

SCREENING AIR MODELLING ASSESSMENT OF EMISSIONS FROM AN ASPHALT BATCHING PLANT AT TONROE QUARRY, ARDARHAN, CO. GALWAY

Technical Report Prepared For

TOBIN Consulting Engineers

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Our Reference

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1	19/03/20	Revised ELVs for NO ₂ and SO ₂	3.0 & 4.0
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Record of Approval

Details	Written by	Approved by
Signature		
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Title	Air Quality Consultant	Director (Air Quality)
Date	10 April 2020	10 April 2020

EXECUTIVE SUMMARY

AWN Consulting was requested by TOBIN Consulting Engineers to carry out a screening computer modelling study of air emissions from a permitted Asphalt Batching Plant at Tonroe quarry in Ardrahan, Co. Galway.

The screening model employed, AERSCREEN⁽¹⁾, was developed by the USEPA and is recommended by the EPA, in EPA publication “*Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)*”⁽²⁾ for screening assessments. As outlined in Section 5.1 of AG4, the use of screening models will give a conservative estimation of the impact from the facility:

“Screening models are designed to be conservative in their prediction of ambient pollutant concentrations. Thus, if the ambient pollutant levels predicted by a screening model, including background concentrations, are below the relevant ambient air quality standard for the pollutant assessed, then further assessment with a more advanced model may not be required. The assessment using a screening model should always be conservative (e.g. using maximum emission rates only).” (Section 5.1, AG4 (EPA, 2020))

The assessment was carried out to ensure that the air emissions from the Asphalt Batching Plant, based on the proposed licence limit values, would not lead to levels of pollutants which would exceed the air quality guideline values. The assessment determined the ambient impact at the boundary of the site and beyond to ensure that ambient air quality standards are not exceeded. Under this scenario, all pollutants were found to be well below the environmental assessment levels, peaking at 70% of the limit values when worst case background values are included, and thus will pose no health risk to the nearby community.

Maximum annual mean concentrations of NO₂ and SO₂ were also predicted within the nearby designated sites of the Castletaylor Complex SAC & pNHA and Ardrahan Grassland SAC. Concentrations were well within their respective limit values for the protection of ecosystems and will not pose an issue to the designated ecological receptors.

Overall, the main findings of the study are as follows:

- Emissions of NO₂, SO₂, CO and particulates (PM₁₀ / PM_{2.5}) at their proposed maximum emission limit values are in compliance with both the applicable short-term and long-term ambient air quality standards at all off-site locations.
- Maximum annual mean concentrations of NO₂ and SO₂ at the nearby designated sites are within the limit values for the protection of ecosystems.
- There will be no risk to the ambient air quality environment due to emissions from the asphalt batching plant.

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1.0 INTRODUCTION

AWN Consulting was requested by TOBIN Consulting Engineers to carry out a screening computer modelling study of air emissions from a permitted Asphalt Batching Plant at the existing Tonroe quarry in Ardrahan, Co. Galway.

The AERSCREEN (version 19191)⁽¹⁾ computer model was developed by the USEPA and is recommended by the EPA, in EPA publication “*Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)*”⁽²⁾ for screening assessments.

The assessment was carried out to ensure that the air emissions would not lead to levels of pollutants which would exceed the air quality guideline levels. The assessment determined the ambient impact at the boundary of the site, closest receptor and beyond to ensure that ambient air quality guideline values are not exceeded.

2.0 AMBIENT AIR QUALITY STANDARDS

In order to reduce the risk to health from poor air quality, National and European statutory bodies have set limit values in ambient air for a range of air pollutants. These limit values or “Air Quality Standards” are health or environmental-based levels for which additional factors may be considered. For example, natural background levels, environmental conditions and socio-economic factors may all play a part in the limit value which is set (see Table 1).

Air quality significance criteria are assessed on the basis of compliance with the appropriate standards or limit values. The applicable standards in Ireland include the Air Quality Standards Regulations 2011, which incorporate European Commission Directive 2008/50/EC which has set limit values for the pollutants NO₂, SO₂, particulates (PM₁₀ / PM_{2.5}) and CO (see Table 1). Council Directive 2008/50/EC combines the previous Air Quality Framework Directive (96/62/EC) and its subsequent daughter directives (including 1999/30/EC and 2000/69/EC).

Pollutant	Regulation ^{Note 1}	Limit Type	Value
Nitrogen Dioxide (NO ₂)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 18 times/year	200 µg/m ³ NO ₂
		Annual limit for protection of human health	40 µg/m ³ NO ₂
		Annual critical level for protection of vegetation	30 µg/m ³ NO + NO ₂
Sulphur Dioxide (SO ₂)	2008/50/EC	Hourly limit for protection of human health - not to be exceeded more than 24 times/year	350 µg/m ³
		Daily limit for protection of human health - not to be exceeded more than 3 times/year	125 µg/m ³
		Critical limit for the protection of ecosystems	20 µg/m ³
Particulate Matter (as PM ₁₀)	2008/50/EC	24-hour limit for protection of human health - not to be exceeded more than 35 times/year	50 µg/m ³ PM ₁₀
		Annual limit for protection of human health	40 µg/m ³ PM ₁₀
Particulate Matter (as PM _{2.5})	2008/50/EC	Annual limit for protection of human health	25 µg/m ³ PM _{2.5}
Carbon Monoxide (CO)	2008/50/EC	8 - hour limit for protection of human health	10,000 µg/m ³

^{Note 1} EU 2008/50/EC – Clean Air For Europe (CAFE) Directive replaces the previous Air Framework Directive (1996/30/EC) and daughter directives 1999/30/EC and 2000/69/EC

Table 1 Environmental Assessment Levels For Pollutants

3.0 MODELLING METHODOLOGY

3.1 AERSCREEN Model

Air emissions from the facility were modelled using the USEPA approved AERSCREEN air dispersion model⁽¹⁾. AERSCREEN is an approved regulatory screening model which uses a full set of meteorological conditions including all stability classes and wind speeds to find the maximum short-term impact. Screening models are usually applied before a refined air quality model to determine if more detailed modelling is needed. Thus, AERSCREEN is designed to be conservative in its prediction of ambient pollutant concentrations.

3.2 Model Input Parameters

The AERSCREEN model requires a number of site specific stack input parameters in order to carry out the dispersion modelling predictions. In this assessment the facility comprises of one emission point (stack). The stack parameters have been obtained based on information provided by the client.

These site specific stack input parameters are outlined in Tables 2 and 3. The estimated process emission concentration and mass emissions (in mg/Nm³ and g/s respectively) are outlined in Table 3 for worst-case operations based on proposed emission limit values. Normalised conditions for concentrations and volume flow rates are referenced to 273.15K, 101.3 Pa, dry gas and no correction for oxygen content as per EPA guidance on previous licencing applications.

Stack Reference	Stack Height (mOD)	Exit Diameter (m)	Temp (K)	Volume Flow (Nm ³ /hr)	Exit Velocity (m/sec actual)
Asphalt Batching Plant	47.3	1.24	343.15	70,000	21.29

Table 2 Process Emission Details.

Parameter	Worst-Case Emission Concentration (mg/Nm ³)	Emission Rate (g/s)
NO ₂	200	3.89
CO	850	16.53
TSP (PM ₁₀) ^{Note 1}	20	0.39
SO ₂	100	1.94

^{Note 1} For the purposes of this modelling assessment it has been assumed that 100% of TSP emissions are of the size fraction PM₁₀

Table 3 Air Emission Rates From Permitted Asphalt Batching Plant at Tonroe Quarry in Ardrahan, Co. Galway Under Worst-Case Conditions.

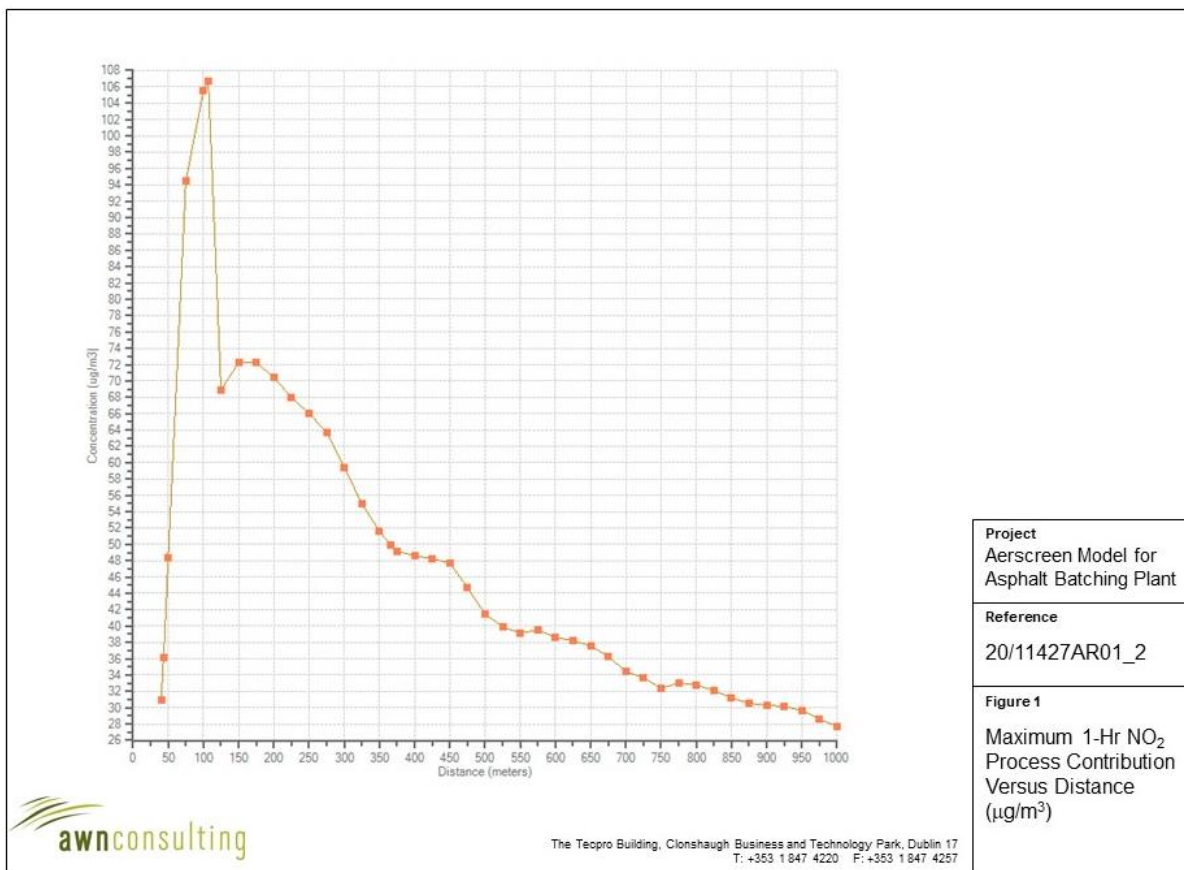
4.0 MODELLING RESULTS

4.1 Ambient Concentrations

The ambient modelling results beyond the site boundary for the worst-case emissions of NO₂, CO, particulates (PM₁₀) and SO₂ are detailed below. The worst-case emissions versus distance from the stack for NO₂ are shown in Figure 1.

The maximum predicted concentration for all pollutants peaks at a distance of 107 m from the stack. The closest property (i.e. sensitive receptor) is approximately 365 m from the stack. Pollutant concentrations decrease with increasing distance from the source.

Table 4 shows the variation in ambient concentrations of NO₂, CO, PM₁₀ and SO₂ with averaging period (Short-Term and Annual Mean) at the worst-case location.



Pollutant	Emission Rate (g/s)	Scaled Short-Term Concentration (µg/m ³)	Scaled Annual Mean Concentration (µg/m ³)
NO ₂	3.89	106.80	10.68
CO	16.53	1037.12	-
PM ₁₀	0.39	16.27	2.71
SO ₂ – Hourly	1.94	135.57	-
SO ₂ – Daily	1.94	81.34	-

Table 4 Predicted Ground Level Concentrations For Short-Term and Annual Mean at the Worst-Case Location

Table 5 compares the short-term concentrations of NO₂, CO, particulates (PM₁₀) and SO₂, to their respective short-term environmental assessment levels (EAL) with background values included where a short term background concentration is available. Background values are based on guidance issued in EPA Guidance Note AG4. As shown in Table 5, the worst case pollutant is SO₂ at 70% of the short-term daily EAL when a background concentration of 5.7 µg/m³ is included.

Parameter	Mass Emission (g/sec)	Background Concentration (µg/m ³) ^{Note 1}	Short-term Process Contribution (µg/m ³)	Short-term Predicted Environmental Concentration (µg/m ³)	Short-term Environmental Assessment Level (µg/m ³)
NO ₂ – Hourly	3.89	26.9	106.80	133.70	200
CO – 8-Hour	16.53	500	1037.12	1537.12	10,000
PM ₁₀ – Daily	0.39	17.7	16.27	33.97	50
SO ₂ – Hourly	1.94	9.8	135.57	145.37	350
SO ₂ – Daily	1.94	5.7	81.34	87.04	125

Note 1 Background values based on guidance issued in Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

Table 5 Predicted Short-Term Ground Level Concentrations at the Worst-Case Location

Table 6 compares the annual average concentrations of NO₂ and particulates (PM₁₀ / PM_{2.5}) to their respective long-term environmental assessment levels (EAL). As shown in Table 6, the worst case scenario peaks at 35% of the long-term EAL for PM_{2.5} when background concentrations are included.

Parameter	Mass Emission (g/sec)	Background Concentration (µg/m ³) ^{Note 1}	Annual Average Process Contribution (µg/m ³)	Annual Average Predicted Environmental Concentration (µg/m ³)	Annual Ambient Environmental Assessment Level (µg/m ³)
NO ₂	3.89	3	10.68	13.68	40
PM ₁₀	0.39	9	2.71	11.71	40
PM _{2.5} ^{Note 2}	0.39	6	2.71	8.71	25

Note 1 Background values based on guidance issued in Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

Note 2 It is assumed that 100% of PM₁₀ emissions are also PM_{2.5} as a conservative case

Table 6 Predicted Annual Mean Ground Level Concentrations at the Worst-Case Location

It should also be noted that there are two designated sites in the vicinity of the permitted asphalt plant, these include the Castletaylor Complex SAC and pNHA (site code 000242) approximately 195m to the direct north of the emission point and the Ardrahan Grassland SAC (site code 002244) approximately 620m to the direct south of the emission point. Table 7 below outlines the maximum predicted annual mean concentrations of NO₂ and SO₂ within the designated sites. Annual mean concentrations are compared against the ambient air quality standards for the protection of ecology (Table 1).

As can be seen in Table 7, concentrations peak at 64% of the annual limit value for SO₂ in the Castletaylor Complex SAC & pNHA. While concentrations within the Ardrahan Grassland SAC peak at 47% of the limit value for SO₂. In terms of NO₂, concentrations peak at 43% and 33% of the annual limit value in the Castletaylor Complex SAC & pNHA and Ardrahan Grassland SAC respectively.

Parameter	Mass Emission (g/sec)	Background Concentration ($\mu\text{g}/\text{m}^3$) ^{Note 1}	Annual Average PC ($\mu\text{g}/\text{m}^3$)	Annual Average PEC ($\mu\text{g}/\text{m}^3$)	Annual Ambient EAL ($\mu\text{g}/\text{m}^3$)
Castletaylor Complex SAC & pNHA - NO ₂	3.89	6	7.05	13.05	30
Castletaylor Complex SAC & pNHA - SO ₂	1.94	3	9.88	12.88	20
Ardrahan Grassland SAC - NO ₂	3.89	6	3.83	9.83	30
Ardrahan Grassland SAC - SO ₂	1.94	3	6.37	9.37	20

Note 1 Background values based on guidance issued in Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

Table 7 Maximum Predicted Annual Mean Concentrations Within Designated Sites

5.0 CONCLUSION

Ambient concentrations at the permitted Asphalt Batching Plant at the Tonroe Quarry in Ardrahan Co. Galway based on proposed licence emission limit values, were assessed using the USEPA approved AERSCREEN air dispersion model. AERSCREEN is an approved regulatory screening model which uses a full set of meteorological conditions including all stability classes and wind speeds to find the maximum short-term impact. Thus, AERSCREEN is designed to be conservative in its prediction of ambient pollutant concentrations.

The AERSCREEN air dispersion model was used to model NO₂, CO, particulates (PM₁₀ / PM_{2.5}) and SO₂ concentrations in the ambient environment. The dispersion model predicted the worst-case ground level concentrations of these pollutants at distances from 40 m – 1000 m from the source.

The model results show that predicted ambient concentrations of all modelled pollutants are well within their respective limit values even when it is assumed that the emission concentrations at licenced emission limit value are maintained for a full year. Thus, the study was able to confirm that even under worst-case operations NO₂, CO, particulates (PM₁₀ / PM_{2.5}) and SO₂ ambient concentrations will be well below the air quality limits and will pose no health risk to the nearby community.

Maximum annual mean concentrations of NO₂ and SO₂ were also predicted within the nearby designated sites of the Castletaylor Complex SAC & pNHA and Ardrahan Grassland SAC. Concentrations were well within their respective limit values for the protection of ecosystems and will not pose an issue to the designated ecological receptors.

Overall, the main findings of the study are as follows:

- Emissions of NO₂, SO₂, CO and particulates (PM₁₀ / PM_{2.5}) at their proposed maximum emission limit values are in compliance with both the applicable short-term and long-term ambient air quality standards at all off-site locations.
- Maximum annual mean concentrations of NO₂ and SO₂ at the nearby designated sites are within the limit values for the protection of ecosystems.
- There will be no risk to the ambient air quality environment due to emissions from the asphalt batching plant.

REFERENCES

- (1) USEPA (2016) AERSCREEN Model User's Guide
- (2) EPA (2020) Air Dispersion Modelling from Industrial Installations Guidance Note (AG4)

APPENDIX 1

AERSCREEN OUTPUT FILE (NO₂ Ambient Impact)

AERSCREEN 16216 / AERMOD 19191

04/09/20
16:52:12

TITLE: TUNROE ASPHALT PLANT

***** STACK PARAMETERS *****

SOURCE EMISSION RATE:	3.8900 g/s	30.873 lb/hr
STACK HEIGHT:	18.30 meters	60.04 feet
STACK INNER DIAMETER:	1.240 meters	48.82 inches
PLUME EXIT TEMPERATURE:	343.1 K	158.0 Deg F
PLUME EXIT VELOCITY:	21.290 m/s	69.85 ft/s
STACK AIR FLOW RATE:	54477 ACFM	
STACK BASE LONGITUDE:	-8.8197 deg	512054. Easting
STACK BASE LATITUDE:	53.1760 deg	5891865. Northing
STACK BASE UTM ZONE:		29
REFERENCE DATUM (NADA):		4
STACK BASE ELEVATION:	25.76 meters	84.51 feet
RURAL OR URBAN:	RURAL	
FLAGPOLE RECEPTOR HEIGHT:	1.80 meters	5.91 feet
DIGITAL ELEVATION MAP(S)	C:\ireland\terrain\SRM_30m\SRMv3_1_N53W009.tif	
INITIAL PROBE DISTANCE =	1000. meters	3281. feet
NO _x TO NO ₂ CHEMISTRY		PVMRM
NO ₂ /NO _x IN-STACK RATIO:		0.10000
OZONE BACKGROUND CONCENTRATION:	0.60000E+02 UG/M3	

***** BUILDING DOWNWASH PARAMETERS *****

BUILDING HEIGHT:	12.7 meters	41.7 feet
MAX BUILDING DIMENSION:	70.0 meters	229.7 feet
MIN BUILDING DIMENSION:	16.0 meters	52.5 feet
BUILDING ORIENTATION TO NORTH:	90. degrees	
STACK DIRECTION FROM CENTER:	45. degrees	
STACK DISTANCE FROM CENTER:	51.8 meters	169.9 feet

***** FLOW SECTOR ANALYSIS *****
25 meter receptor spacing: 40. meters - 1000. meters

TEMPORAL PERIOD	FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAXIMUM 1-HR CONC (ug/m3)	IMPACT DIST (m)	RECEPTOR HEIGHT (m)	
-----	10	71.71	27.91	-56.39	29.71	72.28	175.0	-1.07	AUT

20	71.25	38.98	-66.44	21.89	64.42	175.0	-1.33	AUT
30	68.62	48.86	-74.47	13.41	58.11	200.0	-1.00	AUT
40	63.91	57.25	-80.23	4.51	53.93	200.0	-0.76	AUT
50	57.25	63.91	-83.56	-4.51	50.60	200.0	-0.02	AUT
60	48.86	68.62	-84.35	-13.41	47.91	200.0	0.24	AUT
70	38.98	71.25	-82.57	-21.89	35.72	225.0	0.81	WIN
80	0.00	0.00	0.00	0.00	34.26	325.0	4.15	SUM
90	0.00	0.00	0.00	0.00	34.19	325.0	3.26	SUM
100	0.00	0.00	0.00	0.00	33.99	325.0	5.72	SUM
110	0.00	0.00	0.00	0.00	33.84	325.0	7.75	SUM
120	0.00	0.00	0.00	0.00	33.84	325.0	8.15	SUM
130	0.00	0.00	0.00	0.00	33.84	325.0	8.04	SUM
140	0.00	0.00	0.00	0.00	33.84	325.0	8.17	SUM
150	0.00	0.00	0.00	0.00	33.83	325.0	7.24	SUM
160	0.00	0.00	0.00	0.00	33.95	325.0	5.94	SUM
170	0.00	0.00	0.00	0.00	34.07	325.0	5.24	SUM
180	0.00	0.00	0.00	0.00	34.17	325.0	4.67	SUM
190	0.00	0.00	0.00	0.00	34.25	325.0	4.00	SUM
200	0.00	0.00	0.00	0.00	34.18	325.0	3.17	SUM
210	0.00	0.00	0.00	0.00	34.27	300.0	2.24	SUM
220	63.91	57.25	22.98	-4.51	100.3	100.0	-2.76	AUT
230	57.25	63.91	19.65	4.51	98.64	100.0	-2.30	WIN
240	48.86	68.62	15.73	13.41	83.88	100.0	-0.84	SUM
250*	38.98	71.25	11.32	21.89	105.6	100.0	0.24	SUM
260	0.00	0.00	0.00	0.00	34.39	300.0	1.62	SUM
270	0.00	0.00	0.00	0.00	34.59	300.0	0.75	SUM
280	0.00	0.00	0.00	0.00	34.91	300.0	-0.46	SUM
290	0.00	0.00	0.00	0.00	34.71	300.0	0.24	SUM
300	0.00	0.00	0.00	0.00	35.01	300.0	-0.75	SUM
310	0.00	0.00	0.00	0.00	35.19	300.0	-1.36	SUM
320	0.00	0.00	0.00	0.00	35.19	300.0	-1.33	SUM
330	0.00	0.00	0.00	0.00	35.16	300.0	-1.23	SUM
340	0.00	0.00	0.00	0.00	35.09	300.0	-1.01	SUM
350	0.00	0.00	0.00	0.00	35.19	300.0	-1.76	SUM
360	70.00	16.00	-44.63	36.63	65.49	150.0	-1.51	AUT

* = worst case flow sector

***** MAKEMET METEOROLOGY PARAMETERS *****

MIN/MAX TEMPERATURE: 250.0 / 310.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
 DOMINANT CLIMATE TYPE: Average Moisture
 DOMINANT SEASON: Summer

ALBEDO: 0.18
 BOWEN RATIO: 0.80
 ROUGHNESS LENGTH: 0.100 (meters)

SURFACE FRICTION VELOCITY (U*) ADJUSTED

METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR MO DY JDY HR
 -- -- -- -- --
 10 03 30 30 13

```

H0      U*      W*  DT/DZ  ZICNV  ZIMCH  M-O LEN      Z0  BOWEN  ALBEDO  REF  WS
-----
250.37  0.897  1.800  0.020  715.  1955.  -221.5  0.100  0.80  0.18  10.00
    
```

```

HT  REF  TA      HT
-----
10.0  250.0  2.0
    
```

WIND SPEED AT STACK HEIGHT (non-downwash): 11.1 m/s
 STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.3 meters
 ESTIMATED FINAL PLUME RISE (non-downwash): 22.1 meters
 ESTIMATED FINAL PLUME HEIGHT (non-downwash): 40.4 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

```

YR MO DY  JDY  HR
-----
10 03 15  30  13
    
```

```

H0      U*      W*  DT/DZ  ZICNV  ZIMCH  M-O LEN      Z0  BOWEN  ALBEDO  REF  WS
-----
14.36  0.438  0.600  0.020  462.  667.  -449.8  0.001  1.50  0.60  10.00
    
```

```

HT  REF  TA      HT
-----
10.0  250.0  2.0
    
```

WIND SPEED AT STACK HEIGHT (non-downwash): 10.6 m/s
 STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.3 meters
 ESTIMATED FINAL PLUME RISE (non-downwash): 22.8 meters
 ESTIMATED FINAL PLUME HEIGHT (non-downwash): 41.1 meters

***** AERSCREEN AUTOMATED DISTANCES *****
 OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	RECEPTOR HEIGHT (m)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	RECEPTOR HEIGHT (m)
40.00	30.88	-0.76	500.00	41.50	1.32
43.36	36.20	-0.76	525.00	39.96	2.92
50.00	48.29	-0.88	550.00	39.06	3.87
75.00	94.51	-2.13	575.00	39.47	-1.37
100.00	105.6	0.24	600.00	38.55	-0.43
125.00	68.86	-0.86	625.00	38.26	0.10
150.00	72.28	-1.67	650.00	37.58	0.24
175.00	72.28	-1.07	675.00	36.29	2.64
200.00	70.47	-0.44	700.00	34.45	2.25
225.00	67.97	0.41	725.00	33.63	9.16
250.00	66.01	1.16	750.00	32.31	0.96
275.00	63.68	0.37	775.00	32.99	0.36
300.00	59.46	-0.43	800.00	32.73	0.24
325.00	55.04	-0.76	825.00	32.10	2.54
350.00	51.63	-0.70	850.00	31.16	3.15
365.90	49.95	-0.71	875.00	30.48	-0.13
375.00	49.09	-0.82	900.00	30.30	0.34
400.00	48.59	-1.62	925.00	30.20	0.75
425.00	48.19	-1.62	950.00	29.65	2.85
450.00	47.72	-1.31	975.00	28.65	2.23
475.00	44.77	-0.27	1000.00	27.71	1.62

 ***** AERSCREEN MAXIMUM IMPACT SUMMARY *****

CALCULATION PROCEDURE	MAXIMUM 1-HOUR CONC (ug/m3)	SCALED 3-HOUR CONC (ug/m3)	SCALED 8-HOUR CONC (ug/m3)	SCALED 24-HOUR CONC (ug/m3)	SCALED ANNUAL CONC (ug/m3)
ELEVATED TERRAIN	106.8	106.8	96.09	64.06	10.68

DISTANCE FROM SOURCE 107.00 meters directed toward 250 degrees
 RECEPTOR HEIGHT 0.12 meters

IMPACT AT THE
 AMBIENT BOUNDARY 30.88 30.88 27.79 18.53 3.088

DISTANCE FROM SOURCE 40.00 meters directed toward 230 degrees
 RECEPTOR HEIGHT -0.76 meters

AERSCREEN OUTPUT FILE (1g/s Ambient Impact)

AERSCREEN 16216 / AERMOD 19191

04/09/20
16:44:17

TITLE: TUNROE ASPHALT PLANT 1G/S

***** STACK PARAMETERS *****

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SOURCE EMISSION RATE:      1.0000 g/s          7.937 lb/hr
STACK HEIGHT:              18.30 meters        60.04 feet
STACK INNER DIAMETER:     1.240 meters        48.82 inches
PLUME EXIT TEMPERATURE:  343.1 K             158.0 Deg F
PLUME EXIT VELOCITY:     21.290 m/s         69.85 ft/s
STACK AIR FLOW RATE:      54477 ACFM
STACK BASE LONGITUDE:    -8.8197 deg         512054. Easting
STACK BASE LATITUDE:     53.1760 deg         5891865. Northing
STACK BASE UTM ZONE:      29
REFERENCE DATUM (NADA):  4
STACK BASE ELEVATION:    25.76 meters        84.51 feet
RURAL OR URBAN:          RURAL

FLAGPOLE RECEPTOR HEIGHT:  1.80 meters        5.91 feet

DIGITAL ELEVATION MAP(S)    C:\ireland\terrain\SRTM_30m\SRTMv3_1_N53W009.tif

INITIAL PROBE DISTANCE =    1000. meters        3281. feet
    
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***** BUILDING DOWNWASH PARAMETERS *****

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BUILDING HEIGHT:          12.7 meters        41.7 feet
MAX BUILDING DIMENSION:  70.0 meters        229.7 feet
MIN BUILDING DIMENSION:  16.0 meters        52.5 feet
BUILDING ORIENTATION TO NORTH:  90. degrees
STACK DIRECTION FROM CENTER:  45. degrees
STACK DISTANCE FROM CENTER:  51.8 meters        169.9 feet
    
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***** FLOW SECTOR ANALYSIS *****
25 meter receptor spacing: 40. meters - 1000. meters

TEMPORAL PERIOD	FLOW SECTOR	BUILD WIDTH	BUILD LENGTH	XBADJ	YBADJ	MAXIMUM 1-HR CONC (ug/m3)	IMPACT DIST (m)	RECEPTOR HEIGHT (m)	
10		71.71	27.91	-56.39	29.71	50.83	300.0	-0.43	SPR
20		71.25	38.98	-66.44	21.89	49.31	300.0	1.08	AUT
30		68.62	48.86	-74.47	13.41	45.92	300.0	-0.12	AUT
40		63.91	57.25	-80.23	4.51	43.52	300.0	-0.76	AUT
50		57.25	63.91	-83.56	-4.51	40.72	300.0	-0.60	AUT
60		48.86	68.62	-84.35	-13.41	30.27	275.0	0.30	WIN
70		38.98	71.25	-82.57	-21.89	25.16	275.0	2.79	WIN
80		0.00	0.00	0.00	0.00	19.83	775.0	9.19	WIN
90		0.00	0.00	0.00	0.00	19.83	775.0	9.31	WIN

100	0.00	0.00	0.00	0.00	19.86	750.0	10.04	WIN
110	0.00	0.00	0.00	0.00	20.29	725.0	19.24	WIN
120	0.00	0.00	0.00	0.00	19.83	750.0	9.16	WIN
130	0.00	0.00	0.00	0.00	19.75	750.0	6.24	WIN
140	0.00	0.00	0.00	0.00	19.73	750.0	5.08	WIN
150	0.00	0.00	0.00	0.00	19.70	775.0	2.60	WIN
160	0.00	0.00	0.00	0.00	19.71	775.0	3.17	WIN
170	0.00	0.00	0.00	0.00	19.68	775.0	0.24	WIN
180	0.00	0.00	0.00	0.00	19.69	775.0	1.26	WIN
190	0.00	0.00	0.00	0.00	19.69	775.0	1.81	WIN
200	0.00	0.00	0.00	0.00	19.72	775.0	4.24	WIN
210	0.00	0.00	0.00	0.00	19.69	775.0	1.67	WIN
220	63.91	57.25	22.98	-4.51	66.29	100.0	-2.76	WIN
230	57.25	63.91	19.65	4.51	66.36	100.0	-2.30	AUT
240	48.86	68.62	15.73	13.41	55.38	100.0	-0.84	SUM
250*	38.98	71.25	11.32	21.89	68.90	100.0	0.24	SUM
260	0.00	0.00	0.00	0.00	19.68	775.0	-0.76	WIN
270	0.00	0.00	0.00	0.00	19.66	750.0	-1.57	WIN
280	0.00	0.00	0.00	0.00	19.67	775.0	-1.76	WIN
290	0.00	0.00	0.00	0.00	19.68	775.0	-0.76	WIN
300	0.00	0.00	0.00	0.00	19.67	775.0	-1.11	WIN
310	0.00	0.00	0.00	0.00	19.68	775.0	0.80	WIN
320	0.00	0.00	0.00	0.00	19.69	775.0	1.24	WIN
330	0.00	0.00	0.00	0.00	19.71	775.0	3.24	WIN
340	0.00	0.00	0.00	0.00	19.71	775.0	3.37	WIN
350	0.00	0.00	0.00	0.00	19.75	750.0	6.03	WIN
360	70.00	16.00	-44.63	36.63	45.35	300.0	-1.76	WIN

* = worst case flow sector

***** MAKEMET METEOROLOGY PARAMETERS *****

MIN/MAX TEMPERATURE: 250.0 / 310.0 (K)

MINIMUM WIND SPEED: 0.5 m/s

ANEMOMETER HEIGHT: 10.000 meters

SURFACE CHARACTERISTICS INPUT: AERMET SEASONAL TABLES

DOMINANT SURFACE PROFILE: Grassland
 DOMINANT CLIMATE TYPE: Average Moisture
 DOMINANT SEASON: Summer

ALBEDO: 0.18
 BOWEN RATIO: 0.80
 ROUGHNESS LENGTH: 0.100 (meters)

SURFACE FRICTION VELOCITY (U*) ADJUSTED

 METEOROLOGY CONDITIONS USED TO PREDICT OVERALL MAXIMUM IMPACT

YR MO DY JDY HR

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 10 01 14 14 13

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O LEN	Z0	BOWEN	ALBEDO	REF WS
114.73	0.547	1.200	0.020	574.	932.	-136.2	0.100	0.80	0.18	6.00

HT	REF TA	HT
10.0	310.0	2.0

WIND SPEED AT STACK HEIGHT (non-downwash): 6.6 m/s
 STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.3 meters
 ESTIMATED FINAL PLUME RISE (non-downwash): 21.0 meters
 ESTIMATED FINAL PLUME HEIGHT (non-downwash): 39.3 meters

METEOROLOGY CONDITIONS USED TO PREDICT AMBIENT BOUNDARY IMPACT

YR MO DY JDY HR

 10 05 31 14 01

H0	U*	W*	DT/DZ	ZICNV	ZIMCH	M-O	LEN	Z0	BOWEN	ALBEDO	REF	WS
-37.82	0.392	-9.000	0.020	-999.	565.	152.1	0.010	1.00	0.20	7.00		

HT	REF	TA	HT
10.0	310.0	2.0	

WIND SPEED AT STACK HEIGHT (non-downwash): 7.9 m/s
 STACK-TIP DOWNWASH ADJUSTED STACK HEIGHT: 18.3 meters
 ESTIMATED FINAL PLUME RISE (non-downwash): 13.2 meters
 ESTIMATED FINAL PLUME HEIGHT (non-downwash): 31.5 meters

***** AERSCREEN AUTOMATED DISTANCES *****
 OVERALL MAXIMUM CONCENTRATIONS BY DISTANCE

DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	RECEPTOR HEIGHT (m)	DIST (m)	MAXIMUM 1-HR CONC (ug/m3)	RECEPTOR HEIGHT (m)
40.00	20.83	-0.76	500.00	38.65	0.79
43.36	24.25	-0.75	525.00	37.15	0.70
50.00	31.94	-0.88	550.00	35.79	0.73
75.00	62.37	-2.13	575.00	34.63	1.35
100.00	68.90	0.24	600.00	33.61	1.97
125.00	40.03	-1.76	625.00	32.76	2.24
150.00	37.52	-0.57	650.00	31.91	2.24
175.00	37.28	1.26	675.00	31.28	2.64
200.00	39.00	-0.44	700.00	30.55	2.25
225.00	44.13	0.41	725.00	29.83	1.64
250.00	48.55	1.16	750.00	29.14	0.96
275.00	48.52	0.37	775.00	28.50	0.36
300.00	50.83	-0.43	800.00	28.09	1.59
325.00	49.50	-0.76	825.00	27.70	2.54
350.00	46.37	-0.70	850.00	27.30	3.15
365.90	44.58	-0.71	875.00	26.78	3.04
375.00	45.08	3.40	900.00	26.31	3.24
400.00	46.57	3.89	925.00	25.81	3.24
425.00	44.78	2.84	950.00	25.23	2.85
450.00	42.53	2.24	975.00	24.63	2.23
475.00	40.46	1.50	1000.00	24.04	1.62

***** AERSCREEN MAXIMUM IMPACT SUMMARY *****

CALCULATION	MAXIMUM 1-HOUR CONC	SCALED 3-HOUR CONC	SCALED 8-HOUR CONC	SCALED 24-HOUR CONC	SCALED ANNUAL CONC

PROCEDURE	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)	(ug/m3)
ELEVATED TERRAIN	69.72	69.72	62.75	41.83	6.972

DISTANCE FROM SOURCE 107.00 meters directed toward 250 degrees
 RECEPTOR HEIGHT 0.12 meters

IMPACT AT THE AMBIENT BOUNDARY	20.83	20.83	18.74	12.50	2.083
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DISTANCE FROM SOURCE 40.00 meters directed toward 230 degrees
 RECEPTOR HEIGHT -0.76 meters