SECTION D: ENVIRONMENTAL AND SOCIAL CONSTRUCTION MANAGEMENT PLANS

CHAPTER D2: ATMOSPHERIC EMISSIONS CONSTRUCTION MANAGEMENT PLAN

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2 ATMOSPERIC EMISSIONS

2.1 INTRODUCTION

The Atmospheric Emissions Construction Management Plan is designed to ensure the minimisation of air quality and greenhouse gas ('GHG') impacts during the Construction Phase of the Oyu Tolgoi Project (the 'Project' or 'Oyu Tolgoi'). The plan establishes guidelines for the management of atmospheric emissions, including identification of applicable "Project Standards"[1], mitigation controls and monitoring programmes.

2.2 OBJECTIVES

The objectives of this Management Plan are to:

- Outline the applicable standards with regards to the emissions and air quality;
- Define the operational procedures for air quality management;
- Define roles and responsibilities;
- Define monitoring and reporting procedures;
- Define training requirements; and
- Achieve zero regulatory or community/herder concerns regarding air quality/emissions management.

2.3 SCOPE

The Project is committed to comply with various environmental standards which are managed through several Management Plans as described in *Chapter D1: Environmental and Social Management Plan Framework* (the' ESMP Framework'). The ESMP Framework sets out the management framework for a suite of topic-specific Management Plans for the following phases of the Project (see the ESMP Framework Document for the definition of these phases):

1. Construction phase
2. Operations phase.

For the construction phase, Management Plans are developed that address health and safety (HSMPs), environmental (EMPs), and social (SMPs) aspects of the Project.

This Management Plan is part of a group of construction phase Management Plans. The Management Plan covers all Construction Phase activities that have the potential to generate atmospheric emissions (see Section 2.4 for further details). Particular reference is made here to the following Management Plans that have direct cross-linkages to air quality impacts:

- *D11: Construction Traffic Management Plan* (e.g. in relation to dust control);
- *D8: Construction Waste Management Plan* (e.g. in relation to the use of the incinerator);
- *D4: Topsoil Management Plan* (e.g. in relation to dust control);
- *D18: Construction Community Health, Safety & Security Management Plan* (in relation to off-site impacts on communities and specifically in relation to dust nuisance); and
- Plans within the Oyu Tolgoi Health and Safety Management System (e.g. management of occupational health aspects associated with dust and other atmospheric emissions).

2.4 SOURCES OF IMPACT

Atmospheric emissions during the Construction Phase relate principally to plant/vehicle exhaust emissions and dust generation (the potential for dust to be emitted during construction is strongly

[1] As set out in section 2.5.

dependent on the type and nature of activities taking place, such as the movements of vehicles and their speed, soil stripping activities, trench excavation, backfill and reinstatement).

The Environmental and Social Impact Assessment ("ESIA") identified the following primary sources of air emissions associated with the Construction Phase:

Table 2.1: Key Emission Sources

Source	Emissions of Primary Concern	Comments
Diesel power generators (10 x 2MW)	Oxides of nitrogen (NO_X), sulphur dioxide (SO_2), Particulates	Due to increase to 20x2 MW units in late construction/early operations phase and then phased out when transmission cables are installed.
Waste incinerator	NO_X, SO_2, Particulates, cadmium and dioxins/furans	Existing incinerator to be replaced with EU-compliant incinerator in 2012
Temporary coal-fired boilers	NO_X, SO_2, Particulates	Due to be replaced by permanent CFB in 2012 (see below).
Permanent coal-fired Circulating Fluidized Boilers (CFB) (2 x 7MW & 2 x 29MW)	NO_X, SO_2, Particulates	Due to replace the temporary CFBs in 2012 (see above).
Construction vehicles	NO_X, SO_2, Particulates (exhaust-generated), dust (wheel generated)	
Dust-generating physical construction works in licence area, including: ▪ Topsoil stripping ▪ Initial mining ▪ Road grading	Dust	
Dust-generating physical construction works: outside licence area: Gunii Hooloi pipeline, Gashuun Sukhait road, transmission lines and permanent airport	Dust	

Potential impacts associated with gaseous and dust emissions include:

- Vegetation stress, crop damage and damage to standing tree communities;
- Pollution of ponds, watering holes and ephemeral streams which provide drinking water for wildlife and livestock;
- Nuisance impacts associated with dust deposition for herders/rangelands;
- Safety impacts (related to poor visibility on roads);
- Health impacts to workers from exposure to particulates (PM_{10} and $PM_{2.5}$) together with gaseous emissions (which can lead to inhalation and lung disease);
- Visual impacts and community perception of the mine and mine-related infrastructure; and
- Contribution to GHG emissions.

2.5 PROJECT STANDARDS

2.5.1 Emission Standards

A comparison of selected applicable standards for the control of key emissions sources is provided below, together with the identification of the standards with which Oyu Tolgoi is committed to comply.

Table 2.2: Atmospheric Emission Standards

Source	Pollutant	Standard (mg/Nm^3) unless stated otherwise				Comments
		Project	**Mongolian**	**IFC[6]**	**EU**	
Diesel generators	NO_X	1460[1] 1,850[2]	NA[7] NA NA	1460[1] 1,850[2]	N/A[5]	Note that Project generators are rated at 2MW and hence below IFC threshold (3-50MW).
	Particulate Matter (PM)	50[3]		50[3]		
	Fuel S content (%)	Lowest practicably available		1.5%		
Coal-fired boilers	NO_X	400	900-1918	650	400[8]	Existing localised boiler to be decommissioned. Project standards will apply to replacement CFB subject to proviso that NO_x emissions may be outside Project Standard limits due to the high nitrogen content of the coal feedstock (see *Chapter C2* for further information)
	PM	50[4]	N/A	50[4]	100	
	SO_2	2000	1630-2710	2000	850	
Incinerators[5]	NO_X	400 (daily)	NA[7]	See EU	400 (daily)	Standards apply to replacement incinerator.
	SO_2	50 (daily)	NA		50 (daily)	
	Dust	10 (daily)	NA		10 (daily)	
	Cd	0.05 (30min) 0.1 (8hr)	NA		0.05 (30min) 0.1 (8hr)	
	Dioxin/furans	0.1	NA		0.1ng TEQ/m^3	
	Temperature	>850ºC	NA		>850ºC	

Notes
[1] *bore size diameter [mm] < 400*
[2] *bore size diameter [mm] > or = 400*
[3] *up to 100 if justified by Project specific considerations*
[4] *up to 150 if justified by environmental assessment*
[5] *Key EU requirements are defined in Directive 2000/76/EC on the Incineration of Waste (as amended). The capacity of the incinerator is 100kg/hr of waste. The power rating of the existing and replacement incinerator is below threshold (50MW) applicable under EU Directive 2001/80/EC.*
[6] *IFC figures for generators and boilers are applicable to thermal ratings of 3-50MW*
[7] *There are no applicable Mongolian emissions standards*
[8] *EU Directive 2001/80/EC on Large Combustion Plant Directive 2001/80/EC*

2.6 AIR QUALITY STANDARDS

As far as reasonably practicable, given the pre-existing high background concentrations of particulate matter, ambient air quality standards are to be complied with for all site activities. These standards include maximum allowable concentrations of airborne particulates for residential areas and are applicable to the accommodation areas at Oyu Tolgoi and nearby communities. Site activities will not contribute to a breach of the following standard when measured at a camp area or nearby community.

Mongolian environmental quality standards applicable to the protection of air quality include:

- MNS (ISO) 4226:2000 Air Quality - General aspects - Units of measurements; and
- MNS 4585:2007 Mongolian National Air Quality Standards – Air Quality Parameters.

The Mongolian National Air Quality Standard (MNS 4585:2007) is intended for urban areas, rather than remote rural areas. Specifically, MNS 4585:2007 states:

> "*This standard applies to reconnaissance, assessment and monitoring of the quality of indoor and outdoor air during planning and utilisation of town and settlements, residential housing, offices, entertainment and public service facilities and civil constructions*".

As MNS 4585 is oriented to urban areas, where populations are subject to additional environmental stresses, the numerical values of the standards are set at a very low value. For example, the permissible level for SO2, the 24-hour average is 20 µg/m3. This is numerically equivalent to the World Health Organisation (WHO) standard for the same averaging period. The WHO publication setting out this guideline recognises that the level is difficult to achieve, and has suggested interim guidelines of 50 and 125µg/m32. Similarly for NO2, MNS 4585 sets out a 20-minute average of 85µg/m3 and a 1-hour average of 68µg/m3. This compares to a WHO 1-hour standard of 200µg/m3.

As a result, MNS 4585:2007 is not considered directly applicable to a remote mining facility due to it being developed for urban environments and compliance with this Standard has not been required for previous DEIAs prepared for the Oyu Tolgoi Project.

The IFC cites the World Health Organization ('WHO') ambient air quality guidelines which typically apply only in jurisdictions where there are no national standards in place. As national standards exist in Mongolia (but which are not considered to be applicable), WHO guidelines are not considered to be Project Standards. Additionally, compliance with EU ambient air quality standards is a requirement of the EBRD.

Table 2.3 presents a comparison of the applicable Mongolian National Air Quality Standards (MNS 4585:2007) against the International Finance Corporation ("IFC") and EU standards.

Table 2.3: Air Quality Standards

Parameter	Averaging Period	Mongolian Standard (µg/m^3)	IFC (WHO) Guideline (µg/m^3)	EU Ambient Air Quality (µg/m^3)
SO_2	10 minutes 20 minutes 24 hours Annual	500 450 20 10	500 NA 20 N/A	NA 350 (1hour) 125 N/A
NO_2	20 minutes 24 hours Annual	85 40 30	200[3] N/A 40	200 (1 hour) N/A 40
Dust (TSP)[1]	30 minutes 24 hours Annual	500 150 100	NA 50[4] 40[5]	N/A
PM_{10}[2]	24 hours Annual	100 50	50 20	50 40
$PM_{2.5}$[3]	24 hours Annual	50 25	25 10	N/A 25

Notes:
1: TSP denotes total suspended particulates
2: PM_{10} denotes particulate matter of less than 10 microns in diameter
3: $PM_{2.5}$ denotes particulate matter of less than 2.5 microns in diameter
4: WHO guideline value based on a 1-hour averaging period
5: WHO guideline values for PM_{10} size fraction is presented – WHO does not prescribe guideline values for total suspended particulates (TSP)
6: Target value enters into force 1.1.2012

[2] World Health Organisation (2006). Air Quality Guidelines for Particulate Matter, Ozone, Nitrogen Dioxide and Sulphur Dioxide. Global Update 2005. Summary of Risk Assessment. WHO/SDE/PHE/OEH/06.02.

IFC General EHS Guidelines (2007)[3] state that in the absence of applicable national ambient air quality standards (and in this case, national standards are considered to apply to urban areas), internationally recognised standards should be applied. EU ambient air quality standards[4] are cited in the IFC General EHS Guidance as recognised international standards and have been adopted as the Project Standard and are outlined below (*Table 2.4*).

Table 2.4: Project Standard, Based on EU Ambient Air Quality Standards

Parameter	Averaging Period	EU Ambient Air Quality Standard (3) (µg/m^3)	Permitted Number of Exceedences per Year
Sulphur dioxide (SO_2)	1 hour 24 hours	350 125	24 3
Carbon monoxide (CO)	8 hours	10,000	N/A
Nitrogen dioxide (NO_2)	1 hour Annual	200 40	18 N/A
Ozone (O_3)	8 hours	120	25
PM_{10}[1]	24 hours Annual	50 40	35 N/A
$PM_{2.5}$[2]	Annual	25	N/A
Lead	Annual	0.5	N/A
Benzo a pyrene	Annual	0.001	N/A

Notes:

1: PM_{10} denotes particulate matter of less than 10 microns in diameter

2: $PM_{2.5}$ denotes particulate matter of less than 2.5 microns in diameter

3: EU air quality requirements from Directive 2008/50/EC on ambient air quality

The ESIA has predicted that under certain circumstances certain Project Standards may be exceeded in certain construction scenarios. The diesel generators have been identified as the key emissions source in relation to which exceedances might occur and hence particular attention is being paid to the control of these sources in order to minimise emissions (see *Section 2.8*).

2.7 ROLES & RESPONSIBILITIES

In addition to the specific responsibilities identified as part of the control measures set out in Section 2.8 below, general responsibilities for atmospheric emission controls are defined below. Overall lines of responsibility between Oyu Tolgoi and the contractors are also described in the ESMP framework document.

Principal Contractors (i.e. direct contractors to Oyu Tolgoi):

- Coordinate and manage all dust control and suppression activities to keep dust levels within accepted levels;
- Minimise worker exposure to airborne dust;
- Provide supervisors and operators with the relevant information (maps, guidelines, training etc.); and
- Develop job specific dust management plans prior to the commencement of works that are likely to generate dust.

Workplace supervisors:

- Adjust operation schedule, where possible, to prevent or reduce dust emissions in the area; and

[3] International Finance Corporation, (2007), Environmental, Health and Safety Guidelines. General EHS Guidelines, Washington, 2007, pp4.

[4] EU air quality requirements from Directive 2008/50/EC of the European Parliament and of the Council of 21 May 2008 on ambient air quality and cleaner air for Europe

- Complete work safely.

Earthworks operators:

- To operate equipment to minimise dust generation wherever possible; and
- Complete work safely.

Oyu Tolgoi Environmental Department:

- Provide guidance to contractors on appropriate mitigation controls;
- Provide advice to contractors on unfavourable weather conditions and the need to amend site operations to avoid unacceptable dust emissions;
- The Oyu Tolgoi Environmental officers will inspect work sites periodically and provide instruction if dust control is insufficient; and
- Review and update this Guideline as required.

A grievance management system has been established to deal with any complaints received from local communities or other stakeholders – see the Stakeholder Engagement SMP.

2.8 MITIGATION MEASURES AND MANAGEMENT CONTROLS

The mitigation measures and management controls that are to be implemented during the Construction Phase to minimise atmospheric emissions are described in the table below.

Table 2.5: Mitigation Measures and Management Controls- Atmospheric Emissions

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
AQ01	Dust control	Spoil Loading activities	Empty loader slowly and keep bucket close to the truck while dumping if operating within 200m of herder *gers* or local communities.	All Supervisors Haulage and Earthmoving Contractors and Operators	Dust management plans. Audit	
AQ02	Dust control	Spoil Loading activities	Treat the surfaces of haul roads using water or reused treated waste water at key locations where dust generation creates a nuisance	Principal Contractors All Supervisors	Dust management plans. Audit	
AQ03	Dust Control	Spoil Haulage	Restrict vehicle speeds on all unsealed roads to a maximum of 80km/h and as low as 10km/h at sensitive receptor locations (e.g. camp areas).	Oyu Tolgoi HSES Dept	Dust management plans. Audit	
AQ04	Dust Control	Roads, stockpiles and loading areas within the construction and camp areas	Trafficable areas around construction sites and camp areas to be constructed in accordance with applicable Project road standards to minimise dust emissions.	Principal Contractors All supervisors	Dust management plans. Audit	See also *Construction Traffic Management Plan D11*
AQ05	Dust Control	Roads, borrow pits, stockpiles and loading areas within the construction and camp areas	Borrow pit and quarry locations to meet applicable environmental and social standards. Oyu Tolgoi to consult with affected communities about the location of borrow pits located outside the Mine Licence Area.	Principal Contractors All Supervisors	Dust management plans audit	
AQ06	Dust Control	Chemical stabiliser use	If using any chemical substances for dust suppression purposes the applicable Material Safety Data Sheets are to be provided to the Environmental department for approval prior to use.	Oyu Tolgoi Environmental Department Principal Contractors All Supervisors	Audit of dust management plans.	See AQ12 for use of chemical stabilisers

AQ07	Exhaust Emissions	Diesel generators	The following mitigation actions will be undertaken to minimise air quality impacts from the operation of the diesel generators:
			▪ Short-term
			  ○ Ambient air quality monitoring will be undertaken to assess whether predicted exceedance of Air Quality standards is being realised.
			  ○ Stack emission monitoring of the diesel generators will be undertaken
			▪ Medium-term
				Oyu Tolgoi Environmental Department
				Principal Contractors
					Records of fuel quality and audit	This action is considered 'mitigation in design'. Further details are provided in the Climate & Air Quality impact assessment chapter, C2.

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
			○ If Air Quality standards are exceeded (see above), additional mitigation measures will be assessed, including modification of the exhaust stacks to improve dispersion in line with IFC guidelines for stack design. ▪ Long term ○ Diesel generators will be phased out, other than for an emergency back-up purposes, by construction of power transmission lines.			
AQ08	Fuel quality	Diesel generators	The lowest sulphur content diesel practically and economically available from local fuel suppliers will be used in the diesel generators	Oyu Tolgoi Principal Contractors	Records of field quality audit	
AQ09	Exhaust Emission	Coal Fired Boilers (existing)	The following mitigation actions will be undertaken to minimise air quality impacts from the operation of the existing coal-fired boilers: ▪ Assess current performance of the boilers and assess significance of impacts of the boilers in order to determine whether improvement measures are necessary prior to long-term replacement plan. ▪ Existing boilers are being replaced by the new Central Heating Plant.	Oyu Tolgoi Environmental Department	Emissions monitoring and audit	
AQ10	Exhaust Emission	Incinerator (existing)	The following mitigation actions will be undertaken to minimise Air Quality impacts from the operation of the existing incinerator: ▪ Short-term ○ Stack emission monitoring of the incinerator will be undertaken as part of an assessment of the current performance of the existing incinerator in order to determine whether improvement measures are necessary prior to long-term replacement plan. ▪ Medium-term ○ As necessary consider whether medium term improvements are required. ▪ Long term ○ Existing incinerator to be replaced by a new incinerator in line with AQ11.	Oyu Tolgoi Environmental Department All Contractors	Emissions monitoring and audit	
AQ11	Exhaust	Incinerator	Existing incinerator to be replaced with EU-compliant	Oyu Tolgoi Environmental	Emission inventory	

ID	Topic/ Aspect	Applicability/ Activity	Control Description	Responsible Parties	Means of verification	Comments
	Emission	(replacement)	incinerator in 2012. The replacement incinerator will meet the Project Standards for emissions identified in Section 2.5 of this Management Plan.	Department Principal Contractors	Plant/vehicle test documentation. Audit	
AQ12	Exhaust Emissions	Mobile plant and vehicles	All mobile plant and vehicles will be selected and maintained to meet Mongolian standards. Use and maintain vehicles/equipment in accordance with good international industry practice.	Oyu Tolgoi Environmental Department All contractors	Procurement records and supplier database. Emission inventory	
AQ13	Emission Inventory	All Activities	An inventory of emissions of different pollutants from different sources will be developed, maintained and annually updated, and this will help to inform the development of future mitigation actions.	Oyu Tolgoi Environmental Department	Audit	
AQ14	Greenhouse gases	All activities	Oyu Tolgoi will work with its principal contractors in the development of procurement plans that target suppliers with good standards of environmental management, and particularly the implementation of energy efficiency programmes (that will particularly focus on the efficient use of fuel, maintenance of engines, etc.	Oyu Tolgoi Environmental Department Oyu Tolgoi procurement department Principal contractors	Procurement records and supplier database.	
AQ15	Emissions	Diesel Generators (DPS1)	Retrofitting catalytic converters on existing Sunfall units to international air emission standards, if emissions testing indicates that existing units do not meet international standards	Oyu Tolgoi Environmental Department	Audit of Emissions Inventory	
AQ16	Dust Control	Vehicles	Restriction on vehicular usage in off-road areas and informal tracks at all times, including tracking of vehicles on GPS system to enable vehicle locations and speeds to be monitored.	Oyu Tolgoi Environmental Department	Audit of vehicle tracking	

2.9 TRAINING

The following training requirements shall be met:

- All employees of Oyu Tolgoi and Contractors to Oyu Tolgoi responsible for dust control activities shall be provided with toolbox training that outlines the mitigation measures identified in *Table 2.6*. Specialist training shall be provided to plant operators and key personnel involved in activities which involve land clearance or construction activities as defined in *Table 2.6*;
- Specialist training will be provided to operators of the diesel generators, the CFB and incinerators to ensure compliance with the applicable requirements of *Table 2.6*; and
- General aspects of environmental management will be included in induction training to be provided to all employees.

2.10 MONITORING

The monitoring measures that are to be implemented during the Construction Phase to ensure compliance with the Project Standards (see *Section 2.5*) are described in the table below. In the event that any monitoring results identify exceedances of any Project Standards, these will be investigated and corrective actions identified (see *Chapter D1: Environmental and Social Management Plan Framework* for further details).

Table 2.6: Monitoring Measures - Atmospheric Emissions

ID	Topic/Aspects	Parameters	Methods	Periodicity	Location	Comments
AM01	Ambient dust (TSP) at standard locations	TSP	Dust deposition gauge. Analysis of weight and composition of dust for metals	Freq: Monthly Duration: 30days	DMP-1 DMP-2 DMP-3 DMP-4 DMP-5 Emulsion plant, DMP-Quarry batch plant and DMP-Petrovis	See *Table 2.7* for further details on locations
AM02	Ambient dust (TSP) at other locations	TSP	Hand-held sensor	Fortnightly	At selected dust generating sites – see comments column	PM10 at 4 sites along the water supply pipeline in April and October. Also includes weekly dust monitoring at locations 0.1 km north and at 1km south east from the airstrip
AM03	Ambient fine PM	PM_{10} $PM_{2.5}$	DustTrak	Freq: Monthly Duration: 24hrs	DMP-1 DMP-2 DMP-3 DMP-4 DMP-5 Emulsion plant, DMP-Quarry batch plant and DMP-Petrovis	See *Table 2.7* for further details on locations
AM04	Ambient combustion products	NO_X SO_2 H_2S	Combination of real time monitoring and passive diffusion tube	Freq: Quarterly (passive), Continuous (real time) Duration: 30 days (Passive)	GEMP-1 GEMP-2 GEMP-3 GEMP-4 GEMP-5 GEMP-JaBa GEMP-KhO, GEMP-TsKh, GEMP-GaSu	See *Table 2.7* for further details on locations Includes locations along the Gashuun Sukhait Road
AM05	Boilers (existing) stack monitoring	NO_X SO_2 CO	Stack sampling and analysis	Bimonthly	Existing boiler stacks	
AM06	CFB (replacement) stack monitoring	NO_X SO_2 PM_{10}	Stack sampling and analysis	Annual	Replacement CFB stacks	

ID	Topic/Aspects	Parameters	Methods	Periodicity	Location	Comments
		$PM_{2.5}$				
AM06	Incinerator (existing) stack monitoring	NO_X SO_2 PM_{10} $PM_{2.5}$ Cadmium Dioxins/furans Temperature	Stack sampling and analysis	Annual	Existing incinerator stack	
AM07	Incinerator (replacement) stack monitoring	NO_X SO_2 PM_{10} $PM_{2.5}$ Cadmium Dioxins/furans Temperature	Stack sampling and analysis	Annual	Replacement incinerator stack	
AM08	Diesel generator stack monitoring	NO_X SO_2 PM_{10} $PM_{2.5}$	Stack sampling and analysis	Annual	Diesel generator stacks	
AM09	Mobile plant and vehicles	NO_X SO_2 PM_{10} $PM_{2.5}$	Exhaust testing	Annual	Mobile plant and vehicle exhausts	

2.11 KEY PERFORMANCE INDICATORS

The Key Performance Indicators (KPIs) which will be used by Oyu Tolgoi to assess its performance with regard dust and air emissions are presented in *Table 2.7* below.

Table 2.7: Key Performance Indicators

ID	KPI	Target	Monitoring measure
AQ-KPI01	Number of reported non-compliances with the mitigation controls identified in this EMP.	Minimise and continued improvement in number of reported non-compliances	See verification column of *Table 2.5*.
AQ-KPI02	Number of exceedances of Project Standards identified in *Table 2.2* and *Table 2.3*.	Target zero and, if instances occur, assess need for corrective action and target continued improvement.	Monitoring requirements identified in *Table 2.6*