



Strategic Environmental Compliance and Performance Review

Industry monitoring

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Department of
Environment, Climate Change and Water NSW



The Strategic Environmental Compliance and Performance Review: Industry Monitoring was undertaken by the Compliance and Assurance Section, Department of Environment, Climate Change and Water NSW (DECCW).

More information

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Executive summary

From 1 July 2009 the Department of Environment and Climate Change was renamed the Department of Environment, Climate Change and Water, with additional responsibilities for water.

The Department of Environment, Climate Change and Water NSW (DECCW) has completed a review of industry monitoring to improve environmental performance.

The review focused on industry monitoring requirements on environment protection licences across various industry types within New South Wales. The review process combined compliance audits with research to establish best environmental management practices.

The objectives of the review were to:

- assess the level of licensee's compliance with monitoring requirements attached to environment protection licences
- determine the extent to which industry uses monitoring data to measure their environmental performance and to manage and minimise environmental impacts
- review monitoring requirements to ensure they are necessary, with a view to cutting red tape and reducing regulatory burden where appropriate.

About this report

This report summarises the findings of the compliance audits completed by DECCW.

The report also provides:

- guidance on how industry can improve its environmental performance by implementing best environmental management practices for undertaking monitoring, including collecting and recording data, analysing and converting data, assessing information for reporting and communicating results
- information on how industry can use data to manage site operations
- information on other initiatives to help industry improve its environmental performance.

Key findings

The results of the audits and review of best environmental management practice show that industry can improve its environmental performance and reduce the potential for environmental harm by:

- identifying potential risks and developing monitoring plans to ensure a systematic approach to monitoring
- conducting in situ and visual checks within processes to determine environmental concerns prior to them becoming an 'end of pipe' problem
- properly maintaining plant and equipment used in the monitoring of emissions to ensure the accuracy of data collected and minimise the risk of environmental controls failing
- ensuring all specified methods and procedures are used when conducting monitoring to accurately report results
- using monitoring data to make informed decisions to improve environmental performance and minimise environmental impacts.

A systematic and rigorous process of follow-up actions has been completed to ensure that issues identified at the audited sites are being addressed.

Valuable information for industry

The review findings provide valuable information to help industry improve its environmental performance and use monitoring data to manage site operations.

Some initiatives identified as part of this review include:

- using historical data to develop trend analysis showing changes in monitoring results and where necessary adopting a course of action to improve performance
- undertaking additional monitoring over and above that required by environment protection licences to improve performance
- conducting monitoring which provides immediate read-outs for day-to-day decision making
- conducting voluntary environmental audits and routine inspections to capture potential environmental concerns.

The findings of this review will also be used to inform DECCW's ongoing review of licences and assessment of applications for new licences. DECCW will continue to work with industry to improve environmental performance at sites in NSW.

Related initiatives

The following related initiatives also assist relevant stakeholders, such as industry and local government to identify ways in which they can monitor their progress in reducing their impact on the environment and benchmark their emissions and impacts against similar activities.

- *Air Emissions Inventory for the Greater Metropolitan Region in NSW* is a detailed listing of pollutants discharged into the atmosphere by each source type during a given time period and at a specific location.
www.environment.nsw.gov.au/resources/air/tr10aei08260.pdf
- The *National Pollutant Inventory* (NPI) is an internet database that provides the community, industry and government with information about the emissions of 93 substances in Australia. NPI data can be used by industry to benchmark their emissions against similar facilities.
www.npi.gov.au
- *Small Waste Facility Environmental Risk Assessment and Mitigation Package* is a software program designed to assist operators of small waste facilities assess and manage environmental risks.
www.environment.nsw.gov.au/warr/ERAMPv1.htm

1 Strategic compliance and performance reviews

From 1 July 2009 the Department of Environment and Climate Change was renamed the Department of Environment, Climate Change and Water, with additional responsibilities for water.

In addition to its other regulatory activities, the Department of Environment, Climate Change and Water NSW (DECCW) undertakes an ongoing program of strategic environmental compliance and performance reviews. The aim of these reviews is to encourage industry to improve their environmental performance. The reviews combine compliance audits (i.e. assessing compliance with environmental legislation) with research to form best environmental management practices. Industry, licensees, state agencies, local government, the community and other stakeholders provide input into various stages of the review process.

Selecting activities and sectors for review

The reviews focus on priority environmental issues identified in various sectors of industry. Previous reviews looked at:

- the wood preservation industry
- liquid chemical storage, handling and spill management practices
- preventing contaminated sites
- environmental impacts of industrial estates.

Sectors and activities targeted for strategic environmental compliance and performance reviews are chosen by assessing major environmental and community concerns alongside DECCW's corporate objectives and strategies.

The criteria considered for the review include the likelihood of harm to human health and the environment from an activity, the complexity of the activity, emissions and wastes from the activity, gaps in understanding of the activity, environmental performance, location of the activity, community concern, the opportunity to make significant environmental gains in relation to the activity and opportunities to integrate with other DECCW programs.

Further information

For more information on these reviews, see
www.environment.nsw.gov.au/licensing/complianceaudit.htm

Relevant legislation

Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) allocates responsibilities for pollution prevention and control to the Environment Protection Authority (EPA)¹, local councils and other public authorities. EPA is the appropriate regulatory authority for:

- regulating activities listed in Schedule 1 of the POEO Act, and premises where scheduled activities are carried out
- ensuring compliance with environment protection licences
- regulating activities carried out by the State or a public authority.

In nearly all other cases the appropriate regulatory authority is the local council. A local council may exercise its powers under the POEO Act only in, or in relation to, the local council's area.

Premises that undertake scheduled activities and meet the licensing threshold are licensed and regulated by DECCW. Activity types include coal mines, livestock intensive industries, waste facilities, petroleum works and sewerage treatment systems. For a full list of all the scheduled activities and the classifications under them, refer to Schedule 1 of the POEO Act (www.legislation.nsw.gov.au/fragview/inforce/act+156+1997+sch.1+0+N).

Environment protection licences issued under the POEO Act set environmental performance requirements. Licences may specify a required performance outcome or a specific environmental management practice. Licence conditions take into account factors such as the surrounding environmental conditions, type of activity and the available technology. Pollution reduction programs and pollution studies are often attached to licences, requiring licensees to carry out work within a specified timeframe to enable them to comply with environmental requirements. Depending on the type of activity carried out, licensees may be required to undertake monitoring for water, noise or air for example.

The POEO Act prohibits certain actions that may pose a risk to the environment, including the pollution of waters (section 120) and leaks and spills of substances (section 116). These restrictions apply to industries and activities whether or not they are licensed.

Authorised officers are appointed to help regulatory authorities exercise their functions under the POEO Act. The powers of authorised officers include:

- the powers of entry and search
- powers to question and identify persons
- powers to issue notices.

The principal types of notices are:

- notices to provide information and records
- clean-up, prevention, prohibition, compliance cost notices (POEO Act Chapter 4 Environment protection notices)
- penalty and noise control notices (POEO Act Chapter 8 Criminal and other proceedings).

¹ Although the EPA is part of DECCW, certain statutory functions and powers, such as the determination of licence applications and other licensing functions under the POEO Act, are exercised in the name of the EPA by DECCW.

2 The industry monitoring review

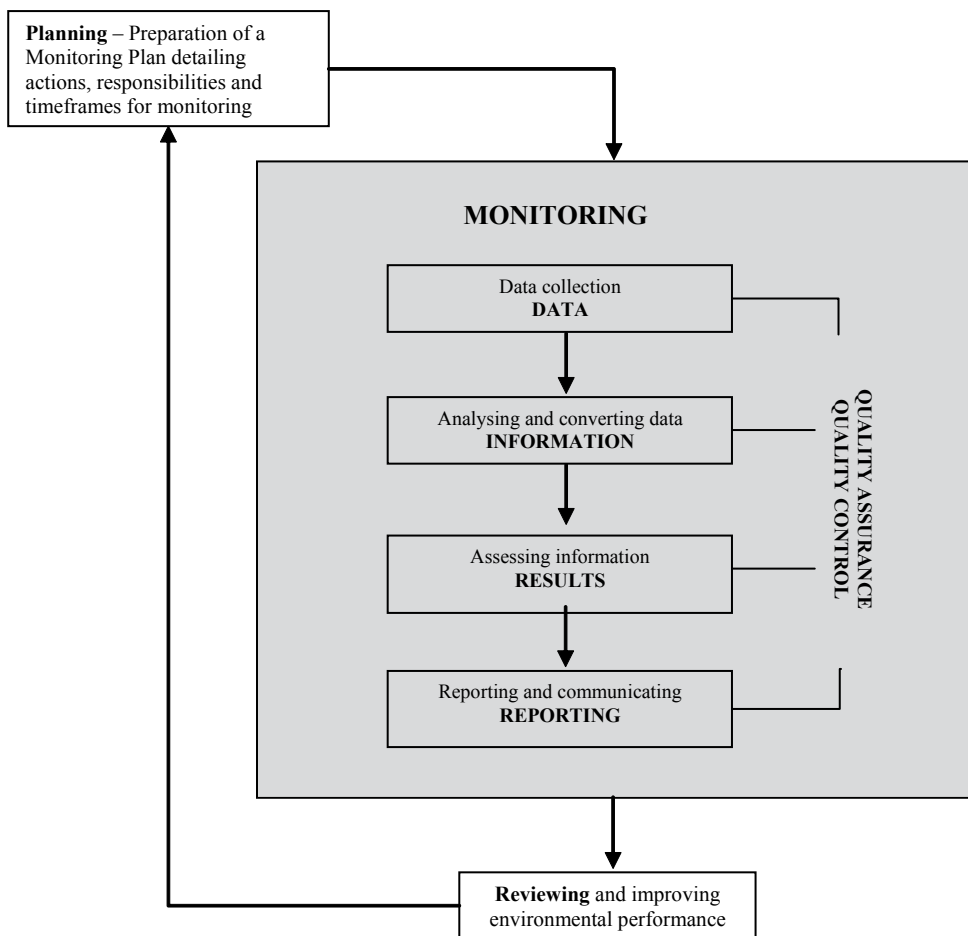
What is monitoring?

Monitoring can be broadly defined as the systematic collection, analysis and interpretation of data to effectively track, manage or alter site management activities.

Monitoring is an important management tool that should be used to help minimise the environmental impacts associated with activities. It can be used by industry to collect information to characterise changes in environmental emissions and to enable appropriate action to be taken when data indicates that the quantity and/or nature of emissions are changing.

Effective monitoring requires the results of measurements to be analysed, and assessed on an ongoing basis, against previous results and relevant criteria, so that trends may be identified. In order to properly monitor any actual or potential environmental issue, samples or measurements taken must be carried out at sufficiently regular frequencies and with appropriate rigour to provide a reliable basis for such an analysis or assessment.

Figure 1: Monitoring process



Note: Figure 1 has been adapted from Standards Australia (2000).

It is essential that monitoring reflects the true nature and environmental impact of any environmental issue. The monitoring process should be outlined in a monitoring plan tailored specifically for each site. The plan should detail the actions, responsibilities and timeframes

for monitoring, how data is to be collected and analysed and what information needs to be extracted in order to manage site operations.

Monitoring that is undertaken to satisfy the requirements of an environment protection licence must be based on the relevant standards and Approved Methods (DEC 2004; DEC 2007). In the case of water and air, where an analysis method is not specified in the manuals, DECCW requires that monitoring be undertaken in accordance with any methodology that a licence condition requires, or if there is no such requirement, any methodology that has been approved by DECCW in writing.

Monitoring is not just the collection of data but rather it is the use of this data to make informed decisions regarding site operations.

Scope of this review

The review examined the following activities:

- data collection
- data analysis and conversion
- information assessment
- reporting
- quality assurance and quality control.

Activities within the review scope were assessed against the audit criteria (i.e. the required performance standards) for the 12 months prior to the date of the audit inspection.

Premises audited

The review included 29 premises (see Appendix A) that are licensed by DECCW under the POEO Act and required to undertake monitoring. The activities, as listed in Schedule 1 of the POEO Act, were audited for the following sectors:

- agricultural produce industries
- cement or lime works
- ceramic works
- chemical storage facilities
- coal mines
- concrete works
- electricity generation
- extractive industries
- livestock intensive industries
- livestock processing industries
- mineral processing or metallurgical works
- paper, paper pulp products industries
- road construction
- sewage treatment systems
- waste facilities.

The audits examined compliance with the limit, operating, monitoring, recording and reporting requirements, and pollution reduction programs relating to monitoring included on individual licences.

DECCW's public register contains details of all licences issued under the POEO Act. Licences are available on DECCW's website at www.environment.nsw.gov.au/prpoeoapp/searchregister.aspx.

Audit methodology

The compliance audits were undertaken in accordance with the procedures and protocols in the *Compliance Audit Handbook* (DEC 2006a) (copies are available from DECCW's Environment Line: 131 555 or www.environment.nsw.gov.au/resources/licensing/cahandbook0613.pdf). When an audit is completed, the findings are presented to the audited organisation as an individual compliance audit report. Individual compliance audit reports are publicly available in the DECCW Library on Level 15, 59 Goulburn Street, Sydney; phone (02) 9995 5000.

The audits were limited to a review of each licensee's compliance with legislation administered by, or statutory instruments issued by, DECCW relating to monitoring. Audit findings were based on information from DECCW files, information supplied by site representatives and observations made during site inspections.

The audit reports contain an action program outlining any non-compliance, recommended actions and agreed timeframes in which the licensee must comply. DECCW staff follow up on compliance audits to ensure the organisation is implementing the actions required of it in the report by the target date outlined in the report. DECCW has a systematic and rigorous monitoring program that tracks these follow-ups to ensure the licensee completes all the required actions.

The findings presented in this report are a collation of the findings presented in the individual compliance audit reports.

Analysing the risks

The risks associated with the non-compliances identified were assessed and coded according to their environmental significance.

Non-compliances were assessed against two criteria: the likelihood of environmental harm occurring and the level of environmental impact. The likelihood of environmental harm was determined by assessing:

- past environmental performance
- current environmental performance
- potential contributing factors.

The level of environmental impact was assessed by considering factors such as the quantity and toxicity of the material and the sensitivity of the receiving environment.

After these assessments were made, information was transferred into the risk analysis matrix shown in Table 1.

Table 1 Risk analysis matrix

	Likelihood of environmental harm occurring			
		<i>Certain</i>	<i>Likely</i>	<i>Less likely</i>
Level of environmental impact	<i>High</i>	Code red	Code red	Code orange
	<i>Moderate</i>	Code red	Code orange	Code yellow
	<i>Low</i>	Code orange	Code yellow	Code yellow

Non-compliance assessed as 'code red' suggests that it is of considerable environmental significance and therefore must be dealt with as a matter of priority. A non-compliance assessed as 'code yellow' suggests that it could receive a lower priority but must still be addressed.

There are also a number of licence conditions such as those relating to administration, monitoring and reporting requirements that do not have a direct environmental significance, but are still important to the integrity of the regulatory system. Non-compliance with these conditions is given a blue colour code.

3 Review findings

This section of the report collectively summaries the various issues identified and reported on in the individual compliance audits conducted by DECCW.

Risk analysis of non-compliances identified

Non-compliances identified during the review were categorised using the risk analysis matrix illustrated in Table 1.

The percentages of non-compliances found in each category during the audit process are shown in Table 2. This review focused on monitoring and reporting requirements and therefore the majority of non-compliances were allocated a blue colour code.

Table 2 Percentage of non-compliances found in each risk category

Colour code of issue	Code red (high risk)	Code orange	Code yellow	Code blue	Total
Percentage of issues	–	–	17%	83%	100%

Collecting and recording data

Collecting data in accordance with strict procedures is important to ensure the integrity and accuracy of data obtained. Rigorous data collection is the foundation for the assessment of environmental impacts.

Improperly collected data can compromise the effective management of site operations and potentially harm the environment.

Samples should be collected so that they are representative of the condition being investigated, and in a manner consistent with the relevant standards for air (DEC 2007) and water (Standards Australia 1998a and referenced in the Approved Methods (DEC 2004)).

It is also important to ensure the proper and systematic recording of monitoring information and observations collected during sampling and analysis. Good record keeping will ensure that all supporting documentation and observations are kept for future reference.

The following non-compliances with licence requirements were identified in the review:

- not monitoring effluent volume, not calibrating volume monitoring equipment or not using the correct unit of measure and sampling method to ensure the accuracy of data collected
- not collecting representative soil and effluent quality samples to enable the proper assessment of the impact of effluent reuse on the utilisation area
- not monitoring the concentration of pollutants at the required frequency and not undertaking groundwater monitoring at all locations, which would help determine the environmental impact over time from activities undertaken at the premises
- not collecting dust monitoring samples in accordance with the specified sampling method and not selecting the locations of dust monitoring gauges in accordance with the specified standard, which would provide a full understanding of the environmental impact from airborne dust
- not recording continuous weather and daily rainfall to determine if any changes to site operations were required or to minimise offsite impacts on the surrounding environment.



Monitoring groundwater enables industry to measure any potential impacts of their activities on groundwater (DECCW)

Analysing and converting data

Environment protection licences require licensees to analyse samples collected in accordance with DECCW-approved methods (DEC 2004; DEC 2005; DEC 2007). By using these approved methods for analysis, DECCW is assured that samples are quality control tested to provide accurate and reliable data. Analyses should be undertaken by an independent accreditation body acceptable to DECCW, such as the National Association of Testing Authorities (NATA), or equivalent.

Data analysis may include consideration of data quality, validity and adequacy to ensure that reliable information is produced.

The following non-compliances with licence requirements were identified:

- laboratories commissioned to undertake the analysis of water samples for certain pollutants were not accredited by a certifying authority such as NATA to undertake the analysis, therefore not providing assurance that the data collected is accurate and reliable
- the analysis of the concentration of pollutants discharged (air and water) was not undertaken in accordance with the methods specified in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC 2007) and *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC 2004). Alternative methods were used without DECCW approval, therefore not assuring the quality of results produced.

Assessing information

The data from the analysis process is used to determine if limits specified by environment protection licences are exceeded, and to compare them against historical data.

Where licence limits are exceeded, licensees should ensure that site operations are reviewed and practices implemented to improve the level of environmental performance and compliance.

The following non-compliances with licence requirements were identified:

- noise limits, and volume and concentration limits for discharges to air and water were exceeded, potentially increasing the risk of harm to the environment
- discharging to waters outside the licence limit requirements, resulting in potential environmental impacts
- licensee was operating outside the specified hours of operation, potentially impacting the surrounding community.



Monitoring stack emissions enables industry to prevent/minimise air pollution (DECCW)

Reporting and communicating results

An Annual Return is required to be submitted by a licensee to provide feedback to DECCW about their environmental performance.

The Annual Return is an important part of the overall integrity of the licensing system and must be signed off at the highest level of the company.

Licensees are required to report monitoring results as part of their Annual Return. Some licensees are also required to report on exceedances in concentration, volume and noise limits, pollution complaints, and reports associated with pollution studies and reduction programs.

The monitoring reports are an important mechanism for licensees to communicate compliance information and the performance of their activities to DECCW.

Reporting can also be used by licensees to document potential impacts and identify environmental trends in order to improve environmental performance.

The following non-compliances with licence requirements were identified:

- monitoring reports supplied with the Annual Return did not contain the required analysis and interpretation of results or actions to correct identified adverse trends to improve environmental performance
- Annual Returns were not submitted or were submitted late
- stack testing reports did not contain the required minimum information as outlined in the *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC 2007) in order to ensure the accuracy and integrity of the data collected
- a report submitted for a noise pollution study did not contain the required information to enable actions to be developed to reduce noise and improve performance
- a wastewater monitoring report was submitted after the due date.

4 After the review

Follow-up by DECCW

A follow-up by DECCW confirmed that issues identified during the compliance audits were being addressed by the licensees to improve environmental performance. These included:

- undertaking monitoring of all environmental media in accordance with specified requirements and at the locations specified in the licence
- collecting samples that were representative of the environment being sampled to better understand the full impact of activities on the environment
- selecting the locations of dust monitoring networks in accordance with the specified standard, to ensure the accuracy of the data collected and to learn how to minimise the impacts of air borne dust on neighbouring communities
- calibrating monitoring equipment in accordance with manufacturer's specifications to ensure the accuracy of data collected
- maintaining and updating procedures for monitoring schedules to ensure consistency in how and when samples are collected and analysed
- having samples analysed for pollutants at laboratories that are accredited by a certification authority such as NATA, and in accordance with the methods specified in the Approved Methods Manual (DEC 2004; DEC 2007) to provide confidence that results accurately reflect what is occurring onsite
- complying with limit requirements and discharging of pollutants to the environment in accordance with licence requirements to ensure there is no impact of activities on the surrounding environment
- submitting Annual Returns, including monitoring reports, to DECCW on time and with all of the required information specified in the licence
- ensuring that stack testing reports contain all the required information as specified in the Approved Methods Manual (DEC 2004; DEC 2007) to ensure the quality of the information collected is reliable.

Integration with licence reviews

The findings of this review will be used to guide the review of environment protection licences. Section 78 of the POEO Act requires DECCW to review environment protection licences once every five years. The licence reviews:

- focus on desired environmental outcomes
- enhance consistency between licences issued to an industry
- improve the effectiveness of the licensing system
- strengthen DECCW's accountability to stakeholders.

Integrating these licence reviews with other regulatory activities such as compliance audit programs, results in a holistic licensing approach.

The findings of this review will also assist in the assessment of any future applications for new licences and help to ensure monitoring requirements effectively address potential environmental impacts.

5 Best environmental management practices for monitoring

Managing environmental risks and impacts from industrial activities is a complex process due to the large number of ecosystems and organisms that exist, the way they interact with one another and their surroundings. Monitoring can generally be defined as having two main purposes, (1) for compliance assessment, and (2) for environmental reporting of industrial emissions (IPPC 2003).

Effective monitoring requires the results of measurements to be analysed, and assessed on an ongoing basis, against previous results and relevant criteria, so that trends may be identified. In order to properly monitor for any actual or potential environmental issue, samples or measurements taken must be carried out at sufficient frequencies and with appropriate rigour to provide a reliable basis for such an analysis or assessment.

Monitoring generally means to be aware of the state of a system. The process of monitoring involves data collection, data analysis, interpretation of the data to determine the state of the system and how the system is changing. Monitoring information may range from simple visual observations to collecting precise numerical data. Information can be used for several purposes; verifying compliance with emission limit values, examining the correct operation of plant processes, and for making environmental management decisions.

Given the complexity of monitoring, its cost, and the fact that the data obtained is used for making decisions on environmental risks, every effort should be made to ensure that the data obtained is appropriately reliable and comparable. Therefore, having a good understanding of the monitoring process is essential.

There are several important considerations for industry to ensure compliance with legislative requirements and on-going good environmental performance. Decisions regarding environmental management are often based on uncertainties due to long time spans, assumptions, difficulty in making accurate projections and scientific uncertainty about potential outcomes. This demonstrates the importance of undertaking on-going monitoring of activities over sufficient time to provide information to assist with managing environmental risks and impacts on the receiving environment.

This monitoring review has identified some issues of concern with the monitoring undertaken by industry, especially in relation to data collection, data analysis and interpretation of the data. These issues have resulted in the non-compliances highlighted in the section on Review Findings and reduced the effectiveness of the monitoring being undertaken by industry. This section provides information on how industry could improve the effectiveness of their monitoring programs by following best environmental management practices for monitoring.

Guidance materials and standards

In reviewing best environmental management practice for monitoring, DECCW has researched current environmental management standards and guidance in the Australian Standards and codes of practice and guidelines addressing environmental risk. In addition DECCW has identified best environment management practices from other jurisdictions and operations that could further enhance the reliability of monitoring data

The following guidance material is particularly relevant to industry monitoring:

- AS/NZS 5667.1:1998 (Standards Australia 1998a) provides general principles to be applied in the design of sampling programs, sampling techniques and on the procedures to be taken to preserve and transport samples

- *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC 2004) lists the sampling and analysis methods to be used when complying with a requirement by, or under, the environment protection legislation, or a licence or notice under that legislation, to test for the presence or concentration of matter in water and the volume, depth and flow of water or wastewater, see www.environment.nsw.gov.au/resources/water/approvedmethods-water.pdf
- *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC 2007) lists the statutory methods that are to be used to sample and analyse:
 - air pollutant emissions from stationary sources (including continuous monitoring) and odour sampling and analysis
 - pollutant emissions from motor vehicles
 - components in, and properties of, petroleum products, see www.environment.nsw.gov.au/resources/air/07001amsaap.pdf
- *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2005) lists the statutory methods that are to be used to model and assess emissions of air pollutants from stationary sources in NSW, see www.environment.nsw.gov.au/resources/air/ammodelling05361.pdf
- *Assessment and Management of Odour from Stationary Sources in NSW* (DEC 2006b) is a policy framework for assessing and managing activities that emit odour and offers guidance on dealing with odour issues to industry, consent authorities, planners, environmental regulators and odour specialists, see www.environment.nsw.gov.au/air/odour.htm.

There are several guidelines produced by DECCW and other government agencies and industries (see Reference list) to help organisations plan for potential environmental events by identifying and understanding statutory compliance obligations, identifying and ranking environmental issues specific to each site and preparing a monitoring and reporting plan.

DECCW has also produced a valuable resource, *Environmental Management Planning* (DECC 2008a), to help industries build more sustainable organisations that include a commitment (policy and strategy) to drive environmental improvement.

The following best environmental management practices on monitoring have been extracted from the research of the standards, codes of practice and guidelines.

Planning

Compliance monitoring is a fundamental activity within environmental protection and is one of the main ways by which adherence to limits and laws can be assessed for regulatory purposes. The information provided by compliance monitoring is also valuable for other environmental and management activities (e.g. for optimising processes, protecting sensitive ecosystems, and informing the public of the effectiveness of environmental protection measures).

Organisations should set clear monitoring objectives before monitoring of activities begin. Monitoring objectives should also be clear for any relevant third party, including external contractors and other possible users of the monitoring data (e.g. regulators, public interest groups and local government). It is good practice to document the objectives at the start, and to systematically review them. The objectives should consider the aims, obligations, uses and users of the data collected during a monitoring program.

A systematic and consistent approach to monitoring is necessary to ensure that the results accurately reflect the environment being sampled. Without such an approach, monitoring data may be biased, misleading and of uncertain quality, resulting in data of little value and a waste of time and resources. It is unlikely that monitoring will be conducted effectively, or deliver useful data, without a plan that documents exactly how, when and where it will be done.

The monitoring review has highlighted cases when the lack of a monitoring plan resulted in licensees not undertaking the sampling of water/air quality as required by the licence. Due to the lack of documented procedures licensees were taking samples from incorrect locations and the frequency of sampling did not correspond to the frequency required by the licence.

Consideration should be given to ensuring that the monitoring plan contains details of the actions, responsibilities and timeframes for undertaking monitoring. If the regulatory requirement on monitoring is across media and processes such as monitoring air emissions, noise, wastewater discharges, soil and groundwater, then the plan should address each type of monitoring.

Developing a plan ensures that organisations will concurrently develop various procedures for sampling and analysis such as where samples should be collected, how frequently samples should be collected, how to store and transport samples correctly, how to analyse samples using the methods specified in the requirement and quality assurance/quality control.

Documented procedures assist organisations to ensure that sampling and analysis is carried out in accordance with regulatory requirements. It also allows organisations to continue to use a consistent approach when there is a turnover in staff.

Sample collection, techniques and handling

Sample collection

Sampling is an integral part of any monitoring program. Little attention is usually given to sampling and the results of monitoring always depend on how sampling is done.

The monitoring review has highlighted cases when licensees were incorrectly collecting samples that were not representative of the media being sampled, questioning the validity of the results generated from the analysis of such samples.

It is important to determine the most appropriate sampling site to ensure the accuracy of the data obtained from the sample collected and for compliance purposes samples should be taken at the location specified by the regulatory requirement.

The sample being taken should be representative of the environment being sampled. A representative sample is one that reflects the same characteristics as, and can be considered an accurate subset of the material being measured.

The following good sample collection practices will enable licensees to collect samples that are representative:

- The sample must always be collected at the same location to ensure that each sample is representative of the area and comparison can be made with previous samples.

- Sampling locations should be properly marked on a map/plan with relevant geographic/global positioning system coordinates, and where appropriate, with permanent markers such as by erecting a sign post.
- Sampling locations should also be assigned unique numbers corresponding to the numbering of sampling locations in the regulatory instrument.

Sampling techniques

Depending on the objectives of the monitoring program or licence requirements samples are collected using different sampling techniques. Determining the most suitable sampling technique is important to ensure the credibility and accuracy of the data obtained from the sample collected. The most suitable method of sampling and the sampling frequency will depend on the type of information needed.

The review has highlighted cases where licensees have not complied with the requirement to use the specified technique for sampling resulting in non-compliances. For example a licensee required to sample periodically at fixed time-intervals, sampled at time-intervals that were not of a sufficient duration to produce representative data covering the full range of operating conditions.

Licensees should ensure that the proper sampling technique is used to collect samples.

Types of sampling

Grab sample is one discrete sample where all of the material is collected at once and can only represent the conditions at a particular time.

Composite sample is made up of a number of grab samples collected over a period of time and mixed together. It represents the average conditions of a site over a specific period of time. For DECCW licences, a twenty-four hour time period is considered standard. Samples are usually collected at one site, but can be collected at multiple sites, such as in soil analyses, and then mixed together.

Composite samples are used only when the parameters to be determined are shown to remain unchanged during collection and preservation.

A composite sample could be composed of one of the following:

- several grab samples, mixed together from various points within the discharge, all samples collected within a short period of time
- grab samples of the same volume, taken from one source over a specific period at regulated times
- grab samples taken from one source over a specific period at irregular intervals in irregular volumes that proportion the flow.

Continuous sampling provides a continuous record of emissions/discharges over an extended and generally uninterrupted period of time.

Periodic sampling is undertaken at fixed time-intervals of sufficient duration to produce representative data that may be reliably extrapolated to provide estimates of emissions across the full range of operating conditions.

Soil sampling

Taking and analysing soil samples can help licensees to better understand any impact their activities are having on soil. For example soil sampling will assist licensees to make better decisions in managing irrigation activities.

Sampling of soils raises unique challenges due to their heterogeneous nature and requires extra consideration to ensure the soil sampled can be considered as representative of the soil from the area being monitored.

The monitoring review highlighted instances when soil samples were collected that were not representative of the area being sampled. For example the results generated from soil samples collected one metre part from an irrigation paddock were not considered representative of the whole paddock.

When taking soil samples to monitor the uptake of nutrients in utilisation areas, licensees should follow the general practices below:

- Surface soil samples from the utilisation area should be taken from a number of different sampling points spread across the paddock and combined to provide a representative sample.
- If the utilisation area is made up of large areas with different characteristics then these areas should be sampled separately. If using the transect method, some areas with two distinct soil types will require a transect line for each soil type. These should be tested separately. If they produce the same results the two transects can be sampled separately and the samples mixed together, giving one representative sample for the area.
- Sub-surface soil samples should be taken at the same depth every time the paddock is sampled avoiding large rocks and large pieces of organic materials. It is difficult to compare results from samples that have been taken from different depths.
- Sampling should be carried out at the same time every year, preferably when the soil moisture will be the same, as differences in soil moisture can affect the results.

Further information on soil sampling can be found in: *Interpreting Soil Test Results – What do all the numbers mean?* (CSIRO Publishing 2007).

Stockpile sampling

Obtaining a representative sample from stockpiles requires considerable care in the sampling selection method. When collecting samples from a stockpile of material (e.g. sand, biosolids, tyres, manure) it is critical that the sample be representative of the entire stockpile being sampled as often a very small amount of material is analysed. This can be achieved by collecting numerous sub samples from different parts of the stockpile, mixing them in a large clean container and then collecting the required amount of sample. AS 1141.3.1–1996 – *Methods for sampling and testing aggregates* (Standards Australia 1996) provides guidance on taking samples of aggregates and sands from stockpiles.

For manure, sampling should be done as close to the time of application as possible as it can change with time.

Instructions for biosolid sampling are included in the *Environmental Guidelines: Use and Disposal of Biosolids Products – Schedule 1: Biosolids Sampling & Analysis Procedures* (EPA 1997).

Water sampling

Undertaking water sampling is an important process for assessing water quality. To ensure that water sampling provides appropriate information, the collection, handling and preservation of water quality samples must be undertaken correctly. Assessing water quality is not as simple as filling a bottle and giving it to a laboratory for analysis. The accuracy of a water analysis is dependent on the sampling method used, how the sample was handled and transported including the time elapsed between sampling and analysis.

The monitoring review highlighted cases when the collection of water samples was not undertaken correctly, questioning the validity of the analytical results generated from such samples.

In order to ensure that water samples are collected correctly water sampling should be undertaken in accordance with the *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC 2004), which also refers to AS/NZS 5667.1 1998 (Standards Australia 1998a). The method in which a water sample is collected and handled in the field is the first step to ensuring representative and reliable analytical data. A sample should be collected and handled in a manner consistent with the collection, handling and preservation principles stated in AS/NZS 5667.1:1998 (Standards Australia 1998a) and APHA (1998) section 1060. If there is any inconsistency between these references, Standards Australia (1998) prevails.

Licensees should document sampling procedures to ensure that samples are collected and handled in a consistent manner. The following practices are particularly important:

- Stagnant water should not be sampled and ensure that samples are free from floating film or organic material. In shallow stretches, samples should be collected from the middle stream.
- Samples from still water bodies (lakes, ponds, reservoirs, dams etc) should generally be collected at multiple locations in the water body and at multiple depths, mixed together and a sub-sample collected.
- When sampling still water bodies that are stratified, three equally sized samples should be collected from the surface, midzone and deeper waters, mixed together and a sub-sample collected.
- Water samples from irrigation discharges should be taken from the hose/pipe connection to the irrigation system. Samples should be free of stagnant water and be representative of the water being applied to the irrigation area.
- Boreholes should be adequately purged before collecting groundwater samples.
- When a sample is to be analysed for suspended sediments or oil and grease, the bottles should not be rinsed with sample water.
- When sampling water in streams or dams the mouth of the bottle should be submerged to at least 10 centimetres below the surface.
- In flowing water, samples should be collected midstream with the mouth of the bottle facing into the current.
- When collecting water samples the bottle should be filled to the top or allow some air space before sealing the bottle, depending on the parameter being analysed. For example sample bottles for nutrient analysis should be filled to the top and for chlorophyll and bacteria samples require an air space.

The following practices are particularly important for taking any type of sample:

- Pre-cleaned bottles rather than rinsed bottles should be used, where practical.
- Sample bottles should be capped and permanently labelled with a unique sample number, the location, date and analyses required.
- Only the recommended type of sample bottle should be used for each analysis. Sample bottles, including bottle caps, must be cleaned according to the recommended methods and should be 'contamination free'.
- Where possible field blanks, trip blanks, field replicates, split replicates and spiked samples should be used to check the quality of samples taken.
- Decontamination of all sampling equipment including shipping coolers is important between sampling to ensure the accuracy of results (AS/NZS 5667.11.1998, Standards Australia 1998b).



Water samples from shallow stretches should be taken mid-stream (DECCW)

Air sampling

Air quality is impacted by air pollutants discharged from industry, motor vehicles and natural sources such as wind-blown dust and smoke from fires. Emission of air pollutants from industries is regulated by DECCW with strict emission control measures and monitoring of the emissions required to be undertaken by licensees.

Monitoring air quality provides industry with an indication of the level of pollutants their activities are releasing into the atmosphere and also allows industry to identify the appropriateness, and assess the effectiveness of pollution control equipment.

The accuracy of air monitoring data is dependant on the sample collection method, sample analysis, data processing, etc. Sample collection and measurements for air quality monitoring should be rigorous, repeatable, well documented, and be undertaken in accordance with specified requirements or accepted methods.

The monitoring review identified issues with how stack testing was being conducted. In a number of cases licensees had undertaken stack testing when plants were not operating under optimal or normal conditions. For example, one audit found that the stack test was carried out when one of the crushing and grinding mills was off line. The review also identified cases when licensees were not using the relevant approved methods specified in the licence or were using alternative methods without obtaining prior approval from DECCW.

Stack testing is a specialised field and most organisations tend to contract out the testing to private consultants. Organisations that use consultants to undertake stack testing should ensure that the consultant undertakes the testing in accordance with the approved method. For regulatory purposes the collection, handling and preservation of air quality samples must be undertaken in accordance with *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC 2007). The analysis of samples must be carried out by a laboratory accredited to perform them or by an independent accreditation body acceptable to DECCW, such as NATA.

Dust Monitoring

The sampling of dust using dust depositional gauges must be undertaken in accordance with the Australian/New Zealand Standard: *Methods for sampling and analysis of ambient air: Method 10.1: Determination of particulate matter – Deposited matter – Gravimetric method* (Standards Australia 2003a). The sampling of PM₁₀ using high volume samplers should be undertaken using AS/NZS 3580, 9.6:2003 (Standards Australia 2003b). When selecting a location for a dust monitoring station, consideration should be given to the locality, terrain, possible physical interference and site security.

The monitoring review highlighted instances when dust monitoring was not being undertaken properly. For example a number of dust depositional gauges were not correctly located and the gauge was not erected vertically as required by the relevant standard. One licensee was not collecting the dust sample within the time specified by the relevant standard.

Further information

For more information about air sampling, see
www.environment.nsw.gov.au/air/faqamsampling.htm



Monitoring dust using dust depositional gauges informs industry on the impacts of their activities on the surrounding environment (DECCW)

Weather sampling

Weather data is used by industry to manage impacts of their activities on the environment. This includes managing dust, making decisions regarding irrigation and monitoring extremes in weather to ensure that effluent ponds do not overflow. Therefore, the sampling, collection and recording of weather data must be undertaken precisely.

The monitoring review highlighted cases when licensees were not recording continuous weather data such as daily rainfall and wind direction to inform any required changes to site operations or to minimise offsite impacts on the surrounding environment .

The siting, operation and maintenance of a weather measurement station should be undertaken in accordance with *AS 2923-1987: Ambient Air – Guide for measurement of horizontal wind for air quality applications* (Standards Australia 1987) and *AS/NZS 3580.1.11 2007 Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment* (Standards Australia 2007).

Noise sampling

Noise generated from licensed industrial activities must not exceed certain criteria set by DECCW. To ensure compliance with these requirements organisations must measure noise generated from activities in accordance with the *NSW Industrial Noise Policy 2000* (EPA 2000).

The monitoring review highlighted cases when licensees were not undertaking noise monitoring to assess compliance with the noise limits stipulated in the licence and noise monitoring was not being undertaken correctly.

Noise monitoring is a specialised field and it is important that personnel undertaking the noise monitoring are adequately qualified to undertake noise measurements and interpret results. The choice of noise measurement methods needs to be compatible with the objectives of the monitoring program or regulatory requirement so as to ensure reliable and accurate results.

Noise levels should be measured using a sound level meter that meets the specifications of a Class 1 or Class 2 sound-level meter as stated in AS IEC 61672.1 and 2 *Electroacoustics – Sound Level Meters* (Australian Standard 2004a and Australian Standard 2004b). The equipment should have a current laboratory calibration certificate or label in accordance with the calibration requirements outlined in the relevant standards. Equipment should also be calibrated in the field in accordance with the standards.

Organisations should also make sure that noise measurements are undertaken when the plant is operating under normal conditions and cover the full cycle of operational activities.



Selection of noise measurement instruments needs to be compatible with the objectives of the monitoring program or regulatory requirement (DECCW)

Odour sampling

Odour can be very subjective and can affect public amenity and the community's quality of life depending on the character or the offensiveness of the odour, the strength of the odour, duration and frequency of odour episodes.

Premises that have the potential for odour emissions are required by the POEO Act to control odours from their activity to ensure that no 'offensive' odour is emitted beyond the boundary of the premises. The term 'offensive odour' is defined by the dictionary in the POEO Act.

A breach of Section 129 of the POEO Act can occur if the occupier of any premises causes or permits the emission of any offensive odour at which scheduled activities are undertaken. DECCW-regulated premises may have odour conditions on their licence to monitor and manage the emission of offensive odour.

If odour is an issue, prior to undertaking any sampling, further research into the cause of the odour should be undertaken and a plan developed to eliminate the source of the odour

Guidance on avoiding and mitigating odours is outlined in the *Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW* (the technical framework) (DEC 2006b).

Any odour sampling must be conducted in accordance with the method for odour sampling from point sources as outlined in the *Approved methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC 2007).

The results from the sampling should be compared against the odour assessment criteria in *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (DEC 2007) and the technical framework (DEC 2006b).

Sampling equipment

In order to collect samples, licensees are required to use specific sampling equipment. The selection of sampling equipment should be based on the purpose of the sampling. When a sample is required to be taken in-situ, care should be taken to ensure that the sampling equipment used to measure the parameter specified is suitable for the purpose and is used appropriately.

The monitoring review highlighted cases where continuous air monitoring was not undertaken in accordance with the specified method and that volume monitoring equipment was not calibrated according to the manufacturers' specification.

When undertaking volume monitoring, stack testing or measuring pH, licensees should:

- ensure that the equipment selected is suitable for the purpose, for example, not using a flow meter with moving parts to measure the volume of a liquid containing a lot of solid particles
- ensure that the systematic/periodic calibration of the equipment being used is undertaken as per the operating instructions/manufacturer's instructions issued for the model
- follow the equipment manufacturer's directions for storage, transportation, calibration, maintenance and use of the equipment.

Preservation, storage and transport of samples

The accuracy of analytical results of samples depends on using the correct collection, storage, and transportation techniques. The quality of the analytical result is directly related to the quality of the sample and the degree of post collection degradation that occurs prior to testing.

Collected samples need to be placed into the appropriate storage container and stored under appropriate conditions. Clean techniques for handling and storage and the chemical or physical stabilisation of the samples need to be observed. Failure to follow these steps can produce either sample degradation or changes of the analyte or contamination of the sample from external sources. Regardless of where or how an analysis is performed, there are certain precautions which should be observed in preparing samples for transport to a laboratory, as careless handling of a sample can produce misleading results.

A sample should be collected and handled in a manner consistent with the collection, handling and preservation principles stated in AS/NZS 5667.1:1998 (Standards Australia 1998a) and APHA (1998) section 1060. If there is any inconsistency between these references, Standards Australia (1998) prevails.

To achieve valid results, the following steps should be taken:

- The recommended preservative for the type of sample being collected should be used.
- Where required, samples should be stored in a cool, dark place. Coolers packed with ice packs are recommended (most samples must be cooled to 4°C during transit to the laboratory). However, samples must not be permitted to freeze unless freezing is part of the preservation protocol. Cool samples as quickly as possible.
- Samples should be kept upright in a cooler and be properly sealed to reduce the possibility of it accidentally opening and to prevent tampering.
- A copy of the sampling record sheet should be packed with the sample. The recommended minimum information that should accompany samples to the laboratory include:
 - site identification or sample location
 - collection time and date
 - departure time from site
 - analyses to be performed
 - the name of person who collected the sample.
- Samples must be transported to the laboratory without delay so that they arrive generally within 24 hours of sampling. Certain analyses must be conducted within specified time limits.

Methods of sample analysis and reporting results

Analytical measurements should be made using methods and equipment which have been tested to ensure they are fit for purpose and provide accurate results to the desired precision. There are various methods that could be used to quantitatively analyse samples. In order to ensure that the precision and accuracy of the method used is fit for the purpose, DECCW licences generally specify methods to be used.

The monitoring review highlighted cases when licensees were not analysing samples using the prescribed method and cases when licensees were using laboratories that were not NATA

and/or similarly accredited or were using laboratories that were NATA accredited, but were not accredited for the type of test being undertaken.

Licensees should ensure that samples required by a licence must be analysed in accordance with the relevant methods specified in the licence. Licensees should also ensure that the laboratory undertaking the analysis is accredited as required by the licence and that it is also accredited for the type of test undertaken.

Unless otherwise prescribed, samples should be analysed in accordance with a method specified in the following documents:

- *Approved Methods for the Sampling and Analysis of Water Pollutants in NSW* (DEC 2004) (www.environment.nsw.gov.au/resources/water/approvedmethods-water.pdf)
- *Approved Methods for the Sampling and Analysis of Air Pollutants in NSW* (DEC 2007) (www.environment.nsw.gov.au/resources/air/07001amsaap.pdf).

These documents list the sampling and analysis methods to be used when complying with a regulatory requirement to test for the presence or concentration of matter, volume, depth or flow of water/air.

DECCW requires (unless otherwise prescribed) that samples should be analysed in a laboratory that has NATA (www.nata.asn.au) or similar accreditation. This is to ensure that staff making analytical measurements are both qualified and competent and that they can perform the analysis properly, and that the technical performance of the laboratory undertaking the analysis is regularly assessed independently.

Alternative methods to those described in the above documents can be used, provided that the results obtained using the alternative method are equivalent to the results obtained using the prescribed method within the limits of the accuracy stated for the prescribed method. If an alternative method is used, approval must be obtained from DECCW prior to using the alternative method.

The monitoring review highlighted cases when licensees reported monitoring results that did not contain all of the necessary information required by the licence. The *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (DEC 2007) and *Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales* (DEC 2004) outline specific information that should be included in sampling reports.

In particular, organisations should ensure that the consultants collecting air monitoring data provide monitoring reports that contain at least the following information:

- name and address of reporting organisation or individual
- date of issue of the report and date, time and place of measurements
- identification of source tested
- the approved method used and details of any deviation from that method
- details of operating conditions during sampling and a statement on the representativeness of the sample taken
- location of sampling plane (upstream and downstream flow disturbances) and any adjustments made to comply with the minimum distances specified in Table 1 of the AS 4323.1-1995 (Standards Australia 1995), number of sampling points and period of sampling (start and end times), average stack gas velocity in metres per second and average stack gas temperature in kelvins

- contaminant molecular weight or density in kilograms per cubic metre
- water content of stack gas, expressed as a percentage by volume
- stack gas volumetric flow rate on a dry basis under standard conditions, in cubic metres per second, concentration of contaminant on a dry basis under standard conditions, in grams per cubic metre and mass emission rate of contaminant on a dry basis under standard conditions, in grams per second
- details of sample preservation, if applicable and factors that may have affected the monitoring results
- precision of the results (using *AS 2706-2003: Numerical values – Rounding and interpretation of limiting values as a guide* (Standards Australia 2003c))
- equipment calibration record.

Similarly organisations contracting out the analysis of samples must ensure that the contracted laboratory provides them with a report containing the following specific information:

- parameters analysed and results of analysis in the units of measure specified in the regulatory instrument
- method of analysis, including the limit of detection and any special restrictions
- whether the laboratory was NATA accredited (include accreditation number) to undertake those analysis using the method specified
- documented records providing an auditable trail from sample receipt to reporting results including:
 - assigned unique laboratory number(s) related to the sample number
 - date and time of sample receipt
 - formal signing off of all sample transfers to establish a chain of custody
 - date and time of analysis
 - analytical method used
 - any comments, including any deviations or non-compliances with the specified method.

Organisations should also ensure that consultants undertaking noise monitoring provide test results in a report which includes at least the following information:

- the noise limits on the statutory instrument (licence/notice)
- the monitoring location and description
- details of the sampling instruments used and recent instrument calibration records
- records of background noise levels, the name of the person (including qualifications) taking measurements, date, time and duration of measurements and weather conditions
- the results of noise measurements at each monitoring location, including a comparison with the licence limits
- an explicit statement as to whether the limits are exceeded or not
- reasons and management strategies where results exceed the licence limit.

Assessing and interpreting results

Assessing monitoring data is an essential prerequisite to the task of interpreting whether an industry is complying with the relevant regulatory requirements and identifying the impact of its activities on the environment. While the analysis and interpretation of monitoring data collected is generally a specific requirement of regulatory instruments, licensees should consider the analysis of all monitoring data generated to inform the environmental performance of their operation.

Through the data evaluation process, data generated by the monitoring program will also provide industry with baseline data, which can then be compared against subsequent data to identify any change and understand its cause. This data can also be used to understand changes in relationships and linkages between activities, causes and effects (anticipated or unexpected), inputs-outputs of systems or product cycles etc.

Monitoring data should be presented in specified reporting formats that best illustrate the status and trends, patterns of variability, and probable impacts on the environment from the emission/discharge for each of the pollutants measured. Reporting trends puts results in context by showing trends overtime and how they compare against the standards. The use of graphs and other forms of pictorial representation to present monitoring data makes is easier to interpret results.

The monitoring review highlighted cases when monitoring reports supplied did not contain the required analysis and interpretation of results or actions to correct identified adverse trends to improve environmental performance. Some stack testing reports submitted to DECCW did not contain the required minimum information as outlined in the relevant approved methods publication.

Licensees that contract monitoring activities to consultants should also ensure that the results of monitoring include an interpretation of the results showing trends and comparisons with relevant standards and limits.

Licensees must also ensure that monitoring data and reports are retained for periods specified by regulatory instruments and make them available to the regulatory authority on request.

Further information

For more information about reporting, see AS/NZS 5667.1:1998 (Standards Australia 1998a), or

Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales (DEC 2007) Section 4, Analytical report.

Quality assurance (QA) and quality control (QC)

The accuracy and precision of data generated by a monitoring program can only be assessed if a good quality assurance (QA) and quality control (QC) program is in place covering all aspects of data collection, analysis and interpretation, and reporting. QA is an important part of a monitoring program that aims to produce data of known precision and bias. It includes written procedures, work instructions, training requirements and record keeping. QC procedures are a set of measures within the methodology to assure that the information collected is accurate and precise, and is recorded and reported in an approved manner. Consistent QA/QC activities produce data of known quality.

The goal of QA/QC is to identify, quantify, and document bias and variability in data that result from the collection, processing, transporting, and handling of samples to ensure that data is interpreted properly. Organisations should ensure that properly documented and implemented QA/QC procedures have been built into monitoring programs.

Organisations undertaking noise, water, air or soil quality monitoring should ensure that trained personnel perform the sampling and analysis required. It is essential that the users of monitoring results are confident that the work has been done in an objective and rigorous manner and to a recognised standard. This means that whoever does the work must not only achieve a high level of quality, but also must demonstrate this to data users.

QA/QC techniques are discussed in AS/NZS 5667.1:1998 (Standards Australia 1998a). The need for these techniques, and which technique to use, will vary according to the circumstances.

6 Using monitoring data to manage site operations

Ongoing monitoring is a critical element in the environmental management of site activities and operations. Monitoring data should be used to identify trends to assist in early detection of environmental impacts and improve environmental performance.

During the audits, DECCW identified the following practices where licensees were looking beyond the licence requirements and were using monitoring results to improve site operations:

- **Daily weather monitoring data** being used to investigate and align with any odour problems or complaints received and included in air modelling reports, noise compliance assessment reports and dust suppression activities.
- **Additional monitoring** over and above licence requirements in order to monitor in-process performance which can assist in resolving issues promptly.
- **Ambient water quality monitoring** upstream and downstream of discharge points to monitor any impact of water discharges on potable water supplies using the national guideline values for the assessment of surface water quality in upland rivers and streams (*Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC and



Weather monitoring data can be used to inform any required changes to site operations or to minimise offsite impacts on the surrounding environment (DECCW)

ARMCANZ 2000) and to assess the performance of the installed control measures and to initiate further measures where necessary.

- **Continuous measurement** of baghouse parameters to avoid the occurrence of bag leakage.
- **Video monitoring** of the stack discharges and blasting operations enabling operators in the control room to take action when necessary.
- **Trend analysis of monitoring data** undertaken on a routine basis to determine any improvement or deterioration in the workplace environment.
- **Biofilter monitoring** including undertaking inspection and recording of back pressure, biofilter media and temperature daily so that problems are detected and actioned on a priority basis to prevent odour emissions/complaints.
- **Routine inspections** of all aspects of plant undertaken to ensure any potential issues are identified and promptly dealt with.
- **Increased frequency of measurement** to enable a quick response to unexpected issues within the process.
- **Measurements** at critical points throughout the sewage treatment process providing useful real time data to ensure that the treatment process is operating efficiently.
- **Visual inspection** of dam levels and recirculating effluent when necessary to maintain a safe dam capacity and prevent discharges to waters.
- **Visual observations** of colour changes in wastewater treatment systems to determine the efficiency of the treatment system.



Having controls in place, such as a visual gauge on the side of the tank assists in reducing the risk of overfilling (DECCW)

- **Reporting monitoring data including exceedances to senior management** on a routine basis.
- **Undertaking voluntary environmental audits** and using the findings to plan necessary action to address any issues identified.
- **Training** of employees to increase awareness of environmental responsibilities and improve environmental performance through site induction and presentations.
- **Implementation of an Environmental Management System**, certified under the Environmental Management Systems Standard AS/NZS ISO 14001:2004 (Standards Australia 2004c).
- **Undertaking ambient dust monitoring** to ensure activities do not cause issues beyond the site boundary or to sensitive receptors.
- **Developing and using monitoring schedules/plans** to ensure licence requirements are complied with and additional monitoring is undertaken to better manage site operations.

7 Related initiatives

The following related initiatives also assists relevant stakeholders, such as industry and local government to identify ways in which they can monitor their progress in reducing their impact on the environment and benchmark their emissions and impacts against similar activities.

Air emissions inventory for the greater metropolitan region in NSW

Air pollution comes from many sources and we need to know the contribution each one makes in order to develop the best approaches for improving air quality. NSW has an air emissions inventory developed over many years and the data is used to inform air quality improvements in NSW.

The air emissions inventory is a detailed listing of pollutants discharged into the atmosphere by each source type during a given time period and at a specific location.

The inventory includes emissions from biogenic (i.e. natural) and anthropogenic (i.e. human) sources such as bushfires, trees and windborne dust, commercial organisations (e.g. quarries, service stations and smash repairers) domestic activities and industrial premises.

Industry monitoring data provides validation of the inventory emission estimates and can identify trends in sector emissions over time.

Further information

For more information about this program, see www.environment.nsw.gov.au/air/airinventory.htm or to view the report, see www.environment.nsw.gov.au/resources/air/tr10aei08260.pdf (DECC 2008b).

The National Pollutant Inventory

The National Pollutant Inventory (NPI) is an internet database that provides the community, industry and government with information about the emissions of 93 substances in Australia. The NPI is implemented cooperatively by the federal government, DECCW and other state and territory governments.

The NPI contains 10 years of emission data from industrial facilities and non-industrial (diffuse) sources such as motor vehicle exhausts. Each year in NSW over 700 facilities from about 100 different industries report on their emissions.

NPI data can be used by industry to improve their manufacturing processes to reduce emissions and to benchmark their emissions against similar facilities. Annual reporting of NPI data also assists industries to document progress in reducing emissions.

Further information

For more information about this program, see www.npi.gov.au

Small waste facility environmental risk assessment and mitigation package

Small waste facilities (those with a throughput of less than 5000 tonnes per annum) play an important role in local waste management. Operators of these facilities (primarily local councils) generally face the challenge of providing an essential service – often with limited budgets and resources – that meets the community’s waste management expectations, while at the same time minimising environmental impacts.

The *Environmental Risk Assessment and Mitigation Package* (E-RAMP) (DECC 2008c) has been developed in consultation with council waste managers across rural regional NSW. This tool, released in June 2008, is designed to assist operators of small waste facilities to assess and manage environmental risks.

With information provided by the user, E-RAMP provides an objective and site-specific assessment of environmental risks and potential measures to treat these risks.

E-RAMP follows the risk management process detailed in AS/NZS 4360:2004 (Standards Australia 2004d). The software package considers in its calculations:

- the sensitivity of the surrounding environment
- the types and quantities of wastes received, stored and/or disposed at the facility
- the presence/absence of management controls and measures to minimise the likelihood of emissions to the environment in determining the risks.

Further information

For more information or to download E-RAMP, see www.environment.nsw.gov.au/warr/ERAMPv1.htm

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Standards Australia 2004c, *AS ISO 14001:2004 Environmental management systems – Requirements with guidance for use*, Standards Australia, Sydney

Standards Australia 2004d, *AS/NZS 4360:2004 Risk management*, Standards Australia, Sydney

Standards Australia 2007, *AS/NZS 3580.1.1:2007, Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment*, Standards Australia, Sydney

Appendix A

Premises audited in this review

Individual compliance audit reports for these facilities are publicly available in the DECCW Library on Level 15, 59 Goulburn Street, Sydney; phone (02) 9995 5302.

Scheduled activity	Licence number	Accountable party
Agricultural processing	171	New South Wales Sugar Milling Co-Operative Ltd
Agricultural produce industries	11878	Pace Farm Pty Ltd
Agricultural produce industries	3547	Rockdale Beef Pty Ltd
Cement or lime works	905	Unimin Lime (NSW) Pty Ltd
Cement or lime works - combined handling	457	CSR Building Products Ltd
Cement or lime works - combined handling	944	Blue Circle Southern Cement Ltd
Ceramic works - glass	6357	ACI Operations Pty Ltd
Chemical storage facilities	134	Lubrizol International Inc
Concrete works – road construction	12592	Abigroup Contractors Pty Ltd
Electricity generating works - gas	5482	EDL CSM (NSW) Pty Ltd
Extractive activities	11649	Newman Quarrying Pty Ltd
Extractive industries	12577	Hi-Quality Environmental Services Pty Ltd
Livestock intensive - feedlot	5001	Rylevisa Pty Ltd
Livestock intensive - feedlot	3864	Rangers Valley Cattle Station Pty Ltd
Livestock processing - rendering	2421	Camilleri Stockfeeds Pty Ltd
Livestock processing - slaughtering	6032	Chillana Pty Limited
Livestock processing - slaughtering, rendering, tanning	1461	Northern Co-Operative Meat Company Ltd
Metallurgical activities	3596	Peak Gold Mines Pty Ltd
Mineral processing or metallurgical	2207	SIMS Group Australia Holdings Ltd
Mineral processing or metallurgical	6163	Tomago Aluminium Company Pty Ltd
Mining (coal)	4460	Thiess Pty Ltd
Mining (coal)	2504	Endeavour Coal Pty Ltd
Mining (coal)	3607	Springvale Coal Pty Ltd
Paper, pulp or pulp products industries	10232	Visy Pulp And Paper Pty Ltd
Sewage treatment systems (large)	2647	Wyong Shire Council
Sewage treatment systems (small)	588	Ballina Shire Council
Sewage treatment systems (small)	2562	Midcoast County Council
Waste facilities	6671	Wagga Wagga City Council
Waste facilities	5921	Tamworth Regional Council

Glossary

Ambient monitoring	All forms of monitoring conducted beyond the immediate influence of a discharge pipe or other emission source.
Analysis	Data analysis is a process of gathering, modelling, and transforming data with the goal of highlighting useful information, suggesting conclusions, and supporting decision making.
Annual Return	Environment protection licence holders are required to complete and submit an annual Statement of compliance with the licence conditions and report the pollutant loads generated by the premises, where applicable.
Appropriate regulatory authority	The EPA, a local authority or a public authority prescribed for the purposes of section 6 (3) of the POEO Act.
Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales	The <i>Approved Methods for the Sampling and Analysis of Water Pollutants in New South Wales</i> is a document that lists the sampling and analysis methods to be used when complying with a requirement by, or under, the environment protection legislation, or a licence or notice under that legislation, to test for the presence or concentration of matter in water and the volume, depth and flow of water or wastewater.
Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales	The <i>Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales</i> is a document that lists the methods to be used for the sampling and analysis of air pollutants in New South Wales for statutory purposes. The document covers: <ul style="list-style-type: none"> · pollutant emissions from stationary sources · pollutant emissions from motor vehicles · components in and properties of petroleum products · pollutants in ambient air.
Authorised officers	A person appointed under Part 7.2 of the POEO Act by an appropriate regulatory authority.
Biosolids	Organic product that results from sewage treatment processes (sometimes referred to as sewage sludge).
Data	Data refers to facts generally collected as the result of a direct observation or experiment. The facts are usually numbers that reflect the result of a measurement determined from the observation or experiment.
Data collection	The process of gathering information.

Effluent	<p>Means:</p> <ul style="list-style-type: none"> a. waste water from sewage collection or treatment plants, or b. waste water from collection or treatment systems that are ancillary to processing industries involving livestock, agriculture, wood, paper or food, being waste water that is conveyed from the place of generation by means of a pipe, canal or other conventional method used in irrigation (but not by means of a tanker or truck), or c. waste water from collection or treatment systems that are ancillary to intensive livestock, aquaculture or agricultural industries, being waste water that is released by means of a pipe, canal or other conventional method used in irrigation as part of day-to-day farming operations.
Environmental Management System (EMS)	Part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy. An EMS can be certified under the international standard ISO 14001.
EPA approved methods	The approved methods for the sampling and analysis of air pollutants in NSW and approved methods for the sampling and analysis of water pollutants in NSW lists the statutory methods that are to be used to sample and analyse water and air pollutants.
In situ monitoring	In situ monitoring is the use of portable analytical instruments to test samples at the location where sampling is undertaken without having to take samples back to the laboratory for testing.
Interpretation	The act or process of applying general principles or formulae to the explanation of results obtained from the analysis of samples, observations etc.
Licensing threshold	A level of production or processing (or capacity to produce or process), above which an activity becomes a schedule under the POEO Act.
Measurement	Is the act or process of assigning numbers according to a rule. It is the process of estimating the magnitude of some attribute of an object, such as its length, weight, or depth relative to some standard (unit of measurement), such as a metre or a kilogram. The term is also used to indicate the number that results from that process.
Monitoring	Monitoring generally means to be aware of the state of a system. The process of monitoring involves data collection, data analysis and interpretation of the data to determine the state of the system and how the system is changing.
Monitoring data	Is data collected for the purpose of characterising changes in an event as the result of a direct observation or experiment. The facts are usually numbers that reflect the result of a measurement determined from observations or experiments.

NATA	National Association of Testing Authorities. Australia's national laboratory accreditation authority.
Offensive odour	means an odour: <ul style="list-style-type: none"> a. that, by reason of its strength, nature, duration, character or quality, or the time at which it is emitted, or any other circumstances: <ul style="list-style-type: none"> i. is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or ii. interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or b. that is of a strength, nature, duration, character or quality prescribed by the regulations or that is emitted at a time, or in other circumstances, prescribed by the regulations.
PM ₁₀	Particulate matter (PM) less than 10 microns in size.
Point source	Means the individual source of discharge, such as a discharge pipe or a chimney stack.
Public authority	Means a public or local authority constituted by or under an Act, and includes a: <ul style="list-style-type: none"> a. government department, or b. statutory body representing the Crown, a State owned corporation or a local council, or c. member of staff or other person who exercises functions on behalf of a public authority.
Quality assurance	A system of procedures, checks, audits and corrective actions to ensure that environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.
Quality control	The overall system of activities that measures the attributes and performance of a process to verify that they meet the stated requirements established.
Receiving waters	Waters into which water discharges flow from an activity.
Sample	A portion, piece, or segment that is representative of a whole.
Sampling plane	The plane normal to the axis of a stack or duct at which sampling takes place. See AS 4323.1-1995.
Scheduled activity	An activity listed in Schedule 1 of POEO Act.
Test	A procedure used to establish the presence, quality, or authenticity of anything.
Utilisation area	The area used for the application of waste and/or waste water.

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