

1. Introduction

SMS Limited Nagpur has been awarded the contract for the Bioremediation of 20 dumpsites as per Cluster 1 and Cluster 2 in the state of Kerala by the Kerala Solid waste management Project. The Bioremediation of sites will be done in 20 locations of Kerala, a team of SMS Limited have visited these 20 dumpsites and have conducted a survey to understand the different locations geographically, the surroundings of the location, the habitation, the communities and people residing near by the dumpsite for an assessment of the risks involved and implementing the mitigation measures to eliminate these risks.

Based on the survey conducted at dumpsite at Kunnamkulam we have prepared an Environment Management Plan to minimize the risks to the environment surrounding the and also to minimize the risks to the community of people residing in the vicinity of the dumpsite. The EMP also covers the plan for the site workers and staff for minimizing the impact of bio mining activity on their health.

2. Audit of the Existing Dumpsite

Kunnamkulam town is expanded in 2001 by adding rural LSGIs of Arthat panchayat in full and parts of Chowwannur and Porkulam making the spread of area to 34.18 sq.km. The land use covers industrial, commercial, residential, agriculture etc. unlike many other urban LSGIs the land utilized for agriculture activities is on the higher side. Dumpsite is surrounded by residential areas, and the area where the dump is situated is marked as a park and open space zone as per survey No. 33. An abandoned quarry and a shrine are existing in the south-west side which is only 20m away from the boundary of the dumpsite. A special school (for physically and mentally challenged Children) located 104 meters from the dumpsite's perimeter. The south-west side of the dumpsite, there is an abandoned quarry and a place of worship. There is a book manufacturing unit in the north-east part, a chapel and a sculptor facility in the south-west side.

3. Contractor EMP

As per the RFB (ANNEXURE III: ENVIRONMENTAL MANAGEMENT PLAN) The Detailed EMP prepared by KSWMP is updated by SMSL and we have considered all the conditions given in the generic EMP to comply with. The updated generic EMP is attached as Annexure-A. Similarly, site specific EMP is also updated and presented below in the tabulated form.

The site specific environmental management plan has been prepared and mitigation measures have been enclosed in this EMP for Kunnamkulam site as Pre-remediation phase, during remediation phase and closure of site.

3.1 Insurance Coverage and Risk Management

Three insurance policies as listed have been procured to cover the works, plant, materials, and equipment, as well as for any loss or damage to other property, personal injury or death (for third parties), and contractor's employees.

1. Employer's liability insurance policy:

Workers are covered under employer's liability insurance policy

2. Public liability industrial policy:

Validity: from 30/05/2025 00:00 hrs to 29/05/2026 midnight

The communities are covered under public liability policy. This policy is generally referred to as third party or public liability cover. The policy is on 'occurrence' basis. The indemnity limit is fixed as Rs. 50,00,000 for any one accident and aggregate during the policy period is Rs. 2,00,00,000.

3. Bharat sookshma Udyam Suraksha policy:

Validity: from 30/05/2025 00:00 hrs to 29/05/2026 midnight

It covers the loss or damages of all types of assets, stock, trolley, portable office cabin, laptops, DG sets, weighbridge and all other goods as per insured trade

ENVIRONMENTAL MANAGEMENT PLAN FOR KURUKKANPARA DUMPSITE, KUNNAMKULAM

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
A Pre-Remediation / Planning Phase						
1	Site Clearance	Total cessation of the dumping	Delay in starting the work	ULB should stop bringing new waste to the dumpsite	Currently dumping has stopped and MCF come RRF segregated wastes will be disposed before handing over the site.	DPMU and ULB
2	Adjacent facilities	Functioning of adjacent facilities like MCF/RRF/Incinerator facility, that are present in the same compound	The working of dumpsite remediation will be affected,	The adjacent facilities should be temporarily closed or separate entrance should be provided. Contractor should officially communicate the exact date of initiation at least 15 working days before mobilizing the machinery or starting the remediation works.	Notice will be given at least 15 days before the start of the remediation work.	DPMU and ULB
3	Statutory Clearance	Obtaining all the statutory clearance for the remediation activity	Delay in starting the work	Contractor should obtain all necessary clearance (annexure 1) before starting work	<ul style="list-style-type: none"> • CTO obtained from KSPCB. Consent No : KSPCB/TS/ICO/1010058 7/2025 <ul style="list-style-type: none"> • Valid upto : 31-03-2026 • In case of fire emergency Water tanks will be provided with pumps and hoses inside the site, the same shall be utilized. 	Contractor with the support of PIU and DPMU

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					<ul style="list-style-type: none"> ● KSEB- not applicable since the contractor is using DG sets. ● Telephone department if any underground cables are going- will be checked and confirmed. 	
4	Consent and permits	Consents and permits to transfer the derived materials and leachate and RDF	Unwanted stock piling at the site.	<ul style="list-style-type: none"> ● The contractor should submit the agreement / permits for disposing the derived materials from the dumpsite including RDF. ● Agreement with nearest treatment plant for transferring the Leachates 	<ul style="list-style-type: none"> ● Contractor will submit relevant agreements – vehicle arrangement, RDF disposal, other derived material disposal and biomedical & hazardous waste disposal. ● Agreement with the nearest treatment plant for transferring the Leachates will be compiled. 	Contractor
5	Sensitive receptors	Planning the remediation work	Affecting the sensitive receptors	All sensitive receptors close to and around the dumpsite should be listed and mapped. Measures to safeguard the nearby sensitive receptors to be mentioned.	<ul style="list-style-type: none"> ● Entire boundary of the dumpsite is already isolated with a compound wall, and tin sheets at least for a height of 1.5 m above maximum height of waste dump, will be provided on two sides of the site. Nearby MCF/RRF will be isolated with barricades wherever necessary. ● Proper leachate collection tank along with leachate 	Contractor with the support of PIU and DPMU

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					channelizing drains will be installed to arrest the leachate flow to nearby plantations.. • Storm water discharge points will be identified accordingly.	
6	Management Plans	All site management plans should be approved. List given in Annexure 2	Delay in starting the work	Contractor should prepare and get approval from DPMU and SPMU for all management plans before starting the work	1. Site layout plan. 2. Leachate Management Plan. 3. Storm water management plan 4. Waste Management plan (inhouse) 5. Work Plan / Legacy Waste Management- 6. Fire Management Plan. 7. Health and Safety Plan. 8. Grievance Redressal Plan. 9. Emergency Response Plan 10. Training schedules The above plans will be submitted before starting the work. These plans will be submitted for approval from DPMU and SPMU.	Contractor
7	Utilities	Mapping of all utilities like telephone, water supply, gas,	Break in the line may cause	All utilities should be marked in coordination	All utilities will be marked in coordination with ULB and	Contractor with the

ENVIRONMENT MANAGEMENT PLAN FOR BIOREMEDIATION OF MUNICIPAL
SOLID WASTE DISPOSAL SITE AT KUNNAMKULAM – PREPARED BY SMSL



No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
		sewage, HT line etc near to the worksite and underground	disruption to the service and inconvenience to the public	with ULB and respected departments. Respective permission if required to be obtained from the concerned department if the dumpsite remediation activity may affect the existing working of utilities	respected departments. The works (excavation/ elevated works) will be executed in presence of authorized persons from concerned departments, if necessary.	support of PIU and DPMU
8	Water	Water source for remediation activities, toilet at the worksite and drinking water for the workers	Extraction from or nearby water source can lead to conflict with the local people requirements.	Contractor should identify water source / arrangement with local distributors, drinking water sources should not be affected	Water will be outsourced for remediation activities and drinking purposes.	Contractor
9	Inventory of facilities and infrastructure and machinery	Making list of all existing infrastructure, machines etc present at the facility	Unauthorized access, theft and damage to existing facilities	Contractor should make a list of all available infrastructure and machinery available at the site and get it signed	All facilities will be enlisted and get it signed before start of the work	Contractor with the help of DPMU
B	During Remediation Phase					
B.1	Site Clearing					
1	Planning the remediation process	<ol style="list-style-type: none"> 1. Preparing site layout 2. Identifying positions of machine and equipment deployment 3. Identifying the leachate tank 4. Identifying vehicle parking area 5. Identifying construction of toilet / establishing mobile or makeshift toilet (as applicable) 	Delay in starting the work, Incidents and Accidents might happen to personnels and Environmental damage	Contractor should identify deployment / position of these facilities in consultation with ULB and get approval from ULB and DPMU. The approved site layout should display at the site	<p>Site layout will be prepared showing all facilities and same will be submitted to DPMU and SPMU for the approval before commencement of the work. The approved site layout will be displayed at the site.</p> <p>Site safety engineer will conduct OHS</p>	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
		6. Identifying sorting, segregating and storing area. 7. Traffic management plan (for transporting the derived material)			training/induction/Tool box talk to workers.	
2	Land / Soil	1. Clearing /preparing the access road 2. Preparing the vehicle parking area 3. Installation/construction of toilet 4. Preparing wash water drain, leachate drain etc 5. Construction of leachate collection tank,	Loss of topsoil, disturbance to surrounding	Only minimum area should be used for these purposes. Existing area should be used as far as possible	Entire activity will be limited to dumpsite only.	Contractor
3	Land	1. Preparing the vehicle parking area / temporary office space 2. Installation of toilet	Change in land use, Loss of topsoil	Only a minimum area should be used for these purposes. Existing area should be used as far as possible	Entire activity will be limited to dumpsite and will be ensured	Contractor
4	Air	Site preparation for vehicle parking, machine deployment, access road and it's repair	<ul style="list-style-type: none"> Dust emission due to the works Emission from DG 	Minimum area should be disturbed. Water should be sprinkled at least twice a day during the work in progress. DG should use sulfur free diesel. DG stack height should match with the minimum the boundary screen sheet	<ul style="list-style-type: none"> Water sprinkling will be carried out twice in a day during the time work in progress and whenever necessary to control dust. Low sulfur high speed diesel will be used for DG. Minimum DG Stack height shall be as per PCB 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					guidelines & CTO recommendation.	
5	Water	Construction activities	Conflict with local people if local sources are using for water extraction. Contamination of nearby water bodies due to the leachate generated from the site and disposal of silted runoff.	<ul style="list-style-type: none"> • If local sources are using the same resource, permission should be obtained before using. • If private tankers are employed, should reach in understanding with them before starting the work. • Drinking water sources should not be used construction activities. • Leachate should be properly collected and treated by hindering chances of percolation to ground water. • Storm water & leachate channelizing drains should properly provide. Leachate collection drain should be properly lined. • If the site is having direct connection to surface water body, site should be provided with desilting tanks at the lower elevation. 	<ul style="list-style-type: none"> • Water will be outsourced for remediation activities & drinking purpose. • Drinking water sources will not be used construction activities. • Leachate will be properly collected and treated by hindering chances of percolation to ground water. • While collecting the leachate, the collection sump will be provided with mesh, which can trap the plastics and other solid particles mixing into the leachate. The trapped plastics and solids will be manually cleaned with the help of workers. We will ensure these activities will be performed in safety manner with appropriate PPE's. • The proposed tank is of capacity will be amended as per work plan, i.e., a factor of safety of 50% is considered. Also the leachate collection tank will be properly covered during rains, and we will ensure it won't get mixed to 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					<p>leachate by providing cut off drains.</p> <ul style="list-style-type: none"> Moreover collected leachate will be evaporated in the pond by solar evaporation. Sani treat deodoriser will be utilized to control the odour at site. Entire leachate will be managed without disposing into land or water bodies. It will be ensured that no nearby water sources will be affected by leachate. Storm water & leachate channelizing drains will be provided properly. Site will be provided with desilting tanks at the lower elevation. 	
6	Noise	<ol style="list-style-type: none"> Increased noise level due to construction activities, movement of vehicles Unloading of machinery 	Noise pollution	<ul style="list-style-type: none"> Noise should be reduced as far as possible. Noise mitigating measures like ear plugs, ear caps should be provided to workers who are employed with high noise generating works. If working near to residential areas, timing should be planned to cause minimum disturbance to the residents 	<ul style="list-style-type: none"> Noise mitigating measures like ear plugs, ear caps will be provided to workers who are employed with high noise generating works. Noisy equipment will be positioned in the site plan as far away as possible from noise-sensitive areas near Institutions and residential neighborhoods. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				<ul style="list-style-type: none"> • Vehicle should not be moved during peak hours • Position noisy equipment in the site plan as far away as possible from noise-sensitive areas like residential neighborhoods, schools, and hospitals. 		
7	Flora and Fauna	Site preparation for vehicle parking, machine deployment, Access road and it's repair	Loss of flora and disturbance to fauna	Site should be selected in such a way that, minimum disturbance to the existing flora and fauna	<ul style="list-style-type: none"> • If necessary the branches of the trees may be trimmed during the transportation of vehicles. 	Contractor
8	Workers Health and Safety	Site clearing, construction activities	Accidents due to lack/inadequate PPEs	<p>Adequate PPE should be ensured to everyone present at the worksite</p> <ul style="list-style-type: none"> • Everyone should be provided with safety caps, boots and gloves • Face mask should be provided for works involved with dust and particulate matter emission 	<ul style="list-style-type: none"> • Everyone will be provided with safety caps, boots, goggles and gloves • Face mask will be provided for works involved with dust and particulate matter emission • For night shift workers reflective coat shall be provided. • A site specific safety engineer will deploy in the site for ensuring the proper usage of PPEs. Safety officer will be 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					responsible for giving proper training for the usage of PPE.	
		Unloading machinery and installation of structures	Accidents due to lack/inadequate PPEs	<ul style="list-style-type: none"> Only experienced workers should be employed Adequate safety precautions should be taken All workers should be provided with PPEs according to the nature of the work Proper safety signage boards should be placed 	<ul style="list-style-type: none"> Only experienced workers will be employed Adequate safety precautions will be taken All workers will be provided with PPEs according to the nature of the work <p>Proper safety signage boards will be placed A safety engineer will deploy in the site for ensuring the proper usage of PPEs. Safety officer will be responsible for giving proper training emergency for the usage of PPE</p>	Contractor
		Clean area for eating food, clean drinking water	Health issues or contamination of food materials	<ul style="list-style-type: none"> Workers should be provided with clean area for eating food. Potable water should be available at the worksite always. 	<ul style="list-style-type: none"> Workers will be provided with clean area for eating food. <p>Potable water will be available at the worksite always</p>	Contractor
		Workers Health and safety measures	Illness, Accidents, Incidents, Loss of time and workmen	<ul style="list-style-type: none"> All workers should be given training on safe working practices. Contact information of nearest hospital should displayed at the work site. 	<ul style="list-style-type: none"> All workers will be given training on safe working practices. Contact information of nearest hospital will displayed at the work site. First Aid kit will be available at the worksite, and it 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				<ul style="list-style-type: none"> • First Aid kit should be available at the work site and it should be displayed in visible manner. • Precautionary boards for using PPEs should be displayed at worksites 	will be displayed in a visible manner. <ul style="list-style-type: none"> • Precautionary boards for using PPEs will be displayed at worksites. 	
9	Public Health and Safety	Construction activities, transportation of vehicles, Preparing access road	Inconvenience to the public, chances of accidents to the pedestrians	<ul style="list-style-type: none"> • Consultation should be arranged with public before initiation of any work- • Peak hours in the morning and evening should be avoided for vehicle movements • Work area should be protected with barricades • Warning boards should be erected at the worksite, if there is no enclosures or compound wall. • CCTV should be installed at the site proper monitoring. • <u>In residential areas all high noise generating operations should be</u> 	<ul style="list-style-type: none"> • Consultation will be arranged with the public before initiation of any work and a schedule for the same shall be submitted before commencement of work. • The site will be protected through barricades or fencing on two sides and wherever necessary. And proper security (24 by 7 basis) shall be provided to control unauthorized entry. • Peak hours in the morning and evening will be avoided for vehicle movements, if necessary. • Warning boards will be erected at the worksite if there are no enclosures or compound walls. 	DPMU, PIU and Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				<u>limited to daytime only (8.00 AM to 6.00 PM)</u>	<ul style="list-style-type: none"> CCTV will be installed at the site with proper monitoring. <p>All the residential areas the high noise generating operations will be limited to day time only i.e. from 8.00 AM to 6.00 PM</p>	
10	<i>Socio-economic</i>	<i>Site Isolation</i>	<p>Site should be properly isolated using fencing mechanism otherwise</p> <ul style="list-style-type: none"> Activities will encroach into adjacent natural habitats unauthorized access of public Aesthetic Management 	<ul style="list-style-type: none"> Site should be properly isolated using barricades or fencing. Security person and CCTV surveillance should be provided. 	<p>Site will be barricaded with barricades and fencing. Hence unauthorized entry will be restricted.</p> <p>Security and CCTV surveillance will be provided.</p>	Contractor
11	Documentation	Documentation of initial site condition		<ul style="list-style-type: none"> Documentation of initial conditions of the dumpsite and surroundings including associated facilities, and land use. 	<p>All the initial conditions, including legacy waste heap, land use around, the associated facilities etc., will be documented through video and photographs and will be submitted to DPMU. Clarity of these documentations will be ensured before the start of the work.</p>	DPMU & Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
B.2	During the remediation Process					
1	Soil	Indiscrete disposal of waste materials	Contamination of the land	<ul style="list-style-type: none"> All the in-house waste materials should be disposed of as per the waste management plan. No waste material should be carelessly thrown around 	<ul style="list-style-type: none"> Site remediation plan will be strictly followed as per SWM rules and CPCB Guidelines, 2019. It will ensure no waste materials will be carelessly thrown around. Orientation will be given to the workers. 	Contractor
		Spillage of waste materials due to careless handling at storage area	Contamination of the surface soil	<ul style="list-style-type: none"> The materials derived from bioremediation should be kept in designated storage area only. Hazardous materials should be kept separately in a sheltered area with non-percolating platform with warning boards clearly written Flammable materials should have a separate storage area away from other materials like RDF All material storage area should provide with proper cover 	Substantiate along with site plan Separate storage areas will be provided for each category as per tender and work requirements. Separate area will be provided for Hazardous materials, with warning boards. Designated areas will be provided for the materials derived from bioremediation. The hazardous waste materials will be stored separately on non-percolating pallets and with warning boards. Flammable materials like RDF and diesel will be stored separated and away from the other stored materials.	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				to protect from odour, fly, dust & fire prevention	All material storage area will be provided with proper tarpaulin cover to protect from odour, flies, mosquito etc Fire management plan will be followed for safety. Workers will be given orientation on housekeeping at storage areas.	
		Spillage of waste materials during transportation	Contamination of the surface soil	<ul style="list-style-type: none"> The trucks should be covered on top with tarpaulins or appropriate materials. The waste materials should not be exposed 	The transportation materials will be covered properly to ensure there won't be any spillage during the transportation. We will ensure the height of the loaded RDF will be less than vehicle body height. It will be ensured that no waste material is exposed during the transportation.	Contractor
		Leachate draining to the soil	Contamination of the surface soil	The leachate management plan should be strictly followed. If any hazardous material found during remediation should be handed over to authorized agency for processing and disposal. MOU with the agency should be submitted.	Leachate management plan will be prepared and will be adhered. If any hazardous material found during remediation will be handed over to authorized agency for processing and disposal. MOU with the agency will be submitted before starting the work.	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
		Draining the wash water to soil	Contamination of the surface soil	<p>Wash water drains should be provided at the remediation site and wash water should not be released to the ground without treatment</p> <p>OR</p> <p>Alternatives of Vehicle washing area to be identified (Car wash area) or wash water not to be drained in leachate collection tank</p>	<p>Wash water drains will be provided, and untreated water won't be released to open land without treatment</p> <p>A dedicated transport fleet will be used on site and only for transportation of bio soil and RDF. These vehicles will not be onsite for a long time; they will be used for lifting the RDF and transporting it to the disposal site. Therefore the requirement for vehicle wash is not essential as the vehicles will not be entering any bio mining area or the waste storage area and will not be contaminated.</p> <p>In case we have the vehicles that are contaminated we will have a dry wash area for cleaning these vehicles.</p>	Contractor
		Leakage / spillage of oil, grease, diesel from the vehicles	Contamination of the surface soil	All vehicles should be checked for leakage and other complaints before starting each trip.	All vehicles will be checked for possible leakage of oil, lubricants, grease, diesel etc. before entering the work site.	Contractor
2	Land	If additional area (outside the dumpsite) is taking for remediation activities	Change in land use / Loss of contamination of topsoil	<ul style="list-style-type: none"> • Minimum disturbance to existing land use should be ensured. • No tree / plants should be cut for this purpose 	Not applicable	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				<ul style="list-style-type: none"> • Agriculture land should not be used for this purpose 		
3	Air	Opening up the dump area	Odour nuisance, pest, flies, gas emission	<ul style="list-style-type: none"> • Odour stabilizing inoculum / bioculture / deodorizer or other materials should be applied before opening up new area. • Banned materials should not be used. As far as possible bio pesticides and biological control should be followed. • List of inoculum and other materials proposed to use should be informed in advance and get approval. • If odor problems at a site reach their peak, operations should be temporarily halted, and odor management actions must be prioritized. • Face mask with odour filters will be provided for workers working on dumpsites 	<ul style="list-style-type: none"> • Odour stabilizing inoculum / bio culture / deodorizer or other materials will be sprayed before opening up new area. Since the dumping is already stopped, the waste heaps are already in stabilized state. Bana Microbes zodor bio culture and Sanitreat deodoriser will be utilized to control the odour at site. • Portable methane gas detectors or fixed monitoring stations equipped with methane sensors will be utilized to mitigate the gaseous emissions at site • If odour problem occurs during the remediation process, the work will be temporarily stopped till the issue is sorted out. • Appropriate PPE including face masks, and covers will be provide to all workers employed at the worksite. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
		Sieving and segregation of materials	Dust, and emission of particulate matter	<ul style="list-style-type: none"> Green net should be provided around the dumpsite area. The height of the net should be at least one and half meter above the maximum height of the waste materials. Water should be sprinkled as often as required, but at least twice a day during the operation time. 	<ul style="list-style-type: none"> Entire boundary of the dumpsite is already isolated with a compound wall, and green nets at least for a height of 3 m above maximum height of compound wall will be provided on two sides of the site and wherever necessary. Nearby MCF/RRF will be isolated with barricades wherever necessary. Water will be sprinkled as per the dust generation, at least twice a day and as when required. 	Contractor
		Storing of derived materials without covering	Particulate matter emission due to wind	All the stored materials should be properly covered.	All the derived stored materials will be covered with tarpaulin sheets to avoid any air emission.	Contractor
		Transportation of the waste materials	<ul style="list-style-type: none"> The fugitive emission from the vehicles Emission from DG 	<ul style="list-style-type: none"> All vehicles should have valid PUC certificates If the road is not tarred, water sprinkling should be done on roads also, to control dust due to increased vehicular movement. 	<p>All vehicles will be ensured for valid PUC certificates.</p> <p>Water sprinkling will be done as per work plan.</p>	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
4	Noise	Operation of Machinery and DG set	Noise hazards due to increased noise level	<ul style="list-style-type: none"> Noise generation should be reduced as far as possible. Staggered operation of machinery should be ensured where ever possible Noise attenuation measures should be provided around high noise generating machineries Noise reduction enclosure should be provided for DG set 	High noise generating operations will be scheduled in staged manner. Noise attenuation measures will be provided around high noise generating operations. Machineries that are used for bio mining process do not have very high noise emission, but we will limit the time any worker or staff spends near these machines. Also the workers will be provided with ear plugs/ear muffs. DG sets will be covered for noise reduction. Proper preventive maintenance of machineries will be ensured, Ear plugs and Ear mufflers will be provided whenever required.	Contractor
		Movement of vehicles	Noise hazards due to increased noise level	<ul style="list-style-type: none"> All vehicles should have approved silencers Idling of vehicle should be restricted Air horns are prohibited in vehicles HORN PROHIBITION signpost to be erected 	<ul style="list-style-type: none"> All vehicles will be ensured for PUC. Idling of vehicle will be restricted Air horns will be prohibited at the worksite.	Contractor
5	Water	Discharge of Surface drain water / Wash water	Contamination of Waterbodies, ground water	Drains should be provided at the remediation site and wash water should not be released to the water bodies	Wash water generated from the workers will be separately collected and disposed off properly for treatment.	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				or open drains without treatment, it should divert to drain outlet only.	Untreated water will not be released to land / water bodies.	
		Discharge of leachates	Contamination of Waterbodies, ground water	<ul style="list-style-type: none"> The leachate management plan should be strictly followed. Collected leachate should be transferred to nearest treatment plan. 	<ul style="list-style-type: none"> Leachate management plan will be strictly followed as per the work plan. 	Contractor
		Indiscriminate disposal of waste particles	Contamination of Waterbodies, ground water	<p>Waste management plan should be followed.</p> <p>Waste materials should not be thrown to the water bodies</p>	<ul style="list-style-type: none"> Site remediation plan will be strictly followed as per SWM rules and CPCB Guidelines, 2019. <p>Workers will be given orientation on Waste Management</p>	Contractor
		Waste water from Toilets	Contamination of Waterbodies, ground water	Liquid waste from toilets should be directed for treatment	Mobile toilets will be made available and the liquid waste will be collected in a tank and will be disposed off using vacuum trucks and to a sewer system/STP.	Contractor
		Waste water percolation from the waste storing area	Contamination of Waterbodies, ground water	Separate sheltered area with non-percolated platform should be provided for storing of hazardous and biomedical waste derive from dumping yard with cut off drains	The hazardous and biomedical waste will be stored separately and on non-percolating platforms with cut off drains.	

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
		Waste water from vehicle washing	Contamination of Waterbodies, ground water	Wash water drains should be provided at the remediation site and wash water should not be released to the water bodies or open drains without treatment	<p>A dedicated transport fleet will be used on site and only for transportation of bio soil and RDF. These vehicles will not be onsite for a long time they will be used for lifting the RDF and transporting it to the disposal site. Therefore the requirement for vehicle wash is not essential as the vehicles will not be entering any bio mining area or the waste storage area and will not be contaminated.</p> <p>In case we have the vehicles that are contaminated we will have a dry wash area for cleaning these vehicles</p>	Contractor
6	Workers health and safety	Remediation Activities	Personal Protection to Workers	<ul style="list-style-type: none"> • Only experienced workers should be employed • Adequate safety precautions should be taken • All workers should be provided with PPEs according to the nature of the work • Everyone should be provided with safety caps, boots and gloves • Face cover should be provided for works 	<p>Only experience labours / labours with training will be employed.</p> <p>All workers will be given PPEs as per the health and safety plan.</p> <p>All recommendations given this EMP will be followed</p> <p>Medical checkup will be provided to the labourers before and after the remediation works.</p> <p>The site will be under surveillance by camera, and round the clock security cover.</p>	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				involved with dust and particulate matter emission <ul style="list-style-type: none"> All workers should undergo free medical checkup before starting the bio mining work and after closure of the site All area should be under camera surveillance. There should be security person present round the clock. All OHS and CHS measures to be followed in line with applicable regulations, guidance ▪ 	Tie up with nearest Primary Health Centre will be provided. Professional and trained drivers will be deployed for safe transportation. Adequate rest will be ensured for drivers and labours by providing rotational shifts.	
			Accidents due to working on heights / heaps	Workers will be allowed to work only on safe heights after stabilizing the slopes.	Precautions will be taken during working at heights and will be allowed to work on heights only after stabilizing the slopes.	Contractor
			Accident due to working on deep excavations	Workers will be allowed to work on excavations only after stabilizing the top portion. In case of waste mound and site edges are sliding or unsafe; provide engineered retention walls.	Precautions will be taken during working at heights and will be allowed to work on heights only after stabilizing the slopes. Barricades, Warning boards and Tapes, barriers shall be ensured in deep excavation areas. The workers will be	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					trained / Notified of the Hazards.	
			Handling contaminated waste particles / hazardous waste particles	<ul style="list-style-type: none"> Workers will give training to handle the contaminated and hazardous materials. Necessary protection measures including gloves, aprons, mask will be provided Sanitizers and disinfectant should be provided to workers dealing with contaminated materials 	<ul style="list-style-type: none"> Workers will be given training to handle the contaminated and hazardous materials. Necessary protection measures including gloves, aprons, mask will be provided Sanitizers and disinfectant will be provided to workers dealing with contaminated materials 	Contractor
			Odor hazardous from the legacy waste	Face mask with odour filters will be provided for workers working on dumpsites	Appropriate face mask with odour filters will be provided for workers working on dumpsites	Contractor
			Accidents due to movement of vehicles	<ul style="list-style-type: none"> Vehicle movement within the dumpsite / remediation area will be restricted Person will be employed for controlling 	<ul style="list-style-type: none"> Vehicle movement within the dumpsite / remediation area will be restricted, speed limit sign boards shall be placed in appropriate places. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				and guiding the vehicles when they are in operation <ul style="list-style-type: none"> • Only drivers with valid license will be employed. • Vehicle will be allowed to move only designated paths 	<ul style="list-style-type: none"> • Person will be employed for controlling and guiding the vehicles when they are in operation. • Only drivers with valid license will be employed. Vehicle will be allowed to move only designated paths	
			Fire from the stored materials	<ul style="list-style-type: none"> • Fire management plan should be strictly followed • Flammable materials will be kept away from other materials, with proper marking 	Substantiate with detailed fire management Plan <ul style="list-style-type: none"> • Fire management plan will be strictly followed • Flammable materials will be kept away from other materials, with proper marking Monthly mock drill will be conducted	Contractor
			Electrical shock during operating machines	<ul style="list-style-type: none"> • All electricals connections will be properly wired and earthed. • No loose connections or hanging wires will be provided. • All workers working on electrical machinery will be provided with electrical resistance gloves and boots 	<ul style="list-style-type: none"> • All electricals connections will be properly wired and earthed. • All workers working on electrical machinery will be provided with electrical resistance gloves and boots 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
			Accident from moving equipment and machinery	<ul style="list-style-type: none"> Only trained person will be operating the moving machineries Appropriate PPEs will be provided for person working on moving machineries Crane, earth movers and JCB operations should accompany with whistle man. Accidents /incidents should be reported to DPMU immediately and detailed report to be submitted as per the given format. 	<ul style="list-style-type: none"> Only trained person will be operating the moving machineries. Appropriate PPEs will be provided for person working on moving machineries. Crane, earth movers and JCB operations will be accompanied with whistle man. DG sets which are used at the sites will be given a cooling period in between the shifts as a precautionary action to prevent accidents Accidents /incidents will be reported to DPMU immediately and detailed report to be submitted as per the given format within the time limit. 	Contractor
			Respiratory issues due to particulate matter emission	Dust and odour filtering masks will be provided to all person present in the worksite	Appropriate Dust and odour filtering masks will be provided to all person present in the worksite	Contractor
		Storage of Waste materials	Fire from the stored materials	<ul style="list-style-type: none"> Fire management plan should be strictly followed 	<ul style="list-style-type: none"> Fire management plan will be strictly followed. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				<ul style="list-style-type: none"> Flammable materials will be kept away from other materials, with proper marking. Flammable materials will not be stored near to RDF Fire extinguishers will be available near the flammable materials. Persons working on dumpsite will be provided training on usage of fire control measures. 	<ul style="list-style-type: none"> Flammable materials will be kept away from other materials, with proper marking. Flammable materials will not be stored near to RDF Fire extinguishers will be available near the flammable materials. The adjacent facilities will be instructed not to burn anything near the site boundary. Persons working on dumpsite will be provided training on usage of fire control measures. The nearby fire station will be alerted in case of any fire. 	
		Lack of clean area for dining and availability of drinking water	Health issues, Loss of time and Workmen	<ul style="list-style-type: none"> Workers should be provided with clean area for eating food. Potable water should be available at the worksite always. 	<ul style="list-style-type: none"> Workers will be provided with clean area for eating food. Potable water will be available at the worksite always. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
		Labour / construction camp (Where laborers are accommodated)		Where the laborers are accommodated, it will be ensured that, <ul style="list-style-type: none"> • Properly roofed • Adequately ventilated • Proper flooring • Comfortable floor area to accommodate all workers • Enough number of toilets • Availability of clean drinking water • Clean dining area 	Local labourers will be employed hence not applicable. If the labourers are given accommodation, these conditions will be adhered.	Contractor
7	Public Health and Safety	During remediation process		In residential areas all high noise generating operations should be limited to day time only (8.00 AM to 6.00 PM)	Not applicable, Since residential areas are found far from our processing facility. If necessary we shall limit the operations.	Contractor
			Respiratory issues due to particulate matter emission	<ul style="list-style-type: none"> • Dust control measures like water sprinkling will be ensured. • Green nets around the area will be provided. • Appropriate additional measures will be deployed on dumpsites near to residential areas • Waste storage areas should strictly covered. • Only covered waste transit is allowed. 	<ul style="list-style-type: none"> • Dust control measures like water sprinkling will be ensured. • Green nets around the area will be provided. • Mist spraying systems will be deployed on dumpsites near to residential areas, if found necessary. • Appropriate Nose masks will be provided • Waste storage areas will be strictly covered with tarpaulins. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					<ul style="list-style-type: none"> All transit of waste are in covered (tarpaulin) vehicles. And also the height of the loaded RDF will be ensured below the height of the vehicle body. 	
			Bad odour from waste materials, pest and flies from the dumpsite	<ul style="list-style-type: none"> Dust control measures like inoculum stabilizing etc should be ensured, at regular interval, at least twice a day Additional measures will be deployed on dumpsites near to residential areas Banned materials should not be used. As far as possible bio pesticides and biological control should be followed. 	<ul style="list-style-type: none"> Odour stabilizing inoculum / bio culture / deodorizer or other materials will be sprayed to control odour and pests. Bana Microbes zodor bio culture and Sani treat deodoriser will be utilized to control the odour at site. Pest identification will be performed, based on that physical and biological controls will be deployed. Banned chemical will not be utilized for pest management. Banned pesticides/chemicals will not be used. As far as possible bio pesticides and biological control will be followed. We will use shiny reflective surfaces, like aluminum foil or CDs, to scare crows, birds and eagles away. For rats natural repellents like peppermint oil if necessary. Bt, NPV, neem-based 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					pesticides, Trichoderma etc., bio-pesticides will be used to control the pests as suggested by Agriculture University, Kottarakara.	
		During transportation of materials	Accident due to movement of vehicles	<ul style="list-style-type: none"> Only drivers with valid license will be employed. Peak hours will be avoided for transporting the materials. Traffic management plan will be strictly followed 	<ul style="list-style-type: none"> Only drivers with valid license is being employed. Peak hours will be avoided for transporting the materials. Traffic management plan will be strictly followed. 	Contractor
8	Socio Economic	Construction Activities	Grievance Redressal Mechanism	<ul style="list-style-type: none"> Grievance redressal mechanism should be developed and got it approved. Contact numbers / mail/ postal address should displayed at the gate/boundary of the dumpsite All complaints received should be properly recorded and handed over to DPMU Proper socioeconomic interventions should be implemented to control public protests. 	<ul style="list-style-type: none"> Grievance redressal mechanism will be developed and got it approved. Contact numbers / mail/ postal address will be displayed at the gate/boundary of the dumpsite All complaints received will be properly recorded and handed over to DPMU Proper socioeconomic interventions will be implemented to control public protests. 	Contractor

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
			Theft and illegal action	Any theft and illegal actions caused from the workers should be the responsibility of contractor	Local labours will be employed. Any illegal activities within the work area and during the working hours will be the responsibility of the contractor	
			Emergency Response Plan	Emergency Response Plan should be developed and got it approved. Emergency Response plan should be displayed at the worksite. Incident reporting mechanism should be followed	The approved Emergency Response Plan will be adopted. Emergency Response plan will be displayed at the worksite. Incident reporting mechanism will be followed as per tender.	Contractor
B.3	Closure of site					
1	Soil	Clearing waste materials (from the legacy waste, construction camp, office, toilet) left at the site	Contamination to soil from left over materials	No materials, parts or construction and demolition waste should be left at the site	The materials passing through the 6mm/15mm sieve are primarily inert and non-hazardous, posing no significant environmental or health risks. The implementation of proper disposal and monitoring measures will ensure minimal environmental footprint. No contamination or degradation of soil and groundwater, No harm to local flora, fauna, or ecosystems, No risks to human health, safety, or quality of life will be ensured.	

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					Closure of the site will be ensured as per the approved work plan.	
2	Air	Compaction and clearing	Dust and particulate matter emission	Water sprinkling should be done before any earthwork	Proper compaction with water sprinkling as detailed in the work plan shall be ensured	
		Dismantling of structures and loading of machinery	Dust emission	Work should be carried out in a way minimum dust emission is generated	All dismantling works shall be taken up with minimum dust emission. The contractor will prepare the plan for site profile & stability after backfilling & future plan to use the dumpsite. The contractor's interventions for its future pollution management after backfilling, specifically for leachate and micro plastics.	
3	Water	Clearing waste materials (from the legacy waste, construction camp, office, toilet) left at the site	Contamination of water bodies from discarded materials	No material should be disposed to the water bodies, or left near the water bodies	No materials will be disposed to the water bodies	
4	Land	Backfilling of the site with bio earth	Contamination of water and soil	Contaminated material should not be used for backfilling the site. Before backfilling, the material must be tested to ensure it is not contaminated.	Testing shall be done to ensure the materials are up to standards needed for backfilling. From testing; (a) if the presence of hazardous material is found in the soil; it will be kept in separate area and disposed through KEIL	

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
					(b) if no hazardous material was found and meets FCO standards; it will be sold as compost if the material has (c) if no hazardous material was found and does not comply FCO standards; then it will be used for backfilling (d) The contractor will prepare the plan for site profile & stability after backfilling & future plan to use the dumpsite.	
5	Workers health and safety	Dismantling structures	Accidents during dismantling	All workers should be provided with adequate Protection Materials like hard hat, gloves and boots. Dust filtering mask should be provided for those activities generating dust	HSE protocols will be followed as per the work plan	
		Clearing sites	Handling contaminated materials	Workers should be provided with gloves, apron and disinfectants.	Workers shall be trained for handling these materials and necessary PPE's will be provided.	
		Loading machinery	Accidents during loading of machinery	Safety precautions should be provided while loading machineries and parts	All machineries and parts will be loaded after ensuring the safety protocols and policies followed	

No	Attribute	Activity	Impact	Recommended Mitigation Measure	Contractors Mitigation Measures	Responsibility
				Mechanized loading should be adopted for heavy parts	Mechanized loading will be adopted for heavy parts	
6	Inventory of facilities and infrastructure and machinery	Cross checking of the inventory list returned	Damages to inventory materials	<ul style="list-style-type: none"> Ensuring the Handover of all inventories listed in the inventory list No breakage or damage should be ensured. Return should be certified by ULB.	<ul style="list-style-type: none"> It will be ensured all materials and infrastructure facilities at the site, listed as per the inventory list, will be handed over without any damage, breakage or complaint. The same will be certified by DPMU/ULB 	Contractor with the help of PIU
7	Documentation	Documentation of final site condition	Lack of quality control documents, records and maintenance of the remediated site	Documentation of final conditions of the dumpsite and surroundings including associated facilities, and land use.	All the final conditions, of legacy waste heap if any, land use around, the associated facilities etc will be documented through video and photographs and will be submitted to DPMU. Clarity of these documentations will be ensured.	Contractor

Note: All the above-mentioned mitigation measures recommended will be revised /updated accordingly on mutual agreement.

Annexure 1: List of Statutory Clearance (as applicable to the site)

1. CTO from KSPCB

The application should clearly mention the proposed Leachate Collection, surface runoff/drain and wash water collection and treatment tank, should be included.

2. Clearance from Ground Water Department / Minor Irrigation Department – (*If applicable to this site*)

3. Clearance from Fire and Rescue Department

The Fire management plan should include the fire mitigation and containment plan for the storage area (storage of RDF and other derived materials and fuel for the DG set).

4. KSEB – (*not applicable to this site as contractor informed using DG set*)

5. Telephone department if any underground cables are going.

6. Water authority if any underground lines are going.

Annexure 2: Site Management Plans (updates site specific)

1. **Site layout plan** - Should include the location of camp office, vehicle parking area, vehicle washing area (if applicable), storage area for derived materials, Storage area of diesel for the DG (calculated based on the work plan), leachate collection tank, DG set location, work area, storm water / wash water drain, storm water collection tank, fire management system placement, Toilet facility etc. should be clearly mentioned in the site layout.

2. **Leachate Management Plan** - drawing showing leachate and Run off channelizing mechanism. Also details of leachate collection tank and desilting tank to be included. Approximate quantity of leachate generation should be estimated. Proposed dimension of the leachate collection tank should be given. If modular plants/units are using, where it will be disposed, and frequency of disposal should be explained. *Copy of the agreement with the treatment plant should be annexed.*

3. **Storm water / wash water management plan**

Position in the site, capacity, expected daily runoff volume, treatment mechanism / disposal mechanism.

4. **Waste Management Plan** (in-house wastes)

Waste generated from camp office, food waste, sewage waste from the toilet will be included in the Waste Management Plan.

5. **Work Plan / Waste disposal plan** (legacy waste)

A detailed forward linkage /disposal plan for all the derived materials from the site including recyclable (for each type as per the SBM and SM), RDF, inert of all kind, etc., will be included in the Work Plan.

6. **Fire Management Plan**

In line with the statutory requirements and Consultant's recommendation

System that going to install – site specific. Specification, number and capacity of each component. Position of installation and training on operation.

7. **Health and Safety Plan**

Over all measures taken for Workers and Public Health and Safety. Site Specific Measures. Recommended protection measures for each item of activity / stages of operation. Site specific details like number, specification of each PPE that will be provided.

8. **Grievance Redressal Plan**

Modes of contact (direct /phone/e-mail/postal). Recording mechanism, Responsibility chart, Escalation matrix and monitoring responsibility to be included in Plan.

9. **Emergency Response Plan**

Including the response plan for major risks (including but not limited to fire, waste slide, working at height, slips and trips, gas inhalation, accidents etc) and extreme climatic events. The person response should be identified, the communication protocols should be listed. Response mechanism including reporting should be explained.

10. **Training Schedule**

Sorting and segregating the waste particles, Handling the hazardous and biomedical waste, Safe working practices, Emergency Response, Inhouse Waste Management, Usage of PPEs and other relevant areas should be included.

Annexure – 3: SOP FOR ASBESTOS MANAGEMENT IN LEGACY WASTE DUMPSITES

Introduction

Asbestos waste refers to any asbestos-containing product or material that is ready for disposal. This includes contaminated building materials, tools that cannot be decontaminated, personal protective equipment (PPE), and damp rags used for cleaning.

This document sets out the management plan and procedures for managing asbestos. The presence of asbestos-containing materials (ACM's) does not in itself constitute a danger. However, it is hazardous when disturbed or damaged and must be treated accordingly. Moreover it can cause health issues as it contains carcinogenic substances.

Scope:

This SOP applies to all personnel involved in bio mining operations, maintenance, and waste management.

The Plan and Procedures apply to all parts of the SMS Ltd of Kerala without exception. This policy is to prevent exposure to the hazards associated with asbestos-containing materials.

Monitoring & Identification of ACM:

The contractor is responsible for determining whether the legacy waste contains asbestos.

To monitor the condition of the ACM, Safety officer ensures that staff visually inspect the material such as asbestos cement pipe and asbestos cement roofing sheet during excavation at regular intervals and immediately report any ACM found in the waste.

The safety officer keeps a written record of these periodic inspections. The record will include:

1. Date of inspection
2. Safety officer details
3. Locations inspected, Such as, Zone No & Coordinates.
4. Nature of ACM (pipe wrap, transit board, ACM Roofing demolition waste etc.) and friability
5. Actions taken

Handling Practise:

While the waste characterization study did not identify ACMs in the legacy waste, there remains a possibility of their presence. Start by exposing the asbestos cement pipe with minimal disturbance. Excavate no closer than 6 inches of the pipe. Carefully uncover the remainder of the soil surrounding the pipe by hand or with a shovel. An assessment should then be made to determine if the pipe is damaged, cracked or broken.

- a) Place 0.006 inch thick polyethylene (“poly”) sheeting under the asbestos cement pipe to prevent soil contamination.
- b) Adequately wet the asbestos cement pipe with amended water using surfactant or liquid soap before and during removal to avoid creating airborne dust.
- c) Separate the asbestos cement pipe at the nearest coupling (bell or compression fitting).
- d) Slide the pipe apart at the joints (no saw cutting) or use other methods that do not cause the pipe to break, become friable or otherwise create the potential to release asbestos fibers.
- e) Wrap the wet asbestos cement pipe in two layers of 0.006 polyethylene sheeting, seal with duct tape and label in accordance with all applicable regulatory requirements. This can be done in the trench or adjacent to the trench.
- f) If the trench is filled with water, the placement of polyethylene sheeting is not required.

Packaging, Labeling, Disposal and Record Retention

- a) Place properly wrapped and labeled AC pipe as well as all other containerized AC waste and debris in a roll-off container(s), or covered trucks, trailers or vans that are lined with 2 layers of 0.006 polyethylene sheeting.
 - i. The container shall be an enclosed and sealed leak-tight container having proper labels placards as required.
 - ii. If open-top roll-off containers are used, they must be properly sealed, labeled and secured inside a locked fenced area when they are not being loaded to prevent access by unauthorized personnel, and covered to prevent water accumulation.
- b) Package, transport and dispose of AC waste in accordance with local, state, and national regulations.

c) Complete waste shipment records must be retained for 2

years by the contractor of the facility that generated the AC waste

d) Dispose of AC waste at KEIL landfill.

Personal Protective Equipment (PPE):

Respirators (half-face or full-face), Coveralls, Gloves, Safety goggles, hard hat

Asbestos Awareness Training

- Training will be mandatory for all individuals working on the dumpsite remediation project. Asbestos awareness training will be tailored to the specific activities involved and will include:
- Procedures for Personal Protection: Learn how to protect yourself from asbestos exposure.
- Required Control Measures: Understand the necessary precautions to prevent asbestos exposure.
- Essential Equipment: Know the proper tools and equipment needed for the job.
- Personal Protective Equipment (PPE): Learn how to select, use, and maintain PPE, including respiratory protective equipment (RPE).
- Decontamination: Understand procedures for cleaning yourself, work equipment, and work areas.
- Waste Handling and Disposal: Learn safe practices for handling and disposing of asbestos waste.
- Emergency Procedures: Be prepared to respond to emergencies related to asbestos exposure.
- Supervisors will receive appropriate training to effectively guide and protect those at risk of asbestos fibre exposure. Training should be conducted through on-site discussions and briefings before work begins. This training should be repeated periodically.
- Supervisors will monitor worker compliance regularly to ensure adherence to practical rules and prevent lapses over time. New workers should receive a briefing before starting work.

References: -

- OSHA Asbestos Standards (29 CFR 1910.1001)
- EPA Hazardous Waste Management Regulations (40 CFR 260-272)
- Local and national regulations
- HWM rules 2016
- MoEFCC Guidance document for assessment and remediation of Contaminated sites in India, 2015

Annexure – 4:

1. Physical and chemical Analysis of good earth/soil:

Sl. no	Nutrient/Parameter	Test Method	Unit	Result	Optimal Level for organic compost use as per FCO 2009 standards	MoEFCC/ Canadian Soil Quality Guidelines Permissible Limits for industrial use
1	pH@25°C	USEPA	-	7.12	6.5 – 7.5	6 - 8
2	Moisture@105°C	USEPA	%	6.4	15.0 – 25.0	-
3	Total Carbon	USEPA 9060A	%	2.03	>12	-
4	Phosphorus (P)	USEPA	%	0.03	>0.4	-
5	Nitrogen (N)	USEPA	%	0.06	>0.8	-
6	Potassium (K)	USEPA	%	0.02	>0.4	-
7	C/N Ratio	USEPA	-	33.8	<20	-
8	Arsenic (As)	USEPA 3050	mg/kg	<0.1	<10	12
9	Selenium (Se)	USEPA 3050	mg/kg	<0.1	<10	2.9
10	Nickel (Ni)	USEPA 3050	mg/kg	2.3	<50	89
11	Zinc (Zn)	USEPA 3050	mg/kg	87.5	<1000	410
12	Cadmium (Cd)	USEPA 3050	mg/kg	<0.1	<5	22
13	Copper (Cu)	USEPA 3050	mg/kg	32.4	<300	91
14	Chromium (Cr)	USEPA 3050	mg/kg	5.6	<50	87
15	Lead (Pb)	USEPA 3050	mg/kg	5.4	<100	600
16	Mercury (Hg)	USEPA 3050	mg/kg	<0.1	<0.15	50

The biosoil was tested using five samples, and the average results are presented in the table above. The findings confirm that all heavy metals are within the permissible limits.

2. Chemical Analysis of inert:

	Parameters Tested	Test Method	Unit	Result	MoEFCC/ Canadian Soil Quality Guidelines Permissible Limits for industrial use
1	pH@25°C	USEPA		6.87	6 - 8
2	Arsenic (As)	USEPA 3050	mg/kg	<0.1	12
3	Selenium (Se)	USEPA 3050	mg/kg	<0.1	2.9
4	Nickel (Ni)	USEPA 3050	mg/kg	<0.1	89
5	Zinc (Zn)	USEPA 3050	mg/kg	3.5	410
6	Cadmium (Cd)	USEPA 3050	mg/kg	<0.1	22
7	Copper (Cu)	USEPA 3050	mg/kg	6.54	91
8	Chromium (Cr)	USEPA 3050	mg/kg	<0.1	87
9	Lead (Pb)	USEPA 3050	mg/kg	3.5	600
10	Mercury (Hg)	USEPA 3050	mg/kg	<0.1	50

Annexure – 5:

Leachate Management Plan:

Leachate Collection and Treatment:

- Trenches will be excavated to collect leachate efficiently.
- The collected leachate will be stored in the HDPE-lined pond as per the site layout plan.
- Given that our biomining operations take place primarily in the summer, much of the leachate will naturally evaporate. However, in case excess leachate accumulates beyond the site's capacity, it will be disposed of at a designated treatment facility. A Memorandum of Understanding (MoU) with the treatment facility (KEIL) is made to ensure proper management and disposal of the leachate which has been attached as annexure in the work plan.
- Within the leachate collection pond, a pump will be used to aerate the leachate and the same pump will be used for spraying the leachate over the windrows for effective stabilization of the legacy waste.
- As per the leachate estimation based on rainfall data, the proposed leachate collection pond will have a capacity of 15,000 litres.

1. Monsoon Season Contingency Plan

Increased Leachate Management: During the monsoon season, if leachate generation increases, a honey-sucker vacuum truck will be stationed on-site to collect and transport the leachate to nearby treatment facilities. Since our project phase will take 6-8 months, we planned to complete the process before next year monsoons. Hence this year we might have 1-2 months monsoon season in Nov-Dec 2024. Incase large quantity generated during monsoon will be sent to nearby treatment facility promptly.

2. Operational Schedule and Site Layout

Excavation Schedule: Excavation and operation of machinery will commence after the monsoon season to minimize leachate generation.

Site Layout Adjustments: The leachate collection pond location is marked in the site layout plan. However, adjustments may be made based on on-site conditions at the time of execution.

By implementing this plan, we aim to manage leachate effectively, ensuring environmental safety and compliance with regulatory guidelines.

Annexure – 6:

Pest Management Plan:

Selection of the pesticide:

The pesticide will be selected on the basis of the target species of the pests. It will be ensured that the pesticides used shows

- Minimal adverse effect on human health
- Effective against the target species and have minimal effect over the non- target species and natural environment.
- The pesticides banned by the Indian government will not be used.

As an alternative and traditional practice for pest control, Turmeric powder and crystal salt will be mixed with water and sprinkled over the target.

Pesticide Storage, Handling and Disposal

Using Personal Protective Equipment: Personal protective equipment will prevent pesticides from coming in contact with the body or clothing. These also protect the eyes and prevent the inhalation of toxic chemicals. Personal safety gear includes clothing that covers the arms, legs, nose, and head.

- Body wear made of cotton will be worn with additional protective clothing. When there is a chance of contacting wet spray, large sleeves with cuff-buttons, and pants with buttons at the bottom offer good protection.
- Helmets, Goggles/Face Shield will be used while handling the pesticides.
- The rubber gloves which is waterproof will be used while handling the pesticides.
- Gumboots which are made of rubber material will be used as it prevents spray from getting in contact with the body.
- A Disposable mask will be used while spraying/application of the pesticide.

Safety during Application:

The following precautions will be taken while applying pesticides.

1. Wearing protective body cover / personal protective equipment (PPE) by the worker
2. Spraying will be done in the windward direction, taking care to see that there are no animals, people, or animal feed nearby;
3. Applying correct dosage and avoiding use of higher dosages than recommended will be ensured.
4. The sprayer and spraying equipment will be checked for leaks before use.
5. Washing hands, face and other body parts with soap after spraying should be done by the worker.

Storage

Precautions that will be taken in storing the pesticides are

- The place of storing of pesticides should be away from human and animals, water sources, direct sunlight and moisture.
- The pesticides should be kept well ventilated place of storing
- Well stacking should be maintained to avoid of spillage

Disposal System

1. At the end of the day's work, the inside of the spray pump should be washed and any residual pesticides should be flushed out;
2. The rinsing water should be collected and carefully contained in clearly marked drums with a tightly fitted lid. This should be used to dilute the next day's tank.
3. All empty packaging should be kept away from common approach space and should be returned to the designated TSDF for safe disposal. Re-use of empty insecticide containers will be prohibited. The used packages shall not be left outside to prevent their re-use.
4. In case the stock remained unutilised and crossed the date of expiry, it will be returned to the supplier.

Annexure – 7:

Occupational Health and Safety Plan:

This section focuses on the various occupational hazards that workers may encounter during the bio-mining process and related activities. Given the high-energy operations and the complexity of the activities involved, it is crucial to identify, assess, and control potential risks to ensure the safety and well-being of all personnel on-site. The following table provides a detailed risk assessment, highlighting the likelihood, severity, and risk rating of each identified hazard, along with the critical control measures that must be implemented to mitigate these risks effectively. Adherence to these guidelines is essential for maintaining a safe work environment and minimizing the risk of accidents or injuries.

Sl.no.	Hazard	Likelihood	Severity	Risk rating	Control measures
1	Slip, trip, falls	High	Medium	Medium	1. Provide proper housekeeping 2. Surface maintenance: ensure all walking surfaces are even and in good condition. Repair any holes, cracks, or uneven surfaces promptly. 3. Ensure adequate lighting in all work areas 4. Providing clear signage to warn of potential hazards. 5. Provide regular training to workers on recognizing and avoiding slip, trip, and fall hazards.
2	Fire (e.g., caused by sparks, hot surfaces, or combustible materials)	Medium	High	High	Fire extinguishers, fire alarms, regular fire drills
3	Unstable slopes /excavated areas-sliding of waste, soil, slipping/sinking of workers, vehicles/equipments due to slope stability issues	Low	High	Medium	Provisions will be made to continue operations in areas less susceptible to problems during inclement weather. During wet weather, procedures to minimize and clean mud tracking on roads are important. Experienced operators / drivers

					Extra or specially placed fencing/portable fencing during windy conditions
4	Dust- nuisance to employees and neighbors	High	Medium	Medium	Water wagons can be used to control dust
5	Fall from height (above 4ft or 1.2 m)	Low/negligible	Medium	Low	Guardrails provide full body arresting system to be provided for worker if working at height
6	Falling of loads from vehicle during movement/ stationed	Low	High	Medium	<ol style="list-style-type: none"> 1. Lane or full road closures during 2. Establish and know where the danger zone 3. Never turn your back on the loading or unloading process while in the danger zone 4. While engaged in loading and unloading operations, the use of cell phones and any other mobile devices should be prohibited 5. Everyone involved in loading a vehicle or managing a transport operation is responsible for making sure the load is <ul style="list-style-type: none"> • Safely loaded • Secure during transport • Safely unloaded
7	Suspended loads	Low	High	Medium	<ol style="list-style-type: none"> 1. Establish lifting /hoisting routes for moving loads 2. Barricades to be provided in those area 3. Conduct safety inspections

8	Movement of heavy equipments, dumpers, earth movers & conflicts with workers/ others on foot/other vehicles	Medium	Medium	Medium	<ol style="list-style-type: none"> 1. Reassess of work practices to reduce vehicle movements within your premises by re-siting operations or installing equipment such as conveyors. 2. Providing adequate lighting throughout 3. Will be planning safe traffic routes, avoiding any danger areas 4. speed limit is establish to reduce the risk and one-way systems 5. Use signposting to explain routes and warn of potential dangers. 6. Drivers given training in safe practices
9	Segregation of wastes in equipments with moving, rotating parts like conveyors, rotary screens	High	High	High	<ol style="list-style-type: none"> 1. Ensure the machine used is appropriate for the job and is well maintained 2. Safety measures are checked; guards, isolators, locking mechanisms, emergency off switches etc. 3. Sufficient staff training so that they can use the machines correctly in accordance with manufacturer's instructions 4. Wear appropriate ppe before operating the machine i.e. Safety glasses, gloves, safety boots 5. do not use a machine or appliance that has a danger sign attached to it. Ensure that only an authorised person uses it and certifies safety 6. do not use a machine or appliance that has a danger sign attached to it. Ensure that only an authorised person uses it and certifies safety 6. do not distract someone that may be using a machine.
10	Movement equipment such as jcb, excavators inside the site	High	High	High	<ol style="list-style-type: none"> 1. Provide barricade between workers and roadway 2. Appoint flagman 3. Safety technologies designed to limit equipment blind spots

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11	Equipment failure (e.g., excavator breakdown, conveyor belt malfunction)	High	High	High	Regular maintenance, safety inspections, emergency procedures
12	Electrocution (e.g., contact with exposed electrical wires)	Medium	High	Medium	Proper electrical insulation, grounding, lockout/tag out procedures
13	Explosive materials (if present in the legacy waste)	Low	Extreme	High	Proper handling and storage procedures, explosive detection equipment
14	Chemical exposure (e.g., to hazardous substances in the waste)	Medium	High	High	Personal protective equipment (ppe), ventilation, spill containment procedures
15	Noise exposure (from machinery and equipment)	High	Medium	High	Hearing protection, noise reduction measures
16	Ergonomic hazards (e.g., repetitive motions, awkward postures)	High	Medium	High	Ergonomic workstations, job rotation, training on proper body mechanics
17	Noise	High	Medium	High	Equipment should be operated behind berms to shield surrounding areas from noise. Access should be designed to minimize the impact that site traffic has on nearby neighborhoods
18	Scavenging	Low	High	Medium	Scavenging & salvaging materials shall be controlled during entire work period.
19	Gas and leachate	Low	Medium	Medium	Assess gas & leachate & its accumulation and flow paths; possible issues. Use multi gas analyzer
20	Adverse weather: stop all works	Low	High	Medium	Solid waste personnel work in all types of weather, with varied equipment and materials that present diverse hazards. Potential accidents include injury from explosion or fire, contaminant or dust inhalation, asphyxiation from poorly vented leachate collection system manholes or tanks, falls from vehicles, operating earth-moving

					equipment, attempting to repair equipment while engines are operating, exposure to extreme cold or heat, and traffic accidents. These shall be avoided
21	Maintenance and backup	Low	Low	Low	Regular equipment maintenance reduces breakdowns and identifies equipment problems early — before more costly and time-consuming repairs are needed. Provisions also must be made for backup equipment, perhaps by keeping additional equipment available
22	Operator details	Low	High	Medium	Food, health, work hours of operator important to prevent mishaps – he need proper rest for min 6 hours. Shall have proper licenses
23	Pest menace-stings, bites, allergies	High	High	High	Mosquitoes, flies and other insects are controlled by covering the waste daily and eliminating standing water, such as in appliances stored for recycling or in surface depressions. To discourage birds, use noisemakers, wire grids and liberal use of cover soils, can keep the working face small and can provide adequate cover.
24	Pest mangement- health issues to workers	High	High	High	Train the workers on storage & use h&s maintain in-out logbook of pesticides dispose packets, bottles & remaining pesticides in line with regulations (in tsdf) health checkups regularly on contagious, water/air borne diseases

Annexure – 8:

Fire Management Plan:

adhering to national and international fire safety standards, aims to mitigate risks and ensure the safety of the facility. Notably, the nearest fire station is only 3 km away, enhancing the site's preparedness for any fire emergencies. In addition to the consultation with the fire and rescue department regarding the biomining process, the department has committed to providing support in case of a fire incident at the site. The maximum response time for fire vehicles is estimated to be between 15 and 20 minutes. According to the proposed fire safety measures at the site, the fire can be effectively controlled for more than 30 minutes.

Fire Prevention

Excavators / loaders / JCB, Automobile trucks / tractors, Electrical Power DG Sets, etc.

- ❖ Measure: Spark Arrestor will be installed for all vehicle/DG sets exhaust discharge outlets.

Dry trees, dry leaves, dry weeds, bushes & shrubs, grasses, and other dry vegetation in the dumpsites

- ❖ Measure: Clear areas free of dry trees, leaves, weeds, bushes, shrubs, grasses, and other dry vegetation that might lead to fire spread in dumpsites will be maintained.

Housekeeping

- ❖ Measure: A good housekeeping policy around the machinery and biomining sites will be implemented.

Fire Watcher

- ❖ Measure: The Fire & Safety Officer will train one site supervisor who will monitor the site and report to the safety officer on a daily basis. The site will be checked for all the fire risk areas by the site supervisor and will report to the safety officer before starting the biomining work on site. The safety officer will be visiting each site as per visits scheduled.

Maintenance of Machineries involved in Bio-mining

- ❖ Recommended Measure: Regular preventive maintenance will be carried out and recorded for all machinery and vehicles deployed in biomining activities.

Conveyor Belts

- ❖ Recommended Measure: Conveyor belt machinery will be properly connected to dual earthing to prevent static electricity discharges and sparks that might lead to fire.

Means of Egress

Emergency Escape Pathways

- ❖ Measure: Clear emergency escape pathways from biomining area to safe public roadways will be maintained.

Emergency Exits

- ❖ Measure: We will provide Emergency exits such that travel distance to an exit from the biomining areas to safer roadways in the dumpsites is less.

Marking of Emergency Escape Pathways

- ❖ Measure: Barricade posts and marking tapes will be provided to identify the emergency escape routes from biomining site areas to safer roadways in the dumpsites and it will be ensured that they are maintained clear always without any obstructions.

Emergency Exit Signs

- ❖ Measure: Sufficient self-illuminated exit signs at every 15 meters of the exit paths showing directions towards the safer emergency exits/roadways in the biomining areas of dumpsites will be arranged.

Fire Detection & Alarms

Fire Watcher

- ❖ Measure: The Fire & Safety Officer will train one site supervisor who will monitor the site and report to the safety officer on a daily basis. The site will be checked for all the fire risk areas by the site supervisor and will report to the safety officer before starting the biomining work on site. The safety officer will be visiting each site as per visits scheduled.

Fire Alarm / Notification

- ❖ Measure: A hand-operable fire siren and/or a portable heavy-duty handheld megaphone with Mic/Talk/Record/Siren, etc., Outdoor PA System with microphone will be arranged on site.

Compartmentation

Storage of Separated RDF during Biomining

- ❖ Measure: Restrict waste materials storage stack width to 20 meters maximum (provided access is available from both sides – if not, a maximum of 10 meters) based on practical fire-fighting considerations during biomining.

Limitations of Storage Stack Height

- ❖ Measure: Storage stack height will be restricted to 4 meters or 4 bales high whichever is lower at dumpsites/biomining areas.

Storage Distance from Adjacent Buildings such as MCF, RRF, Compost Sheds

- ❖ Measure: A clear spatial distance of 10 meters will be maintained between dumpsites and Outdoor storages, MCF / RRF / Compost shed buildings.

Fire Extinguishers

Bio mining activity site area

- ❖ Measure: 4 sets of Mini Fire Shelters made of steel structure & GI sheet shade located diagonally at the processing area (30x30) with specified fire extinguishing equipment:
 1. 4 Nos of Sand Bucket mounted on steel pedestal.
 2. 2 Nos of 6 Kg ABC Dry Powder Fire Extinguishers.
 3. 1 Nos of 4.5Kg CO2 Fire Extinguishers.
 4. 1 No of 25Kg ABC Dry Powder trolley fire extinguisher.

Excavators / loaders / JCB

- ❖ Measure:
 1. 1 No of 2Kg CO2 fire extinguisher.
 2. 1 No of 4Kg ABC Dry Powder fire extinguisher.

Conveyor Belts, Air density Blower, Trommel.

- ❖ Measure: Since this machinery is already located within the processing area, separate fire extinguishers are not required and agreed by the fire consultant.

Automobile Trucks / Tractors

- ❖ Measure: 1 Spark arrestor & 1 no. of 4 kg ABC extinguisher will be ensured.

Electrical Power DG Set/Diesel Tank

- ❖ Measure: 1 No portable CO2 4.5 Kg extinguisher and 1 No 9 Ltrs hand operable foam extinguisher for DG set.

Electrical Main Switch Boards

- ❖ Measure: If the electrical switch boards located more than 15 mtrs travel distance from the nearby CO2 fire extinguisher, Additional 4.5 kg CO2 fire extinguisher will be provided.

Fire Fighting Hose Reels / Hydrants / Pumps / Water Tanks

For Biomining Dumpsites of >10,000 and <25000 tons capacity, Bio mining activity site area with 30 meters x 30 meters in open dumpsite

We propose the following fire safety measures for the site as per the recommendations:

- ❖ 1 Nos of Kirloskar, KDI-1050+ (7.5kW/10HP) monoblock pumpset,
- ❖ 1 Nos 15000 litres water tank made of either steel sectional plates or FRP sectional plates covered by brick/block walls,
- ❖ 2 fire hose reels with 20mm diameter and 36-meter long braided hoses complete with nozzles
- ❖ 2 fire hydrants equipped with 2 hose boxes. Each hose box will contain two 15-meter long, 63mm fire hoses and one branch pipe nozzle with jet/spray/shut-off capabilities.

Additionally, the necessary steel piping, valves, and accessories will be installed as required. A 62.5 kVA genset will provide up to 50 kW of power, ensuring that during a fire scenario, power to the process machinery will be shut down, dedicating the entire power supply to the fire pumps. Upon completion of the work at these sites, the firefighting equipment can be relocated to other locations as needed.

Fire Safety Signs

Warning / Caution Signs

1. NO SMOKING sign boards at strategic locations.
2. Signboard of Prohibited flammable & ignitable materials list in biomining site.

Informative Signs

1. Required Fire safety signs & notices as per KFRS regulations will be placed at strategic locations as required.
2. Do's & Don'ts in case of fire or other emergencies will be displayed at strategic locations.
3. Emergency contact numbers will be displayed in biomining areas for contacting KFRS.

4. Environmental Monitoring Schedule