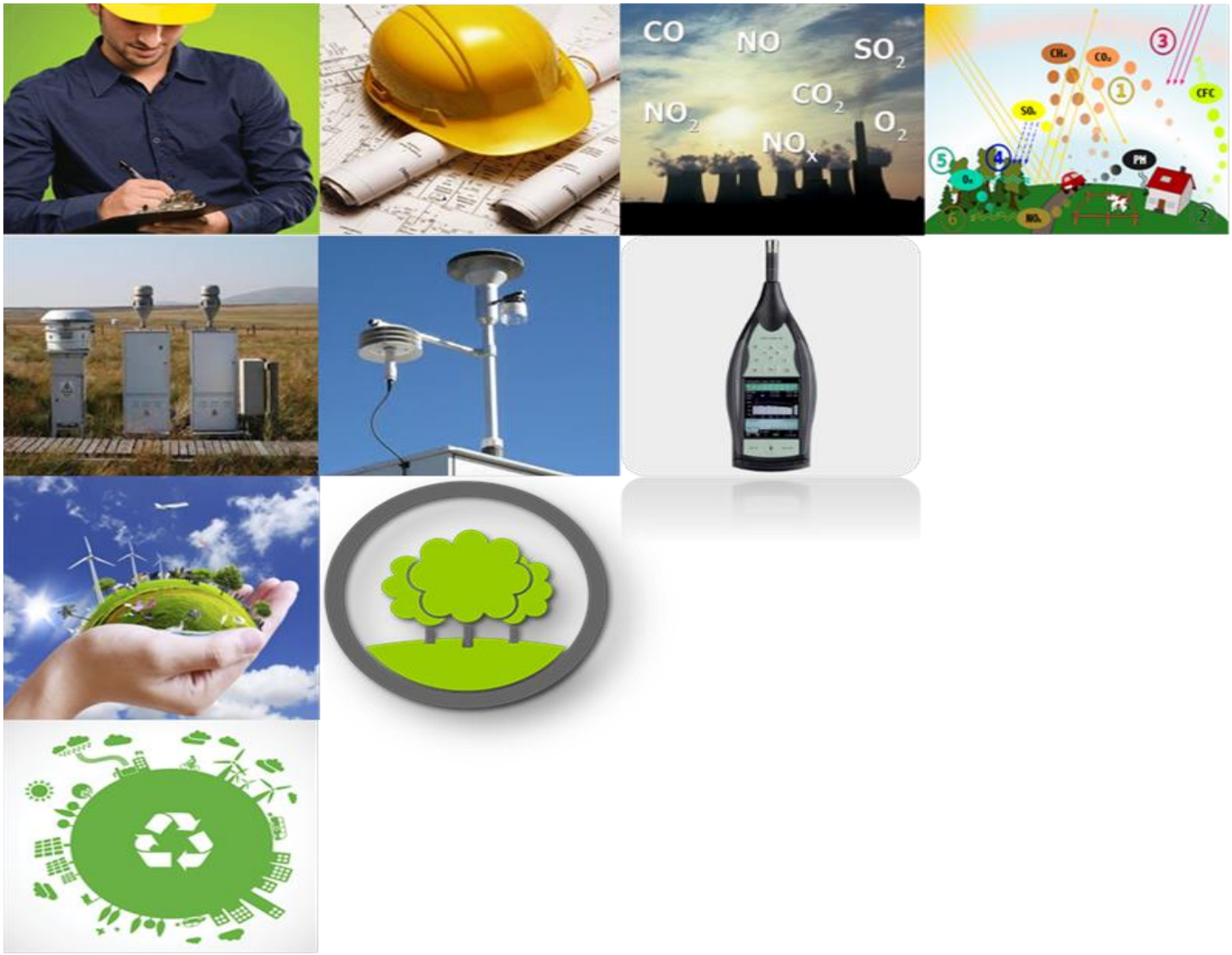

Ambient Air Quality and noise Measurements Report

For Qaha Pressure Reduction Station

Qalyubia Governorate

Petroleum Safety & Environmental Services Co.
(PETROSAFE)

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CONTENTS

1. INTRODUCTION

Air quality and noise monitoring has been carried out as part of the Environmental air and noise quality measurements of Qaha pressure reduction station site located in Qalyubia governorate.

Air quality monitoring has been undertake for the pollutants of primary concerns (NO_2, SO_2, CO, T.S.P and PM_{10}); in order to better characterize the ambient air quality, as part of the environmental measurements required. Where, one-hour average measurements were conducted for carbon monoxide (CO), nitrogen dioxide (NO_2), sulphur dioxide (SO_2), total Suspended Particulates (T.S.P) and particulate matter (PM_{10}), for one location, where the air quality complies with the national guidelines for all the analysed parameters. The site-specific air quality measurements had conducted using Standard ambient air quality monitoring instruments under the supervision of experienced specialists. Noise levels had conducted as per the international standard using type 1 precision noise level meter.

1.1 Objectives

The overall objectives of this monitoring round are to:

- Assess/confirm compliance of the air quality, noise levels in the ambient environment with relevant national guidelines;
- identify any non-compliance issues, if any; and
- Provide general conclusions based on analysis results.

1.2 Scope of Work

- The scope of work of the present monitoring includes the sampling and analysis of active air and noise in the surrounding area as to distinguish whether air quality has influenced by the project activities or not.
- The measurements will be conducted` in one location within the boundaries of the sensitive receptor.

1.2.1 Sampling strategy

The selection of the active air measurement locations has based on the prevailing wind direction; site Topography, the future layout of the proposed project components and the location of the nearest sensitive receptors with respect to the store plots. Moreover, the selection had based on the guidelines stated in the American Society for Testing Materials (ASTM) reference method[1].

The following ambient air pollutants where the target parameters, which will be measure during the monitoring program:

- TOTAL Suspended Particulate (TSP)
- Thoracic particulate (PM_{10})
- Nitrogen dioxide NO_2.
- Sulfur dioxide SO_2.
- Carbon monoxide CO.

Moreover, location of the measurements has shown in the figure below

[1] D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air

1.3 Location

The GPS coordinates of the Ambient Air (**AA**) measurement locations

Table 1-1 Locations Coordinates

Locations	N coordinates	E coordinates
Qaha PRS monitoring point	30°17'54 "N	31° 12'41"E

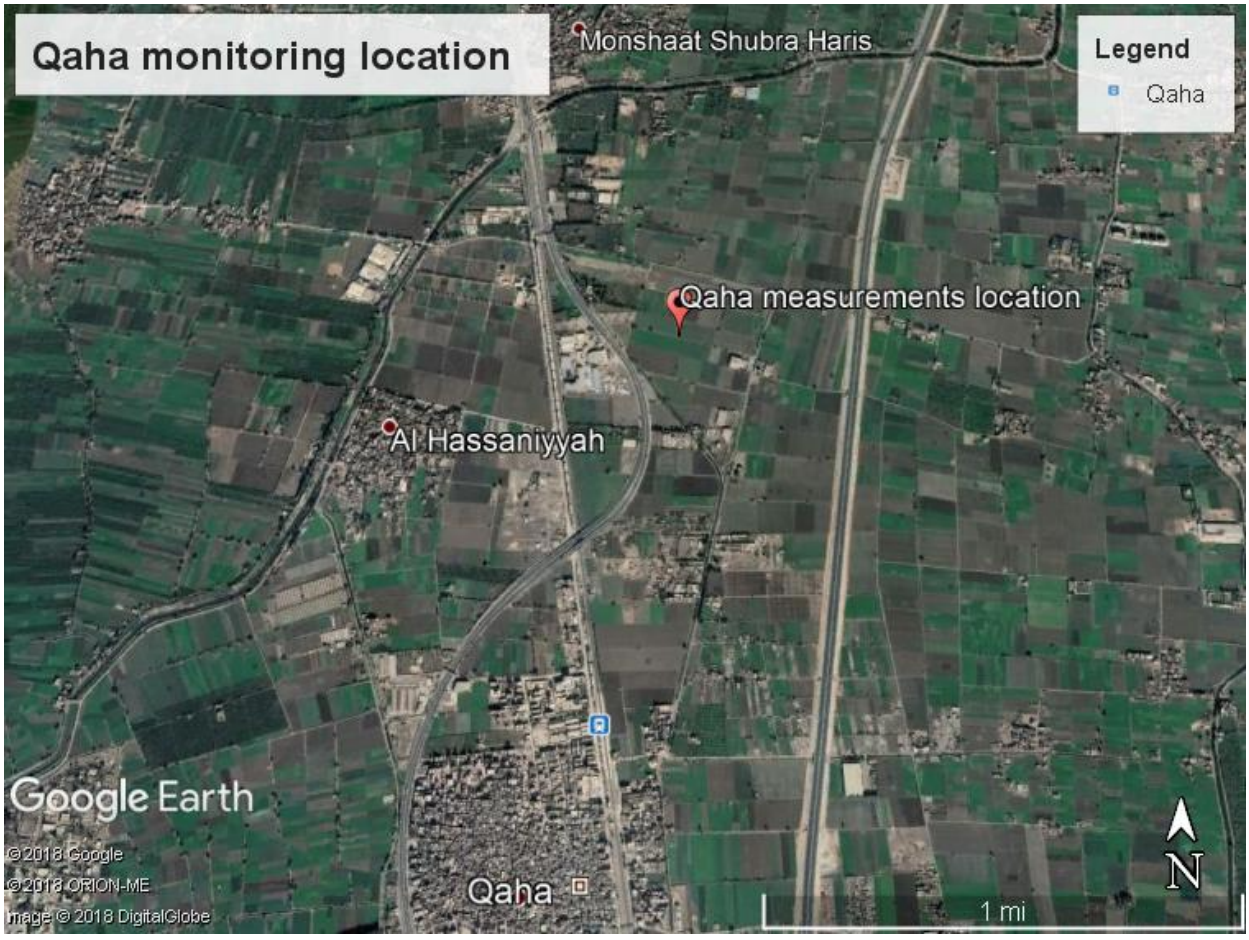

Figure 1-1 location map for Qaha measurements

2. LEGISLATION AND REGULATORY FRAMEWORK

2.1 National and International Legislation

The results of ambient air quality measurements were compared to the national limits set in Annex 5 of the Executive Regulation (D1095/2015) and the guideline values of world health organization (WHO) for the ambient air quality.

Table 2-1 and Table 2-2 lists the corresponding applicable national and international ambient air quality permissible limits.

Table 2-1 Applicable national permissible limits for ambient air quality levels for rural area

Pollutant	**Average Period**	**Egyptian Standards ($\mu g.m^{-3}$)**	**Egyptian Standards (ppm)**
Sulphur dioxide (SO_2)	1 hour	350	0.1337
	24 hours	150	0.0573
	Annual	60	0.0229
Carbon monoxide	1 hour	30,000	26
	8 hours	10,000	9
Nitrogen dioxide (NO_2)	1 hour	350	0.2
	24 hours	150	0.08
	Annual	60	0.032
TOTAL suspended particulate T.S.P	24 hours	230	---------
	Annual	125	---------
Thoracic particles (PM_{10})	24 hours	150	---------
	Annual	100	---------
$PM_{2.5}$	24 hours	100	---------
	Annual	70	---------

Table 2-2 WHO Ambient Air Quality Guidelines2,3

Pollutant	**Average Period**	**Guideline value (µg.m^{-3})**
Sulphur dioxide (SO_2)	24 hours	125 (interim target 1) 50 (Interim target 2) 20 (guideline)
	10 minutes	500
Nitrogen dioxide (NO_2)	1 hour	200
	1 year	40
Thoracic particles (PM_{10})	24 hrs	150 (interim target 1) 100 (interim target 2) 75 (interim target 3) 50 (guideline)
	1 year	70 (interim target 1) 50 (interim target 2) 30 (interim target 3) 20 (guideline)
Ozone	8 hours daily maximum	160 (interim target 1) 100 (guideline)

[2] World Health Organization (WHO). Air Quality Guidelines Global Update, 2005. PM 24-hour value is the 99th percentile.
[3] Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

3. METHODOLOGY

3.1 Ambient air quality

Ambient Air Quality Monitoring equipment is an integrated system of which includes several analyzers with data recording devises. A typical system would include gas analyzers for ambient air analysis, data recording, and signal transmission instrumentation.

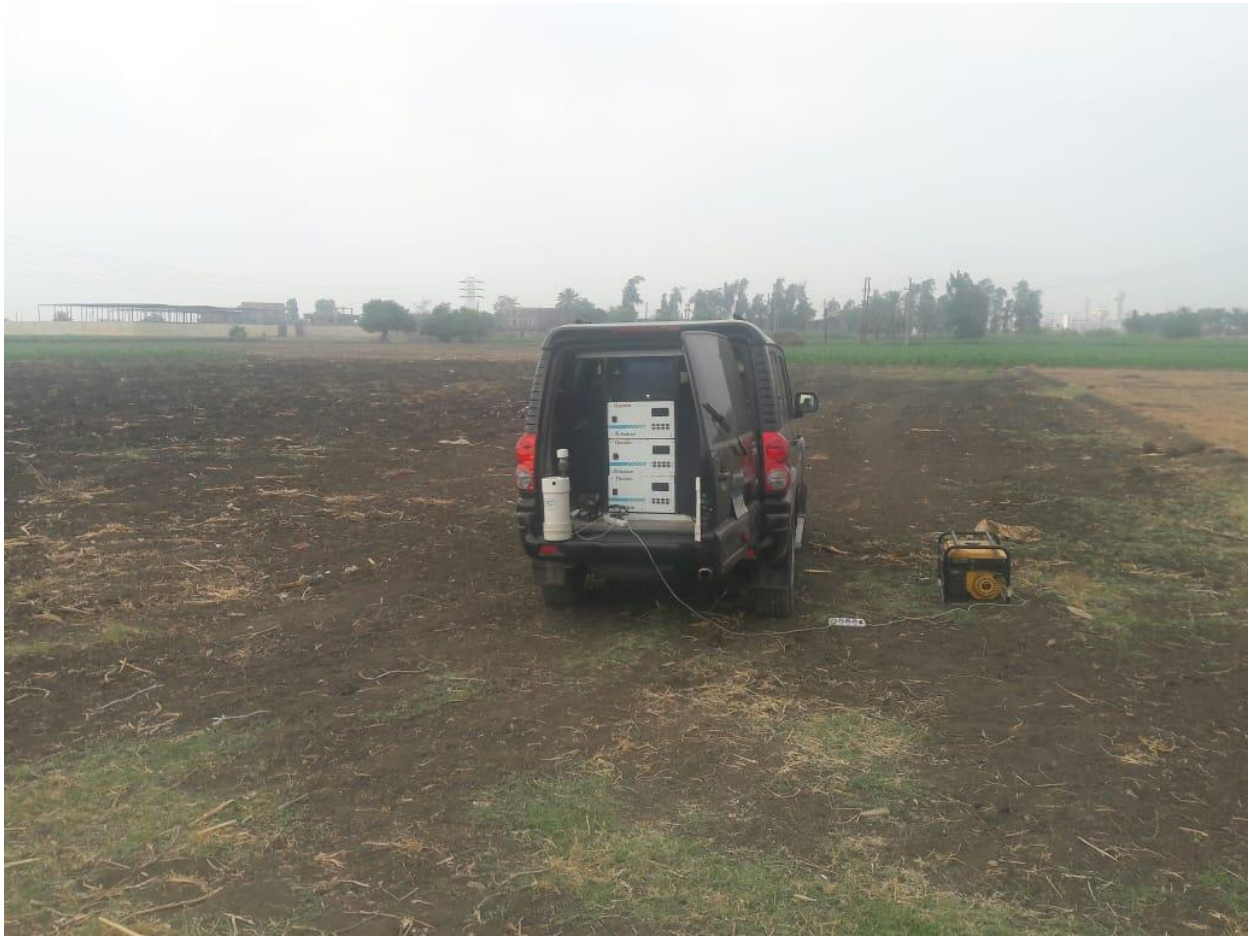

Figure 3-1 ambient air quality monitoring system

Ambient air pollutants

The most common gaseous air pollutants (also known as "criteria pollutants") are carbon monoxide, sulfur oxides, and nitrogen oxides. These pollutants can be harmful to health and the environment, and cause property damage. To acquire baseline information on background levels of Thoracic Particulates, the team conducted four one-hour active sampling using a dust sampler. The sampler measures the respirable fraction of airborne dust (of particle size 0.1 to 10 µm) with a measuring range of 0.001 to 400 mg/m^3 and an accuracy of ± 5 % of the reading. The levels measured and recorded would serve as baseline values for reference during future monitoring activities.

Ambient air quality monitoring station specifications

General Features

- Standard methods of measurement which means:
- SO_2 analyzer: ISO 10498 equivalent to(U.S.A EPA Reference method – EQSA-0486-60) – UV Fluorescence
- NOx analyzer: ISO 7996 equivalent to(U.S.A EPA Reference method – RFNA-1289-74) – Chemiluminescence
- CO analyzer: ISO 4224 equivalent to U.S.A EPA Reference method – RFCA-0981-54) – IR GFC
- PM_{10} sampler: Plow volume sampler equivalent to(EPA method, Appendix J-Reference method FR)
- T.S.P low volume sampler equivalent to(EPA method, Appendix J-Reference method FR)

Ambient Particulate Matter PM_{10} sampler

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Sequential Particulate sampler
- Sampling on filter membranes, which can be used for further Chemical analyses as required by current regulations and standards.
- Active flow Control Flow range: 0-10 LPM
- Nominal flow: 5LPM Sampler
- Dimensions: 10” x 12” x 7” Sampler
- Weight: 9.8LBS (fully configured) Transport Case: 19.75” x 12” x 18”
- The analyzer should be equipped with batteries in order to avoid possible data losses due to power failures.
- Source: Beta Ray Source with appropriate activity
- Ranges: 0-500 µg/ m^3 (2.3 m^3/ h operating flow rate); 0-1,000 µg/ m^3 (1 m3/ h operating flow rate)
- Lower Detectable Limit: ≤ 1.5 µg/ m3 (24 hour cycle time, 2.3 m3/ h operating flow rate)
- Precision: ≤ 0.4 µg/ m^3 (24 hour cycle time, 2.3 m^3/ h operating flow rate)
- Correlation Coefficient R > 0.98

Sulphur Dioxide SO_2 Analyzer (Thermo Scientific SO_2 Analyzer model 43i-USA)

- Approval and Certification : U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method : UV Fluorescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 10 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.5 ppb
- Lower Detectable Limit: ≤ 1 ppb
- Zero drift (daily): ≤ 1 ppb
- Span drift (daily): ≤ 1% of full scale
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Nitrogen Monoxide, Nitrogen Dioxide and Nitrogen Oxides NO, NO_2 & NO_X Analyzer (Thermo Scientific NOx Analyzer - Model 42i- USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method.: Chemiluminescence Technology
- Ranges.: Auto ranging feature, Multiple Ranges to cover from 0 to 20 ppm (especially from 0 to 1 ppm)
- Zero Noise: ≤ 0.2 ppb
- Lower Detectable Limit: ≤ 0.4 ppb
- Zero drift (daily): < 0.5 ppb
- Span drift (daily): < 0.5% of full scale
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

Carbon Monoxide CO Analyzer (Thermo Scientific Carbon Monoxide CO Analyzer model 48i-USA)

- Approval and Certification: U.S.EPA (USA), UBA/ TUV (Germany), / Sira Certification Service
- Measuring Method: Non Destructive Infra-Red Gas Filter Correlation (IRGFC) Technology
- Ranges: Auto ranging feature, Multiple Ranges to cover from 0 to 200 ppm (especially from 0 to 50 ppm)
- Zero Noise: ≤ 0.02 ppm
- Lower Detectable Limit: ≤ 0.04 ppm
- Zero drift (daily): ≤ 0.1 ppm
- Span drift (daily): < 0.5% of reading
- Response time: fast, ≤ 100 seconds
- Precision: ≤ 0.5% of reading
- Linearity: ≤ ± 1% of full scale
- Operating temperature: not exceed 40 °C

3.2 Noise Measurement Methodology

The methodology adopted was to record ambient noise levels for one hour, as per the national and international standards, in the location at the proposed transmission line rout. The following devices had used during the first round of noise level measurements:

- Two B & K 2238 Mediator, Integrating Sound Level Meters, Type I (precision grade), compliant with IEC 1672 Class 1 standard;
- B & K 4198 Outdoor Weatherproof Microphone Kit;
- Digital Camera.

Noise monitoring measurements included recording the following parameters using a Type 1 precision grade hand-held sound-level meters:

- Equivalent continuous noise level (LAeq)
- 95th percentile noise level (LA95)
- 90th percentile noise level (LA90)
- 50th percentile noise level (LA50)
- 10th percentile noise level (LA10)

- Peak sound pressure level (LCpeak)

The following equation[4] is the main equation used to calculated day night equivalent sound pressure level:

$$L_{den} = 10 \log \frac{1}{n} \sum_{i=1}^{n} 10^{0.1(L_i + D_i)}$$ **Where** $L_{den} = \text{Day Night Equivalent}$, $L_i = \text{The hourly } L_{eq}$, $D_i = \text{the addition for the different periods of the day}$, $n = \text{number of measured hours}$.

The sound level meters have calibrated before sound measurements to ensure reliability and precision. GPS coordinates at all locations prior to the start of noise measurements. It has anticipated that most of these locations would remain the same for the purpose of pre-construction, construction, performance guarantee tests and operation monitoring. Figure 1-1 shows the locations of the different noise measurement locations; furthermore, Table 1-1 lists the GPS coordinates of measurement locations, measurement dates, location description and a selection of photos at each location.

[4]The equation used to obtain the average noise level of a designated time interval based on weighted readings according to "Long-term Leq errors expected and how long to measure (Uncertainity & Noise Monitoring)", Dietrich Kuehner, Forum Acusticum 2005 Budapest.

4. RESULTS

The following table present the results for ambient air quality measurements conducted at the location. The objectives of the ambient air quality Monitoring activities conducted at the proposed site are:

- To verify compliance with authorized discharge limits and any other regulatory requirements concerning the impact on the public and the environment due to the normal operation of a practice or a source within a practice;
- to establish air quality baseline which will assist in the estimation of the site impact on the local physical, biological and social environment ;
- To check the conditions of operation and the adequacy of controls on discharges from the source and to provide a warning of unusual or unforeseen conditions and, where appropriate, to trigger a special environmental monitoring program.

The air qualities at the measured site of the project site in the location are exhibiting acceptable levels of classic air pollutants in fact the levels are way below the national guidelines. Generation and dispersion of dust from increased vehicle traffic, especially during the daily activities, may reduce visibility, relative to baseline levels, and, together with combustion engine emissions, may affect ambient air quality. Concentration of dust particles, both total suspended particulate and respirable particulate matter and other pollutants from open burning, emissions from equipment and machinery used in transportation, the nearby emissions from vehicles used to transport passengers also contribute to air pollution. These impacts may affect the human environment and, typically, arise during the ordinary daily activities and, to a much lesser extent, during the operation phase, requiring monitoring and assessment of the natural and man-made air pollutants.

One-hour average results for 8 hours continuous measurements have shown in Table 4-1 for all the measured parameters

Table 4-1 Daily average results (µg/m^3) Location (Qaha PRS monitoring point)

Time	NO_2	SO_2	CO (mg/m^3)	PM_{10}	T.S.P
7:AM	**60.53**	**42.18**	**3.09**	74.15	83.03
8:00	**41.92**	**36.94**	**2.98**		
9:00	**51.51**	**36.41**	**3.21**		
10:00	**59.4**	**50.56**	**3.21**		
11:00	**52.45**	**45.58**	**2.98**		
12:00	**43.8**	**35.89**	**2.98**		
13:00	**64.48**	**48.2**	**3.09**		
14:00	**51.32**	**39.56**	**3.32**		
Limits	**150**	**150**	**10 (mg/m^3)**	**150**	**230**

4.1 Analysis of air quality Results

In general, there are two main factors affecting the ambient air concentration of a certain pollutant emitted from a certain source or sources in a selected area:

- The intensity of the emissions (e.g. concentration and flow rate) from the source or sources.
- The uncontrollable atmospheric dispersion conditions, which include but not limited to (wind speed, wind direction, temperature, humidity, rainfall, atmospheric turbulence, solar radiation intensity and atmospheric pressure).

All the recorded results showed compliance with the national and international guidelines for ambient air quality moreover, most of the data recorded were way below the guidelines, which indicates that the ambient air quality in this area are matching with guidelines of emissions released from proposed sources.

5. NOISE LEVELS RESULTS

Table 5-5-1 presents the results of one-hour average ambient noise measurements and their corresponding national and international permissible limits.

Table 5-5-1 Ambient Noise Levels Readings Location (Qaha PRS monitoring point) 8 hours average

Time	Sound Level Equivalent & Percentile Recordings in dBA for 8 Hours			Permissible Limits LAeq (dBA)	
	LAeq	LA_{max}	LA_{min}	National	International
From 6:00 AM to 14:00 PM	**59.6**	73.2	55.4	**70**	**70**

5.1 Analysis of Noise levels Results

The results of ambient noise measurements had compared to the national permissible limits since the area are mostly agricultural area with small businesses and a little traffic the noise levels varied between 73.2 dB to 55.4 dB at Qaha PRS monitoring point explained this village contains small houses and low traffic flow with no large source of noise pollution consequently the noise levels measured reflected the above mentioned description.

6. CONCLUSION

Based on, the environmental monitoring and measurements performed for the ambient air quality. The results showed compliance with all the national and international guidelines

7. FUTURE RECOMMENDATION

It is recommended that monitoring should continue for all the regulated parameters, in order to verify/assure compliance.

8. REFERENCES

- EU directive 2008 50 EC -ANNEX I Data quality objectives for ambient air quality assessment
- D1357-95 (Reapproved2000) Standard Practice for Planning the Sampling of the Ambient Air
- Egyptian Law 4/1994 Amended by law 9/2009 and Decree 1741/2005, amended by decree 1095 /2011 Annex 6 (amendments to executive regulations of Law 4).

Appendix I - Selection of Photos from the Air Quality and noise Monitoring activities