DAFTAR PUSTAKA

Aly S.H. Hustim. M. Zakaria R. Rahmawati. I.E. 2018. *Aplikasi Model Aermod dalam Memprediksi Sebaran Emisi Cerobong Asap PLTD Tello, Makassar*. Prosiding Seminar Ilmiah Sains dan Teknologi ke-41 Tahun 2018. 4

Alemayehu D. Hackett F. 2015. Gaussian Dispersion Model to Estimate The Dispersion Particulate Matters ($PM_{2,5}$) and Sulfur Dioxide (SO_2) Concentration on Tribal Land, Oklahoma. American Journal of Environmental Science. 11 (6) : 440

Aslim M. A. F. I. Ihsan N. Yani A. 2019. *Pemodelan Sebaran Polutan Udara Akibat Aktivitas PLTD Tello Kota Makassar Menggunakan Model Dispersi Gauss.* Jurnal Sains dan Pendidikan. 15 (1) : 36 – 44.

Assomadi A F. 2018. Pendekatan Baru Model Distribusi Pencemar di AtmosferPerkotaan. Disertasi, Jurusan Teknik Lingkungan ITS.

Bady M. 2017. Evaluation of Gaussian Plume Model against CFD Simulation through the Estimation of CO and NO Concentration in an Urban Area. American Journal of Environmental Science. 13 (2) : 93.

Cahyono W E. 2011. Kajian Tingat Pencemaran Sulfr Dioksida dari Industri di Beberapa Daerah di Indonesia. Berita Dirgantara. 12 (4) : 132.

Cimorelli A.J Et al. 2004. Aermod : Desription of model formulation. Environemtal protection agency: United state.

Darmawan R. 2018. Analisis Risiko Kesehatan Lingkungan Kadar NO2 serta Keluhan Kesehatan Petugas Pemungut Karcil Tol. Jurnal Kesehatan Lingkungan. 10 (1) : 116 – 125.

Eviane D. Natsir T A. Iswanto N. Urufi Z. Adji M. 2020. Air Pollution Dispersion Modeling of Runway and Apron at Sam Ratulangi International Airport. Angkasa Jurnal Ilmiah Bidang Teknologi. 13 (2) : 103.

Fadholi A. 2013. Analisis Data Arah dan Kecepatan Angin Lnadasan Pacu (Runway) Menggunakan Aplikasi Windrose Plot (WRPLOT). Jurnal Ilmu Komputer. 9 (2) : 84.

Nurrohman F., Tjasyono B. 2016. Kajian Indeks Stabilitas Atmosfer terhadap Kejadian Hujan Lebat di Wilayah Makassar (Studi Kasus Bulan Desember 2013-2014). Jurnal Meteorologi Klimatologi dan Geofisika. 3 (2) : 18 – 20.

Hasibuan F. Warsito. Suciyanti S. W. 2015. *Simulasi Model Dispersi Polutan Gas dan Partikulat Molekul pada Pabrik Semen dengan Menggunakan Softwere Mathlab 7.12.* Jurnal Teori dan Aplikasi Fisika. 3 (2) : 142.

Hastutiningrum S. Sunarsih S. Imelda. 2018. Analisis Hubungan Aktivitas Kendaraan Bermotor terhadap Konsentrasi SO_2, dan NO_2 di Udara Ambien (Studi Kasus : Jl. Panembahan Senopati Yogyakarta). Jurnal Teknologi Technoscientia. 11 (1) : 85 – 90.

Jayadipraja E A. Daud A. Assegaf A. H. Maming. 2016. *The Use of Aermod in Modelling The Emission Dispersion of SO2 dan NO2 to Identify Area Exposed to Health Risk.* Public Health of Indonesia. 2 (1) : 1

Kumar A. Dikshit A K. Patil R S. 2021. Use of Simulated and Observed Meteorology for Aiur Quality Modeling and Source Ranking for an Industrial Region. Sustainability. 13 (4275) : 1 – 15.

Kramawijaya A G. 2017. Kajian Emisi Patikulat dan Gas dari Suatu Pertambangan Nikel di Halmahera Tengah. 2 (1) : 166 – 168.

Liandy. 2015. Analisis Sebaran Total Suspended Particulate (TSP), Sulfur Dioxide (SO_2) dan Nitrogen Diokside (NO_2) di Udara Ambien dari Emisi Pembangkit Listrik Tenaga Uap (PLTU) Banten 3 Lontar dengan Model Gaussian. Indonesian Journal of Urban and Environmental Technologi 7 (2) : 47 - 56.

Mijling B. 2019. *High Resolution Mapping of Urban Air Quality with Heterogeneous Observations: a new methodology and its application to Amsterdam.* Atmospheric Measurement Techniques.

Narimawati. 2008. *Metode penelitian Kuantitatif Kualikatif dan R&D.* Alfabeta : Bandung.

Nuning E.K., Azizah R. 2008. Pengaruh Penggunaan Cerobong Asap Model "Water Spons Filter (WSF)" terhadap Penurunan Kadar SO_2 pada Industri Tahu di Sukun, Malang. Jurnal Kesehatan Lingkungan. 3 (1) : 59 – 66.

Peraturan Pemerintah Republik Indonesia Nomor 22 Tahun 2021 tentang Penyelenggaraan Perlingdungan dan Pengelolaan Lingkungan Hidup.

Purba A A. 2020. Urgensi Pengetatan Baku Mutu Ambien Indonesia (Studi Kasus Gugatan Pemulihatan Udara DKI Jakarta). Padjajaran Law Research and Debate Society. 8 (1) : 99.

Rahmadani, Ardhi. 2017. Pemodelan Dispersi Pencemaran Udara Sumber Majemuk Industri Semen di Kabupaten Tuban Jawa Timur (Skripsi). Surabaya Institut Teknologi Sepuluh November.

Ramadhan W M, Soemirat J, Handayani D A. 2017. Kajian Desain Cerobong Asap terhadap Emisi PM_{10} dan SO_2 akibat Pembakaran Batubara di PLTU

PT.X. Jurnal Rekayasa Lingkungan Jurnal Onlien Institut Teknologi Nasional. 1 (5) : 1 – 5.

Ratnani R D. 2008. Teknik Pengendalian Pencemaran Udara yang diakibatkan ole Partikel. Momentum. 4 (2) : 27 -30

Rofienda. 2004. Dampak Negatif Pencemaran Nitrogen Dioksida, Usaha Pencegahan dan Penanggulangannya. Buletin Penelitian. 26 (1) : 26- 27.

Sosaidi D S. Akbar D. Analisis Bilangan Richardson (Ri) untuk Stabilitas Atmosfer Meteorologi Mikro di Staklim Bogor. Jurnal Saintika UNPAM. 2 (2) : 115-119.

Sugiyono. 2009. *Statistika untuk Penelitian.* CV. Alfabeta : Bandung.

Syahrorini S. Rahmansyah A. Pramono S H. 2018. *Distribution Model of Particulate Dust From Chimney of Sidoarjo Sugar.* J-PAL. 9 (2) : 111. https://www.epa.gov/scram/air-quality-models

Varma A S K. Sathish U and Nagarajan N. 2016. Prediction of SPM, SO2 and NO2 Concentration in The Vicinity of Cement Industry Using Gaussian Model. Research Journal of Pharmaceutical, Biological and Chemical Science. 7 (6) :

Varma S A K. 2013. Evoluation of Wind Rose Diagrams for RTPP, KADAPA, S.P, India. International Journal of Innovation Research and Development. 2 (13) : 150 – 155.

Wang X. Liu M. Luo L. Chen X. Zhang Y. Zhang H. Yang S. Li Y. 2021. Spatial and Temporal Distributions of Air Pollutants in Nanchang, Southeast China during 2017-2020. 12 (1298) : 1 – 18.

Widyani A F. 2018. Aplikasi Model Gauss Termodifikasi terhadap Dispersi Pencemaran Udara dari Sumber Majemuk (Studi Kasus Industri Semen di Kabupaten Bogor). Skripsi, Jurusan Teknik Lingkungan Institut Teknologi Sepuluh November.

Yunita R D., Kiswandono A A. 2017. Kajian Indeks Standar Pencemaran Udara ISPU) Sulfur Dioksida (SO_2) sebagai Polutan Udara pada Tiga Lokasi di Kota Bandar Lampung. Analit: Analytical and Environmental Chemistry. 2 (1) : 1.

Zakaria N., Azizah R. 2013. Analisis Pencemaran Udara (SO_2), Keluhan Iritasi Tenggorokan dan Keluhan Kesehatan Iritasi mata pada Pedagang Makanan di Sekitar Terminal Joyoboyo Surabaya. 2 (1) : 75 – 81.

LAMPIRAN

LAMPIRAN 1. Hasil Pengujian Emisi

Sample ID : **Sintering 1 (0)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	1766	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	198	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	7.35	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.10	n/a	n/a	
9	Standard Volume Sample	m^3	1.08	n/a	n/a	
10	Actual Oxygen, O_2	%	18.2	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	6.3	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	19.8	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	101	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	5	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	14	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	160	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	< 10	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	21	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	57	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	6500	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Sintering 2 (0)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	1766	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	252	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	4.74	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.15	n/a	n/a	
9	Standard Volume Sample	m^3	1.12	n/a	n/a	
10	Actual Oxygen, O_2	%	18.3	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	6.8	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	21.3	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	106	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	5	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	15	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	160	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	< 10	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	22	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	63	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	6900	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Sintering 3 (0)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	1766	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	252	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	8.06	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.07	n/a	n/a	
9	Standard Volume Sample	m^3	1.05	n/a	n/a	
10	Actual Oxygen, O_2	%	18.3	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	6.7	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	20.9	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	105	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	6	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	15	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	160	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	< 10	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	26	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	64	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	690	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID	**: Cerobong Kiln (0)**	**WLN Lab ID**	**:**	**2205123**	
Sample Matrix	: Emission Air	Reg. Date	:	05-07-2022	

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	3000	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	152	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	6.05	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.19	n/a	n/a	
9	Standard Volume Sample	m^3	1.17	n/a	n/a	
10	Actual Oxygen, O_2	%	8.0	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	10.2	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	30.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	42.2	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	94	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	10	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	104	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	350	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	12	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	9	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	88	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	290	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Cerobong Reduksi 1 (1)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	2000	n/a	n/a	
4	Ambient Temperature	°C	30	n/a	n/a	
5	Stack Temperature	°C	108	n/a	n/a	
6	Meter Temperature	°C	30	n/a	n/a	
7	Moisture Content	%	9.84	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.02	n/a	n/a	
9	Standard Volume Sample	m^3	1.01	n/a	n/a	
10	Actual Oxygen, O_2	%	16.5	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	12.3	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.3	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	48.9	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	107	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	13	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	51	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	180	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	11	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	32	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	125	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	460	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Cerobong Reduksi 2 (1)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	2000	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	91	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	8.09	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	0.97	n/a	n/a	
9	Standard Volume Sample	m^3	0.95	n/a	n/a	
10	Actual Oxygen, O_2	%	16.7	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	11.8	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.3	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	46.7	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	99	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	12	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	49	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	180	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	10	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	32	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	128	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	460	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Dry Kiln 1 (1)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	3600	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	172	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	3.81	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.37	n/a	n/a	
9	Standard Volume Sample	m^3	1.35	n/a	n/a	
10	Actual Oxygen, O_2	%	17.6	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	7.0	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.2	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	43.2	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	103	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	18	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	36	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	180	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	14	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	59	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	119	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	600	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Dry Kiln 2 (1)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	3600	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	171	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	5.51	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	0.98	n/a	n/a	
9	Standard Volume Sample	m^3	0.96	n/a	n/a	
10	Actual Oxygen, O_2	%	18.0	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	13.6	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	83.4	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	103	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	17	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	33	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	170	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	15	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	66	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	123	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	650	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Reduksi 1-1 (2)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	2000	n/a	n/a	
4	Ambient Temperature	°C	30	n/a	n/a	
5	Stack Temperature	°C	113	n/a	n/a	
6	Meter Temperature	°C	30	n/a	n/a	
7	Moisture Content	%	5.17	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.53	n/a	n/a	
9	Standard Volume Sample	m^3	1.51	n/a	n/a	
10	Actual Oxygen, O_2	%	16.4	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	11.9	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.3	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	47.1	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	97	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	38	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	18	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	210	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	13	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	92	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	43	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	510	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Reduksi 1-2 (2)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	2000	n/a	n/a	
4	Ambient Temperature	°C	31	n/a	n/a	
5	Stack Temperature	°C	130	n/a	n/a	
6	Meter Temperature	°C	31	n/a	n/a	
7	Moisture Content	%	5.75	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.56	n/a	n/a	
9	Standard Volume Sample	m^3	1.53	n/a	n/a	
10	Actual Oxygen, O_2	%	16.3	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	11.8	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.3	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	67.2	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	103	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	38	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	21	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	220	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	13	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	90	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	48	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	510	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Reduksi 2-1 (2)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	2000	n/a	n/a	
4	Ambient Temperature	°C	30	n/a	n/a	
5	Stack Temperature	°C	161	n/a	n/a	
6	Meter Temperature	°C	30	n/a	n/a	
7	Moisture Content	%	5.11	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.49	n/a	n/a	
9	Standard Volume Sample	m^3	1.47	n/a	n/a	
10	Actual Oxygen, O_2	%	17.1	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	11.9	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.2	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	68.3	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	10 2	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	34	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	27	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	200	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	12	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	98	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	78	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	580	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Reduksi 2-2 (2)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	2000	n/a	n/a	
4	Ambient Temperature	°C	30	n/a	n/a	
5	Stack Temperature	°C	105	n/a	n/a	
6	Meter Temperature	°C	30	n/a	n/a	
7	Moisture Content	%	4.75	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.53	n/a	n/a	
9	Standard Volume Sample	m^3	1.51	n/a	n/a	
10	Actual Oxygen, O_2	%	16.5	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	11.4	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.3	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	65.2	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	95	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	37	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	26	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	200	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	12	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	93	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	65	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	490	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Dry Kiln 1 (2)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

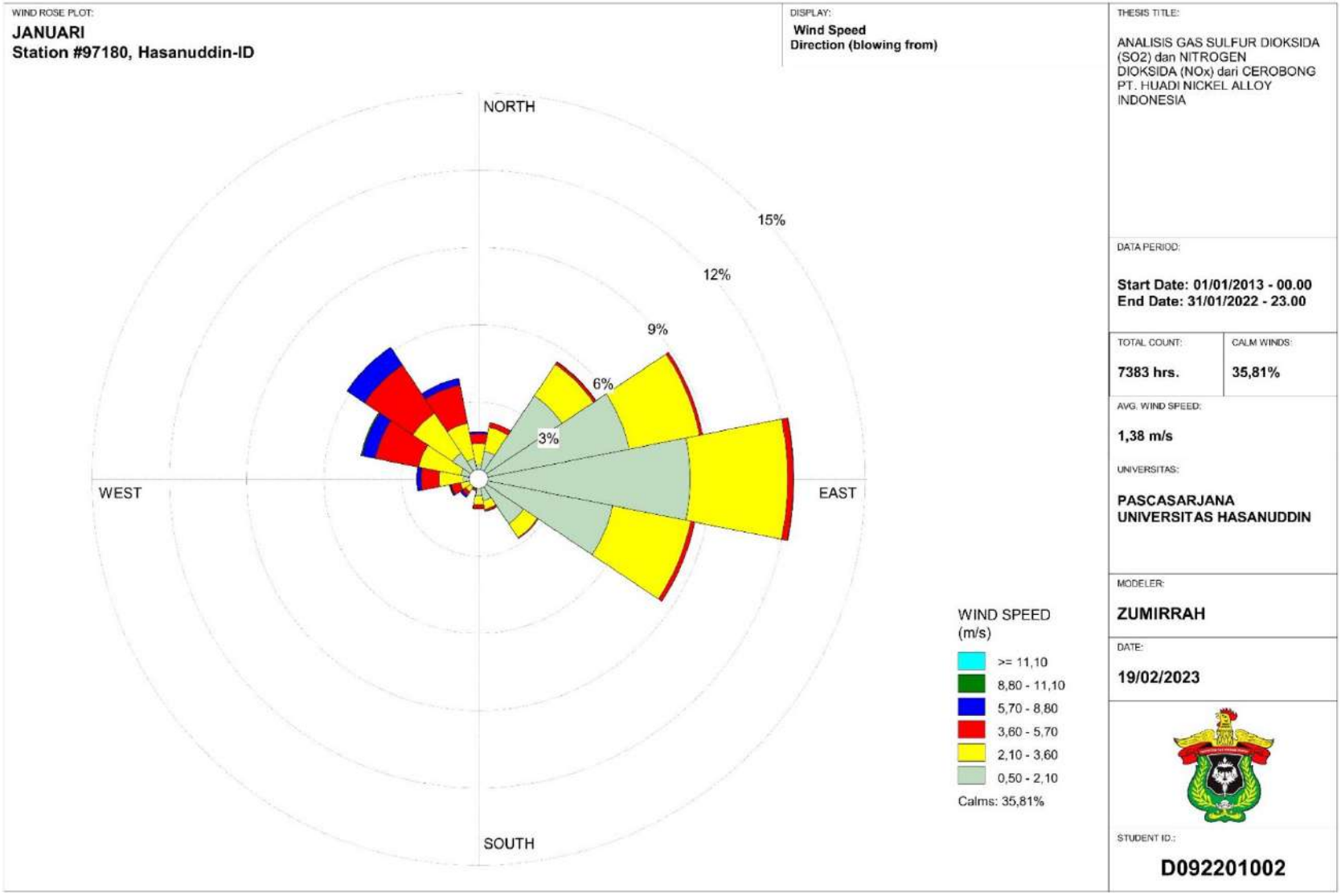
No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	40500	n/a	n/a	
4	Ambient Temperature	°C	30	n/a	n/a	
5	Stack Temperature	°C	113	n/a	n/a	
6	Meter Temperature	°C	30	n/a	n/a	
7	Moisture Content	%	5.17	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.53	n/a	n/a	
9	Standard Volume Sample	m^3	1.51	n/a	n/a	
10	Actual Oxygen, O_2	%	18.5	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	11.6	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	66.1	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	96	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	15	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	11	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	160	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	11	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	70	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	52	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	730	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

Sample ID : **Dry Kiln 2 (2)**
Sample Matrix : Emission Air

Government Regulation Limit (GRL) : PerMen LHK No 4 Tahun 2014 Lampiran I Tabel 4 *(Reduction Kiln)*

No	Text Description	UoM	Result	GRL	Method Reference	Rem Q
	Isokinetic Sampling Stack Condition					
1	Engine	n/a	-	n/a	n/a	
2	Fuel Type	n/a	Coal	n/a	n/a	
3	Capacity	kVA	40500	n/a	n/a	
4	Ambient Temperature	°C	32	n/a	n/a	
5	Stack Temperature	°C	169	n/a	n/a	
6	Meter Temperature	°C	32	n/a	n/a	
7	Moisture Content	%	5.55	n/a	SNI 7117.16.2009	Q
8	Actual Volume Sample	m^3	1.54	n/a	n/a	
9	Standard Volume Sample	m^3	1.50	n/a	n/a	
10	Actual Oxygen, O_2	%	18.3	n/a	SNI 19.7117.10.2005	Q
11	Velocity Linear	m/s	12.4	n/a	SNI 7117.14.2009	Q
12	Dry Molecular Weight	g/mol	29.1	n/a	SNI 7117.15.2009	Q
13	Actual Stack Flowrate	m^3/s	70.8	n/a	SNI 7117.14.2009	
14	Percent of Isokinetic	%	103	n/a	SNI 19.7117.17.2009	
	Emission Air (Actual)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	15	n/a	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	8	n/a	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	150	n/a	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q
4	Hydrogen Sulphide (H_2S)	mg/Nm^3	< 0.1	10	WI-(ID)-[EHS]-LA-056	
5	Opacity	%	11	30	Ringleman	
6	Zinc (Zn)	mg/Nm^3	< 1	50	WI-(ID)-[EHS]-LA-072	
7	Nickel (Ni)	mg/Nm^3	< 0.1	50	WI-(ID)-[EHS]-LA-072	
	Emission Air {Corrected to 10% Oxygen at 25°C, 1 atm)					
1	Sulfur Dioxide (SO_2)	mg/Nm^3	65	800	SNI 7117.18-2009	Q
2	Total Particulate (isokinetic)	mg/Nm^3	32	250	SNI 7117.17-2009	Q
3	Nitrogen Oxide (NO_2)	mg/Nm^3	640	800	WI-(ID)-[EHS]-LA-117 (Electrochemical)	Q

LAMPIRAN 2. Windrose

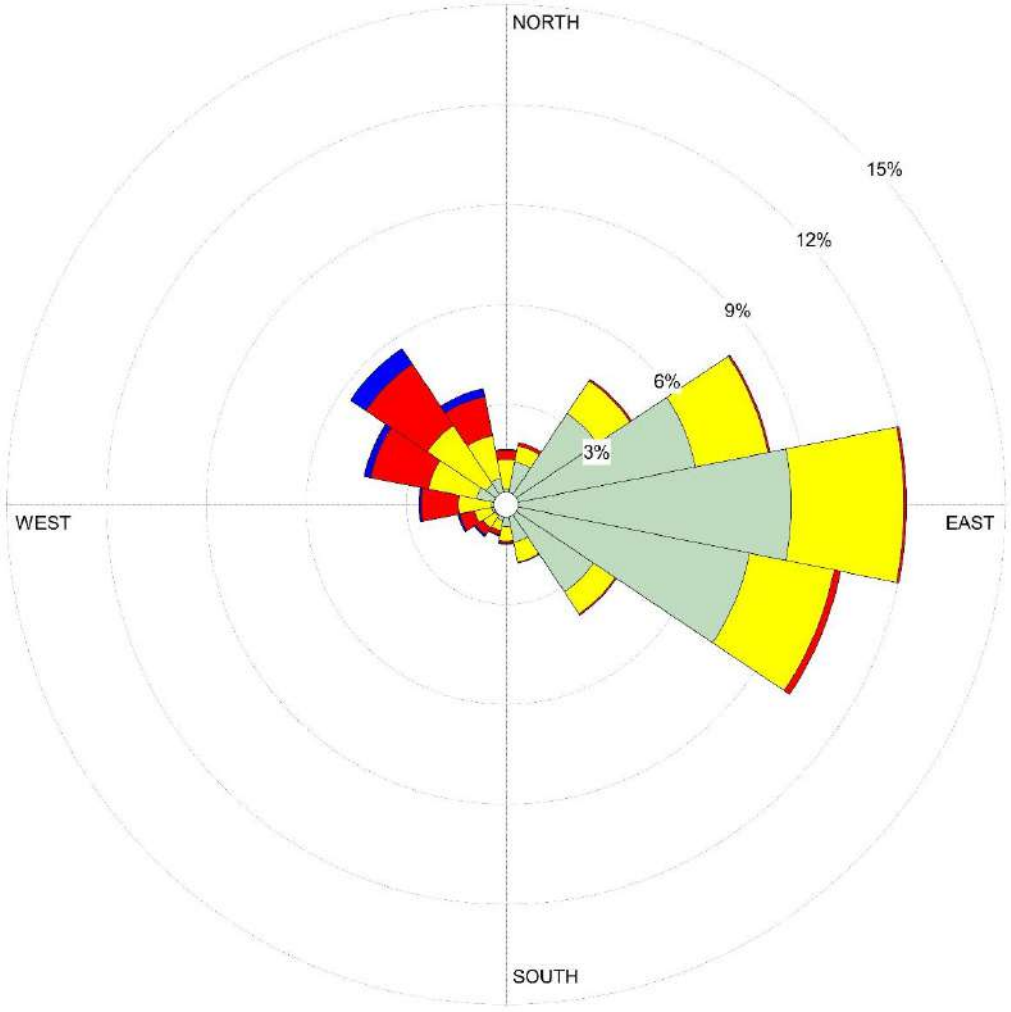


WIND ROSE PLOT:

FEBRUARI
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED (m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 34,77%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/02/2013 - 00.00
End Date: 28/02/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
6623 hrs.	**34,77%**

AVG. WIND SPEED:

1,32 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

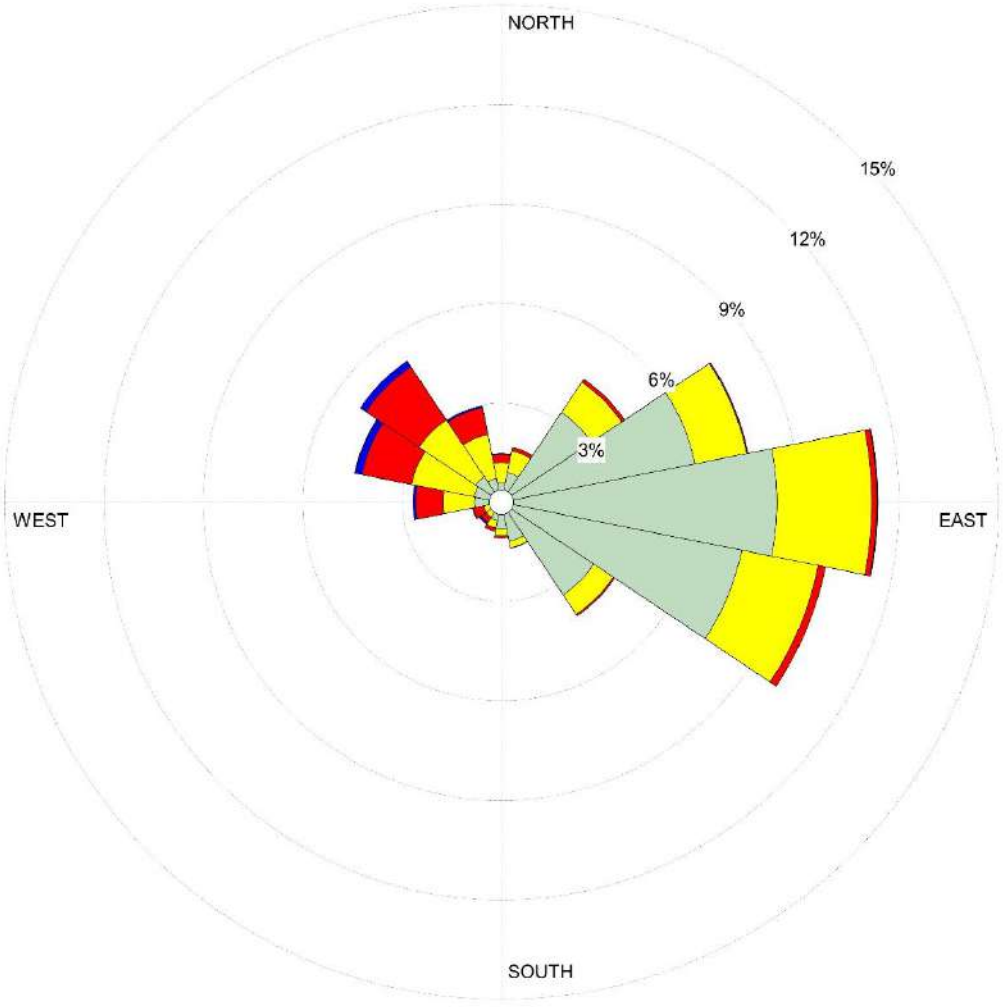
D092201002

WIND ROSE PLOT:

MARET
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/03/2013 - 00.00
End Date: 31/03/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7384 hrs.	**38,90%**

AVG. WIND SPEED:

1,17 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

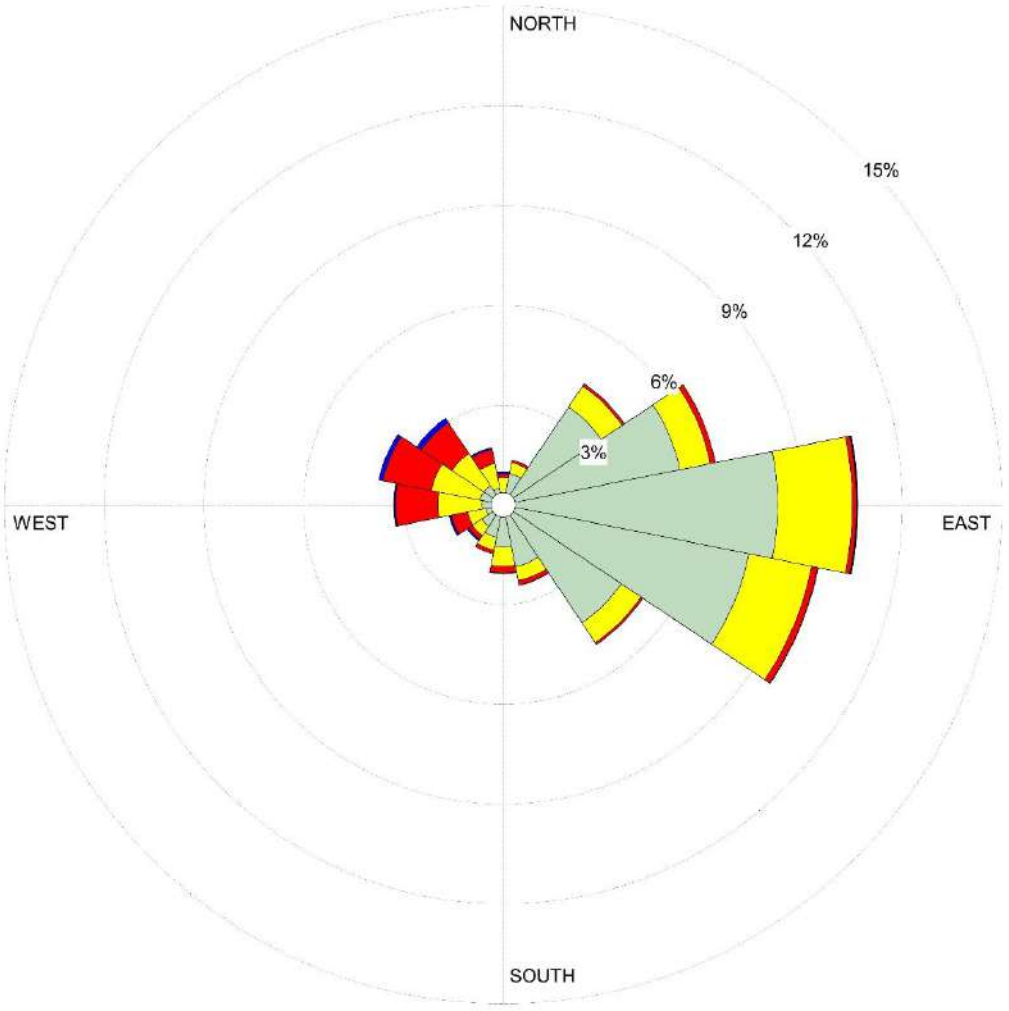
D092201002

WIND ROSE PLOT:

APRIL
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/04/2013 - 00.00
End Date: 30/04/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7168 hrs.	**40,31%**

AVG. WIND SPEED:

1,09 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

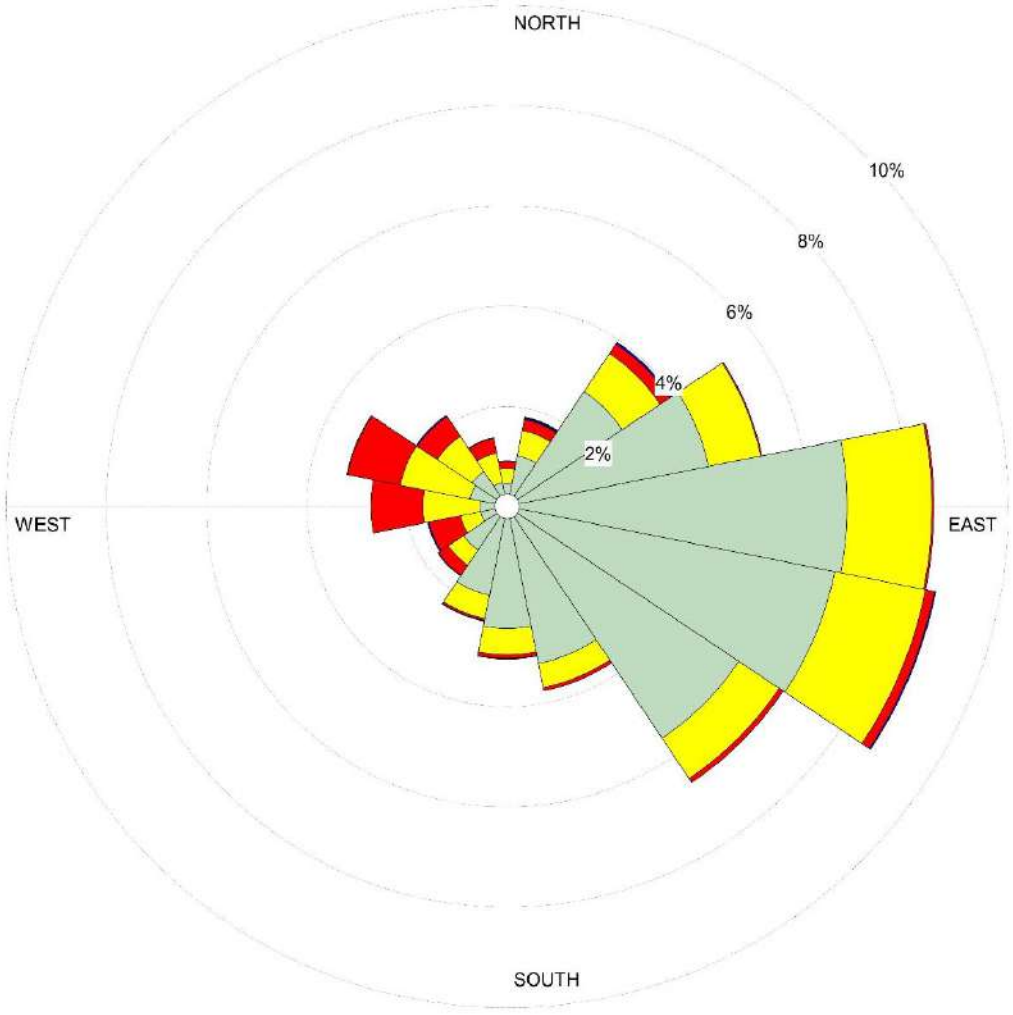
D092201002

WIND ROSE PLOT:

MEI
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED (m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 42,24%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/05/2013 - 00.00
End Date: 31/05/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7356 hrs.	**42,24%**

AVG. WIND SPEED:

0,99 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

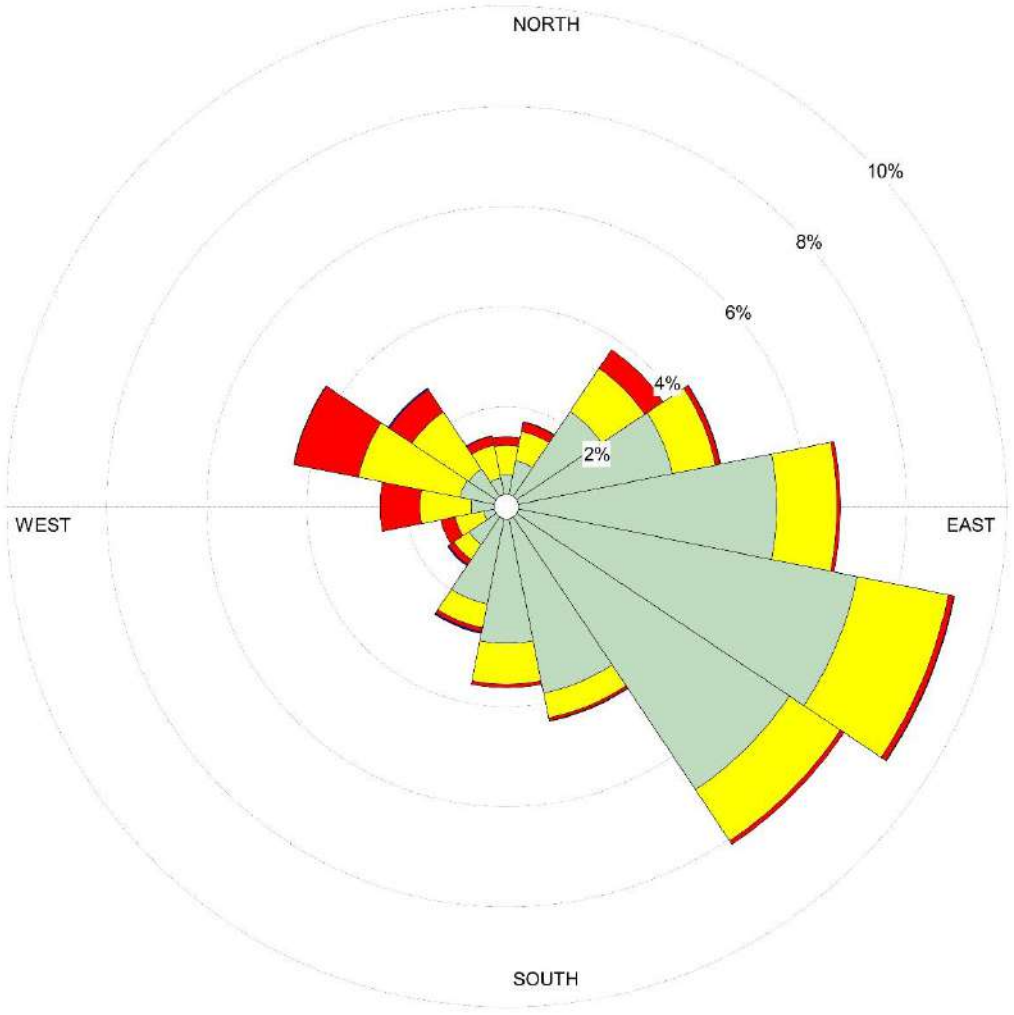
D092201002

WIND ROSE PLOT:

JUNI
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 40,23%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/06/2013 - 00.00
End Date: 30/06/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7161 hrs.	**40,23%**

AVG. WIND SPEED:

1,01 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

D092201002

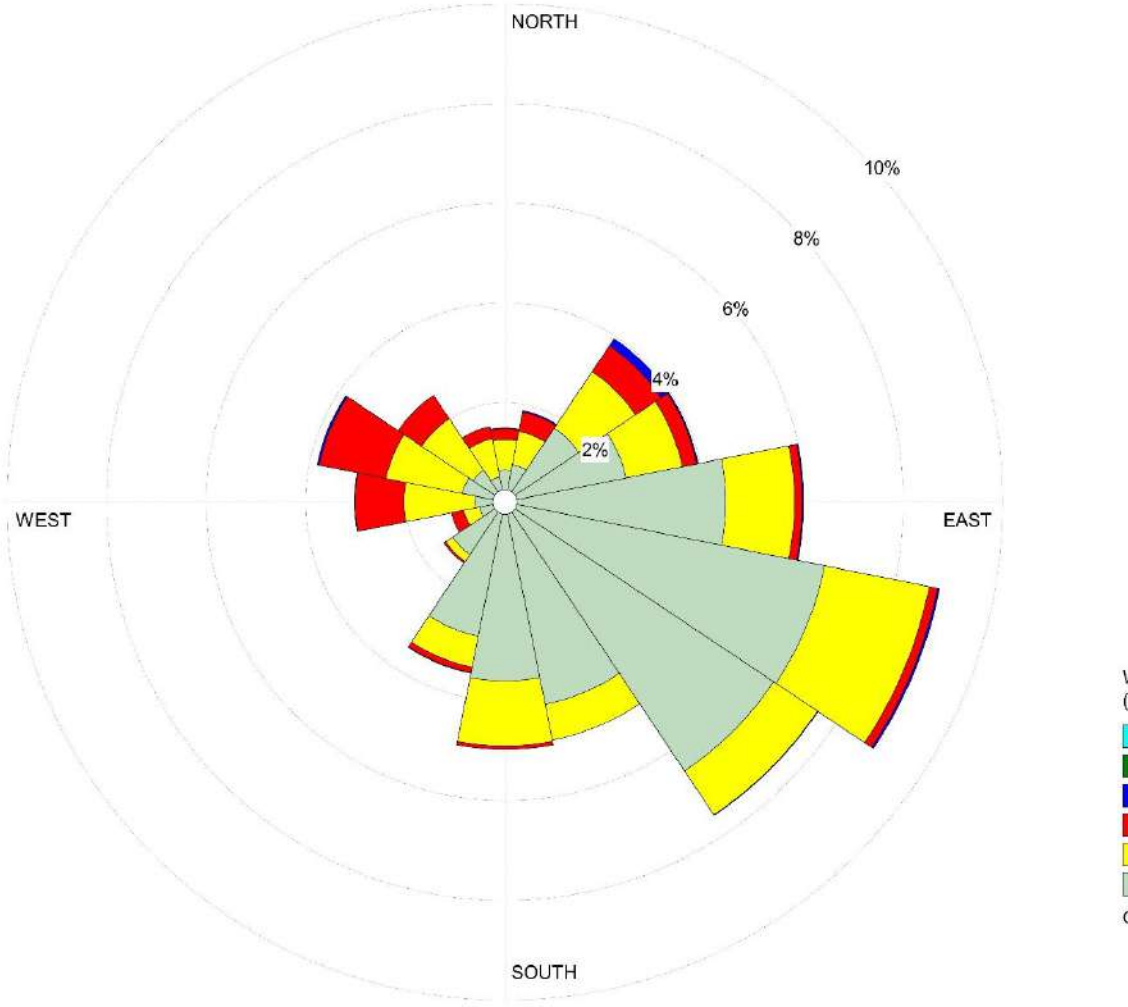
WIND ROSE PLOT:

JULI

Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/07/2013 - 00.00
End Date: 31/07/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7105 hrs.	**39,31%**

AVG. WIND SPEED:

1,09 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

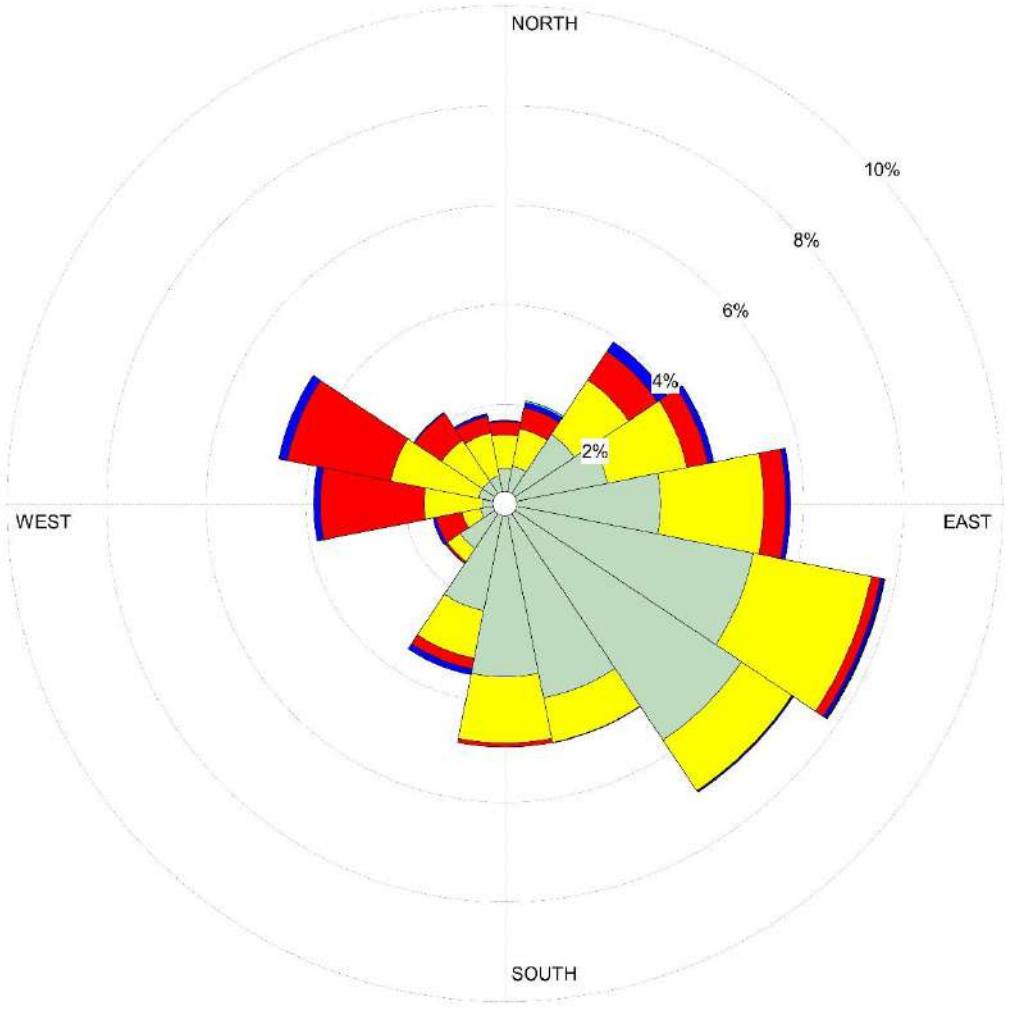
D092201002

WIND ROSE PLOT:

AGUSTUS
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED (m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 38,75%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/08/2013 - 00.00
End Date: 31/08/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7390 hrs.	**38,75%**

AVG. WIND SPEED:

1,29 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID :

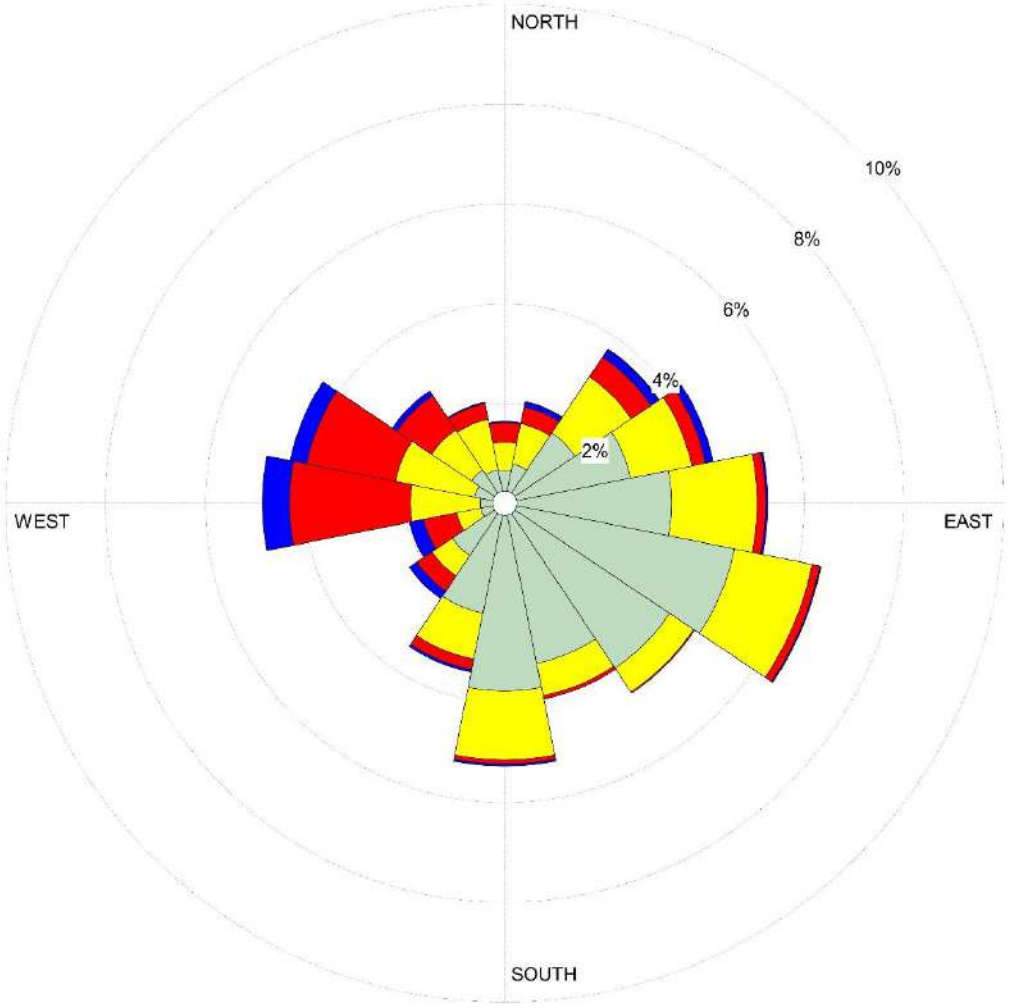
D092201002

WIND ROSE PLOT:

SEPTEMBER
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED (m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 40,94%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/09/2013 - 00.00
End Date: 30/09/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7122 hrs.	**40,94%**

AVG. WIND SPEED:

1,28 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

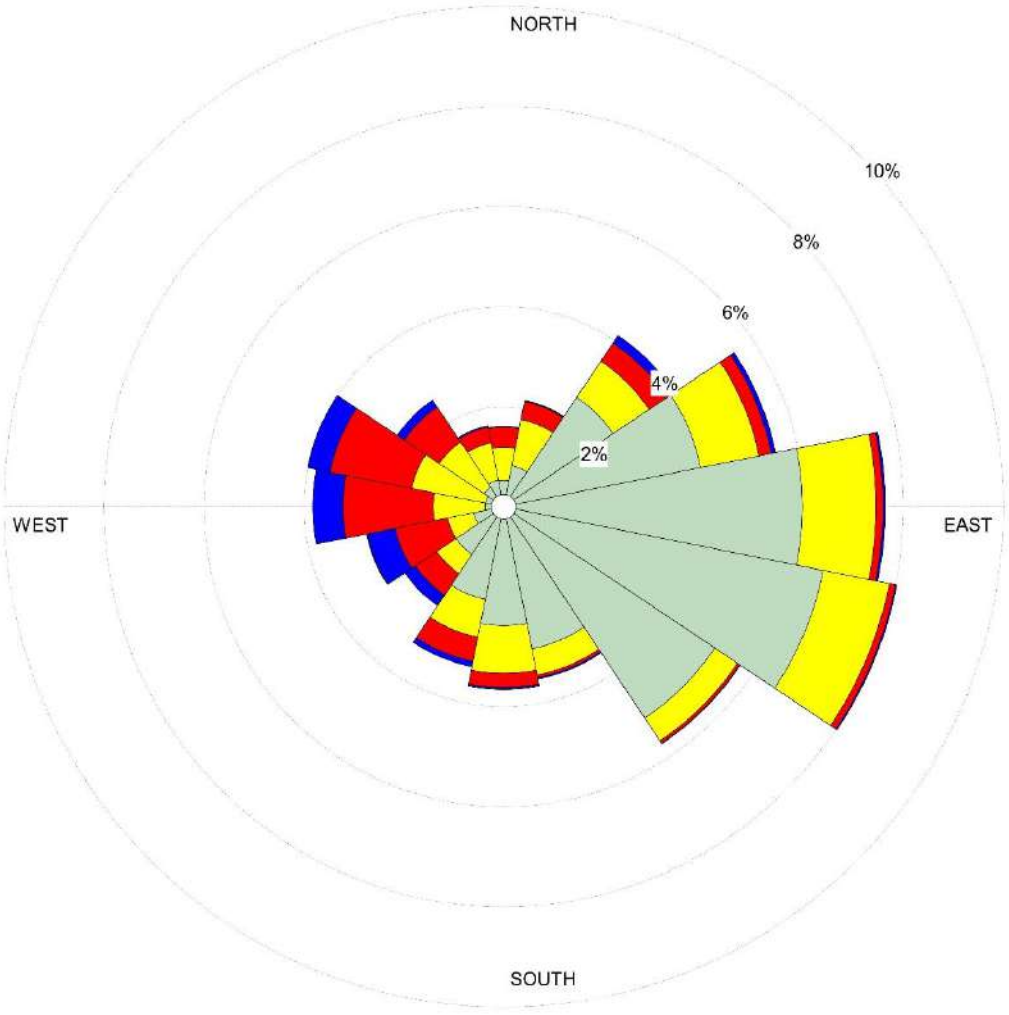
D092201002

WIND ROSE PLOT:

OKTOBER
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED (m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 37,52%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/10/2013 - 00.00
End Date: 31/10/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7146 hrs.	**37,52%**

AVG. WIND SPEED:

1,31 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

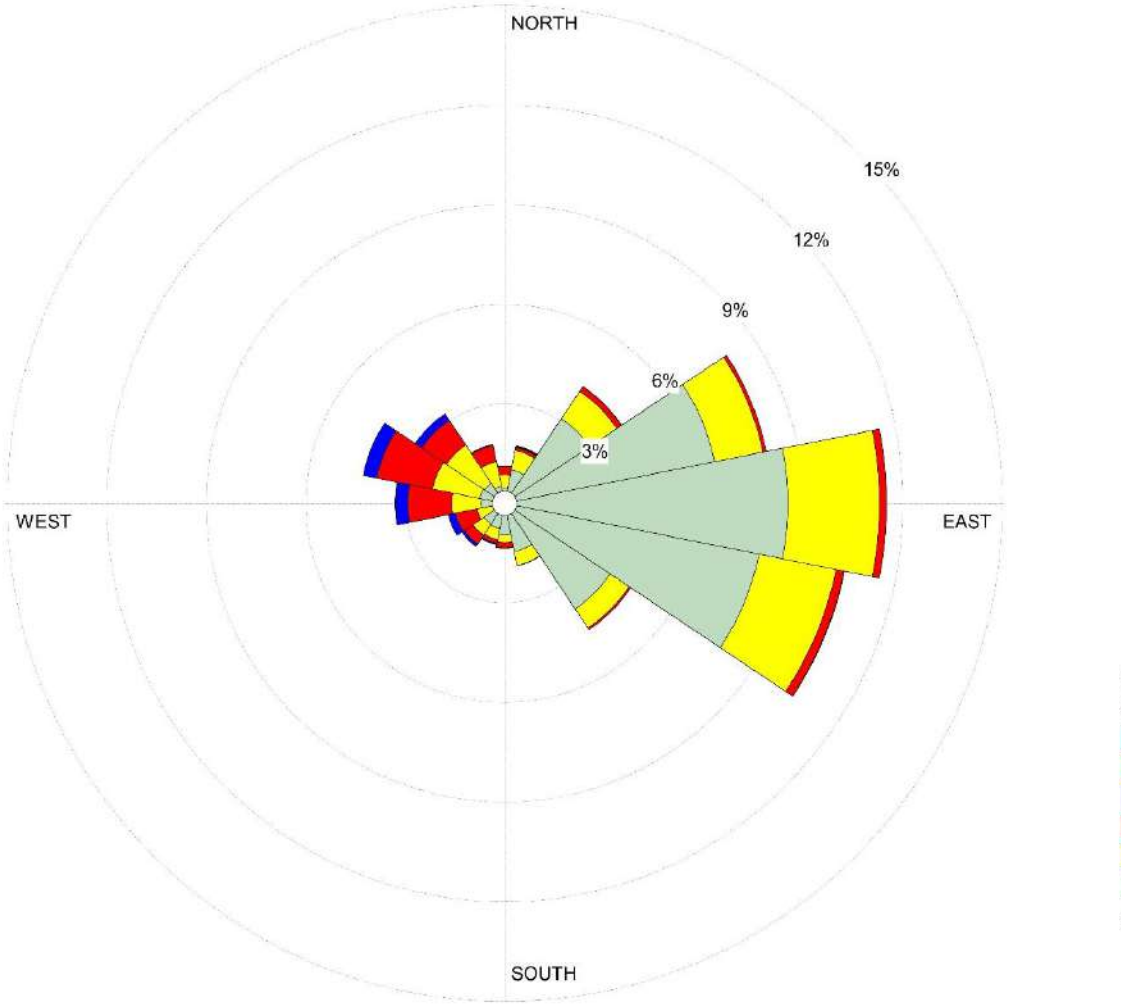
D092201002

WIND ROSE PLOT:

NOVEMBER
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/11/2013 - 00.00
End Date: 30/11/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
6936 hrs.	**37,69%**

AVG. WIND SPEED:

1,20 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

D092201002

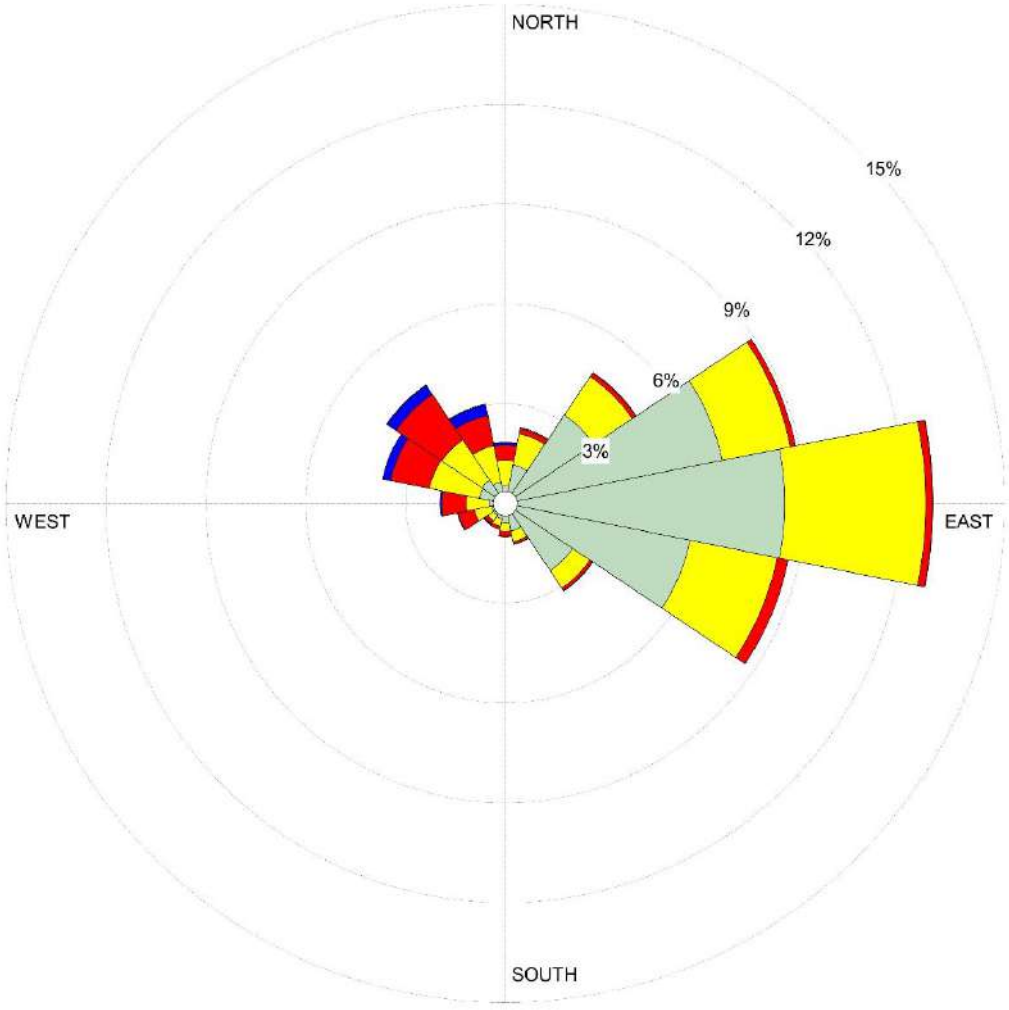
WIND ROSE PLOT:

DESEMBBER

Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

Calms: 39,09%

THESIS TITLE:

ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA

DATA PERIOD:

Start Date: 01/12/2013 - 00.00
End Date: 31/12/2022 - 23.00

TOTAL COUNT:	CALM WINDS:
7350 hrs.	**39,09%**

AVG. WIND SPEED:

1,23 m/s

UNIVERSITAS:

PASCASARJANA
UNIVERSITAS HASANUDDIN

MODELER:

ZUMIRRAH

DATE:

19/02/2023

STUDENT ID.:

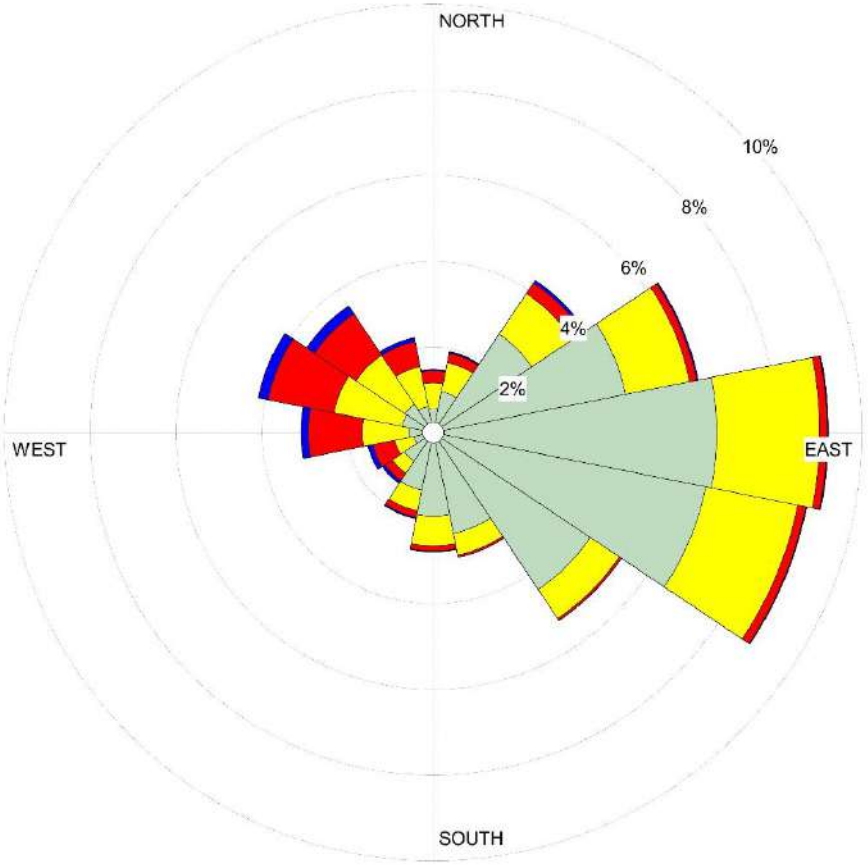
D092201002

WIND ROSE PLOT:

WINDROSE 2013-2022
Station #97180, Hasanuddin-ID

DISPLAY:

Wind Speed
Direction (blowing from)



WIND SPEED
(m/s)

- >= 11,10
- 8,80 - 11,10
- 5,70 - 8,80
- 3,60 - 5,70
- 2,10 - 3,60
- 0,50 - 2,10

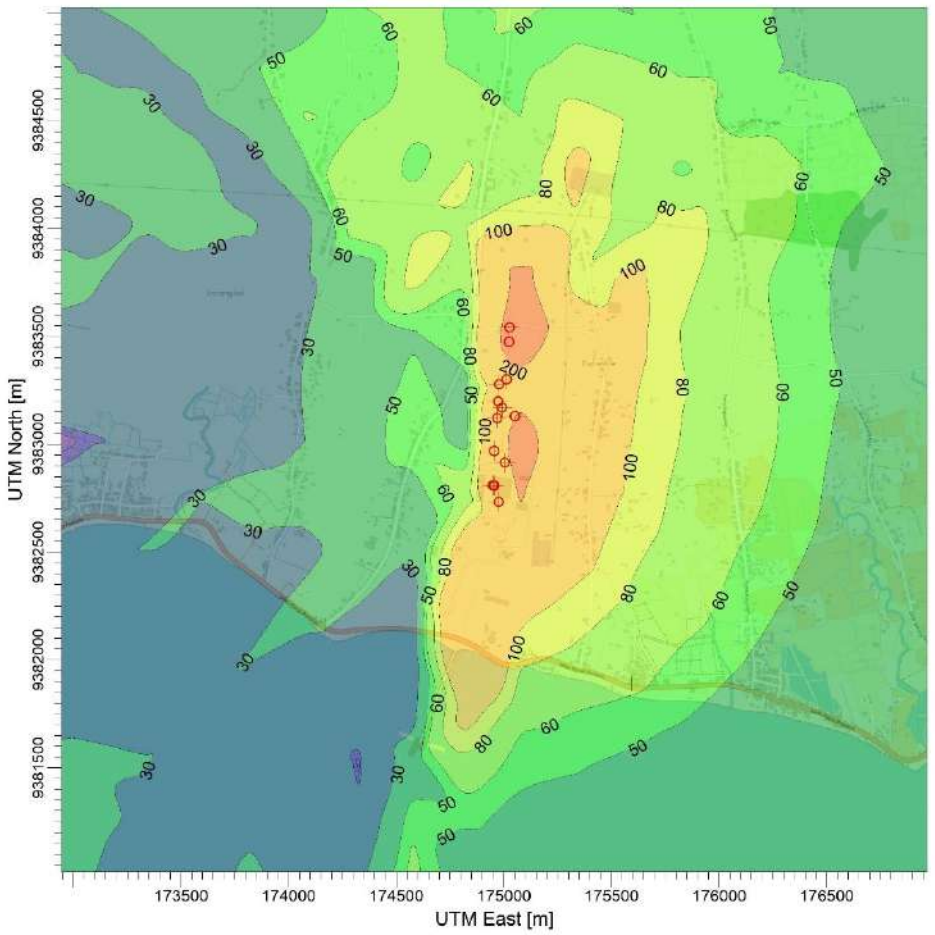
Calms: 38,89%

THESIS TITLE: ANALISIS GAS SULFUR DIOKSIDA (SO2) dan NITROGEN DIOKSIDA (NOx) dari CEROBONG PT. HUADI NICKEL ALLOY INDONESIA	DATA PERIOD: **Start Date: 01/01/2013 - 00.00** **End Date: 31/12/2022 - 23.00**	UNIVERSITAS: **PASCASARJANA UNIVERSITAS HASANUDDIN**	
		MODELER: **ZUMIRRAH**	
	CALM WINDS: **38,89%**	TOTAL COUNT: **86124 hrs.**	
	AVG. WIND SPEED: **1,19 m/s**	DATE: **19/02/2023**	STUDENT ID.: **D092201002**

LAMPIRAN 3. Pola Sebaran

PROJECT TITLE:

POLA SEBARAN NO2
RATA - RATA 1 JAM



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 286 [ug/m^3] at (175076.07, 9383517.25)

7 9 10 30 50 60 80 100 200 286

COMMENTS: Data Input : METEOROLOGI -Station WMO 97180 Hasanuddin -Total Data 87641 Hr TERRAIN WebGis STRM3 (Global-90m)	POINT SOURCES: **14**	UNIVERSITY: **UNIVERSITAS HASANUDDIN**
	RECEPTORS: **447**	MODELER: **ZUMIRRAH**
	OUTPUT TYPE: **Concentration**	SCALE: 1:26.000 0 1 km
	MAX: **286 ug/m^3**	STUDENT ID: **D092201002**

AERMOD View - Lakes Environmental Software

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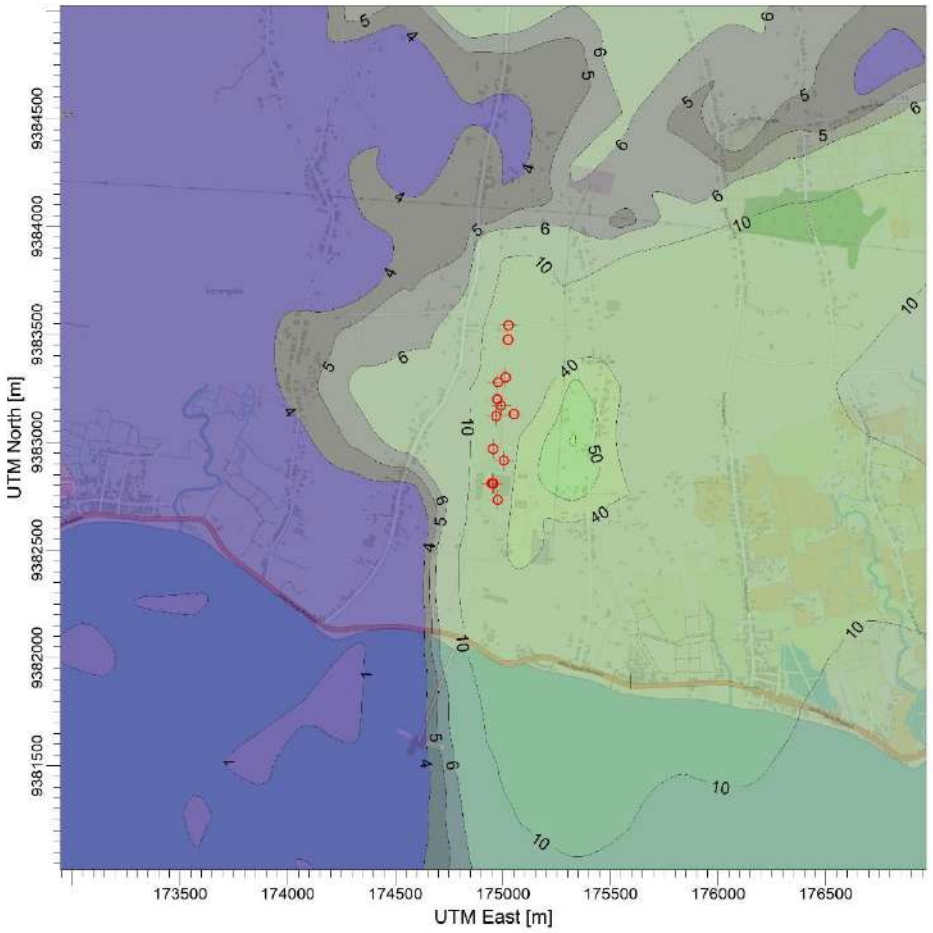
PROJECT TITLE:

POLA SEBARAN NO2
RATA - RATA 24 JAM



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

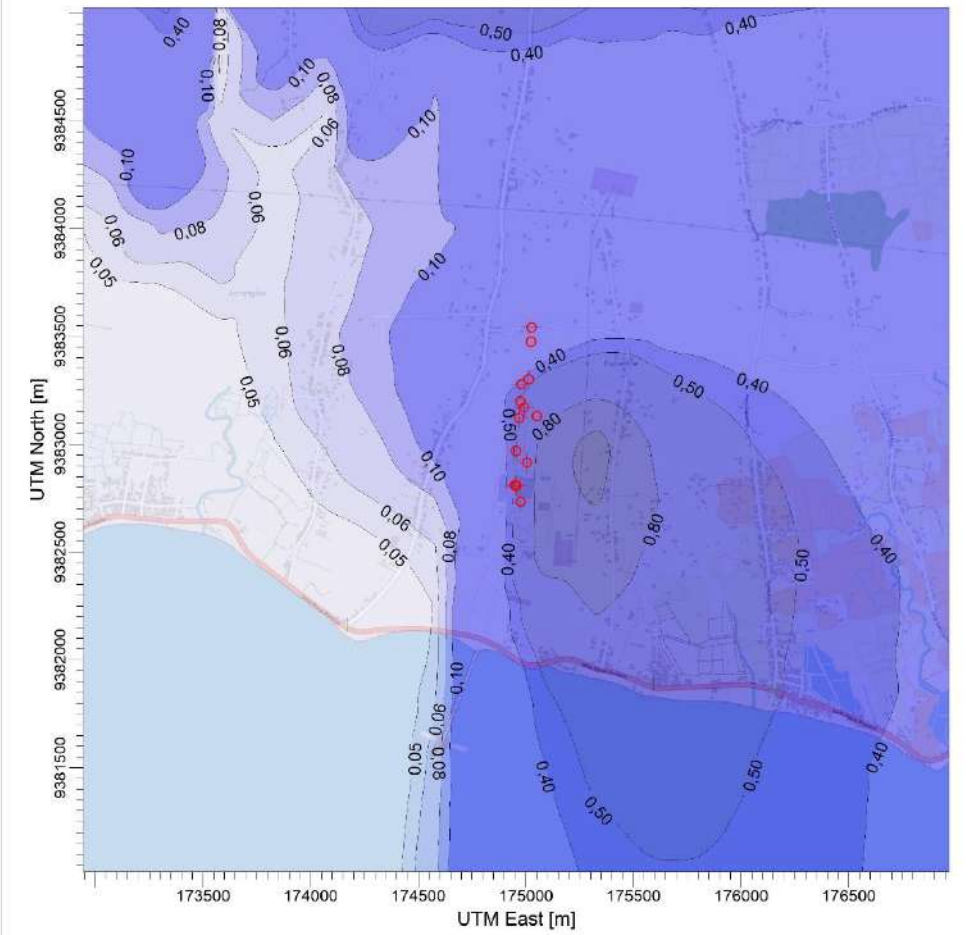
Max: 61,1 [ug/m^3] at (175325,97, 9383016,87)

0,7 1,0 4,0 5,0 6,0 10,0 40,0 50,0 60,0 61,1

COMMENTS:	POINT SOURCES:	UNIVERSITY:
Data Input : METEOROLOGI -Station WMO 97180 Hasanuddin -Total Data 87641 Hr TERRAIN WebGis STRM3 (Global-90m)	**14**	**UNIVERSITAS HASANUDDIN**
	RECEPTORS:	MODELER:
	447	**ZUMIRRAH**
	OUTPUT TYPE:	SCALE: 1:26.000
	Concentration	0 1 km
	MAX:	STUDENT ID:
	61,1 ug/m^3	**D092201002**

PROJECT TITLE:

POLA SEBARAN NO2
RATA - RATA TAHUNAN



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 2,33 [ug/m^3] at (175575,87, 9385518,77)

0,02 0,05 0,06 0,08 0,10 0,40 0,50 0,80 1,00 2,00 2,33

COMMENTS: Data Input : METEOROLOGI -Station WMO 97180 Hasanuddin -Total Data 87641 Hr TERRAIN WebGis STRM3 (Global-90m)	POINT SOURCES: **14**	UNIVERSITY: **UNIVERSITAS HASANUDDIN**
	RECEPTORS: **447**	MODELER: **ZUMIRRAH**
	OUTPUT TYPE: **Concentration**	SCALE: 1:26.000 0 1 km
	MAX: **2,33 ug/m^3**	STUDENT ID: **D092201002**

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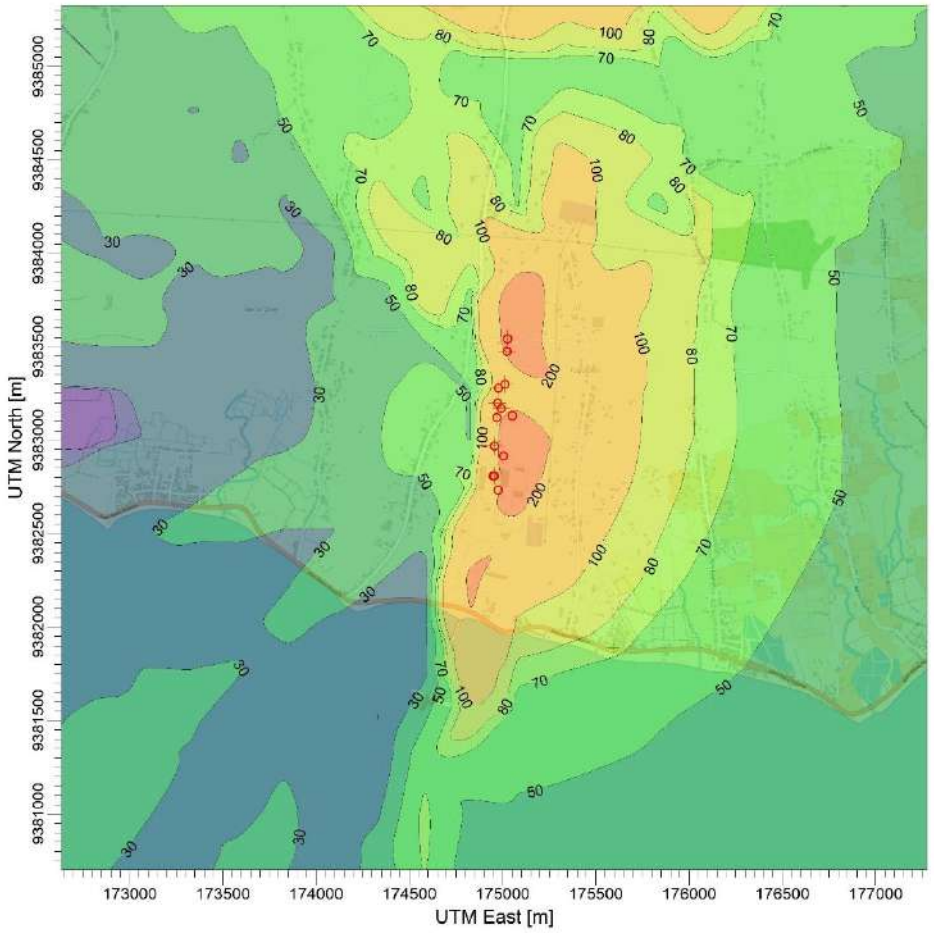
PROJECT TITLE:

POLA SEBARAN SO2
RATA-RATA 1 JAM



PLOT FILE OF HIGH 1ST HIGH 1-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 295 [ug/m^3] at (175076.98, 9383015.27)

8 9 10 30 50 70 80 100 200 295

COMMENTS: Data Input : METEOROLOGI - Station WMO 97180 Hasanuddin - Total data 87641 Hr TERRAIN : WebGis STRM3 (Global-90m)	POINT SOURCES: **14**	UNIVERSITY: **UNIVERSITAS HASANUDDIN**
	RECEPTORS: **447**	MODELER: **ZUMIRRAH**
	OUTPUT TYPE: **Concentration**	SCALE: 1:30,000 0 1 km
	MAX: **295 ug/m^3**	STUDENT ID: **D092201002**

AERMOD View - Lakes Environmental Software

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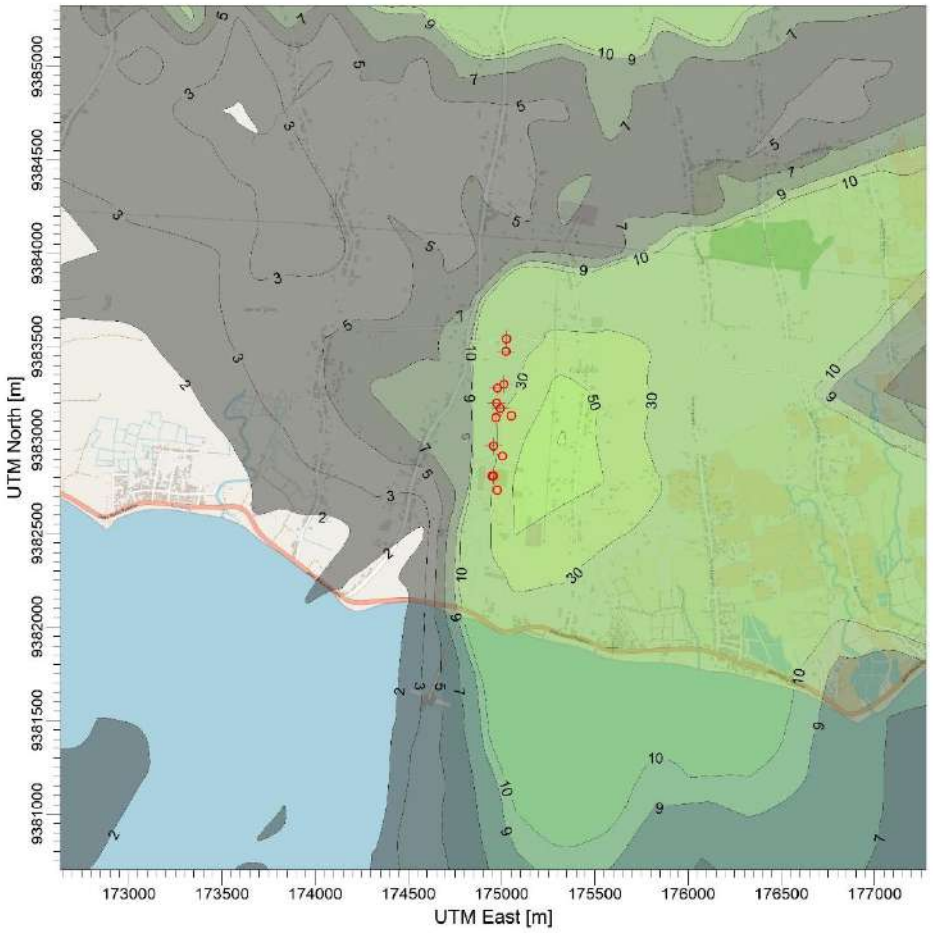
PROJECT TITLE:

POLA SEBARAN SO2
RATA-RATA 24 JAM



PLOT FILE OF HIGH 1ST HIGH 24-HR VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 72,2 [ug/m^3] at (175325,80, 9383015,27)

2,0 3,0 5,0 7,0 9,0 10,0 30,0 50,0 70,0 72,2

COMMENTS: Data Input : METEOROLOGI - Station WMO 97180 Hasanuddin - Total data 87641 Hr TERRAIN : WebGis STRM3 (Global-90m)	POINT SOURCES: **14**	UNIVERSITY: **UNIVERSITAS HASANUDDIN**
	RECEPTORS: **447**	MODELER: **ZUMIRRAH**
	OUTPUT TYPE: **Concentration**	SCALE: 1:30.000 0 1 km
	MAX: **72,2 ug/m^3**	STUDENT ID: **D092201002**

AERMOD View - Lakes Environmental Software

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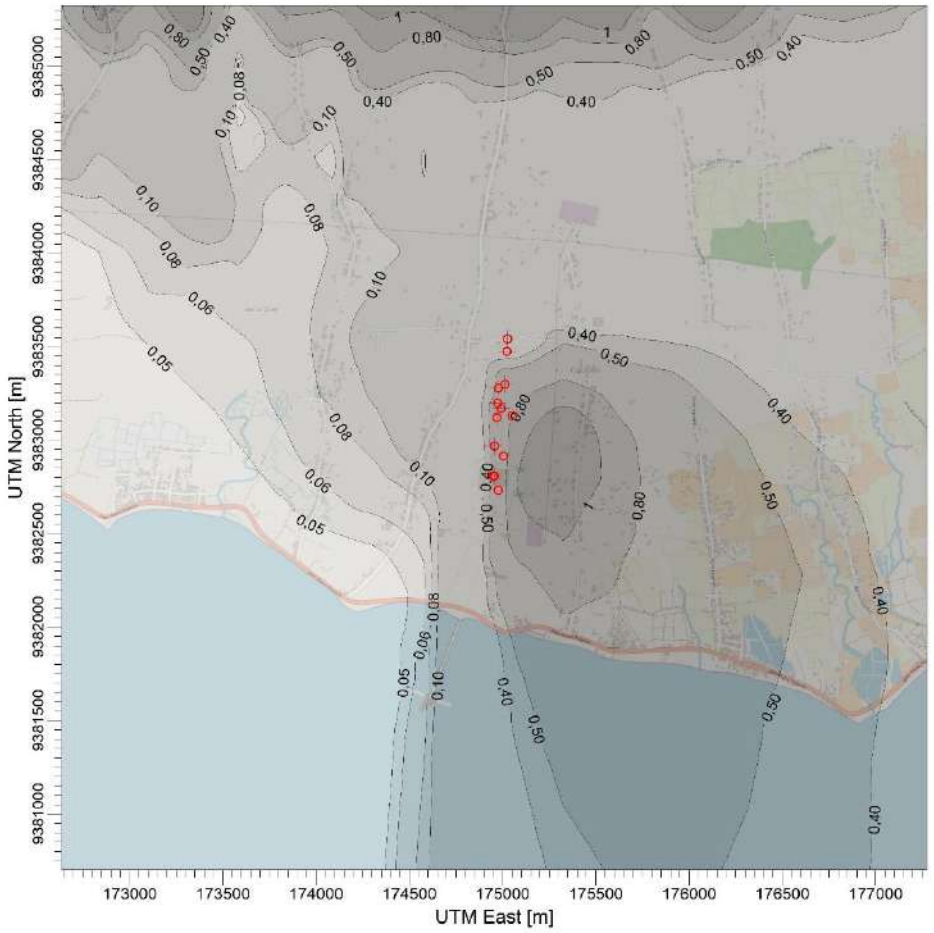
PROJECT TITLE:

POLA SEBARAN SO2
RATA-RATA TAHUNAN



PLOT FILE OF ANNUAL VALUES FOR SOURCE GROUP: ALL ug/m^3

Max: 2,42 [ug/m^3] at (175574,62, 9385513,47)

0,02 0,05 0,06 0,08 0,10 0,40 0,50 0,80 1,00 2,00 2,42

COMMENTS: Data Input : METEOROLOGI - Station WMO 97180 Hasanuddin - Total data 87641 Hr TERRAIN : WebGis STRM3 (Global-90m)	POINT SOURCES: **14**	UNIVERSITY: **UNIVERSITAS HASANUDDIN**
	RECEPTORS: **447**	MODELER: **ZUMIRRAH**
	OUTPUT TYPE: **Concentration**	SCALE: 1:30.000 0 1 km
	MAX: **2,42 ug/m^3**	STUDENT ID: **D092201002**

AERMOD View - Lakes Environmental Software

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LAMPIRAN 4. Spesifikasi Cerobong

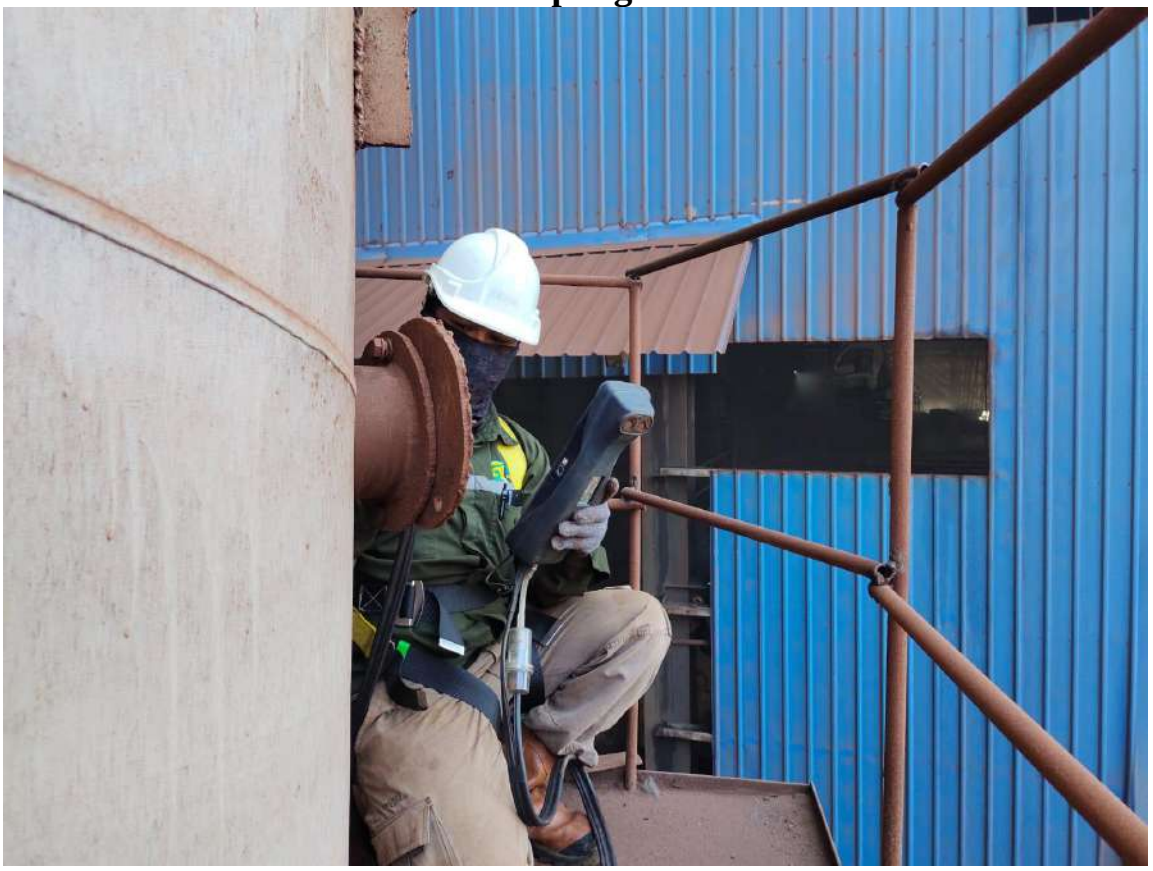
No	Nama Cerobong	Titik Koordinat		Tinggi Cerobong	Diameter cerobong	Tinggi Titik Sampling	Foto Cerobong
		X	Y				
TAHAP 0							
1	Cerobong sintering 1	174948	9382810	19,5 meter	2 meter	7,5 meter	
2	Cerobong sintering 2	174952	9382810	19,5 meter	2 meter	7,5 meter	
3	Cerobong sintering 3	174956	9382809	19,5 meter	2 meter	7,5 meter	
4	Cerobong EP Tungku Furnace	174976	9382733	19,5 meter	2,3 meter	10,65 meter	

No	Nama Cerobong	Titik Koordinat		Tinggi Cerobong	Diameter cerobong	Tinggi Titik Sampling	Foto Cerobong
		X	Y				
TAHAP 1							
1	Cerobong Dry Kiln 1	175012	9383301	15 meter	2,8 meter	6,5 meter	
2	Cerobong Dry Kiln 2	174992	9383171	15 meter	2,8 meter	6,5 meter	
3	Cerobong Reduksi Sintering 1	174973	9383199	10 meter	2.25 meter	4.5 meter	
4	Cerobong Reduksi Sintering 2	174977	9383279	10 meter	2.25 meter	4.5 meter	

No	Nama Cerobong	Titik Koordinat		Tinggi Cerobong	Diameter cerobong	Tinggi Titik Sampling	Foto Cerobong
		X	Y				
TAHAP 2							
1	Cerobong Reduksi Sintering 1	175023	9383476	10 meter	2.25 meter	4.5 meter	
2	Cerobong Reduksi Sintering 2	175026	9383543	10 meter	2.25 meter	4.5 meter	
3	Cerobong Dry Kiln 1	174955	9382970	14,5 meter	2,70 meter	7,8 meter	
4	Cerobong Dry Kiln 2	174968	9383122	14,5 meter	2,70 meter	7,8 meter	

No	Nama Cerobong	Titik Koordinat		Tinggi Cerobong	Diameter cerobong	Tinggi Titik Sampling	Foto Cerobong
		X	Y				
5	Cerobong Reduksi Sintering 1-2	175004	9382916	14,5 meter	2,70 meter	4,5 meter	
6	Cerobong Reduksi Sintering 2-2	175051	9383131	14,5 meter	2,70 meter	4,5 meter	

LAMPIRAN 5. Dokumentasi Sampling




EL-ALLOY
INDONESIA

LAMPIRAN 6. Data Output

Control Pathway

AERMOD

Dispersion Options

Titles

C:\Lakes\PT HUADI NIKEL ALLOY INDONESIA\AERMOD\PT HUADI NO2\PT HUADI

Dispersion Options

☐ Regulatory Default ☑ Non-Default Options

- ☑ Flat & Elevated Terrain
- ☐ No Stack-Tip Downwash (NOSTD)
- ☐ Run in Screening Mode
- ☑ Conversion of NOx to NO2 (OLM or PVMRM)
- ☐ No Checks for Non-Sequential Met Data
- ☐ Fast All Sources (FASTALL)
- ☐ Fast Area Sources (FASTAREA)
- ☐ Optimized Area Source Plume Depletion
- ☐ Gas Deposition

BETA Options:

- ☐ Capped and Horizontal Stack Releases
- ☐ Adjusted Friction Velocity (u^*) in AERMET (ADJ_U*)
- ☐ Low Wind Options

- ☐ SCIM (Sampled Chronological Input Model)
- ☐ Ignore Urban Night / Daytime Transition (NOURBTRAN)

Dispersion Coefficient

Rural

Output Type

- ☑ Concentration
- ☐ Total Deposition (Dry & Wet)
- ☐ Dry Deposition
- ☐ Wet Deposition

Plume Depletion

- ☐ Dry Removal
- ☐ Wet Removal

Output Warnings

- ☐ No Output Warnings
- ☐ Non-fatal Warnings for Non-sequential Met Data

Pollutant / Averaging Time / Terrain Options

Pollutant Type

NO2

Exponential Decay

☐ Yes ☑ No

Averaging Time Options

Hours ☑ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 6 ☐ 8 ☐ 12 ☑ 24

☑ Month ☐ Period ☑ Annual

Terrain Height Options

☐ Flat ☑ Elevated

SO: Meters
RE: Meters
TG: Meters

Flagpole Receptors

☐ Yes ☑ No

Default Height = 0.00 m

Control Pathway

AERMOD

Optional Files

☐ Re-Start File ☐ Init File ☐ Multi-Year Analyses ☐ Event Input File ☑ Error Listing File

Detailed Error Listing File

Filename: PT HUADI NO2 KOREKSI.err

☐ Model Debug File ☐ Met Profile Debug File

NOx to NO2 Conversion Options

☑ OLM (Ozone Limiting Method)
☐ PVMRM (Plume Volume Molar Rate Method)

Default Ozone Concentration: PPB
Filename:
Unit: ug/m^3

Source Pathway - Source Inputs

AERMOD

Point Sources

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/s]	Gas Exit Temp. [K]	Gas Exit Velocity [m/s]	Stack Inside Diameter [m]
POINT	STCK1	174948.00	9382810.00	18,49	19,50	0,41580	471,15	6,30	2,00
		Cerobong Sintering 1							
POINT	STCK2	174952.00	9382810.00	18,60	185,00	0,48650	525,15	6,78	2,00
		Cerobong sintering 2							
POINT	STCK3	174956.00	9382809.00	18,70	19,50	0,54340	525,15	6,65	2,00
		Cerobong sintering 3							
POINT	STCK4	174976.00	9382733.00	18,60	119,50	0,37950	425,15	10,16	2,30
		Cerobong EP Tungku Furnace							
POINT	STCK5	175012.00	9383301.00	22,67	15,00	2,54850	445,15	7,02	2,80
		Cerobong Dry Kiln 1							
POINT	STCK6	174992.00	9383171.00	20,22	15,00	5,50440	444,15	13,54	2,80
		Cerobong Dry Kiln 2							
POINT	STCK7	174973.00	9383199.00	19,87	10,00	1,56480	381,15	12,30	2,25
		Cerobong Reduksi Sintering 1							
POINT	STCK8	174977.00	9383279.00	21,09	10,00	1,49440	364,15	11,75	2,25
		Cerobong Reduksi Sintering 2							
POINT	STCK9	175023.00	9383476.00	27,44	10,00	4,38030	386,15	11,85	2,25
		Cerobong Reduksi Sintering 1-1							
POINT	STCK10	175026.00	9383543.00	29,20	10,00	6,69340	434,15	17,18	2,25
		Cerobong Reduksi Sintering 2-1							
POINT	STCK11	174955.00	9382970.00	18,69	14,50	4,62700	386,15	11,54	2,70
		Cerobong Dry Kiln 1							
POINT	STCK12	174968.00	9383122.00	19,80	14,50	4,60200	442,15	12,37	2,70
		Cerobong Dry Kiln 2							

Source Pathway - Source Inputs

AERMOD

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/s]	Gas Exit Temp. [K]	Gas Exit Velocity [m/s]	Stack Inside Diameter [m]
POINT	STCK13	175004.00	9382916.00	19,61	14,50	6,04800	403,15	11,74	2,70
		Cerobong Reduksi Sintering 1-2							
POINT	STCK14	175051.00	9383131.00	21,87	14,50	6,06360	378,15	11,39	2,70
		Cerobong Reduksi Sintering 2-2							

Source Pathway - Source Inputs

AERMOD

Point Sources

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/s]	Gas Exit Temp. [K]	Gas Exit Velocity [m/s]	Stack Inside Diameter [m]
POINT	STCK1	174948.00	9382810.00	18,49	19,50	12,87000	471,15	6,30	2,00
		Cerobong Sintering 1							
POINT	STCK2	174952.00	9382810.00	18,60	185,00	14,69700	525,15	6,78	2,00
		Cerobong sintering 2							
POINT	STCK3	174956.00	9382809.00	18,70	19,50	14,42100	525,15	6,65	2,00
		Cerobong sintering 3							
POINT	STCK4	174976.00	9382733.00	18,60	119,50	12,23800	425,15	10,16	2,30
		Cerobong EP Tungku Furnace							
POINT	STCK5	175012.00	9383301.00	22,67	15,00	25,92000	445,15	7,02	2,80
		Cerobong Dry Kiln 1							
POINT	STCK6	174992.00	9383171.00	20,22	15,00	54,21000	444,15	13,54	2,80
		Cerobong Dry Kiln 2							
POINT	STCK7	174973.00	9383199.00	19,87	10,00	22,48400	381,15	12,30	2,25
		Cerobong Reduksi Sintering 1							
POINT	STCK8	174977.00	9383279.00	21,09	10,00	21,48200	364,15	11,75	2,25
		Cerobong Reduksi Sintering 2							
POINT	STCK9	175023.00	9383476.00	27,44	10,00	24,02100	386,15	11,85	2,25
		Cerobong Reduksi Sintering 1-1							
POINT	STCK10	175026.00	9383543.00	29,20	10,00	39,61400	434,15	17,18	2,25
		Cerobong Reduksi Sintering 2-1							
POINT	STCK11	174955.00	9382970.00	18,69	14,50	48,25300	386,15	11,54	2,70
		Cerobong Dry Kiln 1							
POINT	STCK12	174968.00	9383122.00	19,80	14,50	45,31200	442,15	12,37	2,70
		Cerobong Dry Kiln 2							

Source Pathway - Source Inputs

AERMOD

Source Type	Source ID	X Coordinate [m]	Y Coordinate [m]	Base Elevation (Optional)	Release Height [m]	Emission Rate [g/s]	Gas Exit Temp. [K]	Gas Exit Velocity [m/s]	Stack Inside Diameter [m]
POINT	STCK13	175004.00	9382916.00	19,61	14,50	34,27200	403,15	11,74	2,70
		Cerobong Reduksi Sintering 1-2							
POINT	STCK14	175051.00	9383131.00	21,87	14,50	31,94800	378,15	11,39	2,70
		Cerobong Reduksi Sintering 2-2							

Receptor Pathway

Receptor Networks

Note: Terrain Elavations and Flagpole Heights for Network Grids are in Page RE2 - 1 (If applicable)
Generated Discrete Receptors for Multi-Tier (Risk) Grid and Receptor Locations for Fenceline Grid are in Page RE3 - 1 (If applicable)

Uniform Cartesian Grid

Receptor Network ID	Grid Origin X Coordinate [m]	Grid Origin Y Coordinate [m]	No. of X-Axis Receptors	No. of Y-Axis Receptors	Spacing for X-Axis [m]	Spacing for Y-Axis [m]
UCART1	172577.07	9380514.97	21	21	249.90	250.19

Non-Uniform Cartesian Grid

Option not in use

Uniform Polar Grid

Option not in use

Non-Uniform Polar Grid

Option not in use

Discrete Receptors

Discrete Cartesian Receptors

Record Number	X-Coordinate [m]	Y-Coordinate [m]	Group Name (Optional)	Terrain Elevations	Flagpole Heights [m] (Optional)
1	176151.44	9381864.16		8.51	
2	175591.80	9381890.17		7.86	
3	174171.23	9382162.85		4.83	
4	174023.57	9383252.85		18.75	
5	177293.00	9381900.00		8.52	
6	174112.57	9384286.63		29.42	

Discrete Polar Receptors

Option not in use

Plant Boundary Receptors

Cartesian Plant Boundary

Primary

Option not in use

Intermediate

Option not in use

Receptor Pathway

Discrete Cartesian Receptors (ARC) for EVALFILE Output

Option not in use

Receptor Groups

No Receptor Groups Specified

Meteorology Pathway

AERMOD

Met Input Data

Surface Met Data

Filename: ..\..\AERMET\NOAA\HASANUDDIN.SFC
Format Type: Default AERMET format

Profile Met Data

Filename: ..\..\AERMET\NOAA\HASANUDDIN.PFL
Format Type: Default AERMET format

Wind Speed

Wind Speeds are Vector Mean (Not Scalar Means)

Wind Direction

Rotation Adjustment [deg]:

Potential Temperature Profile

Base Elevation above MSL (for Primary Met Tower): 10,00 [m]

Meteorological Station Data

Stations	Station No.	Year	X Coordinate [m]	Y Coordinate [m]	Station Name
Surface		2013			HASANUDDIN
Upper Air		2013			HASANUDDIN

Data Period

Data Period to Process

Start Date: 01/01/2013 Start Hour: 1 End Date: 31/12/2022 End Hour: 24

Wind Speed Categories

Stability Category	Wind Speed [m/s]	Stability Category	Wind Speed [m/s]
A	1.54	D	8.23
B	3.09	E	10.8
C	5.14	F	No Upper Bound

Results Summary

C:\Lakes\PT HUADI NIKEL ALLOY INDONESIA\AERMOD\PT HUADI\PT HUADI.isc

SO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	295.18325	ug/m^3	175076.98	9383015.27	19.60	0.00	19.60	11/08/2020, 14
24-HR	1ST	72.21555	ug/m^3	175325.80	9383015.27	20.00	0.00	20.00	22/01/2019, 24
MONTH	1ST	6.51015	ug/m^3	175574.62	9385513.47	58.70	0.00	58.70	30/09/2013, 24
ANNUAL		2.42415	ug/m^3	175574.62	9385513.47	58.70	0.00	58.70	

Results Summary

C:\Lakes\PT HUADI NIKEL ALLOY INDONESIA\AERMOD\PT HUADI NO2\PT HUADI

NO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	286.39174	ug/m^3	175076.07	9383517.25	27.90	0.00	27.90	26/02/2013, 21
24-HR	1ST	61.13356	ug/m^3	175325.97	9383016.87	20.10	0.00	20.10	22/01/2019, 24
MONTH	1ST	6.14824	ug/m^3	175575.87	9385518.77	58.90	0.00	58.90	30/09/2013, 24
ANNUAL		2.32816	ug/m^3	175575.87	9385518.77	58.90	0.00	58.90	

LAMPIRAN 7. Pengolahan Data AERMET dan AERMOD

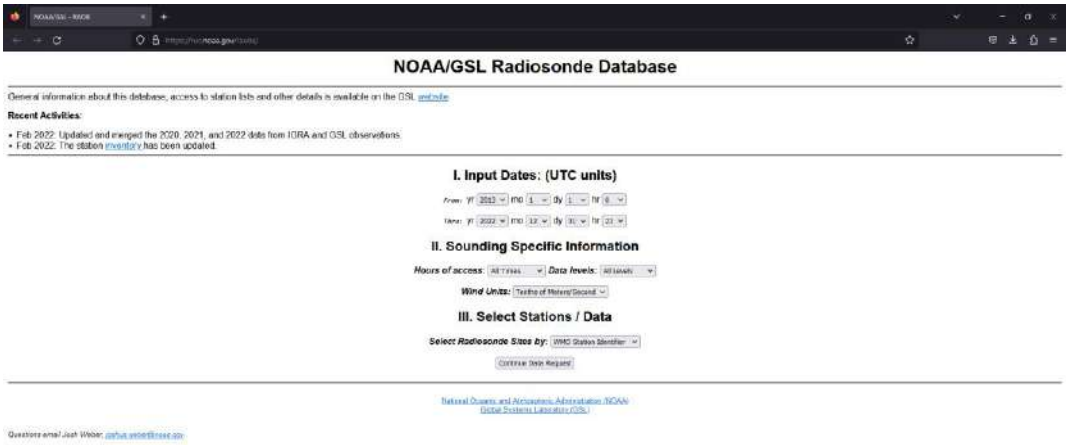
AKSES DATA

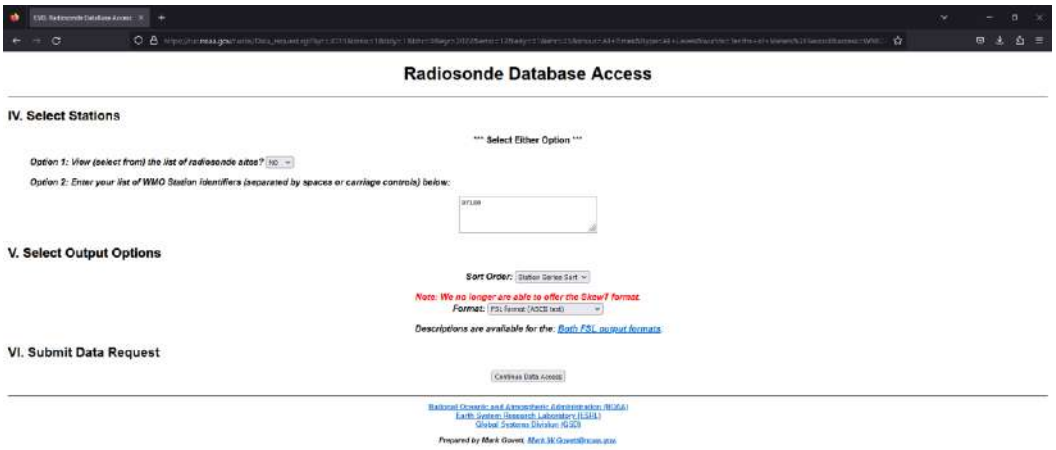
- **Akses data meteorologi permukaan.**

  Data meteorologi permukaan di peroleh dari stasiun pemantauan Hasanuddin WMO 97180 yang di akses melalui NOAA via FTP browser melalui link ftp://ftp.ncdc.noaa.gov/pub/data/noaa . Dengan memilih stasiun Hasanuddin dengan kode WMO 97180 pada tahun 2013-2022.

- **Akses data meteorologi atas.**

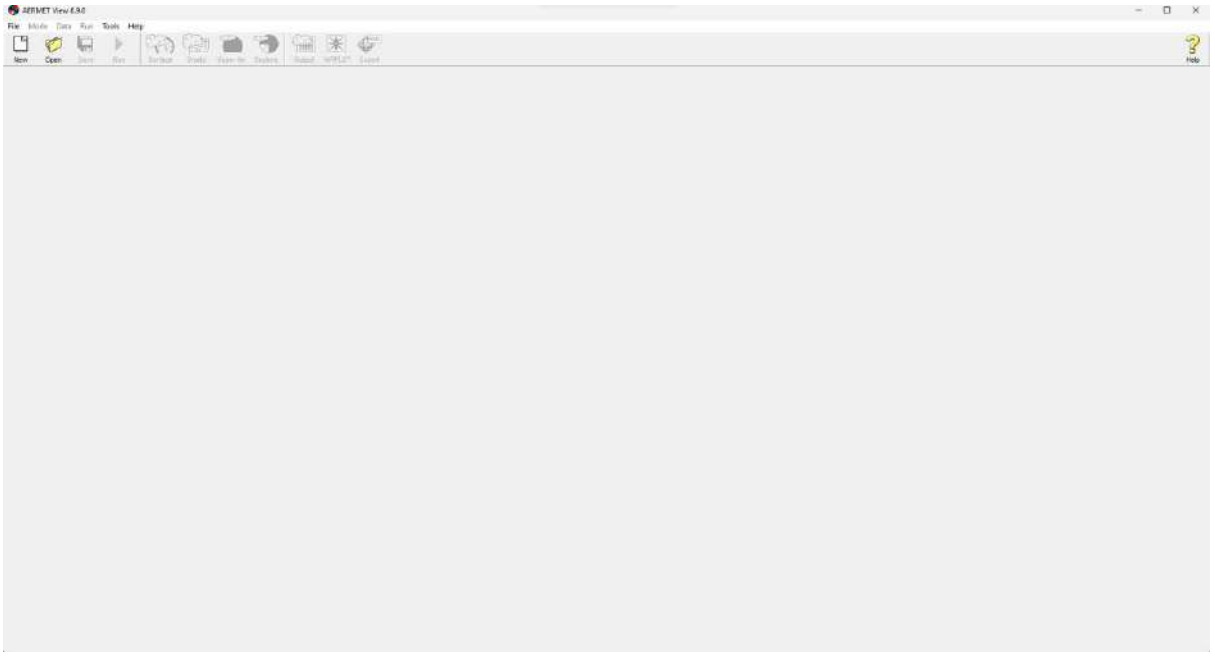
  Data meteorologi atas diakses melalui link https://ruc.noaa.gov/raobs/ Dengan memilih stasiun Hasanuddin dengan kode WMO 97180 pada tahun 2013-2022.



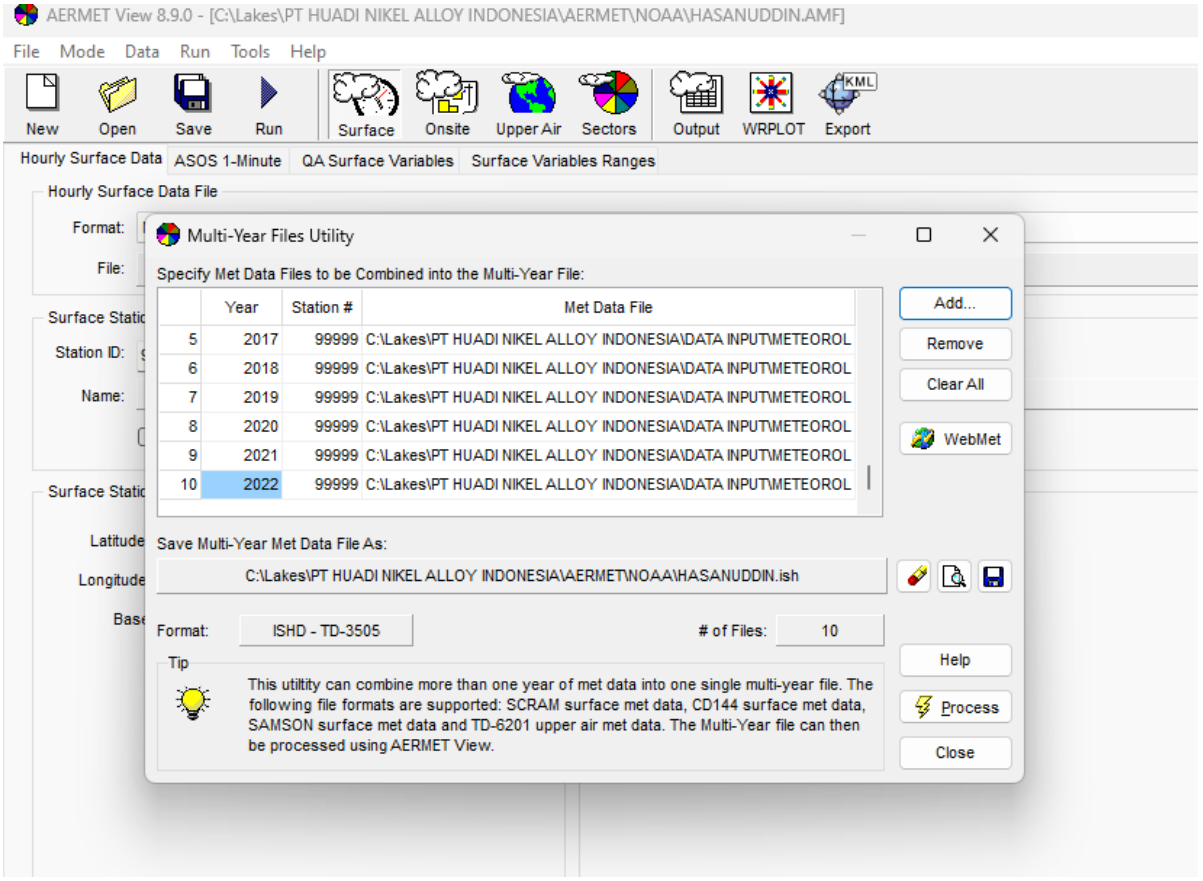


AERMET

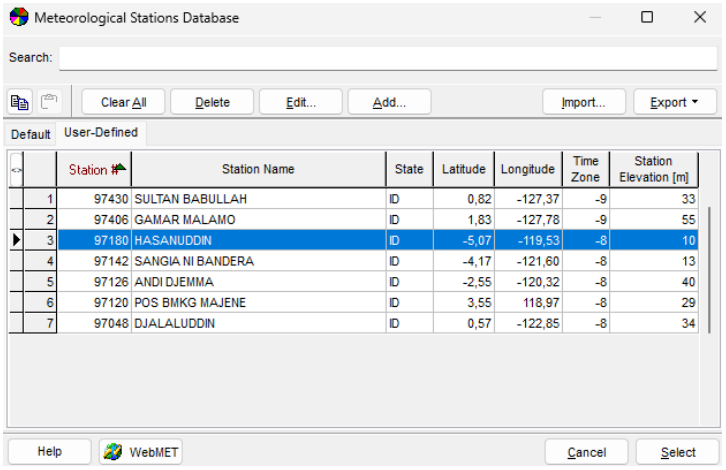
- Membuka Aplikasi AERMET View



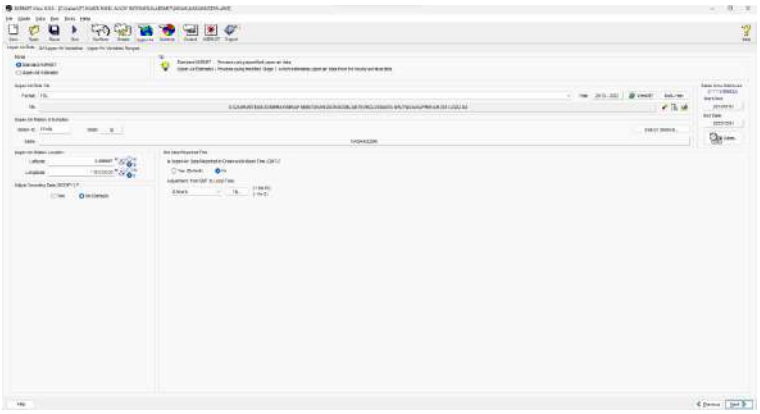
- Input daya multi year 2013-2022 kemudian “Process” pada menu “Surface”



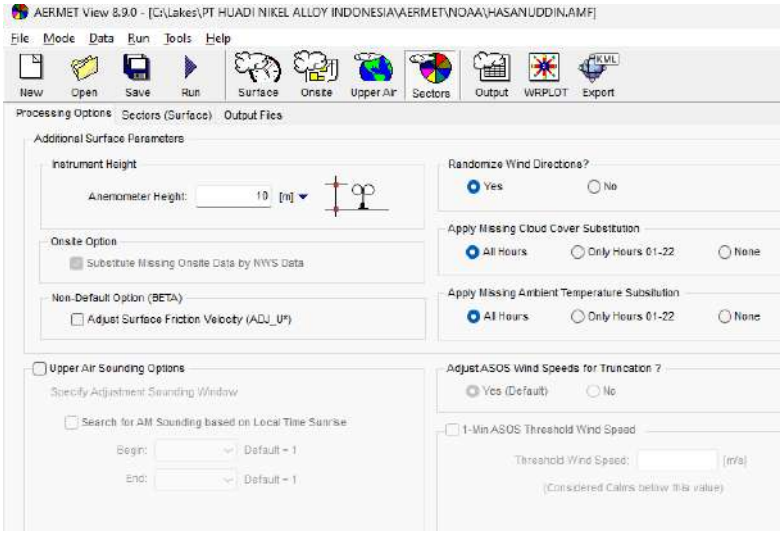
- Pilih lokasi stasiun “Hasanuddin” pada daftar stasiun



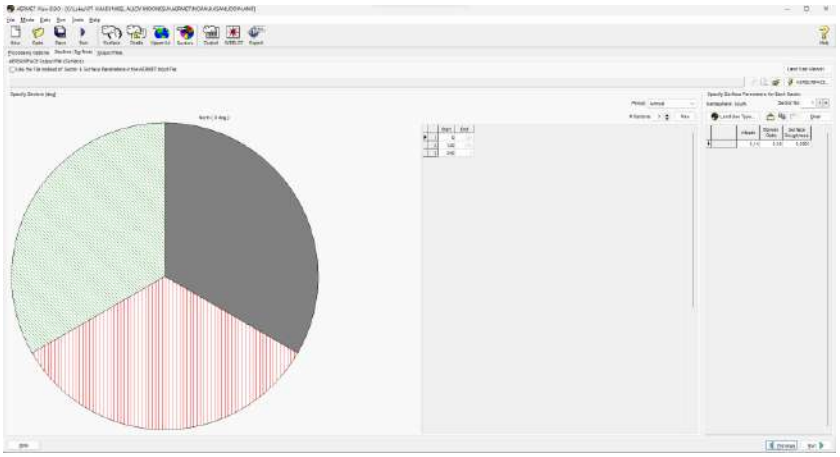
- Input meteorologi atas 2013-2022 pada menu “Upper air”



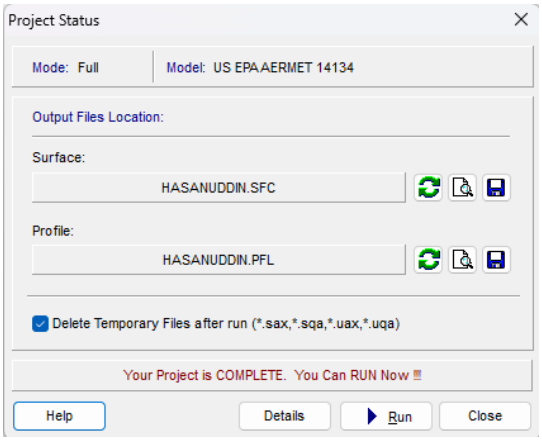
- Input Ketinggian Anemometer pada menu “Sector”, “Processing Option”

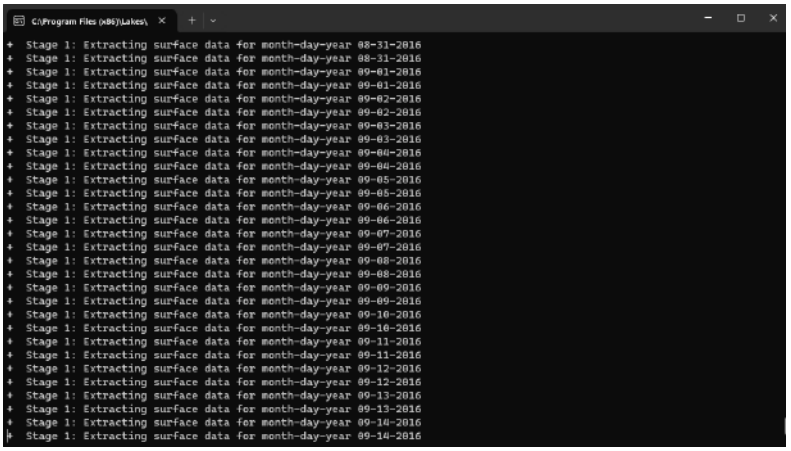


- Membagi dan menentukan peruntukan lahan yang di peroleh dari webgis.



- Running

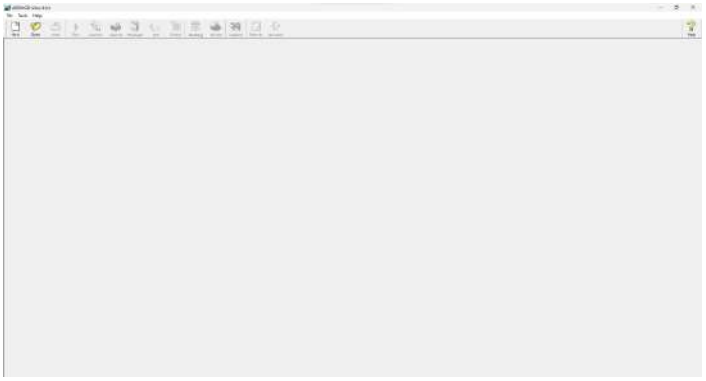




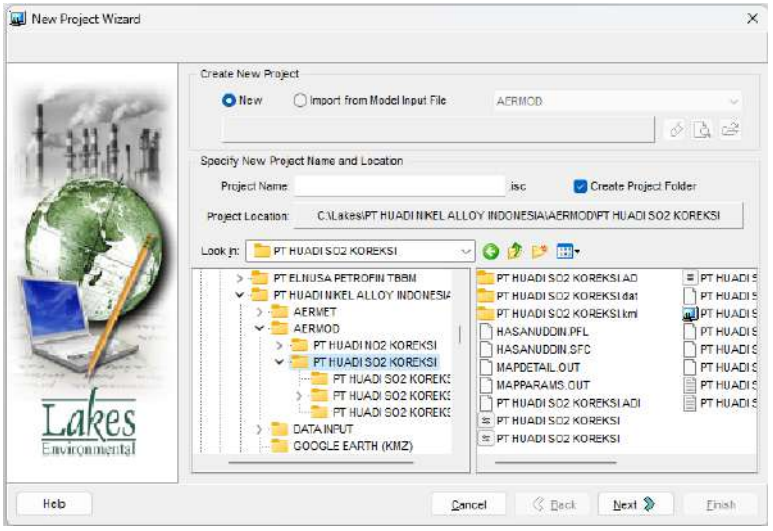
Output file kebutuhan AERMOD Berupa file .SFC dan .PFL

AERMOD

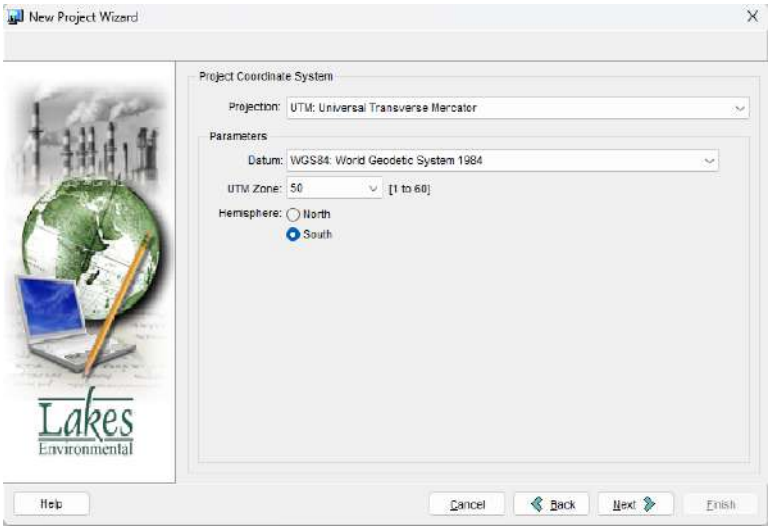
- Membuka aplikasi AERMOD View



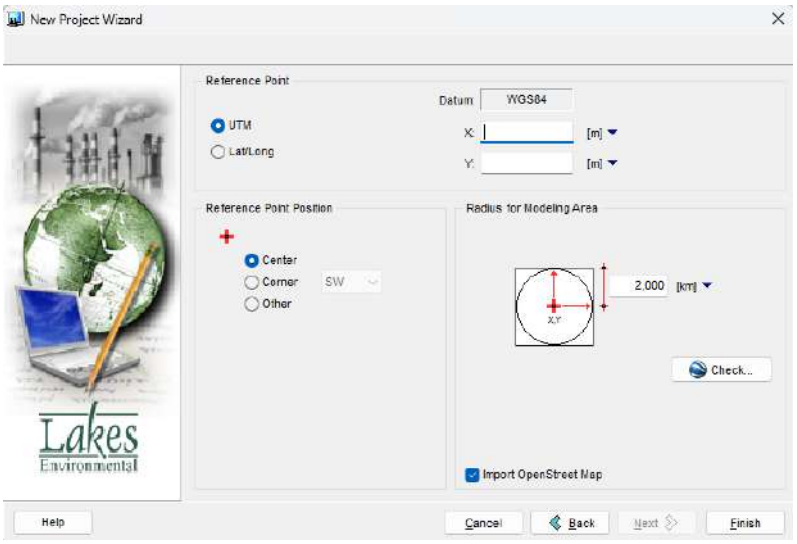
- Membuat file baru “New” dan memsukkan nama file.



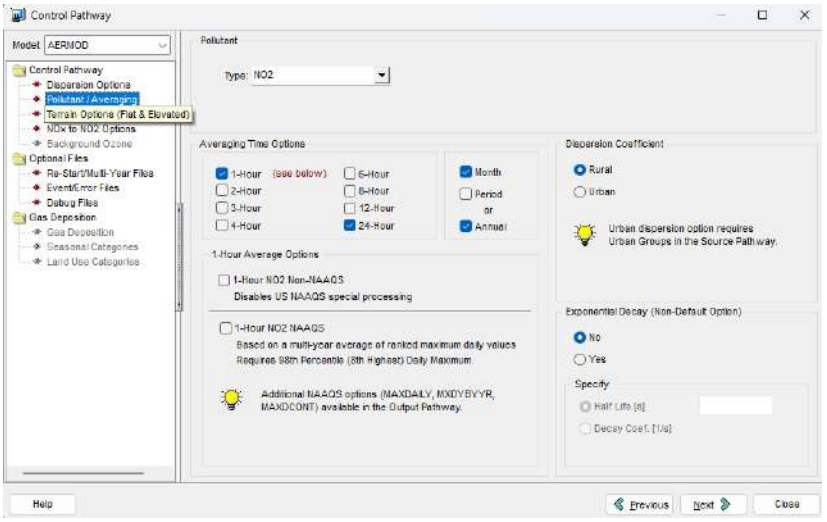
- Menentukan Koordinat Sistem (UTM WGS84:World Geodetic System 1984) (UTM Zone : 50S)



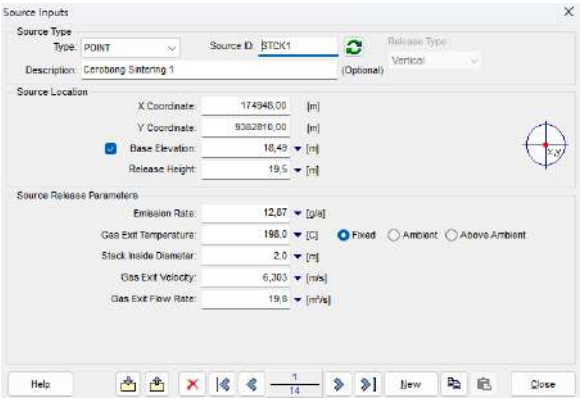
- Memasukkan koordinat center serta radius pemodelan

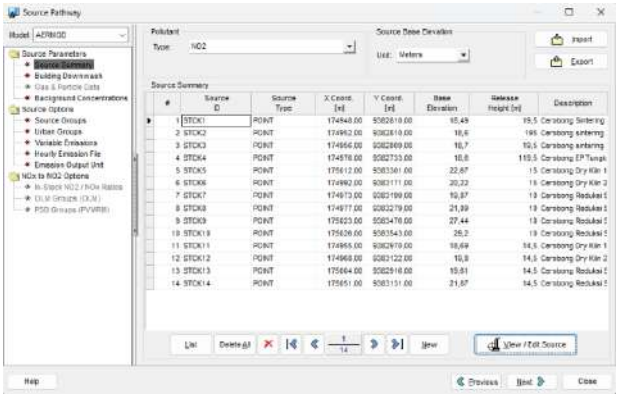


- Pada menu “Control” Menentukan jenis polutan dan periode waktu pemodelan.

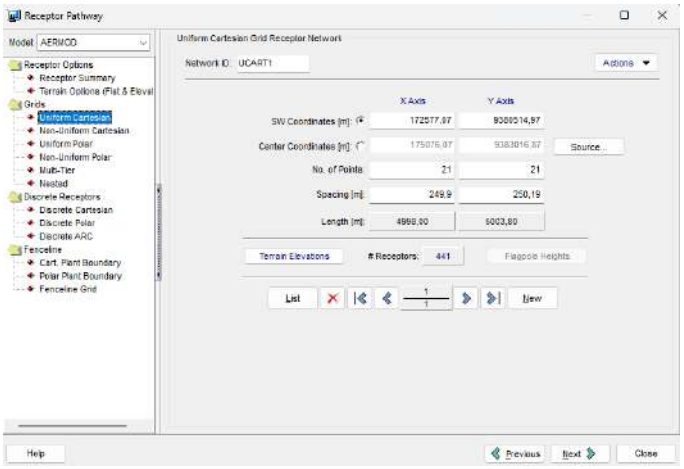


- Pada menu “Source” memasukkan data koordinat, tinggi, diameter, elevasi, suhu dan laju alir cerobong serta laju emisi hasil perhitungan dari pengukuran.

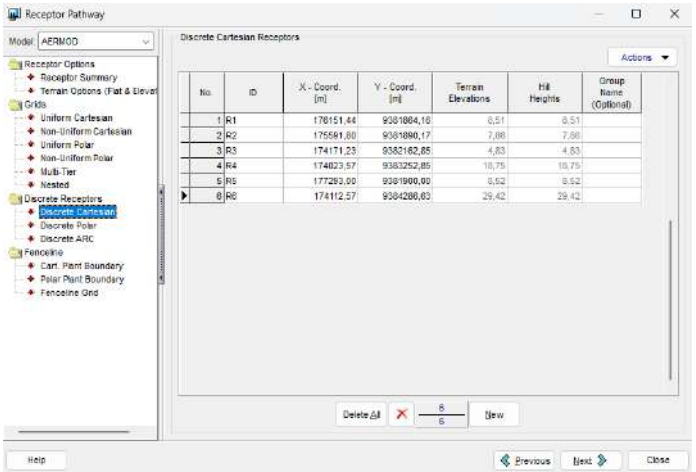




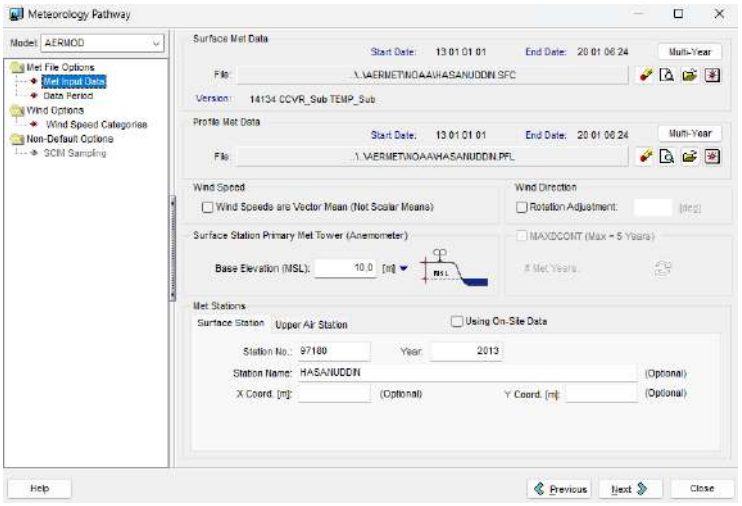
- Pada menu “Receptor” menentukan koordinat, jumlah dan jarak grid dalam sub menu “Unifor Cartesian”.



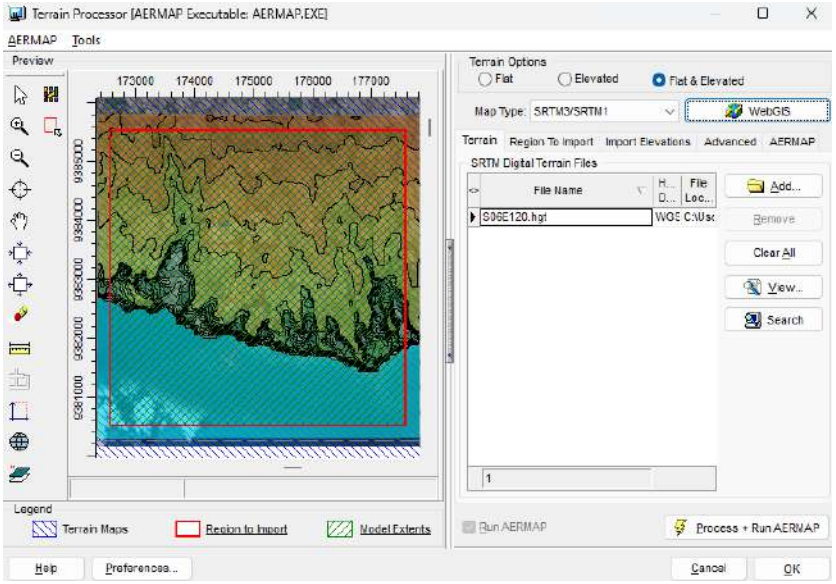
- Pada menu “Receptor” menentukan receptor sensitive pada sub menu “Discrete Cartesian”



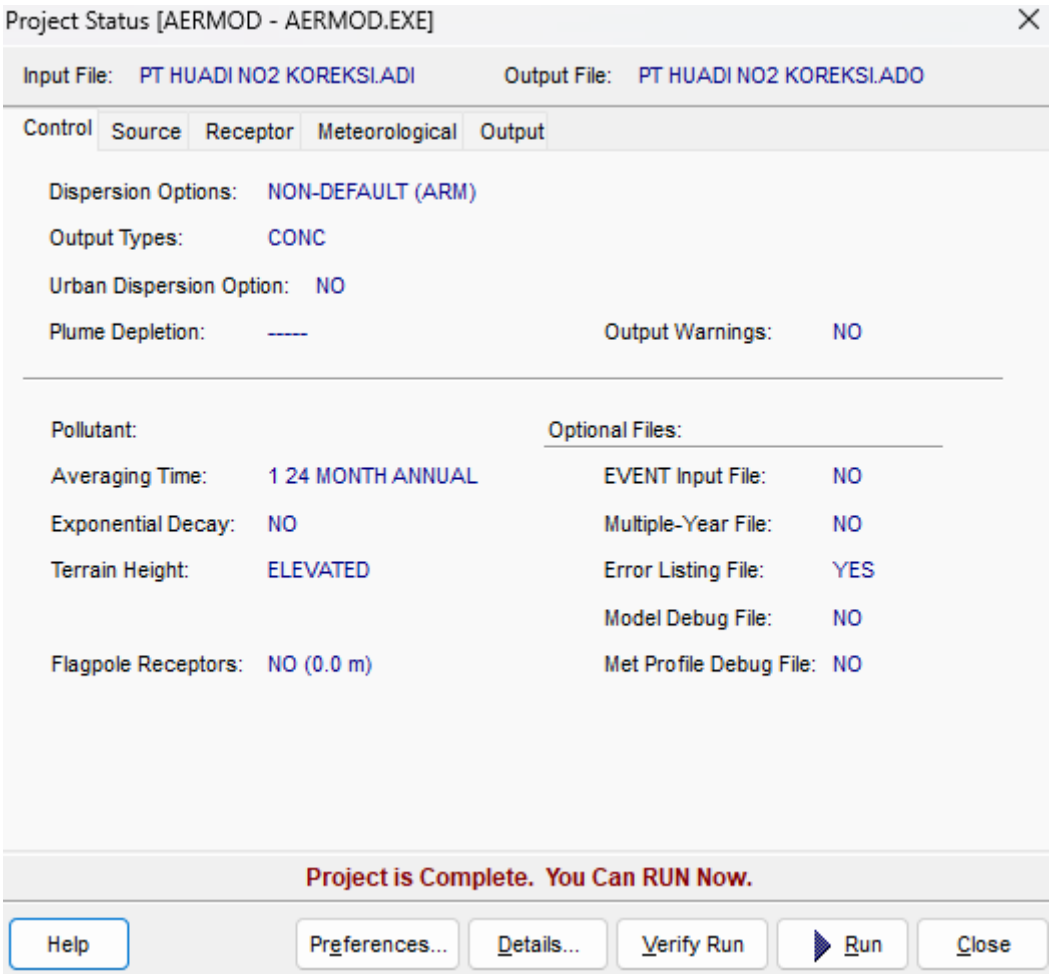
- Pada menu “Met” memasukkan data meteorologi hasil pengolahan AERMET.



- Pada menu “Terrain” memasukkan data topografi yang di peroleh dari Webgis (SRTM3 Global 90 meter) kemuadian “Process + Run AERMAP.



- Runing AERMOD


Project Status [AERMOD - AERMOD.EXE]
Input File: PT HUADI NO2 KOREKSI.ADI
Output File: PT HUADI NO2 KOREKSI.ADO
Control
Source
Receptor
Meteorological
Output
Dispersion Options: NON-DEFAULT (ARM)
Output Types: CONC
Urban Dispersion Option: NO
Plume Depletion: -----
Output Warnings: NO
Pollutant:
Averaging Time: 1 24 MONTH ANNUAL
Exponential Decay: NO
Terrain Height: ELEVATED
Flagpole Receptors: NO (0.0 m)
Optional Files:
EVENT Input File: NO
Multiple-Year File: NO
Error Listing File: YES
Model Debug File: NO
Met Profile Debug File: NO
Project is Complete. You Can RUN Now.
Help
Preferences...
Details...
Verify Run
Run
Close

LAMPIRAN 8. Perhitungan ISPU

Nilai batas ISPU berdasarkan Peraturan Menteri Lingkungan Hidup Dan Kehutanan Republik Indonesia Nomor 14 tahun 2020 dengan persamaan.

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$

Keterangan:

I : ISPU terhitung

I_a : ISPU batas atas

I_b : ISPU batas bawah

X_a : Konsentrasi ambien batas atas (µg/m^3)

X_b : Konsentrasi ambien batas bawah (µg/m^3)

X_x : Konsentrasi ambien nyata (µg/m^3)

Tabel Konversi Nilai Konsentrasi SO_2 dan NO_2 ISPU

ISPU	**SO_2 (µg/m^3)**	**NO_2 (µg/m^3)**
0 – 50	52	80
51 – 100	180	200
101 – 200	400	1130
201 – 300	800	2260
>300	1200	3000

Kategori Angka Rentang ISPU

Kategori	Status Warna	Angka Rentang
Baik	Hijau	1 – 50
Sedang	Biru	51 – 100
Tidak Sehat	Kuning	101 – 200
Sangat Tidak Sehat	Merah	201 – 300
Berbahaya	Hitam	>300

A. ISPU Terhadap Konsentrasi Maksimal Hasil Pemodelan

- SO_2 Rata-Rata 1 Jam (295 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(200 - 100)}{(400 - 180)}(295 - 180) + 100$$
$$I = 152.3$$

- SO_2 Rata-Rata 24 Jam (72.2 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(100 - 50)}{(180 - 52)}(72.2 - 52) + 50$$
$$I = 57.9$$

- SO_2 Rata-Rata Tahunan (2.42 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(52 - 0)}(2.42 - 0) + 0$$
$$I = 2.3$$

- NO_2 Rata-Rata 1 Jam (286 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(200 - 100)}{(1130 - 200)}(286 - 200) + 100$$
$$I = 109.2$$

- NO_2 Rata-Rata 24 Jam (61.1 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(80 - 0)}(61.1 - 0) + 0$$
$$I = 38.2$$

- NO_2 Rata-Rata Tahunan (2.33 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(80 - 0)}(2.33 - 0) + 0$$
$$I = 1.5$$

Parameter	**Periode**	**Konsentrasi Maksimal (µg/m^3)**	**Nilai ISPU**	**Status ISPU**	**Rentang Angka ISPU**
SO_2	1 Jam	295	152.3	Tidak Sehat	101 – 200
	24 Jam	72.2	57.9	Sedang	51 – 100
	Tahunan	2.42	2.3	Baik	1 – 50
NO_2	1 Jam	286	105.5	Tidak Sehat	101 – 200

24 Jam	61.1	38.2	Baik	1 – 50
Tahunan	2.33	1.5	Baik	1 – 50

B. ISPU Terhadap Konsentrasi Rata-Rata Desa Papanloe

- SO_2 Rata-Rata 1 Jam (50.41 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(52 - 0)}(50.41 - 0) + 0$$
$$I = 48.47$$

- SO_2 Rata-Rata 24 Jam (7.73 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(52 - 0)}(7.73 - 0) + 0$$
$$I = 7.43$$

- SO_2 Rata-Rata Tahunan (0.72 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(52 - 0)}(0.72 - 0) + 0$$
$$I = 0.69$$

- NO_2 Rata-Rata 1 Jam (56.59 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(80 - 0)}(56.59 - 0) + 0$$
$$I = 35.37$$

- NO_2 Rata-Rata 24 Jam (8.82 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(80 - 0)}(8.82 - 0) + 0$$
$$I = 5.51$$

- NO_2 Rata-Rata Tahunan (0.33 µg/m^3)

$$I = \frac{(I_a - I_b)}{(X_a - X_b)}(X_x - X_b) + I_b$$
$$I = \frac{(50 - 0)}{(80 - 0)}(0.33 - 0) + 0$$
$$I = 0.21$$

Parameter	Periode	Konsentrasi Maksimal (µg/m^3)	Nilai ISPU	Status ISPU	Rentang Angka ISPU
SO_2	1 Jam	50.41	48.47	Baik	1 – 50
	24 Jam	7.73	7.43	Baik	1 – 50
	Tahunan	0.72	0.69	Baik	1 – 50
NO_2	1 Jam	56.59	35.37	Baik	1 – 50
	24 Jam	8.82	5.51	Baik	1 – 50
	Tahunan	0.33	0.21	Baik	1 – 50