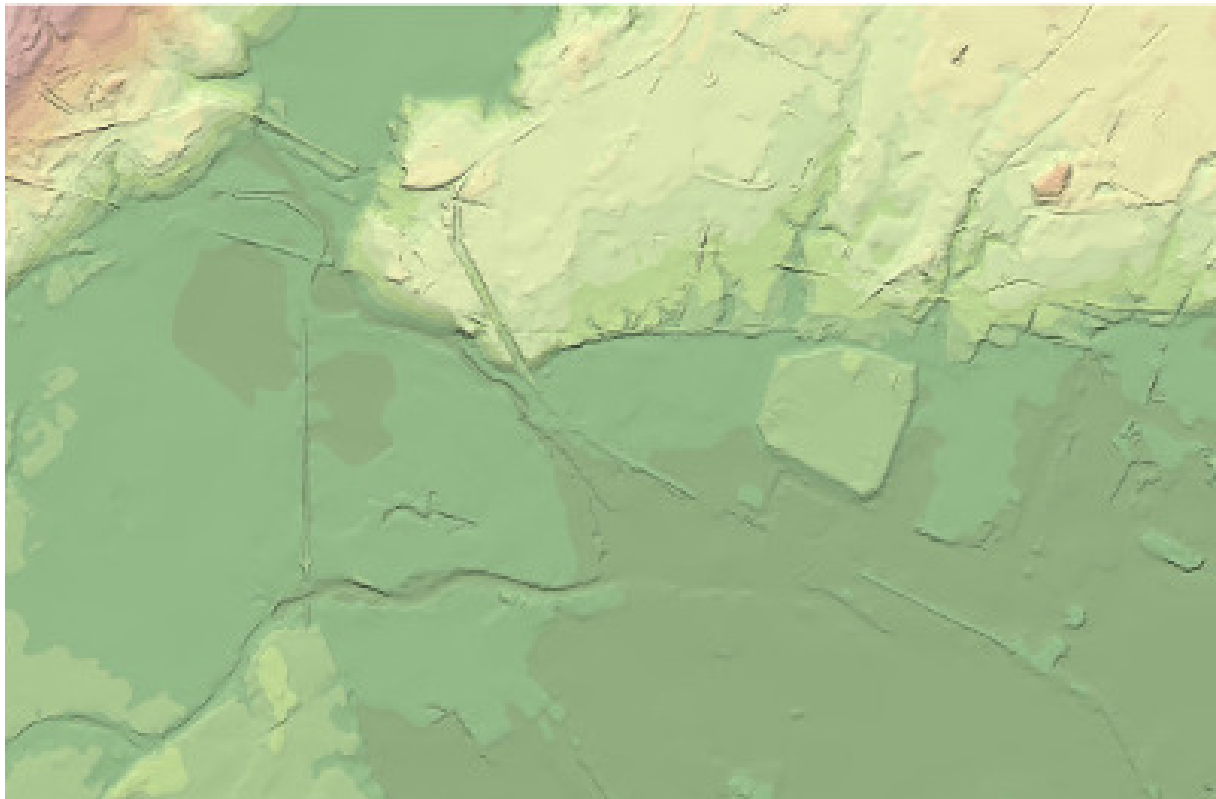


## 13. POLLUTION

The use of land and human activities gradually deteriorates the environment through destruction of ecosystems and natural habitat and depletion of resources such as air, water and soil. The consequences may be undesirable impacts or alterations to the environment. These impacts may influence and change the boundaries and potentials for future activities and for quality of human living. The purpose of this section is to establish linkages between land use and the location of pollution sources and to reflect on the extent to which development pressures have influenced and changed the environment. This information will be used to inform the desired state of environment for the study area.

### 13.1 Landscape Modification

A high resolution shaded relief map, which displays the topographical character of the study area in a 3-dimensional view (**Figure 41**), shows a distinct pattern of elevated structures and excavations for infrastructure, notably associated with port and industrial development. The modification of the landscape surface impacts natural ecosystems and constitutes an important element of the range of adverse environmental impacts that infrastructure may have.



**Figure 1: Extract from the shaded relief map of the study area. Note the linear structures depicting road and railway networks, as well as the tailings dam protruding from low land.**

The linear infrastructure in this example (road and railway networks) partitions the land and splits natural ecosystems into smaller units. The decline in biodiversity associated with these units will depend on the conditions of the original unit, the size and distribution of the newly formed parts and the barrier effect of the infrastructure delineating the unit<sup>1</sup>. The construction of the railway line in the study area has impacted natural geomorphological processes, causing sedimentation concentration and altered drainage patterns of the floodplain in the area. Similarly the Gypsum Slimes Dam that was built on the floodplain has blocked the natural drainage of water. Future landscape modifications must take the existing partitioning effect into account as well as the size and ecological quality of units. The EMF's task is to provide guidance in this regard.

### 13.1 Air pollution

Localised air quality problems occur across the study area. As a result a study to assess air quality within the municipality was initiated in 2005 with the aim of informing spatial development planning<sup>2</sup>. The study has identified the air *pollution sources* in the area (**Table 14**) and emphasized industrial, vehicle tailpipe emissions and biomass burning as the main sources of emissions within the City of uMhlathuze. The *primary air pollutants* are Sulphur Dioxide (SO<sub>2</sub>) and fine particulate matter (PM<sub>10</sub>), while Fluoride has also been identified as a potential threat.

**Table 1: A summary of the main sources of air pollution in the study area**

TYPE	SOURCES
Industrial sources	<ul style="list-style-type: none"> <li>The main industry sources include Bayside and Hillside Aluminium, Mondi Paper &amp; Pulp Mills, Richards Bay Coal Terminal, Foskor, Tongaat Hulett, Lafarge Cement, Ticor SA, Tata Steel and Pulp United, and the National Ports Authority.</li> <li>Various smaller industrial and commercial operations contribute through activities such as spray painting, sand blasting, dry cleaning, small boiler and incineration processes, etc</li> </ul>
Mining operations	<ul style="list-style-type: none"> <li>The two main operational mines in the municipality are Ticor Hillendale and Hlanganani Sandwork Operations.</li> <li>Richards Bay Minerals falls outside the municipal boundaries but has air quality impacts on the city.</li> </ul>
Transport-related emissions	<ul style="list-style-type: none"> <li>The main sources are from vehicles (roads), railroad, airport and shipping.</li> </ul>
Household fuel combustion	<ul style="list-style-type: none"> <li>The use of fuels for space heating and/or cooking within local communities.</li> </ul>
Biomass burning	<ul style="list-style-type: none"> <li>Crop-residue burning and general wild fires associated with agriculture (sugar cane) and</li> </ul>

<sup>1</sup> Evaluation and assessment guidance is available in: European Environment Agency (1998) *Spatial and Ecological Assessment of the TEN: Demonstration of Indicators and GIS Methods*. Progress Report on the DGVII-DGXI-Eurostat-EEA Working Group of the SEA of the TEN, April 1998, Copenhagen.

<sup>2</sup> Liebenberg-Enslin H and Petzer G (2006) *Review of Spatial Development Framework for the City of uMhlathuze based in an Air Quality Investigation*. Report produced by Airshed Planning Professionals (Pty) Ltd for the local municipality in April 2006. Report No. APP/05/UMH-02 rev 4, Halfway House.

TYPE	SOURCES
	forestry.
Waste treatment facilities	<ul style="list-style-type: none"> <li>• There are two water treatment facilities and three landfill sites in the municipal area.</li> <li>• Mondi paper mills have their own landfill sites at Mondi Richards Bay and Mondi Felixton</li> <li>• Bayside Aluminium operates an ash site.</li> </ul>
Miscellaneous emissions	<ul style="list-style-type: none"> <li>• Wind-blown dust from open areas and agricultural activities</li> <li>• Informal refuse burning</li> <li>• Tyre burning</li> <li>• Regionally transported (imported) pollutants</li> </ul>

Of the total annual emissions of the main pollutants in **Table 15** industry accounts for all of the hydrogen emission (HF), more than 99% of the SO<sub>2</sub> emission, 77% of the particulate emissions and 54% of the NO<sub>x</sub> emission. Emissions from transportation are dominated by petrol and diesel motor vehicles that account for 44% of the total NO<sub>x</sub> emission and 84% of the CO emissions in the City of uMhlatuze. The majority of homes are electrified and emissions from residential fuel burning are very low.

**Table 2: Total emissions of key pollutants in t/a from the main source in the City of uMhlatuze (adapted from Liebenberg and Petzer, 2006 and CSIR Environmentek, 2005)<sup>3</sup>**

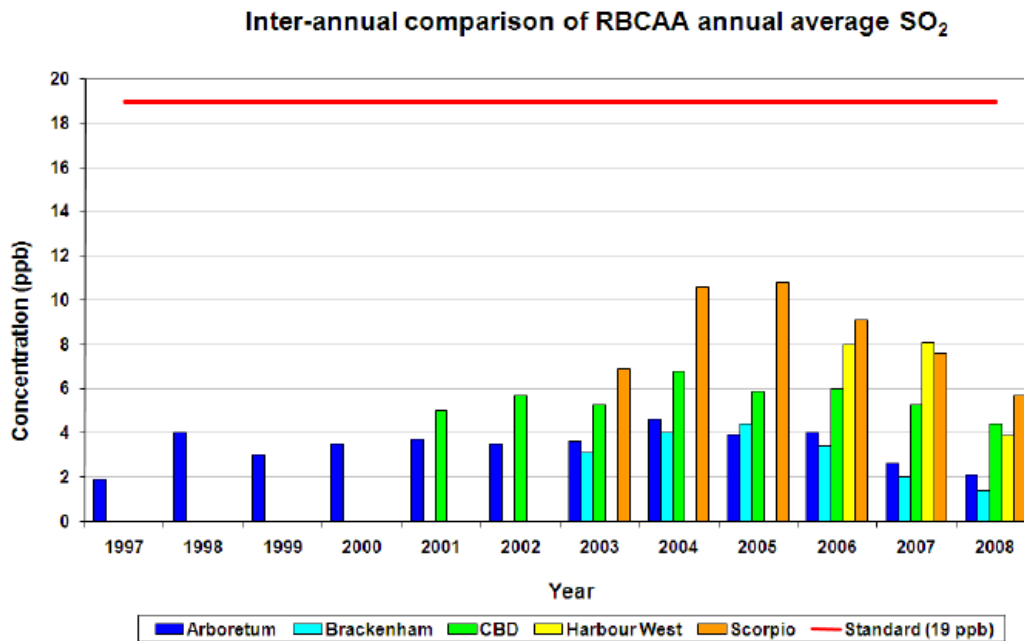
	Particulates	SO <sub>2</sub>	NO <sub>x</sub>	HF	NH <sub>3</sub>	H <sub>2</sub> S	CO
<b>Industry</b>	3,316.61	21,761.12	1,214.66	95.43	104.07	18.15	
<b>Mining</b>	696.18						
<b>Diesel &amp; petrol vehicles</b>	38.57	90.15	981.00				5,170.00
<b>Biomass burning</b>	234.45	9.38	48.45				1,015.94
<b>Total</b>	4,285.81	21,860.65	2,244.11	95.43	104.07	18.15	6,185.94

The Richards Bay Clean Air Association (RBCAA) operates five ambient air quality-monitoring stations in Richards Bay. The annual average SO<sub>2</sub> concentration shows growth as industrial sources is introduced and expanded, with a decrease in 2006 (**Figure 42**). The highest concentrations occur close to the major industries (Scorpio), followed by the CBD and the Harbour. The South African annual ambient air quality standard is not exceeded anywhere, but exceedence of the short term standards occur at Scorpio (Liebenberg and Petzer, 2006, Ecoserv, 2008). Exceedence of the South African 24-hour PM<sub>10</sub> standard occur (Ecoserv, 2007<sup>4</sup>; 2008<sup>5</sup>).

<sup>3</sup> CSIR Environmentek (2005): Air Quality Specialist Study for the Proposed Tata Steel Ferrochrome Project at Richards Bay – Alton North Site, ENV-D-C 2005-044.

<sup>4</sup> Ecoserv (2007): Annual technical report for 2008, Ambient air quality, Prepared for Richards Bay Clean Air Association, AQ002, March 2007.

<sup>5</sup> Ecoserv (2008): Annual technical report for 2008, Ambient air quality, Prepared for Richards Bay Clean Air Association, AQ002, March 2008.



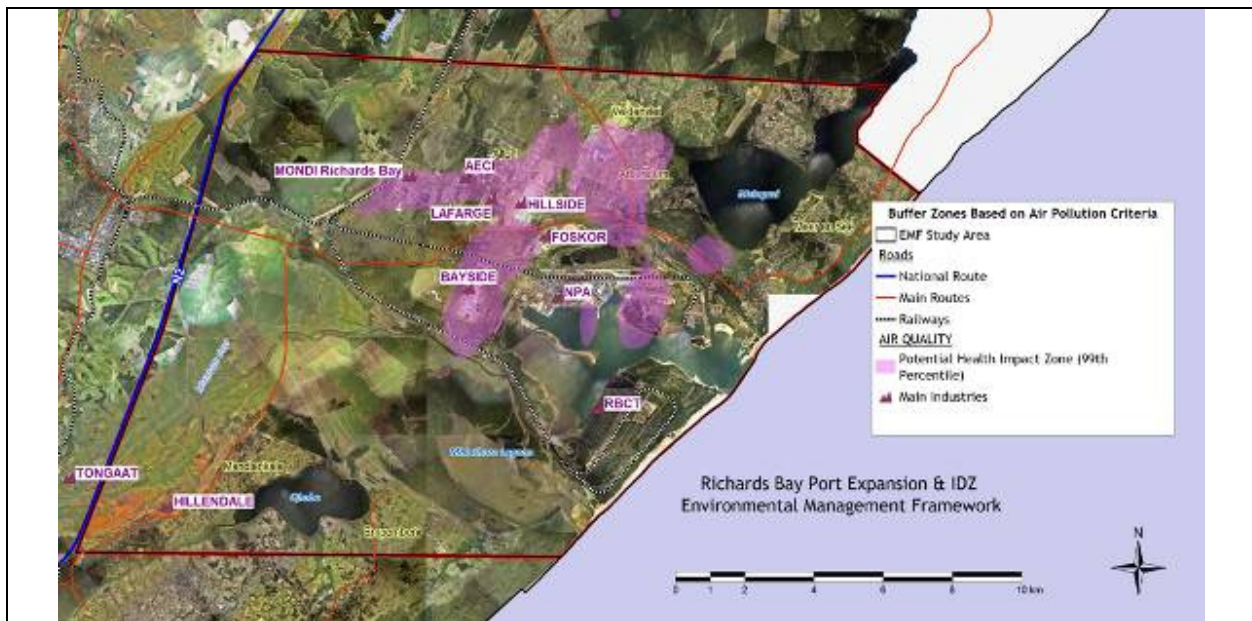
**Figure 2: Annual average SO<sub>2</sub> concentrations at the RBCAA monitoring stations (Ecoserv, 2008)**

The 2005 air quality assessment<sup>6</sup> included the identification of ambient air quality limits and targets, areas where air quality limits are exceeded or are in danger of being exceeded, the determination of buffer zones for existing industrial areas and the identification of possible future industrial development areas that would not impact on human health and the environment.

### **13.1.1 Buffer zones**

The buffer zones that were delineated for the area are reflected in **Figures 43-48**. The main criteria for buffer delineation is potential health impacts and environmental or nuisance impacts. These zones were determined by air dispersion modelling and health risk screening assessments. Visual impacts and nuisance from dust were not considered as criteria in this exercise. The zones represent the **impact areas** based on the *existing* air quality situation. In other words, they characterize the areas which are 'incompatible' with residential and other sensitive land uses. The available information further indicates that should industry operate at their full permit allocations adverse risks to the environment and human health can be expected.

<sup>6</sup> The City of uMhlatuze has adopted Local Air Quality Guidelines (Council Resolution 4272 of 21 November 2006) that includes emission targets and implementation of Air Quality Buffer Zones.



**Potential Health Impact Zone (99<sup>th</sup> Percentile)**

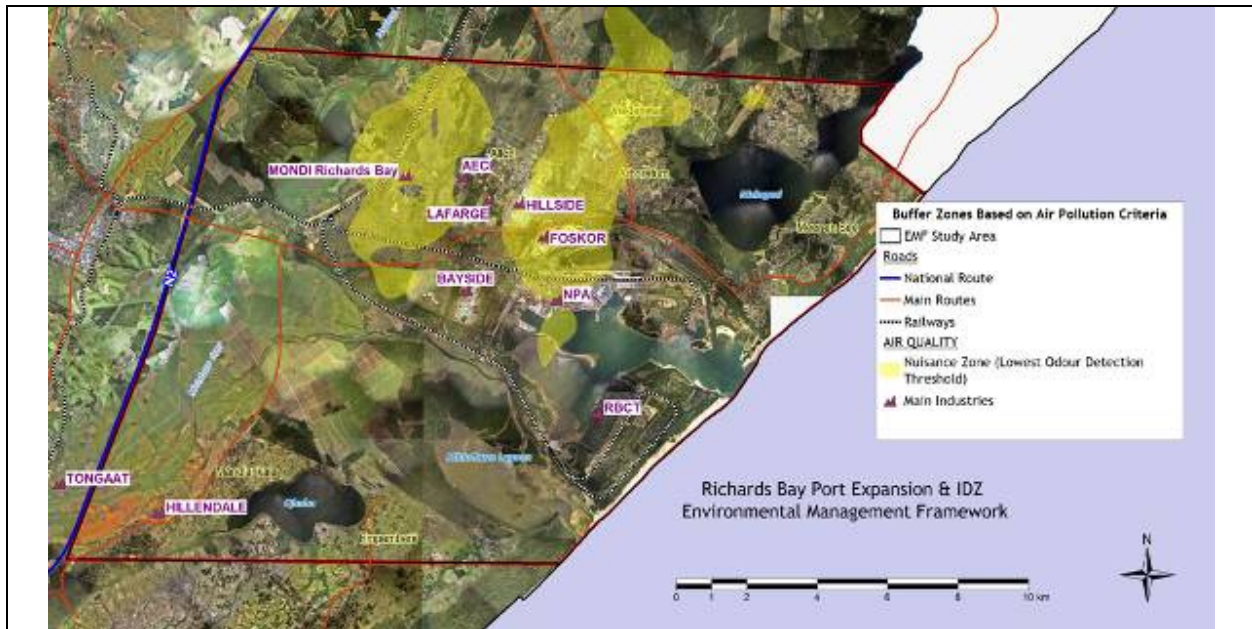
The zone incorporates mainly the CBD and the industrial areas surrounding it and Arboretum.

It demands a priority focus for decision-making.

Further industrial development resulting in SO<sub>2</sub> emissions should preferably not be considered within this zone until such time as the concentrations are within acceptable limits. These levels will have to be determined by the City of uMhlatuze.

Industries cannot be allowed to operate at full permit capacity in this zone.

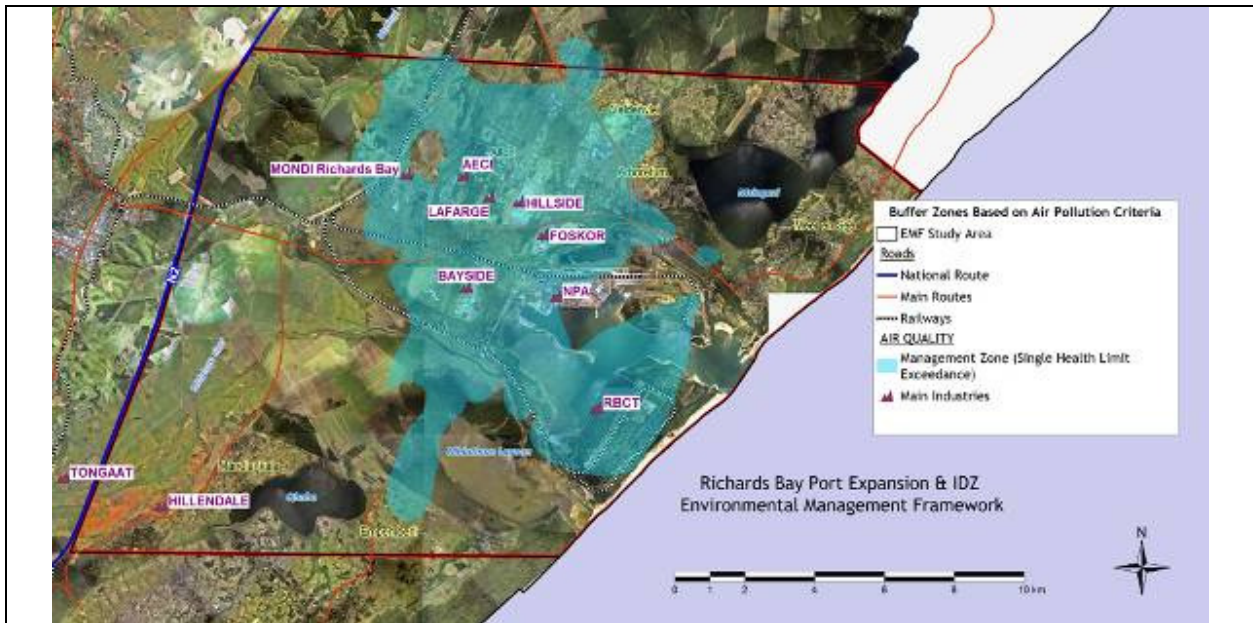
**Figure 3: Potential Health Impact Zone (99<sup>th</sup> Percentile)**



**Nuisance Zone**

The zone areas where people may experience discomfort due to unpleasant odours. It falls within the critical zone.

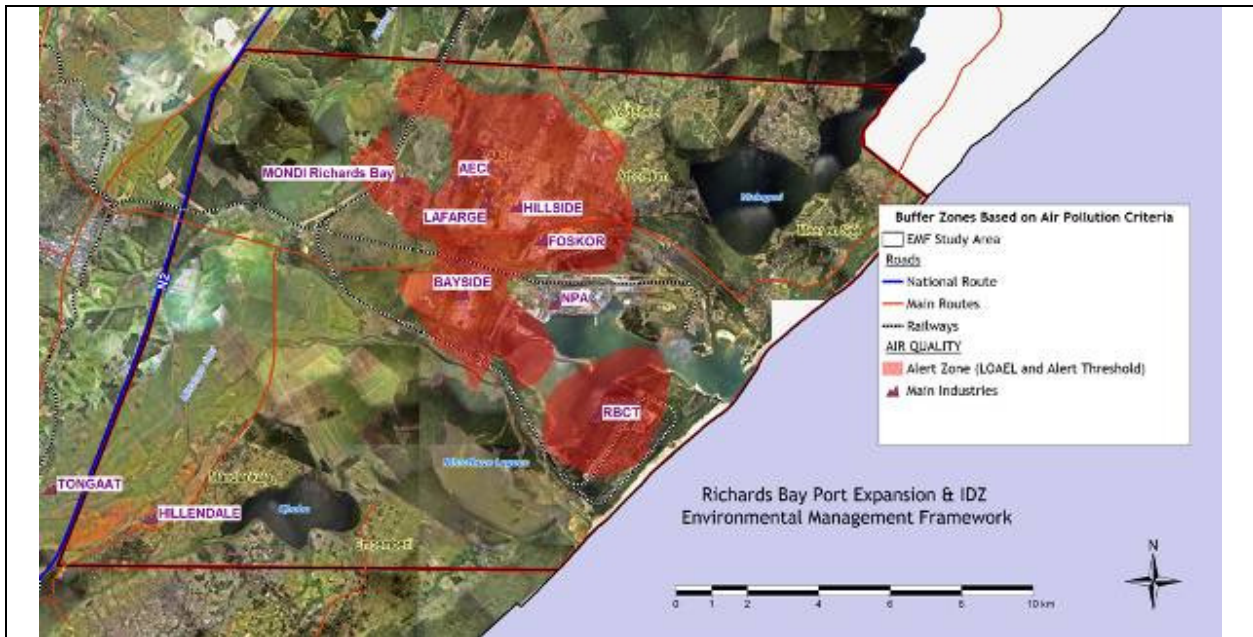
**Figure 4: Nuisance Zone (Lowest Odour Detection Threshold)**



**Management Zone**

The main part of Richards Bay falls within this zone including the industrial areas, CBD, Arboretum and Brackenham. This zone could result in possible health implications. The ambient monitoring network should be expanded to ensure representative monitoring within this zone.

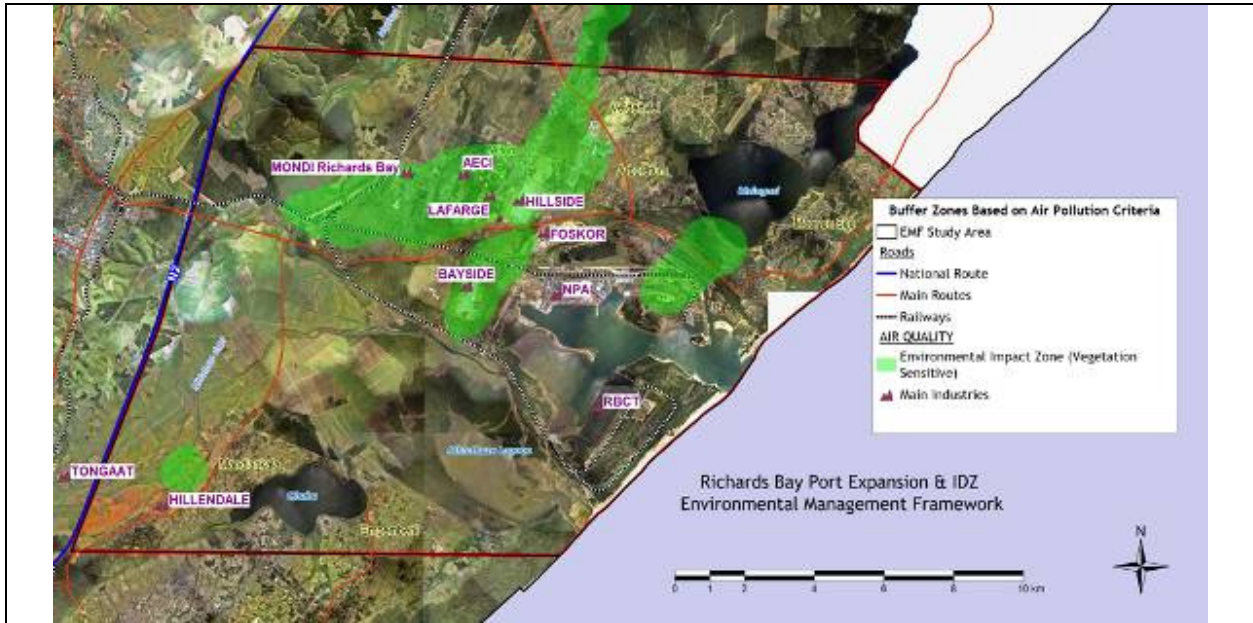
**Figure 5: Management Zone (Single Health Limit Exceedance)**



**Alert Zone**

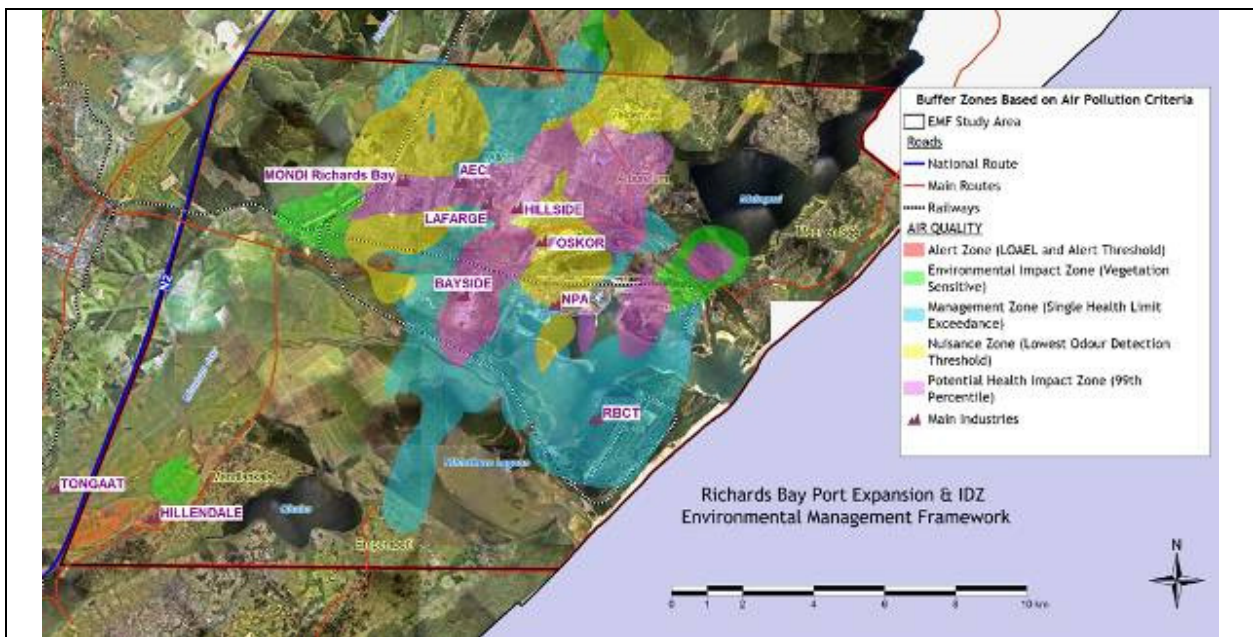
The main pollutants of concern in this zone are PM10 around the harbour and SO2 at the CBD and surroundings. Any further industrial development within this zone resulting in these two pollutants should be carefully considered since effects may be noticed by sensitive individuals, and actions to reduce these effects may be needed. (LOAEL: The lowest level at which adverse effects for a specific pollutant have been observed).

**Figure 6: Alert Zone (LOAEL\* and Alert Threshold)**



**Environmental Impact Zone**  
Areas where possible negative impacts on vegetation growth could occur.

**Figure 7: Environmental Impact Zone (Vegetation Sensitive)**



**Buffer Zones**  
The combined buffer zones based on air pollution criteria.

**Figure 8: Buffer Zones Based on Air Pollution Criteria**

### **12.1.2 The impacts of air pollution**

The impacts of particulates (diameter less than 10 µm, i.e. PM10) could be harmful to humans as they can be inhaled and may get trapped in the lungs resulting in health impacts. When combined with other gases particulates may be toxic and harmful to human health. There is a proven correlation between concentrations of PM10 and public health; the impacts of high concentrations of sulphur dioxide include bronchiolar constrictions and respiratory infections<sup>7</sup>.

The impacts of poor ambient air quality on human health and well-being as well as on the environment have been recognised by the inhabitants of the City of uMhlatuze. Community concerns regarding the levels of air pollution have resulted in the establishment of the Richards Bay Clean Air Association (RBCAA) in 1997. Since then the RBCAA has been playing a fundamental role in maintaining an ambient monitoring system in the study area and making recommendations in terms of air quality. Members, representing the main industries in the area, finance the system based on the “polluter pays principle”.

Environmental justice NGO *groundWork South Africa* has also recognised the impacts of poor ambient air quality on human health in the study area, particularly as it relates to the siting of industrial development adjacent to residential communities. They have criticized the Department of Trade and Industry for promoting industrial development in an area that is in close proximity to residential areas<sup>8</sup>.

National and provincial government have acknowledged the significance of air quality in Richards Bay and has prioritized the area for air quality management interventions, for example:

- Richards Bay is one of 12 municipalities rated on a national scale as having ‘poor air quality’<sup>9</sup>.
- The right of communities to breathe clean air has been reiterated by the National Ministry.
- Public hearings on the Air Quality Bill were taken to Richards Bay during 2004 in recognition of local air quality problems and subsequent to unfortunate industrial incidents in the area.
- Provincial government has initiated an Emission Inventory Database for KwaZulu-Natal<sup>10</sup> and highlighted the need for air quality management in Richards Bay as a priority.

Air pollution is a significant constraint for the development of industry in the area. Further industrial development resulting in SO<sub>2</sub> and PM10 emissions should preferably not be considered within the CBD and the industrial areas surrounding it and Arboretum until as the concentrations are within acceptable levels (Liebenberg and Petzer, 2006).

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<sup>7</sup> WHO (2000). *Air Quality Guidelines*, World Health Organisation, Geneva.

<sup>8</sup> Peak B (2006) *Who will bear the cost of pollution in Richards Bay?* Groundwork’s Quarterly newsletter, Volume 8, No 1, March 2006. Available online at <http://www.groundwork.org.za>

<sup>9</sup> DEAT (2007) *The National Framework for Air Quality Management in the Republic of South Africa*. Department of Environmental Affairs and Tourism (DEAT), Government Gazette, No. 30824 of 11 September 2007.

<sup>10</sup> Zanoluhle Environmental Services (2007) *Emission Inventory Report*. Prepared for the Department of Agriculture and Environmental Affairs, Howick.

It is clear that air quality capacity in Richards Bay has been reached and it is unlikely that the situation will change in the foreseeable future. The Port Due Diligence Studies have also noted the potential constraints from a port expansion perspective<sup>11</sup>. There is a potential land use conflict in the strategic direction proposed by the Minister of Trade and Industry through the IDZ. Opportunities do however exist for industry types with no or low air pollution potential. Industrial activities with pollution potential could also be sited in the hinterland where air quality capacity has not yet reached limits.

The following key issues and information gaps have been identified:

- The possibility of identifying the area as an air pollution “hot spot” by DEA should be investigated.
- The issue of port emissions of pollutants from the Port was raised. The relevance of the Air Emissions Inventory for the Port of Richards Bay compiled by COEX Environmental Planners to the EMF must be ascertained.
- The impact of current air pollution on human health in Richards Bay is not clearly understood. The DAE&RD together with the uMhlatuze Municipality have recently called for tenders for a comprehensive health study in Richards Bay to establish the relationship between air pollution concentrations and respiratory health.
- The impact of climate change on the atmospheric conditions (and hence climate change) is unclear and should be considered in planning.

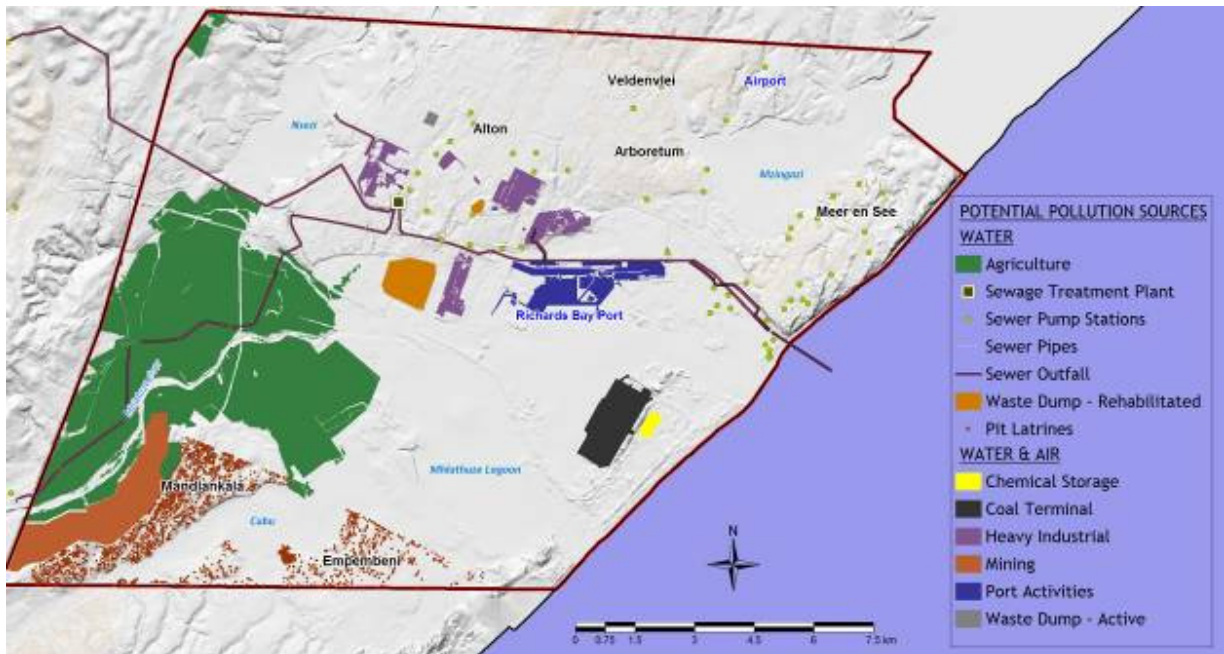
## 13.2 Potential Pollution Sources

The various land use activities in the area that cause pollution and/or degradation of environmental resources (water and air) have been summarized in **Figure 49**. Pressures such as agricultural activities and mining operations influence water quality through erosion and sedimentation. Irrigation in the middle reaches of the Mhlatuze catchment causes water quality problems such as eutrophication of coastal lakes (Lake Nsezi). Land uses such as heavy industrial and port activities cause air pollution. High concentrations of metals (aluminium) have been detected in the estuary and have been linked to the nearby aluminium smelters. Water quality of the freshwater resources in the study are minimised through discharge into the sea.

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<sup>11</sup> Du Toit F (2009) *Due Diligence Investigation for Acquisition of Land for Future Port Development: Gap Analysis*. Report produced by Ilifa Africa Engineers (Pty) Ltd for Transnet National Ports Authority, March 2009. Ilifa document no 28007/Transnet Richards Bay, Meerensee.

There are also other sources of pollution outside the study area that cause local environmental problems. For example, industrial development upstream from the study area contributes to water quality decline within the Mhlathuze River and the Estuary. Upstream activities include the Tongaat Hulett Sugar Mill, the Mondi Paper-Pulping Plant, and various other agricultural and informal farming activities.



**Figure 9: Potential Pollution Sources**