Att: Director –Infrastructure Projects
Department of Planning and Environment
Application number –SSI 13_6136
Major Projects Assessment
GPO Box 39 Sydney NSW 2001.

Dear Project Directors,

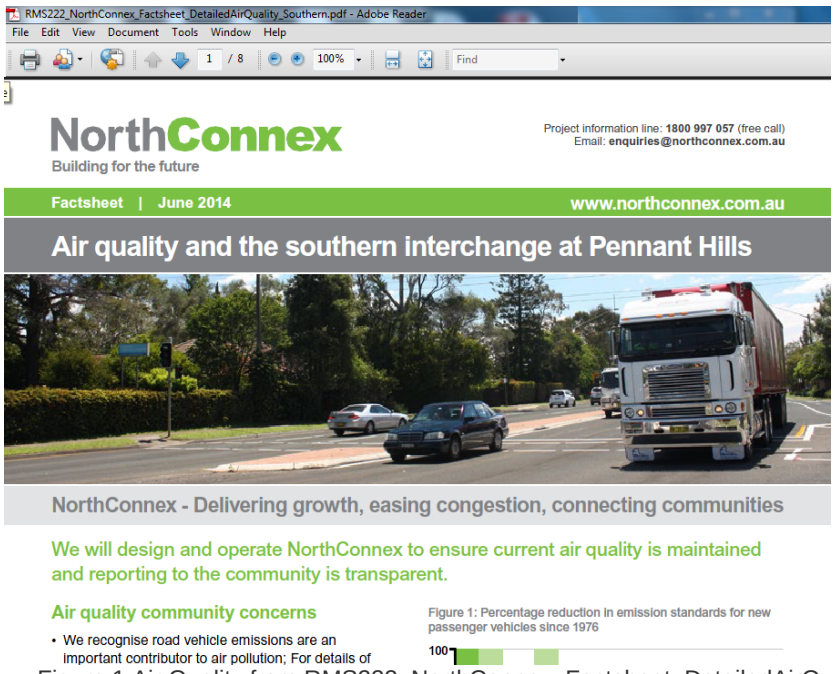


Figure 1 Air Quality from RMS222_NorthConnex_Factsheet_DetailedAirQuality_Southern.pdf

Figure 1 is the Fact sheet (June 2014) Air Quality proposed solution by NorthConnex for Southern Interchange. Dual (one upward and one downward/reversed) Air flow tunnels (9.2 KM) will be built from southern interchanges (144M Aust Height Datum) to northern interchange (180M Aus Height Datum). An estimated 4,000vehicles/hr will pass through the tunnel. High concentrated pollutant (bad air quality) generated by In-tunnel vehicles and will be drawn away by moving traffic and then extraction through a (30~35) M height ventilation outlet at both entries. Filtration technology (M5 East Tunnel filtration plant) will NOT be used.

This submission split into five parts in order to identify how the high air quality (2014) standard can be maintain/monitor/control within 2 KM surrounding resident area when the high concentrated pollutant emitted from both (35M height) ventilation outlets for NorthConnex tunnel operation in 2019:

A. Understanding of existing good Air Quality (AQ) and Healthy Standard within 2KM surrounding area from both ventilation outlets.
B. Calculation pollutant generated in the 9.2KM tunnel based on the Vehicle Emission Standards and the impact of pollutant released at two ventilation outlets.
C. Requirement to limit the pollutant concentration released from the tunnel ventilation outlets.
D. Penalty if the existing Air Quality standard (2014) failed to be maintained within 2 KM surrounding area at two tunnel ventilation outlets.
E. Two simple models propose to simulate the (real environment) affects within the 2KM area centre from both ventilation outlets

Part A. <u>Understanding the existing Air Quality (AQ) and Healthy Standard within 2KM surrounding (West Pennant Hills) area from both ventilation outlets</u>.

A1. The web links given in ref [1,2,3,4,5,6] has provided the good data indications how the good Air Qualify existing in the West Pennant Hills area and region..

A2. Australia has good Air Quality record ranking - the 2nd best in the world.

A3. Compare the AQ standard setting in the world (European countries, USA, NZ and Australia).

Part B Calculation pollutant generated in the 9.2KM tunnel based on the Vehicle Emission Standards and the impact of pollutant released at two ventilation outlets.

B1. The web links given in ref [7] has provides the vehicle emission standards. This can be used to calculate/estimates how much of pollutant produces in the tunnel and the amount of high concentrated pollutant released from the ventilation outlet.

B2. The basic formula to calculate the total amount pollutant released at the ventilation outlet = Vehicle Emission standards/KM * 9.2 KM * 4000 number of vehicle passing through the tunnel /hour.

B3. Without the NorthConnex project, the total amount of pollutant is evenly distributed along the pennant hill road, the good AQ maintains. With NorthConnex project, the total amount of tunnel pollutant is centralise and released at two spot of ventilation outlets. As such, the overall AQ is not improved. It just collecting (Pennant Hills road path) bad AQ to be released at two spot of ventilation outlets and make worst (Bad AQ) within 2KM surrounding resident area from two ventilation outlets.

Part C Requirement to limit the pollutant concentration released from the tunnel ventilation outlets.

C1. Refer to web links ref [8, 9], below summaries the requirement to set up the limit of pollutant concentration emitted from the tunnel ventilation outlets:

C2 use of air quality index (AQI) calculation - http://www.environment.nsw.gov.au/AQMS/dataindex.htm

C3. The range of Air Quality (Ozone, NO2, Visibility, CO, CO2, SO2, PM10, and PM2.5) should be set within the very good ranges (blue colour indication) in according to the Air quality data shown in http://www.environment.nsw.gov.au/AQMS/hourlydata.htm

Air quality data readings - updated hourly

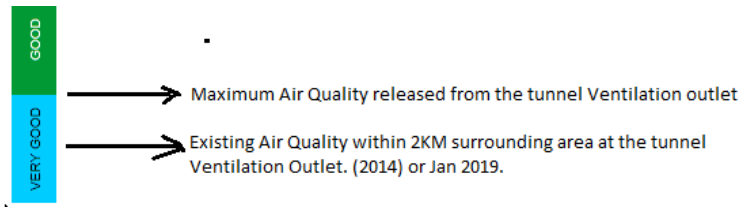
NSW map | Upper Hunter map | Newcastle map | NSW index values | NSW data readings | Sydney forecast | Alerts | Subscribe

Wednesday
27 August 2014
3 - 4 pm (AEST)
Previous | Next | Select
Show index values

VERY GOOD | GOOD | FAIR | POOR | VERY POOR | HAZARDOUS

Pollutants		Ozone O3	Ozone O3	Nitrogen dioxide NO2	Visibility NEPH	Carbon monoxide CO	Sulfur dioxide SO2	Particles PM10	Particles PM2.5
Averaging Periods		1-hour average	rolling 4-hour average	1-hour average	1-hour average	rolling 8-hour average	1-hour average	rolling 24-hour average	rolling 24-hour average
Sydney East	Randwick	3.0	3.1	-0.1	0.15		0.0	20.8	
	Rozelle	2.8	2.6	0.4	0.12	0.1		14.1	
	Lindfield	2.9	2.7	0.3	0.11		0.0	10.8	
	Chullora	2.0	2.1	1.0	0.14	0.2	0.0	12.1	5.5

C4. Within the very good (blue colour) Air Quality indication, the requirement to set up the limit of pollutant concentration released from the tunnel ventilation outlets are:



Part D. Penalty if the existing Air Quality standard (2014) failed to be maintained within 2 KM surrounding area at two tunnel ventilation outlets.

The penalty rate should be set in according to the level of air quality range between the maximum (very good AQ blue colour range) and the existing Air Quality (2014 or Jan 2019) within 2Km surrounding area at tunnel ventilation outlets.

The penalty will charge 30% the tunnel annual profits if AQ reach Max of very good (blue colour) range monitoring from the 2KM surrounding area. The rate of penalty is proportional to the level starting from the existing AQ (2014) standard within 2kM surrounding area. Such penalty, 50% will be used to improved the facility for the tunnel air quality released from the ventilation outlets and other 50% penalty will be used to compensate the resident within 2km surrounding area from the tunnel outlet ventilations.

The penalty will charge 50% the tunnel annual profits if AQ get into good (green colour) range monitor within 2KM surrounding area.

Part E. Two simple models propose to simulate the (real environment) affects within the 2KM area centre from both ventilation outlets.

If NorthConnex tunnel project team does not have confident to achieve the limit/requirements (see Part C), NorthConnex should re-design the tunnel ventilation outlet or alternative solutions or stop the NorthConnex project.

The result of AQ mathematic model used in the M5 tunnel East was not as predicted. It required a lot of M5 tunnel improvements. The result of AQ mathematic model simulated in Appendix G - Technical working paper - Air quality - Part 1 Vol.3 (http://northconnex.com.au/library.php) was a conception simulation (Not a real environment simulation). The windy data should be taken from 2KM surrounding area from the ventilation outlet (Not the whole Sydney). Such AQ simulation could not resolve the un-predictable risk for AQ (2014) maintain within 2KM surrounding resident and could not achieve the AQ standard specified in part C.

Two simple (models) solutions proposes for the real environment simulation how the aero-dynamics Design to improve the (real) Air flow within 2KM surrounding resident area from the (35M height) tunnel ventilation outlets:-

E1. **Real simulation model 1.** Hire a (long range arm) truck to carry a smoke generator and elevates it up to 35M height at the proposed tunnel ventilation outlet. It simulates the wasted gas emitted from a chimney at the (fire) power station. If wind air flow (all direction) push smoke upward to the sky. The solution of tunnel ventilation outlet is accepted. If Not, it need to design the tunnel aero-dynamics to enable the air flow upward to the sky without affect 2km surrounding resident area or alternative air treatment should be improved at the ventilation outlets.

E2. **3D simulation model 2**. Use a 3D printer to produce 2km surrounding resident area model. Air flow is simulated in difference direction point to the (smoke) ventilation outlet point. Improve/modify the tunnel ventilation outlet aero-dynamics design to enable the smoke air flow upward to the sky without affect 2km surrounding resident area.

Both simulations might be provided the possible better solution in the tunnel design (such as reserve space for air treatment) at the ventilation outlet.

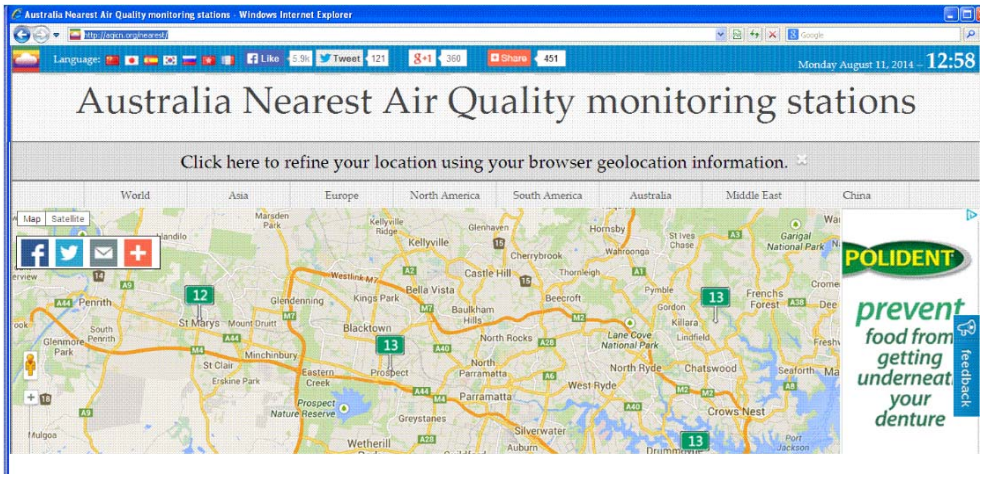
E3. Hot air produced by vehicles will move upward from south to the north side, the aero dynamics to push the tunnel air flow down from North interchange to South interchange is not a good idea.

Appendix - Web Links

A. Standard of existing Air Quality and Healthy in West Pennant Hills and Regions
[1] Existing (Air Quality) environment (Page 17 to 30 in Appendix G - Technical working paper - Air quality - Part 1 Vol.3 (http://northconnex.com.au/library.php)

[2] RMS222_NorthConnex_Factsheet_DetailedAirQuality_Southern.pdf (8 pages) via Google search

[3] Australia Nearest Air Quality Monitoring Stations shows good Air Quality Data via web
http://aqicn.org/nearest/



[4] Health impacts of transport emissions in Australia Economic costs or WP_063 or BTRE working Paper 63 -- http://www.google.com/url?url=http://www.bitre.gov.au/publications/2005/files/wp_063.pdf&rct=j&frm=1&q=&esrc=s&sa=U&ei=AaD7U4j_GNbi8AWuxoCAAQ&ved=0CDkQFjAG&usg=AFQjCNHTJUchXHu3uChP-qj2I822xKvjQA

[5] U.S.A. NAAQS standard -- http://www.epa.gov/ttn/naaqs/

[6] USA CDC Centre Disease Control and Prevention. http://ephtracking.cdc.gov/showHome.action

[7]Vehicle Emission Standards - http://www.infrastructure.gov.au/roads/environment/emission/

[8]Air quality index (AQI) calculation - http://www.environment.nsw.gov.au/AQMS/dataindex.htm

[9]Range of AQ -http://www.environment.nsw.gov.au/AQMS/hourlydata.htm