabilitation program for all affected fauna If there will be requirement of tree felling during remediation process, then permission for tree felling will be sought as per the guidelines of Andhra Pradesh State Government.
Wildlife	No wild life is found near the site	None	No mitigation measures is required

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
Aesthetics	Excavation of sediments forms NMK & Chillan lake. Excavation of soil from hot spot 1 and 2. Piling up of soil and sediments.	Sediments and soil excavations and stabilization of sediments, needs machinery and additional infrastructure for segregation of sediments into different size and than stabilistaion. Also piling up of soil l& sediments will leads to Visual and aesthetics losses.	Soil and sediments should be placed in confined place either within lake or outside lake. Noor Mohammad Kunta (NMK) Lake should be developed as a recreation place after remediation and all infrastructure required for attracting recreation should be provided at this site. In the vicinity of NMK one Dargah is located which is important for all groups of people, should be given special attention and this area should be considered for integrated development. There will be positive impact on aesthetics once remediation work will complete, first due to cleaning of waste and second due to development of park and landscaping at NMK and Chillan lake with stabilized sediments (detail landscaping plan for both lakes will be designed during detail design).
Traffic	Worker, staff of contractor, staff of supervision consultants.	Increased traffic movements, dust	All vehicles should be checked for "Pollution Under Control" certificates and occasional spot testing of emission from vehicles should be carried out with the assistance of the local administration. Proper traffic management by local administration
Accident Risk	Transportation of Waste	In present case (In-situ treatment or Option-2) there will be no transportation of waste to TSDF site hence accident risk will be negligible.	Proper traffic safety signs and traffic rules will be followed during remediation.
HW spillage	Transportation of Waste	In present case (In-situ treatment or Option-2) there will be no transportation of waste to TSDF site, hence there is no HW spillage risk	

Environmental Component	Activity	Site-Specific Impacts	Mitigation Measures
		involved.	
Livelihood	Remediation/Closure of sites	About 10 rag pickers will lose their income in case of closure of KIE at NMK site. Per day income of these rag pickers is about Rs 50.	In case of loss of livelihood, compensation for the transition period will be provided to all affected persons. In the unlikely and unforeseen case of temporary land acquisition, conditions of mutually agreed contract between contractor and owner of land will be followed.
Shelters	Remediation/Closure of sites	None of the shelter would be affected	
Agriculture activities	Remediation/Closure of sites	There are no agricultural activities near Noor Mohammad Kunta hence there will be no loss of agricultural production	
Employment	Excavation of waste, site preparation and sediments stabilization activities.	Some employment will be generated as a result of excavation, stabilization and during landscaping activities of MNK.	No mitigation measure is required.
Infrastructure	Remediation/Closure of sites.	As a result of remediation work lot of temporary and permanent Infrastructure will be developed during remediation work.	No mitigation measure is required.
Cost	Remediation	Cost involved for in-situ treatment is Rs 838,866,958 which is Rs 435,501,000 less than ex-situ treatment (Option-1).	Option-2 is economical than option-1.

CONCLUSION

HOOGHLY HW SITE

- Exposure to air pollution during the remediation will be comparatively less due to early completion of work as a result of reduced transportation distance compared to option1. However, higher air pollution is anticipated at Chakundi site due loading and unloading of waste and also during site development.

- Exposure to noise pollution will also be less due to in-situ remediation of HW sites as well as due to early completion of excavation work because of short transportation distance. However higher noise is anticipated at Chakundi site due upgradation of existing site as well as due loading and unloading of waste from other sites.

- Probability of an accident during transportation will be low due to a significant reduction in the distance from over 150 km to about 5 - 17 km compared to option1.

- Probability of spillage risk is low due to very short transportation distance as also because the waste will be transported after stabilisation.

- Exposure to the community along the transport pathway will be insignificant due to the reduced transportation distance of the stabilized waste to the storage site

- There will be no additional traffic movement between HW sites and TSDF, though short distance traffic will be more. Fuel consumption will thus also be reduced.

- Impact on business activity and livelihood at the HW site will be less, due to in-situ remediation, reduced transport time and early completion of the project.

- Employment opportunity generated will be less in option 2 than option 1 due to early completion of work; however the site development for storage and disposal of waste will generate additional employment opportunity.

- Estimated cost of the project in the case of option 1 (Rs.36.2 crores) is significantly higher than in the case of option 2 (Rs.23.3 Crores)

NOOR MOHAMMAD KUNTA HW SITE

- Increased air and noise pollution is anticipated due to excavation, preparation of stabilisation site and stabilisation of waste within NMK HW sites as compared to option1
- Probability of an accident during transportation will be low due to a significant reduction in the distance from over 150 km to about 2 to 5 km compared to option1.

- Probability of spillage risk is low due to very short transportation distance as also because the waste will be transported after stabilisation.

- Exposure to the community along the transport pathway will be insignificant due to the reduced transportation distance of the stabilized waste to the storage site

- There will be no additional traffic movement between HW sites and TSDF, though short distance traffic will be more. Fuel consumption will thus also be reduced.

- Employment opportunity generated will be higher in option 2 than option 1 due to development of stabilisation site and stabilisation of waste within NMK

- Estimated cost of the project in the case of option 1 (Rs.127.4 crores) is significantly higher than in the case of option 2 (Rs.83.9 Crores)