Table 28 (Continued): Predicted Particulate (PM_{10}), Mercury & Sulphur Dioxide Concentrations from Process Stack Emissions at sensitive receptors in proximity to the proposed infrastructure site.

Air Quality & Dust IA Ref No.	Address	90.4%ile of 24 Hour PM_{10} Conc (µg/m^3) - Process Stack Emissions	Annual Mean PM_{10} Conc (µg/m^3) - Process Stack Emissions	Annual Mean Mercury Conc (µg/m^3) - Stack Emissions	Annual Mean SO_2 Conc (µg/m^3) - Stack Emissions
AQSR 34	208 Greencastle Road	0.809	0.270	0.00085	0.00018
AQSR 35	216 Greencastle Road	0.805	0.259	0.00086	0.00019
AQSR 36	K/2012/0141/RM at 208 Crockanboy Road	0.573	0.217	0.00055	0.00011
AQSR 37	St Patrick's GFC	0.541	0.186	0.00046	9.00E-05
AQSR 38	Greencastle Amateur Boxing Club	0.531	0.179	0.00044	9.00E-05
AQSR 39	Greencastle Community Assoc	0.540	0.183	0.00045	9.00E-05
AQSR 40	St Patrick's Church, Sheskinshule	0.436	0.135	0.00037	7.00E-05
AQSR 41	Green Elves Nursery	0.500	0.170	0.00054	0.00011
Limit Values		50 µg/m3	40 µg/m3	-	20 µg/m3

Table 29: Predicted Dust Deposition Rates and Particulate (PM_{10} & $PM_{2.5}$) Concentrations from DSF Area Fugitive Emissions at sensitive receptors in proximity to the proposed infrastructure site.

Air Quality & Dust IA Ref No.	Years 1-5 Max 24 - Hour Dust Dep. Rate mg/m²/day	Years 1-5 – Total Annual Dust Dep. Rate mg/m²/yr	Years 16-20 Max 24 - Hour Dust Dep. Rate mg/m²/day	Years 16-20 Total Annual Dust Dep. Rate mg/m²/yr	Years 1-5 90.4% ile of 24 Hour PM_{10} Conc (µg/m³)	Years 1-5 Annual Mean PM_{10} Conc (µg/m³)	Years 16-20 90.4% ile of 24 Hour PM_{10} Conc (µg/m³)	Years 16-20 Annual Mean PM_{10} Conc (µg/m³)	Years 1-5 Annual Mean $PM_{2.5}$ Conc (µg/m³)	Years 16-20 Annual Mean $PM_{2.5}$ Conc (µg/m³)
AQSR 1	0.4	9.79	0.96	30.71	0.30	0.09	1.34	0.39	0.03	0.07
AQSR 2	0.61	10.09	0.86	28.21	0.30	0.09	1.31	0.37	0.03	0.07
AQSR 3	0.55	10.95	1.22	33.57	0.31	0.09	1.53	0.42	0.03	0.08
AQSR 4	0.49	9.76	0.81	29.81	0.31	0.08	1.44	0.39	0.03	0.07
AQSR 5	0.53	12.63	1.23	42.8	0.37	0.11	2.04	0.53	0.04	0.09
AQSR 6	0.62	19.81	2.6	80.08	0.60	0.16	3.11	0.87	0.05	0.17
AQSR 7	1.07	20.01	1.83	68.02	0.50	0.16	2.80	0.76	0.06	0.15
AQSR 8	0.55	15.59	1.27	49.65	0.43	0.13	2.19	0.61	0.05	0.11
AQSR 9	0.59	13.33	1.03	38.56	0.36	0.11	1.79	0.48	0.04	0.08
AQSR 10	0.87	15.54	1.42	35.16	0.42	0.12	1.76	0.45	0.05	0.08
AQSR 11	1.04	18.12	1.89	45.84	0.44	0.14	2.07	0.56	0.06	0.09
AQSR 12	1.02	27.78	3.31	94.09	0.76	0.21	3.45	1.03	0.09	0.19
AQSR 13	0.68	13.32	1.02	35.08	0.37	0.11	1.80	0.46	0.04	0.08
AQSR 14	0.57	10.94	1.15	37.06	0.34	0.11	2.05	0.50	0.04	0.11
AQSR 15	1.69	30.15	2.46	80.1	0.71	0.25	2.88	0.86	0.12	0.12
AQSR 16	1.07	21.25	2.17	60.89	0.51	0.19	2.47	0.70	0.08	0.11
AQSR 17	1.27	21.68	2.01	57.26	0.55	0.21	2.29	0.66	0.10	0.10
AQSR 18	0.78	12.19	1.37	38.22	0.37	0.12	1.70	0.50	0.05	0.08
AQSR 19	1.18	26.99	1.48	52.43	0.72	0.21	2.39	0.59	0.10	0.08
AQSR 20	1.06	25.31	1.37	45.77	0.55	0.18	1.96	0.52	0.08	0.07
AQSR 21	0.84	17.88	1.09	32.96	0.35	0.13	1.28	0.39	0.06	0.06
Limit Value	350 mg/m2	-	350 mg/m2	-	50 µg/m3	40 µg/m3	50 µg/m3	40 µg/m3	25 µg/m3	25 µg/m3

Table 29: (Continued) Predicted Dust Deposition Rates and Particulate (PM_{10} & $PM_{2.5}$) Concentrations from DSF Area Fugitive Emissions at sensitive receptors in proximity to the proposed infrastructure site.

Air Quality & Dust IA Ref No.	Years 1-5 Max 24 - Hour Dust Dep. Rate mg/m²/day	Years 1-5 – Total Annual Dust Dep. Rate mg/m²/yr	Years 16-20 Max 24 - Hour Dust Dep. Rate mg/m²/day	Years 16-20 Total Annual Dust Dep. Rate mg/m²/yr	Years 1-5 90.4% ile of 24 Hour PM_{10} Conc (µg/m³)	Years 1-5 Annual Mean PM_{10} Conc (µg/m³)	Years 16-20 90.4% ile of 24 Hour PM_{10} Conc (µg/m³)	Years 16-20 Annual Mean PM_{10} Conc (µg/m³)	Years 1-5 Annual Mean $PM_{2.5}$ Conc (µg/m³)	Years 16-20 Annual Mean $PM_{2.5}$ Conc (µg/m³)
AQSR 22	1.69	23.66	1.28	42.78	0.47	0.15	1.57	0.47	0.06	0.07
AQSR 23	2.23	47.84	2.06	63.4	0.67	0.20	1.65	0.48	0.05	0.06
AQSR 24	1.36	16.6	0.89	28.43	0.28	0.09	1.04	0.32	0.03	0.05
AQSR 25	0.97	13.13	0.81	23.47	0.26	0.07	0.87	0.27	0.03	0.04
AQSR 26	0.56	10.83	1.03	19.47	0.18	0.06	0.72	0.22	0.02	0.03
AQSR 27	0.78	10.63	0.79	19.24	0.16	0.06	0.63	0.21	0.02	0.03
AQSR 28	0.54	10.91	0.54	18.46	0.17	0.05	0.56	0.19	0.01	0.02
AQSR 29	0.54	10.46	0.52	17.45	0.17	0.05	0.50	0.17	0.01	0.02
AQSR 30	0.9	14.77	0.98	21.41	0.16	0.06	0.40	0.19	0.02	0.03
AQSR 31	0.98	24.12	0.79	31.95	0.20	0.07	0.54	0.22	0.02	0.03
AQSR 32	0.96	22.24	0.83	28.61	0.19	0.07	0.45	0.20	0.02	0.03
AQSR 33	0.75	26.66	0.94	33.85	0.20	0.07	0.52	0.22	0.02	0.03
AQSR 34	0.84	33.9	0.9	42.02	0.27	0.11	0.71	0.26	0.04	0.04
AQSR 35	0.83	35.83	0.99	47.89	0.25	0.10	0.76	0.29	0.03	0.04
AQSR 36	0.59	21.18	2.72	87.71	0.65	0.18	3.67	1.00	0.06	0.21
AQSR 37	0.6	11.89	0.62	19.51	0.18	0.06	0.56	0.19	0.02	0.02
AQSR 38	0.57	11.25	0.58	18.55	0.17	0.05	0.54	0.18	0.01	0.02
AQSR 39	0.59	11.57	0.6	19.03	0.18	0.05	0.55	0.19	0.02	0.02
AQSR 40	0.81	10.62	0.87	18.71	0.16	0.06	0.65	0.21	0.02	0.03
AQSR 41	0.7	13.46	0.92	25.4	0.28	0.10	1.01	0.31	0.04	0.04
AQSR 42	0.7	13.59	0.92	25.62	0.28	0.10	1.03	0.32	0.04	0.04
Limit Value	350 mg/m²	-	350 mg/m²	-	50 µg/m³	40 µg/m³	50 µg/m³	40 µg/m³	25 µg/m³	25 µg/m³

6.2.3 Discussion of Predicted Impact of Process Stack Emissions

Table 30: Significance of Impact of predicted PM_{10} concentrations, assuming worst-case emissions from all process stacks (point sources) and DSF Area sources.

AQSR Ref No.	Cumulative Annual Mean PM_{10} Conc. ($\mu g/m^3$)	Ambient PM_{10} Conc. ($\mu g/m^3$)	AQS Limit Value ($\mu g/m^3$)	PC %age of limit value	PEC %age of limit value	Significance of Impact
AQSR 1	0.53	11	40	1.3%	28.8%	Negligible
AQSR 2	0.54	11	40	1.3%	28.8%	Negligible
AQSR 3	0.59	11	40	1.5%	29.0%	Negligible
AQSR 4	0.56	11	40	1.4%	28.9%	Negligible
AQSR 5	0.71	11	40	1.8%	29.3%	Negligible
AQSR 6	1.09	11	40	2.7%	30.2%	Negligible
AQSR 7	0.98	11	40	2.5%	30.0%	Negligible
AQSR 8	0.79	11	40	2.0%	29.5%	Negligible
AQSR 9	0.65	11	40	1.6%	29.1%	Negligible
AQSR 10	0.58	11	40	1.5%	29.0%	Negligible
AQSR 11	0.71	11	40	1.8%	29.3%	Negligible
AQSR 12	1.26	11	40	3.1%	30.6%	Negligible
AQSR 13	0.57	11	40	1.4%	28.9%	Negligible
AQSR 14	0.61	11	40	1.5%	29.0%	Negligible
AQSR 15	1.02	11	40	2.6%	30.1%	Negligible
AQSR 16	0.85	11	40	2.1%	29.6%	Negligible
AQSR 17	0.82	11	40	2.1%	29.6%	Negligible
AQSR 18	0.63	11	40	1.6%	29.1%	Negligible
AQSR 19	0.81	11	40	2.0%	29.5%	Negligible
AQSR 20	0.74	11	40	1.8%	29.3%	Negligible
AQSR 21	0.58	11	40	1.5%	29.0%	Negligible
AQSR 22	0.70	11	40	1.7%	29.2%	Negligible
AQSR 23	0.88	11	40	2.2%	29.7%	Negligible
AQSR 24	0.51	11	40	1.3%	28.8%	Negligible
AQSR 25	0.45	11	40	1.1%	28.6%	Negligible
AQSR 26	0.36	11	40	0.9%	28.4%	Negligible
AQSR 27	0.36	11	40	0.9%	28.4%	Negligible
AQSR 28	0.35	11	40	0.9%	28.4%	Negligible
AQSR 29	0.34	11	40	0.9%	28.4%	Negligible
AQSR 30	0.37	11	40	0.9%	28.4%	Negligible
AQSR 31	0.43	11	40	1.1%	28.6%	Negligible
AQSR 32	0.38	11	40	0.9%	28.4%	Negligible
AQSR 33	0.43	11	40	1.1%	28.6%	Negligible
AQSR 34	0.53	11	40	1.3%	28.8%	Negligible

Table 30: (Continued) Significance of Impact of predicted PM_{10} concentrations, assuming worst-case emissions from all process stacks (point sources) and DSF Area sources.

AQSR Ref No.	Cumulative Annual Mean PM_{10} Conc. (µg/m^3)	Ambient PM_{10} Conc. (µg/m^3)	AQS Limit Value (µg/m^3)	PC %age of limit value	PEC %age of limit value	Significance of Impact
AQSR 35	0.55	11	40	1.4%	28.9%	Negligible
AQSR 36	1.21	11	40	3.0%	30.5%	Negligible
AQSR 37	0.38	11	40	0.9%	28.4%	Negligible
AQSR 38	0.36	11	40	0.9%	28.4%	Negligible
AQSR 39	0.37	11	40	0.9%	28.4%	Negligible
AQSR 40	0.35	11	40	0.9%	28.4%	Negligible
AQSR 41	0.48	11	40	1.2%	28.7%	Negligible

Note: PC = Process Contribution

PEC = Predicted Environmental Contribution

When in operation, the PM_{10} emissions from all process stacks and DSF Area fugitive emissions result in a worst-case process contribution of 4.26 µg/m^3 which is a predicted environmental contribution of 30.52% of the 90.41th %ile of the 24-hour PM_{10} limit value of 50 µg/m^3 at the worst affected residential receptor, AQSR 12, 216 Crockanboy Road. As outlined in Table 30, the predicted cumulative process stack and DSF Area fugitive PM_{10} emissions will have a negligible impact on local air quality in relation to the annual mean PM_{10} limit value of 40 µg/m^3 at all receptors.

There are no combustion sources on site apart from a Smelting Furnace in the Processing Plant Gold Room. This Smelting Furnace will be fitted with a furnace hood and skirt extraction so that emissions pass through a cartridge filter, a HEPA filter and Carbon Adsorption vessel (SIC) prior to the exhaust vent. Hence, there will be no combustion gas emissions such as Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Sulphur Dioxide (SO_2) and Benzene emissions from process stacks on site.

6.2.4 Discussion of Predicted Dust Deposition Rates & Concentrations from DSF Operations;

During initial phases of the DSF (Years 1 – 5), when the operational area on the DSF is in closest proximity to the receptors to the east and south-east of the DSF, a maximum daily dust deposition rate of 2.23 mg/m^2/day will be experienced at AQSR 23 - 56 Mullydoo Road. This is <1% of the suggested guideline limit value of 350 mg/m^2/day. The total annual dust deposition rate of 47.8 mg/m^2/year at AQSR 23 - 56 Mullydoo Road equates to a daily average dust deposition rate of 0.14 mg/m^2/ day. The predicted maximum ambient PM_{10} concentrations in proximity to the initial phases of the DSF (Years 1 – 5), are a 90.4th %ile of 24 Hour PM_{10} concentrations of 0.76 µg/m^3 versus a limit value of 50 µg/m^3 and an annual mean PM_{10} concentration of 0.25 µg/m^3 versus a limit value of 40 µg/m^3. The predicted maximum annual mean $PM_{2.5}$ concentration is 0.12 µg/m^3 versus a limit value of 25 µg/m^3.

During later phases of the DSF (Years 16 – 20), when the operational area on the DSF is in closest proximity to the receptors to the west and south-west of the DSF, a maximum daily dust deposition rate of 3.31 mg/m^2/day will be experienced at AQSR 12 - 216 Crockanboy Road. This is <1% of the suggested guideline limit value of 350 mg/m^2/day. The total annual dust deposition rate of 94.1 mg/m^2/year at AQSR 12 - 216 Crockanboy Road equates to a daily average dust deposition rate of 0.25 mg/m^2/day. The predicted maximum ambient PM_{10} concentrations in proximity to the operational phases of the DSF from Years 16 – 20, are a 90.4th %ile of 24 Hour PM_{10} concentrations of 3.67 µg/m^3 versus a limit value of 50 µg/m^3 and an annual mean PM_{10} concentration of 1.03 µg/m^3 versus a limit value of 40 µg/m^3. The predicted maximum annual mean $PM_{2.5}$ concentration is 0.21 µg/m^3 versus a limit value of 25 µg/m^3.

The air dispersion model predicts a higher dust deposition rate and ambient PM_{10} and $PM_{2.5}$ concentrations at the nearest sensitive receptors in the later phases of the DSF (Years 16 – 20), due to the fact that the extent of the journey on the unpaved roads across the DSF will be longer than in the earlier phases of the DSF. Unpaved roads are the most significant potential source of dust emission. Potential fugitive dust sources will be dampened and wetted using the proposed dust control measures to prevent dust emissions, especially during periods of dry weather as outlined in Section 7.0 Mitigation Measures.

A geochemical characterisation study has been undertaken to assess the acid rock drainage and metal leaching (ARDML) potential of the waste rock material that will be generated during operations to influence the backfill strategy and the construction and management of the DSF. Table 31 presents the findings of the tailings characterisation.

Table 31: Tailings characterisation

	Parameter	Units	LDM	Float Tails
ICP-MS & AES	**Al**	mg/kg	100	66000
	Be	mg/kg	5	<5
	Ba	mg/kg	10	1693
	Bi	mg/kg	0.1	1
	Ca	mg/kg	1000	10000
	Cd	mg/kg	0.2	<0,2
	Co	mg/kg	0.5	10.1
	Cr	mg/kg	10	200
	Cu	mg/kg	10	50
	Fe	mg/kg	100	35100
	K	mg/kg	1000	28000
	Mg	mg/kg	100	7400
	Mn	mg/kg	10	770
	Mo	mg/kg	2	10
	Na	mg/kg	n/d	6180
	Ni	mg/kg	5	39
	Pb	mg/kg	5	14
	$S_{total\ ICP\text{-}AES}$	mg/kg	200	1065
	Sb	mg/kg	0.1	3
	Se[1]	mg/kg	5	194
	Sn	mg/kg	1	3
	Ti	mg/kg	100	2900
	Zn	mg/kg	5	47
	Ag	mg/kg	1	<1
	As	mg/kg	5	27
	Ce	mg/kg	0.1	65
	Cs	mg/kg	0.1	2.5
	Ga	mg/kg	1	18
	Ge	mg/kg	1	2
	Hf	mg/kg	1	6
	In	mg/kg	0.2	<0,2
	La	mg/kg	0.1	34
	Nb	mg/kg	1	9
	P	mg/kg	100	700
	Rb	mg/kg	0.2	113
	Sr	mg/kg	10	113
	Ta	mg/kg	0.5	<0,5
	Th	mg/kg	0.1	9.1
	Tl	mg/kg	0.5	0.6
	U	mg/kg	0.05	2.43
	V	mg/kg	5	60
	W	mg/kg	1	6
	Y	mg/kg	0.5	16.9
	Zr	mg/kg	0.5	213

n/d: undetermined

The Air Quality Standards Regulations include limit values for ambient concentrations of arsenic (As), cadmium (Cd) and nickel (Ni). The target value for the total content in the PM_{10} fraction averaged over a calendar year for arsenic (As), cadmium (Cd) and nickel (Ni) is 6 ng/m^3, 5 ng/m^3 and 20 ng/m^3 respectively.

The TA Luft Air Quality Standard outlines deposition limit values for certain trace metals and their inorganic compounds, such as arsenic (As) (4 μg/m^2/day), cadmium (Cd) (2 μg/m^2/day), lead (Pb) (100 μg/m^2/day), mercury (Hg) (1 μg/m^2/day), nickel (Ni) (15 μg/m^2/day) and Thallium (Th) (2 μg/m^2/day) as outlined in Table 2.

As shown in Table 31, arsenic (As), cadmium (Cd), nickel (Ni) and Thallium (Th) account for very trace levels in the tailings content, i.e. <0.2 mg/Kg (0.000002%), 39 mg/Kg (0.0039%), 27 mg/Kg (0.0027%) and 9.1 mg/Kg (0.00091%) respectively.

The predicted worst-case dust deposition rate of 3.31 mg/m^2/day will occur at AQSR 12, 216 Crockanboy Road. Therefore, this equates to the following trace metal deposition rates;

- Arsenic (As) = 0.00066 μg/m^2/day,
- Cadmium (Cd) = 0.129 μg/m^2/day,
- Nickel (Ni) = 0.089 μg/m^2/day, and
- Thallium (Th) = 0.03 μg/m^2/day.

Therefore, there are no predicted exceedances of the TA Luft Air Quality Standard deposition limit values for trace metals and their inorganic compounds.

Due to the detection of the presence of quartz in the DSF tailings the potential impact of the dispersion of Quartz (Respirable Crystalline Silica) has been assessed. The results for the ambient concentrations of $PM_{2.5}$ dust particles, i.e. respirable dust, are very low and well in accordance with the ambient air quality standard limit value for $PM_{2.5}$ dust of 25 μg/m^3. Where published ambient air quality limits do not exist for substances of interest, it is common to use the conservative assumption of 1/100th of the EH40/2005 Workplace Exposure Limits (WEL) for an eight-hour time-weighted average reference period to compare with annual average predictions. The Occupational Air Quality standard for Quartz (Respirable Crystalline Silica) as quoted in EH40/2005 Workplace Exposure Limits is 0.1 mg/m^3 (100 μg/m^3). Therefore, a conservative annual average limit value for Quartz (Respirable Crystalline Silica) of 1 μg/m^3 has been recommended. The highest predicted annual mean $PM_{2.5}$ concentration at the nearest properties to the DSF is 0.21 μg/m^3. Even assuming a worst-case scenario where all ambient $PM_{2.5}$ is Quartz (Respirable Crystalline Silica), a predicted concentration of 0.21 μg/m^3 is well below 1/100th of the EH40/2005 WEL for Quartz (Respirable Crystalline Silica).

The UK Highways Agency Interim Advice Note 61/05 '*Guidance for Undertaking Environmental Assessment of Air Quality for Sensitive Ecosystems in Internationally Designated Nature*

Conservation Sites and SSSIs' as a supplement to the DMRB guidelines suggests that the most sensitive species appear to be affected by dust deposition at levels above 1,000 $mg/m^2/day$. This deposition rate is considerably greater than the maximum predicted deposition rate on lands adjacent to the proposed infrastructure site as shown in Annex A, Figures 3 - 6. Therefore, the impact of dust deposition on sensitive ecosystems is considered insignificant.

6.2.4 Air Quality & Dust Emissions from the Ventilation Raises

The air pollutant and dust emission dispersion modelling from the mine ventilation raises has been based on nitrogen dioxide, sulphur dioxide and benzene diffusion tube monitoring data from the existing underground mine. The emissions of particulates and carbon monoxide have been modelled using the relevant Occupational Exposure Limits from the EH40 / 2005 Workplace exposure Limits (HSE), i.e. an internal mine respirable dust concentration at the EH40 limit value of 4 mg/m^3 and an internal mine carbon dioxide concentration at the EH40 limit value of 35 mg/m^3. The emission rates are shown in Table 6.

Table 32: Significance of Impact of predicted Nitrogen Dioxide (NO_2), Carbon Monoxide (CO), Sulphur Dioxide (SO_2), PM_{10} and Benzene concentrations from ventilation raise emissions.

Pollutant	Period Average	Ambient Conc (AC) (µg/m³)	Predicted Maximum Ground Level Conc (µg/m³) – Process Contributions (PC)	Predicted Maximum Ground Level Conc (µg/m³) at Receptor – Process Contributions (PC)	Predicted Environmental Conc at Receptor (PEC) (µg/m³)	Limit Value µg/m³	PEC %age of limit value	Significance of Impact
Nitrogen Dioxide (NO_2)	99.8th %ile of Maximum 1 Hour Conc.	7.8	54.38	5.35 (AQSR 44 - 49 Camcosy Rd)	13.15	200	6.6%	Negligible
	Annual Mean Conc.	3.9	0.49	0.07 (AQSR 44 - 49 Camcosy Rd)	4.39	40	9.9%	Negligible
Carbon Monoxide (CO)	Running 8 - Hour Mean		9139.7	1943.2 (AQSR 44 - 49 Camcosy Rd)	1943.2	10000	19.4%	Negligible
Sulphur Dioxide (SO_2)	99.7th %ile of Maximum 1 Hour Conc.	2	0.0173	0.02 (AQSR 44 - 49 Camcosy Rd)	2.02	350	0.6%	Negligible
	99.2th %ile of Maximum 24 Hour Conc.	2	0.056	0.01 (AQSR 44 - 49 Camcosy Rd)	2.01	125	1.6%	Negligible
	Annual Mean Conc.	1	0.002	<0.01 (AQSR 44 - 49 Camcosy Rd)	1.01	20	5.1%	Negligible
PM_{10}	90.4th %ile of Maximum 24 Hour Conc.	11	22.85	3.16 (AQSR 44 - 49 Camcosy Rd)	14.36	50	28.3%	Negligible
	Annual Mean Conc.	11	9.7	1.48 (AQSR 44 - 49 Camcosy Rd)	12.48	40	31.2%	Negligible
Benzene	Annual Mean Conc.	0.9	0.01416	<0.01 (AQSR 43 - 45 Camcosy Rd)	0.91	5	18.2%	Negligible

Due to ventilation emissions, the 99.79th %ile of maximum 1-hour Nitrogen Dioxide (NO_2) PEC of 13.15 µg/m³ at the worst affected receptor at AQSR 44 - 49 Camcosy Road equates to 6.6% of the AQS limit value. The annual mean NO_2 PEC of 4.39 µg/m³ is 11% of the AQS limit value of 40 µg/m³ at the worst affected receptor. The running 8-Hour mean Carbon Monoxide (CO) PEC of 1,943.2 µg/m³ at the worst affected receptor at AQSR 44 - 49 Camcosy Road equates to 19.4% of the AQS limit value. The Sulphur Dioxide (SO_2) dispersion modelling results indicate that the maximum short term and annual mean ground level concentrations are well below the relevant air quality standards at the nearby receptor locations. The SO_2 PEC equate to 0.6% the 1-hour AQS limit value, 1.6% of the 24-hour AQS limit value and 5.1% of the annual mean AQS limit value at the worst affected residential receptor.

Due to ventilation emissions, the 90.4th %ile of maximum 24-hour PM_{10} PEC of 18.89 μg/m^3 at the worst affected receptor at AQSR 44 - 49 Camcosy Road equates to 37.8% of the AQS limit value. The annual mean PM_{10} PEC of 14.7 μg/m^3 is 36.8% of the AQS limit value of 40 μg/m^3 at the worst affected receptor. The annual mean Benzene PEC of 0.91 μg/m^3 is 18.2% of the AQS limit value of 5 μg/m^3 at the worst affected receptor at AQSR 43 - 45 Camcosy Road. The predicted ambient PM_{10} and Benzene concentrations are worst-case values based on the air quality within the mine shaft being at the relevant occupational limits values.

6.2.5 Air Quality & Dust Impact from Operational Traffic on Public Roads

Vehicular Emissions from Public Roads during Operation

As indicated in the predicted traffic flows for the development the following staggered traffic flows will result during the operation phase of the development;

- Proposed Hourly Flows: Cars 7 – 8 AM & 6 - 7 PM = 54 (Operatives)
  8 – 9 AM & 5 - 6 PM = 24 (Admin)
  6 – 7 AM & 7 - 8 PM = 45 (Operatives)
  HGVs (throughout daytime only) = 14 two-way movements.

The predicted pollutant concentrations during operation in the vicinity of the local public roads due to traffic emissions are outlined in Table 33. This is based on the Annual Average Daily Traffic (AADT) flows in proximity to the proposed development during operation as outlined in Table 11. The DMRB assessment has been based on a worst-case year of assessment of 2020.

Table 33: Predicted pollutant concentrations during operation in the vicinity of the local public roads due to traffic emissions (assuming operation commences in 2020).

Road & Receptor Location	Pollutant concentrations at receptor (excluding Background Concentrations for all pollutants except for PM_{10})						
	CO	Benzene	1,3-butadiene	NO_x	NO_2	PM_{10}	
	Annual mean mg/m^3	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Annual mean $\mu g/m^3$	Days >50 $\mu g/m^3$
At Site Entrance - AQSR 13 - Without	0.00	0.00	0.00	6.41	4.11	11.05	0.00
At Site Entrance - AQSR 13 - With	0.00	0.00	0.00	6.51	4.15	11.06	0.00
At Rouskey Village - Without	0.00	0.00	0.00	6.81	4.26	11.09	0.00
At Rouskey Village - With	0.00	0.00	0.00	6.91	4.30	11.10	0.00
At Greencastle Village - Without	0.01	0.01	0.01	8.21	4.79	11.23	0.00
At Greencastle Village - With	0.01	0.01	0.01	8.26	4.81	11.24	0.00
Limit Value	10 mg/m^3	3.25 $\mu g/m^3$	2.25 $\mu g/m^3$	30 $\mu g/m^3$	40 $\mu g/m^3$	40 $\mu g/m^3$	35

The predicted air quality pollutant concentration results have been compared with the relevant Air Quality Standard Regulations (Northern Ireland) 2010 limit values (See Table 1). Using the information as described, the results of the DMRB Screening assessment indicate that there will be a very small increase of the NO_2 and PM_{10} concentrations in proximity to the local public roads due to traffic emissions. Tables 34 & 35 summarise the DMRB Screening assessment predictions and the description of impact on air quality at the relevant receptor locations.

Table 34: Description of impact on NO_2 concentrations during operation in proximity to the local public roads.

Receptor	Absolute Change	Relative Change (% of AQS)	Percentage of predicted concentration relative to AQS	Significance
At Site Entrance - AQSR 13	0.04	0.1%	10.37%	Negligible
At Rouskey Village	0.04	0.1%	10.76%	Negligible
At Greencastle Village	0.02	0.04%	12.02%	Negligible

Table 35: Description of impact on PM_{10} concentrations during operation in proximity to the local public roads.

Receptor	Absolute Change	Relative Change (% of AQS)	Percentage of predicted concentration relative to AQS	Significance
At Site Entrance - AQSR 13	0.01	0.02%	27.65%	Negligible
At Rouskey Village	0.01	0.03%	27.76%	Negligible
At Greencastle Village	0.01	0.02%	28.1%	Negligible

As outlined in Section 7 Assessing Significance of EPUK/IAQM guidance document a judgment of significance should be made by a competent professional. There will be a small increase in local traffic flows during the operation of the Curraghinalt Project. This will result in a negligible impact on the air quality in the vicinity of the development. In accordance with IAQM and the DMRB Screening Assessment guidance and methodology a detailed atmospheric dispersion model is not required.

Dust Emissions from Road Haulage Vehicles during Operation

As stated above, it will take approximately two years to excavate the planned decline to link the mine workings with the main portal entrance. During this time, the current exploration portal entrance will be used to provide access for underground mine development. Once construction of the main portal entrance is complete, no further waste or ore will be hauled from the exploration portal. Therefore, the estimated 35 trucks loads per day of waste and ore from the current exploration portal entrance to the site via Camcosy Road and Crockanboy Road will cease. This will remove all potential for wind-blown dusts from road haulage vehicles. All such vehicle movements will henceforth be confined to within the site boundary.

As outlined above, Dispersion Models 2 and 3 have assessed the Total Suspended Particulate (TSP) emissions from the unpaved and paved road sources with the operational area on the DSF in closest proximity to nearest receptors to the proposed infrastructure site. Table 29 presents the predicted dust deposition rates and ambient PM_{10} and $PM_{2.5}$ concentrations at sensitive receptors in closest proximity to the proposed infrastructure site.

6.2.6 Emission to Atmosphere from Cyanide Recovery and Detoxification;

The cyanide recovery and detoxification circuit will receive carbon-in-leach (CIL) tailings slurry and will initially dilute and then thicken the slurry, effectively "washing" the cyanide into the thickener overflow stream which will then be recycled back to the beginning of the CIL circuit or to the solution detoxification circuit. Once washed, the slurry now containing less cyanide, will be pumped to the detoxification circuit where the residual cyanide will be chemically destroyed (oxidized). The thickened washed tailings slurry will be further diluted to achieve the appropriate solids density for detoxification and pumped to two agitated tanks in series, where the cyanide will be destroyed by means of the SO_2/AIR cyanide destruction process. Sodium Metabisulphite will be utilised as a source of SO_2 and Zinc Sulphate ($ZnSO_4.4H_2O$) will be added to catalyse the reaction. This process, developed in the 1980s by INCO, is well established, and is utilised effectively at numerous mining sites worldwide. After cyanide detoxification, the process slurry will comply with the EU limit of less than 10 ppm weak acid dissociable (WAD) cyanide (as per Directive 2006/21/EC, Article 13(6) and 'The Planning (Management of Waste from Extractive

Industries) Regulations (Northern Ireland) 2015'). It will be further mixed (diluted) with a portion of flotation tailings and will be pumped to two large storage tanks (required for paste backfill plant shutdowns). The slurry will then pass to the underground paste backfill plant, where it will be mixed with binders to produce a backfill paste that will be used as a cemented fill in the depleted stope areas.

In terms of emissions from the Cyanide Detoxification Tanks the main reaction for the cyanide destruction is:

$SO_2 + O_2 + H_2O + CNWAD^- \rightarrow CNO^- + H_2SO_4$ [1]

and thus, any free cyanide or hydrogen cyanide in aqueous solution will be oxidized initially, and there will be none to negligible production of HCN gas as an emission source.

In time, cyanate will hydrolyse to produce ammonia (NH_3), as per Equation 2 below:

$CNO^- + H^+ + H_2O \rightarrow CO_2 + NH_3$ [2]

The kinetics of the hydrolysis reaction depends on a series of factors, that include pH and temperature. At high pH (as in the detoxification tanks) and low temperatures the hydrolysis is relatively slow. For example, at pH 7 the hydrolysis may take >20 hours, while at pH 2 the hydrolysis takes place in less than 10 minutes. Since the cyanide destruction process is conducted at pH 8-8.5, there will be no NH_3 emissions from the detox tank during normal operations.

NH_3 is quite soluble in water and could form various ammonium salts such as $(NH4)_2CO_3$ in the presence of Na_2CO_3 that is used in the tails treatment. This means that it is unlikely that even if all of the cyanate hydrolysed to ammonia (which in itself is unlikely), then not all of it would become ammonia gas as an emission to atmosphere.

Under typical operating conditions, where the pH is maintained at approximately pH 8–8.5 and the detoxification tank is designed for 2 hours of residence time, there will be none to a negligible production of ammonia as an emission source. Hence, ammonia dispersion modelling is not required.

Based on the Australian Government, Department of The Environment and Heritage's, National Pollutant Inventory (NPI) "Emission Estimation Technique Manual for Gold Ore Processing" Version 2.0 (2006), hydrogen cyanide (HCN) emission rates from each CIL tank at a pH of 10 have been calculated using the equation;

$E = (\{0.013 \times [HCN(aq)] + 0.46\} \times A \times T \times 0.96/10^3)$

Where:

E = Emission of CN (kg)

$[HCN(aq)] = [NaCN] \times 10(9.2 - pH)$

[NaCN] = Concentration (as mg/l) of NaCN in the leach/adsorption tank

pH = pH in the leach/adsorption tank

A = Surface area (m2) of the leach/adsorption tank

T = Period of emissions (hours)

CIL Tank (#)	1	2	3	4	5	6	7	8	9	10
Leach Time (hrs)	4.8	9.6	14.4	19.2	24	28.8	33.6	38.4	43.2	48
[NaCN] (mg/L)	3000	3000	3000	3000	3000	2722	2390	1833	1243	890
pH	10	10	10	10	10	10	10	10	10	10
A (m^2)	28.26	28.26	28.26	28.26	28.26	28.26	28.26	28.26	28.26	28.26
[HCN(aq)] (mg/L)	475.5	475.5	475.5	475.5	475.5	431.4	378.8	290.6	197.1	141.1
E (g)	865	865	865	865	865	790	701	552	394	299
A (m^2)	28	28	28	28	28	28	28	28	28	28
Time (s)	17280	17280	17280	17280	17280	17280	17280	17280	17280	17280
HCN Emission Rate ($g/m^2/s$)	0.00177	0.00177	0.00177	0.00177	0.00177	0.00162	0.00144	0.00113	0.00081	0.00061

The 10 No. CIL tanks have subsequently been modelled as area sources with a tank radius of 3m using *Aermod*. Based on the HCN emission rates from the surface of the CIL tanks at a pH = 10, the following HCN Concentrations were predicted.

Table 36: Maximum predicted Hydrogen Cyanide (HCN) concentrations in proximity to the proposed infrastructure site.

Receptor Location	Annual Mean HCN Conc.	Max. 1-Hour HCN Conc.	Max. 15-Min HCN Conc. Note 1	Significance
Conc. @ Worst-case Receiver AQSR 23	2.96 µg/m^3 (0.00268 ppm)	755.86 µg/m^3 (0.68 ppm)	1,012.9 µg/m^3 (0.91 ppm)	Negligible
Maximum Ground Level Conc. (GLC) in proximity to CIL tanks	130.2 µg/m^3 (0.12 ppm)	6,886.2 µg/m^3 (6.24 ppm)	9,227.5 µg/m^3 (8.36 ppm)	Negligible

Note 1: A conversion factor from 1-hour to 15-minute concentration is given in the H1 Annex F publication, i.e. the 15 minute 99.9%ile is derived by multiplying the 1 hour 99.9%ile concentration by 1.34.

In terms of an assessment of significance, the National Institute for Occupational Safety and Health (NIOSH) which is the US agency responsible for conducting research and making recommendations for the prevention of work-related injury states that the "*chosen Immediately Dangerous To Life or Health (IDLH) value is based on the statements by Patty [1963] that 45 to 54 ppm is "tolerated by man for 0.5 to 1 hour without immediate or late effects; 110 to 135 ppm, however, may be fatal after 0.5 to 1 hour or later, or dangerous to life [Flury and Zernik 1931; Dudley et al. 1942]".* The short-term exposure limit (15 min reference period) quoted by the UK Health and Safety Executive (HSE) is 10 ppm in the workplace. This occupational limit value will not be exceeded and negligible and insignificant HCN concentrations will occur at the nearest residential properties.

6.2.7 Cumulative Air Quality Impact

Proposed developments in the area in include residential buildings, agricultural buildings and wind turbine developments. There is no potential for a significant cumulative air quality impact from the operation of the proposed Curraghinalt Project together with any such development in the area. These proposed developments have no potential air quality impacts in common with the proposed Curraghinalt Project. Also, the potential for cumulative air quality impacts of any significance is negated by the distance of these developments from the proposed Curraghinalt Project.

6.2.8 Air Quality Impact during Decommissioning

On cessation of mining and processing of gold at the site the plant will be decommissioned and closed. The equipment to be used for the decommissioning of the plant is expected to be similar to the equipment used during the construction phase. As such, the air quality and dust impacts during the decommissioning operations will be the same or similar to the construction related levels and as with the construction phase this impact will be of short duration. As such, no significant air quality and dust impacts are expected during the decommissioning phase of the plant. With the termination of the mining and processing of gold activities, the air quality concentrations and dust levels within and around the site are expected to revert back to those that existed prior to the operations. Therefore, no residual air quality and dust impacts are expected.

7 Mitigation Measures

7.1 Construction Mitigation Measures

During the construction phase there will be the potential for air quality and dust impacts that are typical of such a development. In order to avoid significant impacts from dust emissions during the construction phase, the following measures should be adopted. Using these measures will reduce the potential for construction dust nuisance to a negligible impact:

- A daily site walk-over to inspect the perimeter and check for dust deposition close to the edge of the construction site.
- A weekly inspection of the local area be carried out to check for any evidence of excessive levels of dust deposition as a result of the construction site activities. The inspection will extend along the haul road between the decline portal and the proposed infrastructure site (along the Camcosy and Crockanboy Roads).
- Provision of easily cleaned hard standing area within the site for vehicles entering, parking and leaving the existing exploration site and the proposed infrastructure site construction site. Where necessary, vehicles will be cleaned prior to exit from the site in a wheel wash facility.
- Provision of site personnel and mechanical road sweepers to clean the site hard standing area and to clean any mud or debris deposited by works vehicles from the public roads in the vicinity of the site.
- Fine, dry construction materials will be stored within buildings or in areas that are either enclosed or shielded from the wind.
- Handling areas will be maintained in as clean a condition as practicable in order to reduce the risk of dust emissions.

7.2 Operational Mitigation Measures

The following dust mitigation measures will be employed to minimise operational dust impacts. The aim of the mitigation measures outlined below is to minimise the release of fugitive dust from unpaved and paved roads, stockpiles and the DSF working areas to the surrounding environment. Outlined in detail below are the dust suppression measures that will be routinely implemented as part of the operations at the proposed infrastructure site.

The site manager will have the overall responsibility for ensuring that operations within the proposed infrastructure site comply with the requirements of any relevant planning conditions / authorisation.

The proposed infrastructure site will have at its disposal a suitable water bowser and water supply to allow for dampening down of the unpaved and paved roads, stockpiles and the DSF working areas when windblown dust from these surfaces has the potential to arise. The occurrence of potential wind-blown dust is typically weather dependent but suitable procedures and measures will be routinely followed and available to minimise windblown dust from the site surfaces. Wind and weather forecasts will be monitored and work will cease where dust cannot be controlled.

Access Roads, Site Roads and Vehicle Loading Activities & Movements:

The objective of these procedures is to minimise the creation and release of dust generated by transportation activities during both access to and from the site as well as from traffic movements within the site.

- Regular attention shall be paid to cleaning dust material from all roadways, hard surfaced areas and working areas of the facility. Dust from clean-up shall be re-incorporated into the waste rock stockpile. This shall be undertaken during especially dry periods when fugitive dust emission is most likely, during lulls in operations and at the end of each working period.
- All site road and other areas where vehicles are regularly moving shall be kept clean, by sweeping and / or by wetting;
- When loading vehicles, the following procedures should be adhered to:
    - No overloading of vehicles or containers resulting in either peaks of cargo or overspill onto the working areas or roadways.
    - Keep fall heights of the material into the transport vehicles to a minimum.
- Strictly applied, on-site speed limits shall be set, displayed and observed for the movement of all vehicles (15 mph)

Stockpiling Operations:

The aims of these procedures are to ensure that mineralised materials are stockpiled only within the designated ROM stockpile area and that any release of dust to atmosphere is minimised.

- The ROM stockpile area is to be immediately adjacent to the Crusher Building and is surrounded by the proposed cutting which will reduce exposure and the potential for wind-blown dusts.
- Stockpiling and offloading operations to the ROM stockpile adjacent to the Crusher building shall be co-ordinated in such a way as to minimise double handling of material.
- Unloading of materials at the ROM stockpile shall be carefully undertaken to ensure minimum exposure to winds and in such a way that releases of dust to atmosphere are minimised.
- The ROM stockpiling area will be managed and clearly and physically delineated to deter vehicles from running over the ROM stockpile edge.

- The ROM stockpile shall be managed to ensure that the profile of material will minimise wind whipping.
- The ROM stockpile shall be profiled and stored by flattening out peaks and ridges.
- The dust suppression equipment used in the ROM stockpile area shall be regularly checked to ensure that it is working properly.

DSF Operations:

The aims of these procedures are to ensure that the waste rock material and filtered tailings that will be generated during operations to construct the DSF will be managed so that any release of dust to atmosphere is minimised.

- As the DSF will be sequenced, reclamation will be an ongoing process as the side slopes are developed and each phase is completed.
- Reclamation details are further developed in the closure plan appended to the Environmental Statement.
- The tailings will be spread in lifts approximately 0.3 m thick using a bulldozer and compacted with a minimum of four passes of a 10 tonne smooth vibrating drum roller. The objective is to achieve up to 95% of the maximum standard Proctor dry density.
- Haul truck loading and offloading operations to the DSF working area shall be co-ordinated in such a way as to minimise double handling of material.
- Unloading of materials at the DSF working area shall be carefully undertaken to ensure minimum exposure to winds and in such a way that releases of dust to atmosphere are minimised.
- The DSF working area shall be managed to ensure that the profile of material will minimise wind whipping, as well as using wind-break fencing to prevent wind-blown dusts.
- The DSF working area will be managed and clearly and physically delineated to deter vehicles from accessing areas of the DSF that have already been established and re-vegetated.
- The unpaved haul roads across the DSF area will be frequently monitored for wind-blow dust potential and wetted as appropriate using a water bowser as shown below.

- The dust suppression equipment used in the DSF working area shall be regularly checked to ensure that it is working properly.

Plates 1-6 below indicate the workings of a similar DSF at the Greens Creek Mine in Alaska. This gold mining site is operated very similarly to that proposed at the proposed infrastructure site. Plates 1-6 indicate managed haul roads, clearly and physically delineated working areas, spread and compacted tailings before the ingress of water associated with precipitation, wind-break fencing to prevent wind-blown dusts and on-going sequenced re-vegetation of areas.

Plate 1: Haul truck leaving processing building.

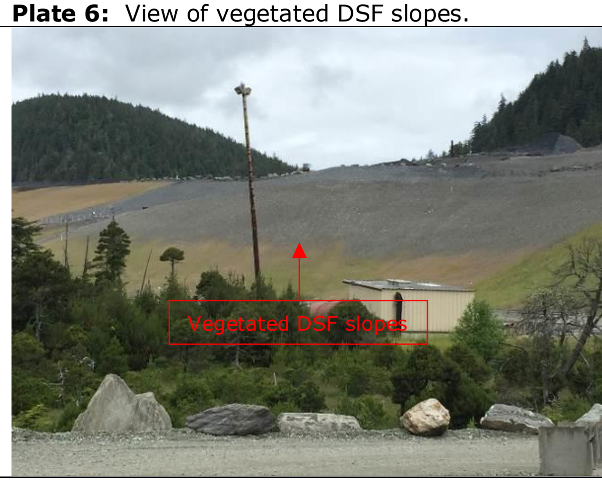
Plate 2: Haul road from processing building to DSF.

Plate 3: View of haul truck accessing working area of DSF.

Plate 4: View of working area of DSF.

Plate 5: View of DSF area.

Plate 6: View of vegetated DSF slopes.



Monitoring & Reporting:

- A high standard of housekeeping will be maintained on site.
- Contingency plans shall be made to provide dust control in the event of equipment malfunction, whether by loan, hire or other arrangements.
- Systems for monitoring processes, responding to and reporting pollution incidents shall be devised. This information shall be kept in a logbook, together with information regarding equipment failure, periods of significant dust emissions off-site and the inspection of roadways, together with any remedial action taken.
- Any complaints received from neighbouring properties will be logged and appropriate actions taken to reduce the potential for further complaint.

Dust Management Plan:

The following Dust Management Plan will be implemented at all times and special importance will be placed on these actions on high wind days.

Table 37: Dust Management Plan:

Parameter	Action	Responsibility
Induction	Induction for all employees will include information on: • Potential sources of dust • Dust Management Plan, Monitoring program and licence conditions • Speed limits onsite and staying on designated roads • Who to report dust issues too	Manager
Windy Conditions	• Monitor wind and weather forecasts and cease working where dust cannot be controlled.	Manager
Traffic	• Adhere to site speed limits and designated roads	Drivers
Open Areas	• Minimise open areas exposed to wind erosion as much as practical by completing an assessment of areas suitable for stabilisation, and carry out stabilisation works. • Tree shelter belts will be maintained along site boundaries where appropriate, to assist with containing dust from open areas.	Manager
Dust Suppression	• Operate water bowsers during dry, windy conditions and during the summer months, generally from April to September, across the site to apply water to operational areas (i.e. roads and loading areas) • All unpaved roads being used for heavy vehicle traffic within the DSF area will be treated with dust suppression, where appropriate. • Apply dust suppression to all non-active stockpiles prone to wind erosion. • Install and maintain dust suppression on the ROM stockpile area adjacent to the Crusher building.	Manager and Site supervisor

Table 37 (Continued): Dust Management Plan:

Parameter	Action	Responsibility
Crushing in Crusher Building	• Daily inspections of dust suppression systems to ensure operational and record as being checked on Plant Maintenance Sheet • Continually monitor dust suppression systems during crushing operations of the plant • On days where dust cannot be controlled shut down operations until dust can be satisfactorily managed	Plant Operator
Loading & haulage	• Haul truck operators to monitor loading conditions and call on water bowser to dampen areas in dusty conditions • Haul truck operators to monitor road conditions and call on water trucks to dampen roads when dusty • Haul truck operators to reduce speed to minimise dust • On days where dust cannot be controlled shut down operations until dust can be satisfactorily managed	Site Operators
Re-vegetation	• Conduct any topsoil stripping, preparation and planting only during suitable wind and weather conditions, so as to minimise the generation of dust. • After re-establishment of areas, vegetative cover will be planted, as part of the progressive rehabilitation program.	Production Manager
Record Keeping	• All actions undertaken for mitigation of dust during dusty conditions will be recorded by the site supervisor. • Document all readings, wind directions, area omitting dust and actions undertaken. • This information will be used to determine compliance when auditing and reporting.	Site supervisor
Dust Monitoring	• Monitoring is required to enable an assessment of the effectiveness of the dust management controls and improvements to be made, where required. • Dust deposition monitoring along the site perimeter boundaries • A report on the results of this monitoring shall be available to the local authority on a quarterly basis.	Manager
Complaint Records	• Complaints will be logged and maintained on site for 5 years.	Manager
Performance Indicators	The effectiveness of the Dust Management Plan will be reviewed against the following indicators: • Compliance with licence criteria and guideline values for dust deposition monitoring. • The level of substantiated complaints received and registered. • The level of complaints satisfaction achieved. • The absence of fugitive dust originating from the site. • Audit results of compliance with actions	Manager

7.2.1 Building Design and Orientation

Dust emissions from the crushing operations and conveying of crushed material will be negligible. In the proposed site layout, it has been determined that for dust and noise control purposes the primary crusher will be enclosed within a purpose designed structure. The coarse ore stockpile, which will store ore post the primary crusher and prior to the SAG Mill, will also be covered. The SAG Mill grinding process will also be enclosed within the proposed Processing Building. The conveyors from the primary crusher to the coarse ore stockpile to the SAG Mill within the Processing Building will also be covered with dust abatement measures installed. All material drops will occur within the coarse ore stockpile and the SAG Mill within the Processing Building. The dust generated in the crusher building, the conveyors and the covered stockpile will be controlled using dust collectors. The dust collectors will very significantly reduce the potential for dust emission to atmosphere. Therefore, there will be little potential for fugitive dust emissions in proximity to these sources.

7.2.2 On-going Air Quality & Dust Monitoring:

DGL are committed to installing continuous Air Quality & Dust monitoring locations along the proposed infrastructure site boundary in the direction of the closest Air Quality & Dust sensitive receptors. This continuous Air Quality & Dust monitoring will be used to establish if the recommended Air Quality & Dust mitigation measures allow for the relevant limits to be achieved at the nearest sensitive receptors. Therefore, during periods of calm weather when Air Quality & Dust impacts are more likely to have the potential to give rise to nuisance, operations such as haul trucks to and from the DSF area as well as dozer and vibratory packer activities on the DSF will be curtailed if necessary.

Monitoring Procedure

Personnel

A suitably qualified and experienced engineer will be appointed to carry out the monitoring procedure.

Monitoring Methodology

- Continuous monitoring of the site boundary for total suspended particulates (TSP), $PM_{10,}$ $PM_{2.5}$ and PM_1 dust particles will be carried out using an airborne particle monitor such as the Turnkey Osiris monitor. This instrument gives real time continuous data of total suspended particulates (TSP), $PM_{10,}$ $PM_{2.5}$ and $PM_{1.}$ Directionality can be calculated as the wind speed and direction will be recorded by an on-site meteorological station. Two instruments will be mounted at site perimeter locations along the boundaries in closest proximity to sensitive residential receptors. The final locations will be agreed with FODC and are subject to the provision of electricity to the monitoring location. The PM_{10} and $PM_{2.5}$ results will be compared against the relevant limit values in the Air Quality Standards Regulations (Northern Ireland) 2010 (SR 2010/188). The following limits will be used in the assessment of measured levels;
    - PM_{10} 24 Hour Mean concentration limit = 50 μg/m^3 not to be exceeded more than 35 times a calendar year
    - PM_{10} Annual Mean concentration limit = 40 μg/m^3
    - $PM_{2.5}$ Annual Mean concentration limit = 25 μg/m^3

- Dust and metal deposition monitoring will be undertaken at four site boundary locations (north, south, east and west) around the proposed infrastructure site using Bergerhoff dust deposition gauges as referred to in the VDI-Standard: 2119 Part 2 Measurement of atmospheric depositions - Determination of the dust deposition according to the Bergerhoff method and VDI-Standard: 4320 Part 2 Measurement of atmospheric depositions - Determination of the dust deposition according to the Bergerhoff method. The final locations will be agreed with FODC. For determining the rate of dust deposition, the dust deposition gauges will be exposed to the atmosphere for the sampling period of 30+/-2 days. The dust samples will be collected on a monthly basis and analysed at an accredited analytical laboratory. Dust deposition will be calculated from the mass of the dry residue, the exposure period and the aperture size of the dust deposition gauge. The dust residue in the dust deposition gauge will be acid digested and analysed for a suite of metals. The following dust deposition limits will be used in the assessment of measured dust deposition levels;
  - Dust Deposition Rate limit = 350 mg/m^2/day (averaged over a 30+/-2 day period using Bergerhoff Gauge Method).
  - Dust Deposition Rate limit affecting sensitive ecological receptors = 1,000 mg/m^2/day.

- Passive diffusion tube monitoring for nitrogen oxides (NOx), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), BTEX and volatile organic compounds (VOC) using diffusion tubes will be undertaken at four site boundary locations (north, south, east and west) around the proposed infrastructure site with analysis provided by Gradko International. The final locations will be agreed with FODC. Passive diffusion tube monitoring will be carried out monthly intervals (30+/-2 day periods). The NOx, NO_2, SO_2 and Benzene results will be compared against the relevant limit values in the Air Quality Standards Regulations (Northern Ireland) 2010 (SR 2010/188).

<u>Recording</u>

All records will be held at the DGL site offices. The records will be made available on site to officers of FODC. Monitoring Records will be retained by DGL for five years after completion of the survey period.

DGL will nominate a resident Liaison Manager who will maintain contact with local representatives in the immediate area so that any concerns on environmental impacts may be addressed at an early stage.

8 Residual Impacts

8.1 SUMMARY OF IMPACT ASSESSMENT

The Air Quality & Dust levels from the construction and operation of the proposed Curraghinalt Project are predicted to be lower than the relevant air quality and dust standards and guideline limit values.

When compared to the measured baseline Air Quality & Dust levels in the area of the proposed Curraghinalt Project, the increased Air Quality & Dust levels at nearby properties to the proposed infrastructure site will be cause a ***negligible*** Air Quality & Dust impact at the nearest Air Quality & Dust sensitive receptors throughout the lifetime of the gold mine and processing operations.

Table 38: Summary of Residual Impacts

Impact Description	Potential Impact before Mitigation	Key Mitigation Measures	Residual Impact
Impacts on Air Quality & Dust sensitive receptors during construction	*Minor*	Specific mitigation measures are advised during construction phase including: • A daily site walk-over and a weekly inspection of the local area to be carried out to check for any evidence of excessive levels of dust deposition as a result of the construction site activities. This should also take pace along the Camcosy Road and the Crockanboy Road. • Provision of hard standing area within the site for vehicles entering, parking and leaving the existing exploration site and the construction site. Where necessary, vehicles should be cleaned prior to exit from the site. • Provision of road sweepers to clean the site hard standing areas and the public roads in the vicinity of the site. • Fine, dry construction materials will be stored within buildings or in areas that are either enclosed or shielded from the wind. • Handling areas will be maintained in as clean a condition as practicable to reduce the risk of dust emissions.	*Negligible*

Table 38 (Continued): Summary of Residual Impacts

Impact Description	Potential Impact before Mitigation	Key Mitigation Measures	Residual Impact
Impacts on Air Quality & Dust sensitive receptors during operation.	*Minor*	Specific mitigation measures are advised during operation including: • The crusher building, the covered storage, the process building and the conveyors will be enclosed to attenuate the potential for dust emissions; • Regular attention shall be paid to cleaning dust material from all roadways, hard surfaced areas and working areas of the facility and where vehicles are regularly moving, roads shall be kept clean, by sweeping and / or by wetting; • Loading and unloading of vehicles will be carefully undertaken to prevent fugitive dust emission. • Strictly applied, on-site speed limits shall be set, displayed and observed for the movement of all vehicles (15 mph) • Tailings will be transported to the DSF using covered haul trucks as appropriate. • The tailings will be spread in lifts approximately 0.3 m thick using a bulldozer and compacted with a minimum of four passes of a 10 tonne smooth vibrating drum roller. • The tailings must be spread and compacted before the ingress of water associated with precipitation is allowed to materially change the moisture content of the tailings. • Haul truck loading and offloading operations to the DSF working area shall be co-ordinated in such a way as to minimise double handling of material. • The dust suppression equipment shall be regularly checked to ensure that it is working properly. • A high standard of housekeeping will be maintained on site. • Contingency plans shall be made to provide dust control in the event of equipment malfunction, whether by loan, hire or other arrangements. • Systems for monitoring processes, responding to and reporting pollution incidents shall be devised. This information shall be kept in a logbook, together with information regarding equipment failure, periods of significant dust emissions off-site and the inspection of roadways, together with any remedial action taken. • Any complaints received from neighbouring properties will be logged and appropriate actions taken to reduce the potential for further complaint. • A Dust Management Plan will be implemented at all times. • Should any of the stack emission abatement measures fail, then the corresponding area of the plant will be shut down. The detailed operational management and monitoring controls will be addressed in the PPC permit.	*Negligible*

ANNEX A

Air Quality & Dust Dispersion Model Outputs