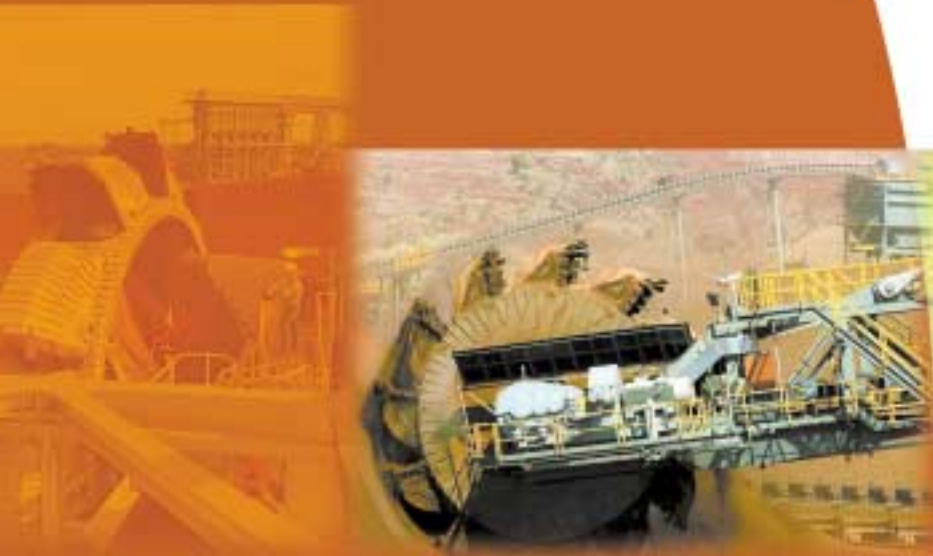




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FLUOR ENVIRONMENTAL & ENERGY **SKM**



LINKING CONSTRUCTION WORKFORCE
CULTURE WITH ENVIRONMENTAL
PERFORMANCE

ASSET DEVELOPMENT PROJECTS

G O L D E N G E C K O A W A R D S 2 0 0 4

Iron Ore



Linking Construction Workforce Culture with Environmental Performance

EXECUTIVE SUMMARY

"The Area C and PACE projects embody the benchmark for implementation of the BHPBIO Environmental Policy and Strategies."

- Vic Natoli (June 2003, independent auditor with DNV on ISO14001 surveillance audit)

The development of a new iron ore mine, the expansion of facilities at Port Hedland and the construction of a new railroad gave BHP Billiton Iron Ore (BHPBIO) an opportunity to raise the bar in the environmental management of resource construction projects - to set new standards that went beyond Government regulation and community expectation.

These massive projects to develop the Area C mine and provide the infrastructure that would support it was a \$A1 billion investment, and the company was determined that the highest standards of environmental management would be incorporated into every stage of the projects.

This was a radical concept. Typically, resource construction projects are driven by budgets and schedules - and meeting the minimum environmental standards required by the regulators.

To change the prevailing culture was never going to be easy. BHPBIO's Asset Development Projects (ADP) team knew that success would require the support and commitment from the highest level within the organisation.

That support was forthcoming, and from the outset the team set out to establish new benchmarks for environmental management in resource construction projects. Stringent environmental contractual requirements and processes were developed, requiring a level of compliance never seen before in the resources sector construction industry.

BHPBIO always knew that achieving new standards was going to be a challenge. It required a complete culture change, not only from the construction companies contracted to work on the projects, but from every one of their employees. It required consistency of decision-making between the client and the supervising engineers.



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It was undertaken in a region where some basic infrastructure (such as recycling facilities) was not available. And it was a challenging environment, which included massive bulk earthworks, dredging, marine construction, and the construction of a railway line in an environmentally sensitive area.

That the team achieved its aim was the result of a combination of environmental excellence and a commitment to the highest environmental standards. It required a willingness to invest financial and personnel resources, a philosophy of including all stakeholders and of encouraging and rewarding innovation from every member of the construction team. In doing so it established a new culture that places environmental management at the forefront of resource project construction priorities.

Environmental best practice and sustainable development were at the heart of the innovations, initiatives, and considerations of the projects. During the life of the projects, new ways of operating were constantly being introduced - many of them a direct result of suggestions from contractor employees, who embraced the ideal of improved environmental management.

And for the construction companies involved in the projects, it's been the catalyst for change, too. All of them, from the major ones to the smallest, have embraced the concept of environmental management with enthusiasm, and have adopted new standards into their operations and activities with other clients.

This outstanding result is a testament to the enormous and genuine commitment that has been made to achieving the highest standards in sustainable development by BHPBIO and its engineers Sinclair Knight Merz (SKM) and Fluor Australia (Fluor).



"Sinclair Knight Merz and Fluor Australia are very proud of what has been achieved on the BHP Billiton projects and we are looking forward to setting new environmental standards for each succeeding project."

*- David Nixon, Project Director,
MPD JV & Fluor Australia*

Background

In 2002, BHP Billiton Iron Ore (BHPBIO) approved the development of a new mine at Area C in the Pilbara region of Western Australia and an expansion of the capacity of its Port Hedland facilities.

This development was split into three distinct projects:

- The Area C Project;
- The Area C to Yandi Railroad (MYR) Project; and
- The Products and Capacity Expansion (PACE) Project.



BHPBIO engaged the engineers SKM and Fluor to implement the three projects. The developments included:

- The development of a mine and processing facility at 'C Deposit' to produce 15 Million tonnes per annum (Mtpa) of MAC™ Marra Mamba lump and fines;
- The installation of infrastructure including power, water, airstrip and access roads;
- The provision of accommodation facilities for a 500-strong mine construction workforce and a permanent operations workforce of 150;
- The development of a new stockyard at Finucane Island;
- A major upgrade and enhancement of dust suppression systems;
- Upgrading the harbour tunnel conveyor from 4500 tonnes/hour (tph) to 10,000 tph;
- The establishment of an additional lump re-screening facility;
- Extending the existing shipping berths at Finucane Island;
- The construction of a 38-kilometre railway spur, linking Area C operations to Yandi;
- The installation of infrastructure including power and water; and
- The provision of accommodation facilities for a 350-strong rail construction workforce.

The three projects, collectively known as the Asset Development Projects, were completed ahead of schedule, with the first ship loading at the new Finucane Island facility taking place in January 2004.

Nature of the Challenge

BHP Billiton has a proud history of environmental management throughout its worldwide operations and is of the firm belief that its performance in this area is a result of workforce culture. It has invested a great deal of time, effort and money to develop this culture through the implementation of the BHP Billiton Charter, Environmental Policy and 15 Environmental Management Standards.

While awareness of environmental issues and a commitment to managing them have significantly improved in recent years, very often these factors have not played a prominent role in decision-making when companies develop and implement major resource construction projects. In the past, the focus of construction projects has been budget and schedules, completing the construction program in the shortest possible time, and meeting minimum environmental requirements.

BHPBIO determined that the three projects managed by the ADP team and its engineers SKM and Fluor would be a perfect opportunity to extend its high standards to major construction projects - to set new standards that went beyond Government regulation and community expectation.

Achieving those new standards was always going to be a challenge. It required a complete culture change, not only from the construction companies contracted to work on the project, but from every one of their employees. And it required consistency of decision-making between the client and the supervising engineers.

To achieve these high environmental management standards during construction required a number of key challenges to be addressed. These challenges included:

- The pre-existing culture of contracting companies and construction industry employees towards environmental management;
- The variability of environmental standards and performance of contractors. Typically, management of environmental aspects was a cursory consideration when bidding for and managing construction contracts;
- Achieving consistency in environmental decision-making uniformly across the three projects between the client and the engineering teams;
- Ensuring environmental approvals for future projects - future approvals issued by the State, particularly for further expansion at Port Hedland, would be contingent on the environmental performance of these projects. It would require a flawless environmental performance report card.
- Challenging site features - the PACE project in particular was adjacent to the harbour and the town of Port Hedland and was open to public view, while the MYR rail route traversed culturally and naturally sensitive areas.
- The project was to be undertaken in a regional area where the environmental infrastructure was in its infancy. For example, recycling of aluminum and cardboard had just started in Port Hedland and had a significant cost associated with it.

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It was an enormous undertaking and one that not only presented these environmental management challenges, but also presented significant technical and construction execution challenges as well.

In spite of this the BHPBIO ADP team and its construction engineers were determined to position the three projects distinctly apart from previous resource industry construction projects, to achieve an outstanding environmental performance and to drive a competitive advantage in the industry - seeing the developments as an opportunity rather than a challenge.

This was succinctly captured by the BHPBIO ADP Project Director Phil Montgomery:

“Legal compliance is only the first step in the journey towards Best Practice.”

“What we shall achieve on these projects will just be the starting level of acceptable environmental performance for the next project.”

And finally, the project scale, size, and schedule were key challenges to achieving industry best practice in environmental management. The total cost of the project was \$A1 billion. It involved more than 100 different contracting companies (25 of them major companies) over a construction period of 22 months. It involved three projects at four different locations spread over 350km and a total of three million man-hours from 2,700 personnel.



Physical and Economic Commitment

BHP Billiton Iron Ore and the engineering firms involved in these massive projects made a major physical and economic commitment to environmental management. That the projects achieved such a high performance was the result of a combination of environmental excellence, commitment to the highest environmental standards, a willingness to invest financial and personnel resources, a philosophy of including all stakeholders and of encouraging and rewarding innovation from every member of the construction team.

Without question, these projects have helped establish a new culture that places environmental management at the forefront of resource project construction priorities.



Rehabilitation of access track at 2 weeks.



Rehabilitation of access track at 2 months.

The first step was the development of a comprehensive Environmental Management System (EMS), implemented during construction and certified to the international standard ISO 14001 - a first in Western Australia. It was this management framework that provided the backbone to bringing about the cultural change and ultimately the exceptional environmental performance of BHPBIO and its engineering and contracting workforce.

The scope, scale and the number of contractors - each with varying levels of environmental culture - that would contribute to the project meant that the only way the environmental aspirations would be achieved was by ensuring a consistent and structured approach that spanned geographically-spread projects. It was also important that the approach be balanced with flexibility, to enable the workforce to innovate to achieve best practice, and for the project engineers to amend the scope as required.

Once the concept of a dedicated EMS was accepted, the challenge became its implementation. EMS's are being used successfully at operating plants where the time-frames are not limited. That is not the case on construction sites. On average, most contractors spent less than four months on site, and even the major contractors were on site for no more than 12 months.

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For the EMS to succeed there had to be a physical and economic commitment of significant proportions.

The construction EMS developed by BHPBIO covered the environmental aspects and activities inherent to the projects.

Its key elements were to:

- Confirm the management commitment;
- Communicate the project's environmental aspirations through measurable and realistic targets and goals;
- Provide direction and leadership by setting minimum environmental standards that exceeded legal compliance and were consistent across the projects;
- Offer sufficient flexibility to the project engineers to change the scope without decreasing the environmental values, and for the workforce to innovate and achieve a higher environmental standard and/or best practice while;
- Identify the monitoring required to confirm that minimum environmental standards were being attained and to highlight where best practice had been achieved; and
- Contain procedures that allowed the management team to periodically review whether the goals and targets were being achieved and to recommend changes to enhance the system.

It was clear that the key to achieving the EMS outcomes would be founded in training that ensured the workforce understood the environmental requirements, were able to communicate what was working and where improvements were required.

- **The environmental team.** An on-site environmental team was established to oversee the implementation of the EMS. The team included representatives of the BHPBIO ADP, SKM and Fluor and their contractors.
- **All supervisory staff** completed the BHPBIO ADP HSE Supervisors' course, which detailed the policies and the legislative framework in place. It also identified the typical environmental hazards relevant to the projects and highlighted the tools available to supervisors to meet the environmental requirements.

This was the first time supervisors were given this type of course, and during the life of the projects over 550 supervisors undertook the course. At a cost of almost \$500,000, this initiative was regarded as a critical element of the endeavour to raise environmental management standards within the construction workforce.

- **All personnel**, including supervisors, had to complete a site HSE induction prior to commencement of work on site. This induction was initially a PowerPoint presentation that covered environmental issues in a small and impersonal environment, as is the norm with most construction projects.

An informal survey identified better ways of delivering the induction, which was subsequently changed to reflect those suggestions. It became more interactive and friendly, with a focus on "doing the right thing" rather than an instructional program.

In its new format, the induction began with a number of stories, which delivered the environmental message as well as highlighting the key project environmental requirements. At the end of the presentation the presenter shook hands with all attendees, and made a personal request to each one of them to assist the project to deliver its environmental outcomes.

"BHPBIO are in the process of redesigning and upgrading their EMS. To achieve both simultaneously is a significant achievement and credit is due to both the individuals concerned (for their effort) and the top management (who are obviously the providing human, financial and technical resources necessary). Of note is the ADP management of the MAC infrastructure design and construction. It has resulted in levels of pollution prevention and operation control being available to the eventual operators that approach the level of best practice. The MAC and PACE projects embody the benchmark for implementation of the BHPBIO Environmental Policy and Strategies."

- Vic Natoli (June 2003, independent auditor with DNV on ISO14001 surveillance audit)

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This novel and highly successful concept was demonstrated by the number of people who approached project leaders at various stages during the term of the projects, and by the approaches of relatives and friends who commented on aspects of the induction, which indicated that environmental awareness had spread beyond the projects and into the community.

The personal contact also encouraged personnel to directly contact the engineers' environmental staff by phone when they believed there was a potential risk or that something was not normal. This meant quick reaction times so preventative solutions could be implemented.

- **Environmental professionals and alignment.** It was understood that the greater proportion of culture development would depend upon the people chosen to represent environment and how they delivered the environmental message.

BHPBIO and its engineers employed a total of eleven environmental professionals to deliver this message. The key success factor was the alignment of the environmental views of the client and engineers.

It was telling that several times at the beginning of the projects, when construction personnel "tried to get the answer they wanted to hear" by asking the same question of both BHPBIO ADP and engineer representatives, the independently-given answers were the same. This alignment and consistency was considered formidable and was respected by contractors thereafter.

- **Financial Incentives - A new benchmark in environmental management for construction projects.** As well as its own high regard for environmental values and commitment, BHPBIO had the vision to place a financial incentive of \$3.9 million in the contract that directly related to the engineers' environmental and safety performance on site.

Positive Contribution to Local Community

The three projects made a significant contribution to the local community. At the PACE project opening ceremony in February 2004, the President of BHP Billiton's Iron Ore Business, Graham Hunt, said that *"to have a sustainable business we need to ensure our communities share in our success"*.

The contribution to local communities as a result of the projects reflects the three aspects that define sustainable development.

ECONOMIC CONTRIBUTION

Approximately \$A1 billion was spent on the three projects and around \$A840 million of that was shared directly with the hundreds of Western Australian companies which worked on the project, and their employees.

- The Area C project had a peak construction workforce of more than 380 people;
- The MYR project had a peak construction workforce of more than 300 people; and
- The PACE project had a peak construction workforce of more than 570 people.

Congratulations on PACE, being responsible for the extensions to the port in Port Hedland having raised over \$80 000.00 which was donated to LivingWorks in the Pilbara. I understand that the major portion of this outstanding contribution came about from the sale of recycling material.

This donation reflects the highly developed sense of community spirit with which the BHP Billiton Asset Development Projects and their partners, Fluor and Sinclair Knight Merz, on the extensions to the port in Port Hedland and the construction of Area C, showed, when they decided to champion the cause to make the Pilbara region a suicide-safe community.

- Laura Hirsch, Livingworks in the Pilbara, 14 March 2004

SOCIAL CONTRIBUTION

Supporting the communities in which it operates is a fundamental commitment for BHPBIO. Eighty percent of BHPBIO's employees and contractors live in Port Hedland and Newman.

Employment recruitment centres were established in Newman and Port Hedland to give local people information about job opportunities, and a database of local people was created to help contractors find suitably skilled local employees.

During the life of the project, BHPBIO donated \$2 million to the Port Hedland Town Council for a "Greening and Streetscape Program" and committed \$4.5 million to the Port Hedland Enhancement Scheme to improve community sporting and cultural facilities.

A sum of \$300,000 was raised by the projects for the Living Works Program to raise awareness of suicide prevention in the region. Of this figure, \$90,000 was raised from the positive cash flow recycling program run by the PACE project. (Please refer to the case study in Appendix)

Indigenous employment as a proportion of the projects was more than five percent. Local indigenous companies, such as Pilbara Waste Management and Excel Industries, were preferred providers of environmental services.

Several initiatives to enhance indigenous relationships were fast-tracked by the projects and have contributed to BHPBIO's goal of achieving 12 percent indigenous employment (a target that reflects approximately the proportion of the Aboriginal population in Pilbara) by 2010. This includes the Port Hedland Educational Partnership (established in conjunction with other stakeholders), designed to support and encourage school attendance and opportunities for further study.

Twenty-five Indigenous students are currently enrolled. Cross-cultural training was part of the BHPBIO HSE Supervisors' Course, which all project supervisors, including contractors, were required to attend.

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ENVIRONMENTAL CONTRIBUTION

Some of the important environmental initiatives introduced during the projects include recycling and waste management facilities in Port Hedland, and innovative workforce training in rehabilitation methods at the inland projects.

When the projects started the recycling of aluminium cans and cardboard in the Pilbara was in its early stages, and the only other recycling service available was for scrap metal and copper wire. By the end of the projects, the recycling facilities established by the project teams had provided a solid foundation on which the community can build.

Waste management was another vehicle for community support. The project maintained a positive cash flow waste recycling program and those funds were donated to Living Works, the Royal Flying Doctor Service, and the Port Hedland Kangaroo Sanctuary.

Several initiatives were established in conjunction with the indigenous community, including total recycling of wood waste into mulch for use on site, setting up a pallet repair centre and ensuring that a Perth hydro-mulching contractor used indigenous labour to carry out the work on site.

A great deal of effort went into managing the rehabilitation of disturbed areas at the inland projects. The engineers' environmental superintendent prepared a detailed presentation on the benefits of minimising any areas of disturbance in the first instance, the appropriate techniques for rehabilitation, and provided one-on-one training on site to the plant operators. The results of meticulous focus on this one aspect were evidenced by the rate of recovery of the rehabilitated areas. For example, 18 months after construction, the borrow pits along the access road to the Area C plant are now almost impossible to discern from the surrounding environment.



Community Awareness and Participation

These projects created the opportunity to provide significant input into the prosperity of the Pilbara communities in which the expansion was being undertaken. As major infrastructure projects BHPBIO knew that the eyes of community would be keenly upon its performance, and saw this as an opportunity to enhance community awareness of the company and its operations, and participation in the project.

Wherever possible, the workforce was sourced locally and across the life of the project the proportion of local people employed was 30 percent. Because they were, in part, a brown-field sites there was also a significant level of interaction between the active operations and the projects (although the project areas were excised to ensure an adherence to the stringent project-specific safety and environmental requirements).

Because of the high number of local employees and the interaction with existing operations, there was a very high community understanding of the environmental management procedures BHPBIO ADP was trying to achieve, and a healthy and honest interaction with the community.

"The HSEC supervisors training course certainly opened my eyes to my (environmental) obligations.... it covered a vast range of environmental info."

Terry Jacobs Henry Walker Eltin 7 February 2003.

An illustration of the level of community support and awareness that existed around the project occurred a month before project completion, when an environmental professional (in work wear) sought assistance from a policewoman who was also a JP to attest a copy of a document. The policewoman was very keen to help, informing the professional that although they had never met she realised who he was and had heard about him and the excellent work that he was doing from her husband, who was also working on the project. Such quick and warm recognition is the best reference a project can get, demonstrating a strong level of community support and appreciation.

Additionally, the incidence of comments from members of the workforce when they suspected the conditions were not "normal" indicate a high level of confidence that appropriate action would be taken when an environmental issue was identified.

A workforce environmental perception survey was carried out early in the project to help the engineers identify processes and procedures that could be improved. As a result of the survey, some systems were changed and new facilities were established. For example, an oily waste bin for the disposal of machine shop rags and a recycling bin for empty chemical containers were introduced as a direct result of the survey. Prompt "close out of action" items generated from the survey led to the development of a mutual trust that was a significant factor in the culture change process and enhancement of environmental performance on site.

Nominee's General Attitude towards the Environment

BHP Billiton was one of the first companies in the world to combine health, safety, environment and community (HSEC) matters in one policy and one set of management standards. As a consequence, wherever the company operates, all these issues are addressed in the decision-making processes.

Knowing that much of its success as a global company depends on how effectively it works with its employees and the communities in which it operates, BHP Billiton regards its HSEC policy as central to its future success. The policy underpins the company's management systems worldwide and sets the foundation from which it operates.

That translates to a genuine commitment to environmental and social responsibility. BHP Billiton remains committed to sustainable development as reflected in the BHP Billiton Charter, and HSEC responsibilities are integral to the way the company does business.

Underpinning the charter is the HSEC policy, which in turn is supported by detailed HSEC management standards. They are backed by a rigorous program of integrated HSEC audits and assessments of HSEC risks for new projects and existing operations.

The company's commitment to achieving new standards of environmental management during the course of construction projects is a reflection of the effectiveness of its HSEC policies. Importantly, the new standards have established a new benchmark within the company and will set the performance level for future projects.

Sinclair Knight Merz is a leading environmental consultancy, with a growing global environmental practice. It is staffed by qualified environmental scientists, engineers, planners, economists, hydro-geologists, and

social scientists with specialised skills in all facets of environmental management. It sees environmental management as the key to success in developing ecologically, socially, and environmentally sustainable projects.

Fluor has a proven HSE management system that integrates the highest international standards - including ISO 14001 - into each project phase. Attention to sustainable development in project execution is just one aspect of its significant HSE achievements. Using a total project approach, Fluor's experts strive to meet the objectives of its customers and to provide safe, cost-effective facilities in harmony with their communities.

For the three BHPBIO ADP projects each organisation developed environmental key performance indicators, environmental objectives and targets and ensured that sufficient environmental resources (personnel and financial) were provided to implement the requirements to make each project successful.

Some specific examples that clearly demonstrate how this commitment and attitude towards the environment by BHPBIO and its Engineers was transferred to the projects include;

- The adoption of preventative environmental design;
- Its recycling initiatives in Port Hedland;
- The concerted environmental monitoring program across a range of environmental aspects;
- Their ability to react to new environmental risks as a result of scope and work method changes;
- Stopping work for environmental protection purposes.

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These are outlined in detail below.

Preventative Environmental Design: The cost of environmental measures covering water use and the elimination and/or minimisation of dust, noise and hydrocarbons from the projects into the environment was estimated to be \$65 million. These included, but are not limited to:

- the construction of standpipes and pumps, as well as hiring several trucks for making water available for dust suppression in work areas and access roads;
- conveyor and ore stockpile dust suppression sprays and moisture control system;
- use of low-noise rated idlers on the conveyors (6 percent higher cost), drives (8-12 percent higher cost), enclosure of wharf transfer station and the use of visible alarms in preference to audible alarms during construction;
- enclosure of conveyors;
- spray and wash water recovery system;
- containment of hydrocarbon containing stationary equipment such as generators, hydraulic units, welding machines, drill rigs, machine drives and transformers;
- secondary containment of all stationary and mobile chemical storage facilities on site;
- ship loader hydrocarbon leak detection and shut-off system;
- construction of site perimeter stormwater diversion drain and settling pond;
- the use of Low Frequency Moisture Meters on the Mining Area C plant to aid in obtaining optimum ore moisture levels.



Recycling. The contracts required each contractor to recycle materials at their own cost. In spite of this the engineers, with the support of BHPBIO ADP, showed leadership by paying for contractor recycling to encourage the contractors to do the right thing. (Case study included as an attachment.) The cost of recycling for the PACE project was \$135,000 and included bin rental, removal, transport to the nearest recycling facility and preparation of waste for recycling. Initiatives introduced included recycling of wood waste, the establishment of a pallet repair facility, a waste exchange where contractors shared empty 44-gallon drums, and the reuse of cable and belt reels. The project provided funding to the council to set up a land farm for treating 13 contaminated soil.



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Environmental Monitoring

- Real-time and activity-specific dust monitoring was carried out with a view to reducing dust emissions. The dust monitor was set up to automatically call an environmental professional when the PM₁₀ (particles less than 10 microns in size) dust level exceeded 90 micrograms per cubic metre (24 hour average PM₁₀ licence limit is 150 micrograms per cubic metre) for three minutes. This allowed the professional to identify the problem source in realtime and to resolve the relevant issue promptly.
- A stormwater monitoring system that measured turbidity, pH, conductivity, dissolved oxygen and flow in real time was set up. This system was linked to a rain gauge and an automatic sampler to take samples of the stormwater at set intervals or according to the water flow. No stormwater was discharged from the site after November 29 2002, when construction of the perimeter stormwater pond was completed. The stormwater pond was one of the first of the project works to be completed to support the environmental commitment.
- Prior to the start of the works, independent background noise assessment was carried out in the town of Port Hedland and a project undertaking was given that there would be no net noise increase as a result of the project. After the commencement of the works, independent noise monitoring from various pieces of equipment such as piling rigs and heavy machinery was undertaken. For equipment identified as having a potential for generating excessive noise, contractors were required to submit noise monitoring results pertinent to the equipment to ensure that project requirements (which were always more stringent than compliance requirements) were met.
- Groundwater quality, level and quantity at the two monitoring bores from which water was drawn for dust suppression and construction water supply was monitored.
- A real-time turbidity monitoring system was set up to monitor marine water quality throughout the life of the project. During

dredging, monitoring of the water quality up-stream and down-stream of the dredge was carried out. No exceedences over the requirements specified in the EPA-approved Dredging Management Plan were observed during the extensive monitoring that was carried out.

Reacting to new environmental risks as a result of scope and work method changes.

- The landscape and the activities carried out on a construction site can change very quickly. Formal weekly inspections and informal daily inspections, as well as monthly and quarterly systems audits, were carried out to identify any scope or work method changes. Formal risk assessments were carried out for scope changes and controls were put in place to prevent environmental impacts. Where prevention was not possible, impact minimisation and control were considered.
- Actions from inspections, audits, incidents and risk assessments were all documented in a Hazard Action Items List (HAIL) and these were closed out within the specified time. During the duration of the projects, more than 2,000 environmental actions were identified and closed out. The HAIL was consistent with the corporate ethos to build on what was learned from these projects and do even better on the next project.
- Where additional risks that required management at a best practice level without compromise could be foreseen, an environmental guidance note was prepared and communicated to all the relevant project personnel. Some examples were "Dust Management during Trenching and Pipe Laying Activities", "Fauna Management Guideline", and "Pesticide Management Guideline".

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Stoppage of non-compliant work

This powerful tool was available and used responsibly on site, in consultation with the contractor representatives. The Site Construction Manager stopped work based on advice from the Environmental Superintendent. Instructions for work stoppage due to environmental reasons included:

- stoppage of vegetation clearing work when the wind direction had the potential to carry dust towards the town of Port Hedland or during high wind conditions;
- tagging out-of-service un-contained fuel containing equipment to prohibit use;
- halting trenching during high wind conditions when the dust generated did not meet the project standards (which were more stringent than the compliance requirements);
- banning the use of one of the dredge's two fuel tanks after it has been contaminated with salt water and was generating black smoke;
- blocking the drain to prevent discharge of tailings dam water;
- prohibiting use of a non-compliant wash-down bay and associated oil/water separator system.

Innovation/Exceedence of Regulatory Requirements

A number of innovations which were developed for each of the asset development projects played a major role in achieving successful environmental outcomes. These innovations can be classified into two distinct groups:

- **Systemic Innovation**
 - Development of contractor management tools; and
 - The use of financial incentives to drive environmental performance.
- **Innovation in Practice**
 - A change in environmental culture; and
 - Environmental initiatives and their recognition.

SYSTEMIC INNOVATION

DEVELOPMENT OF CONTRACTOR MANAGEMENT TOOLS

Contractor performance was seen as the key to achieving successful environmental outcomes during the construction period. As part of the environmental management system, a series of contractor management tools were developed. These tools were split into home office-based tools or site-based tools.

The home office assessment of a contractor's commitment to environmental management or a positive environmental culture consisted of:

- An environmental component to prequalification assessment;
- An environmental information session during tender briefing;
- An environmental component to the tender review;
- Conducting Construction Risk Assessment Workshops (CRAW's) with focus on environmental risks;
- Site kick-off meetings; and
- Endorsement of the Contractor's Environmental Management Compliance Plan prior to mobilisation.

Prequalification Period

The environmental component of the prequalification assessment criteria were aligned closely with the requirements of ISO14001, with contractors needing to demonstrate that they were able to meet these requirements (e.g. legal requirements, policy and management systems, responsibilities and authority, planning and objectives, and training).

Contractors were required to score a minimum of 85 percent on the prequalification checklist before being included on any contract bid list. This was the market's first indication of the high environmental standards required of any organisation wanting to work on the three projects.



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Tender Briefing Session

These sessions were used to explain the details of the contract package to tenderers and provided BHPBIO and the engineers with the opportunity to relate specific environmental requirements of the package. Environmental representation (by both BHPBIO and the engineers) at these sessions heightened the profile of environment and allowed the expectations in terms of the environmental component of their tender submission to be fully communicated.

Environmental Tender Review and HSEC Presentation

Tenders were assessed based on the following attributes:

- The overall environmental performance of the tenderer over the last five years;
- The tenderer's preliminary environmental risk assessment; and
- The quality of the Environmental Management Compliance Plan (EMCP) in terms of its reflection of the requirements of ISO14001 and management of the environmental aspects specific to the contract package.

An environmental review report was passed back to the tenderer for action.

In some instances, tenderers were required to give a HSEC presentation. These presentations usually followed the environmental tender review period and allowed further discussion on the quality of the environmental submission with the tenderers and suggestions of any improvements.

Construction Risk Assessment Workshop

Using the BHPB Risk Assessment Matrix (to standardise the risk assessment process), contractors were required to assess HSEC risks associated with their contract package. This assessment, a compulsory requirement for mobilisation, was presented to BHPBIO and the engineers to ensure that they had given appropriate consideration to the relevant environmental risks.

It should be noted that the risk register developed through this process became a dynamic document once the contractor reached site. Hazard observations and the incident management process necessitated revisiting and updating the risk register on site. Updates were required to be communicated to relevant project personnel.

Perth Kick-off Meeting

Upon contract award, a kick-off meeting was held in the Perth office between the relevant contractor stakeholders, BHPBIO ADP representatives and relevant engineer personnel. This was the final opportunity to reiterate the environmental management requirements of the specific contract package contract prior to the contractor submitting their final version of their EMCP.

Endorsement of Contractor EMCP for Mobilisation

Once all of the requirements of the EMCP had been fulfilled, the engineer's environmental representative was one of the signatories to approve the contractor's mobilisation to the site.

The contract management tools detailed above gave tenderers and contractors a very firm indication of BHPBIO and engineer's uncompromising approach to environmental management.

These home office-based tools were followed up with another set of site tools:

- Inductions;
- Inspections and audits;
- Progress meetings;
- Toolbox and pre-start meetings; and
- Site newsletters and articles.

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On site Kick-off Meetings

Kick-off meetings were held prior to mobilisation to reinforce the environmental requirements on site. Where necessary, site pre-mobilisation inspections of equipment and machinery to be used on site were carried out. These inspections generated improvement actions prior to the commencement of work and such actions were closed out by the contractor prior to bringing equipment to site.

Environmental Inductions

Prior to commencing work on site, all contractors were required to attend a site induction. The engineer's site environmental representative presented the specific environmental component of this induction. It covered the site environmental requirements, BHPBIO's environmental policy and the project's environmental commitments and objectives. No one was able to commence work without having first attended the induction. Personnel in a supervising position were required to attend an additional training session that covered their legal obligations in terms of environmental management.

Regular Inspections

Weekly environmental inspections of all contractors were undertaken using an inspection checklist developed as part of the EMS. Following each inspection the environmental representative, in consultation with the contractor's representative, and the engineer's site representative, would develop a list of required actions with completion dates where necessary and formally issue these to the contractor.

When actions were not undertaken by the required date, the contractor was issued with a non-conformance notice. The potential for inspections to be seen as policing was identified very early in the construction phase and as a result the inspection process evolved to become one of consultation and the sharing of ideas rather than focusing on underperformance. Inspections also provided the opportunity for the recognition of positive environmental management by contractors.

Environmental Compliance Audits

All contractors were audited within one month of mobilisation. The audits were based on their approved EMCP, with the pass mark set at 85 percent. Where this standard was not met, a follow-up audit was undertaken the next month. Once the standard was met, audits were undertaken every three months thereafter. This approach was adopted to encourage good early performance by the contractors. Again, the audit process provided the engineer with the opportunity to recognise good environmental performance.

Contractor Progress Meetings

These were attended by the engineer's site environmental representative to discuss audit findings and environmental issues associated with the relevant contract. The inclusion of the environment as an agenda item at each of these meetings was seen as an additional way to demonstrate BHPBIO's and the engineer's commitment to environmental management.

Attendance at Toolbox and Pre-start Meetings

These meetings were attended by the engineer's site environmental representative and used as a forum for conducting any environmental training and raising environmental awareness among personnel. Some of the additional environmental training provided by the site environmental representative included:

- Rehabilitation methods;
- Hydrocarbon spill management training; and
- Aboriginal heritage training.

These training packages elevated the environment in the minds of many employees and were seen as particularly effective in bringing about the change in environmental culture on site.

"NRW are doing a great job, they have taken the environmental practices they learned on the BHPBIO projects and applied them to our project (the Koolyanobbing Expansion Project)"

*- Michelle Joyce Environmental Officer
Portman Limited September 2003.*

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Site Newsletter and Articles

To improve the general awareness of environmental issues all project construction sites produced newsletters and/or articles highlighting general environmental issues as well as issues that were specific to that site.

The newsletters were also used to publicly recognise contractors for good environmental performance. This recognition was seen as extremely positive by contractor management personnel and encouraged contractors to continually strive to think of ways to do things better.

FINANCIAL INCENTIVES

So what value was there to the engineer in placing such strict environmental requirements on the contractor?

Apart from its own high regard for environmental values and commitment, BHPBIO had the vision to place a financial incentive in the contract that directly related to the engineer's environmental (and safety) performance on site.

Prior to construction, BHPBIO and its engineers developed a scorecard whereby they could measure, by regular monthly site audits, the site environmental performance. Each monthly scorecard had a monetary value assigned to it and so essentially any score of less than 100 percent by the engineer was seen as a loss of potential income.

However, this financial incentive was not the only motivation for the engineer. Evidence of this occurred approximately midway through the construction period when scores of 100 percent on the scorecard were common. It was at this point that BHPBIO and the engineers agreed to increase the requirements of the scorecard - essentially making it more difficult for the engineer to obtain a perfect score.

This was a clear demonstration by all parties of what really mattered - the environment!

INNOVATION IN PRACTICE

A CHANGE IN THE ENVIRONMENTAL CULTURE

The stringent environmental requirements of the contract and the processes set in place to ensure the highest level of environmental management clearly led to a change of culture within the workforce. The specific examples detailed below demonstrate that the focus on environmental values led to innovative handling of processes that, in the past, would have been dealt with by adhering to past practice and regulations.

Dewatering management

Clear indication that the strong emphasis on environmental value was impacting upon the teams' approach during construction occurred during the bulk earthworks phase of the PACE Project.

One aspect of the earthworks involved significant dewatering of groundwater at Finucane Island - with the primary issue being management of its disposal. In fact, this contract required the management of almost three million litres of water each day.

The obvious management solution was to sample and analyse the groundwater and seek approval to discharge it off site. Initial results of analyses indicated that this would be acceptable.

However, applying the hierarchy of environmental management to this problem achieved a more acceptable solution to BHPBIO and the engineers.

A series of settling ponds and standpipes were installed at various locations across the site to temporarily store the groundwater. This ample supply of water was then used for dust suppression and conditioning of fill material rather than being discharged off site.

This simple and inexpensive approach had the flow-on benefit of reducing demand for water from the groundwater bores and turkey's nest specifically installed for dust suppression and conditioning of fill material.

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Dust emissions

In Port Hedland, dust issues have a high profile within the community and one of the key success factors for the project was to manage dust in a proactive and professional manner - from the start of the project planning stage through to commissioning, ship loading, and the final handover of the working plant to the operations. Only 1.5 km of water separates the Finucane Island construction site and Port Hedland, which meant construction activity was in constant view of the community.

The activities covered during the PACE Project included:

- Site preparation (including clearing vegetation);
- Formation of access roads;
- Bulk earthworks, which involved transporting sand and tailings between the tailings dam and the berm being constructed on the eastern side of the island; hauling material located some 40kms from the quarry for the construction of seawall; storage of sand and rejects stockpiles on site;
- Laying track for the stackers and reclaimer; and
- Laying a 5km water pipeline between Port Hedland and Finucane Island that involved trenching using a rock breaker, part of it along the main road in Port Hedland.

The Licence and Works Approval required the project to ensure that the 24hour average concentrations of total suspended particulate (TSP) matter and the 10-micron or under fraction (PM₁₀) did not exceed 260 µg/m³ and 150 µg/m³ respectively.

The PACE Project, in consultation with BHPBIO



ADP, set a 24 hour average PM₁₀ target of 90 µg/m³. It was also agreed that the site performance against the PACE project goal and the Licence limit be monitored and reported on a daily basis to senior management and all the contractors on site. The rationale for this change was to ensure total transparency with the community, as well as raising the awareness of the personnel on site.

Dust Management

“What you can’t measure, you can’t control” is an old adage. The modern learnings of “Don’t assume, communicate”, “Consistency is the key to sustainability of an action” and “Adapt technology to human behaviour to achieve success” became the philosophy for dust management on site.

These site induction covered dust issues and the means to control dust in a very practical way. The message was simple and the content was to:

- Clear only the minimum area of vegetation and wet the area prior to clearing;
- Have dust suppression techniques in place - drive slowly, continuously water the access roads, and work areas; and
- Do not carry out dust generating activities during high wind conditions.

It was also made clear that the equipment and plant was designed to generate the least amount of dust during operation. The site construction manager and the BHPBIO ADP project managers were committed to proactive dust management and supported the cause every time by providing resources or approving temporary postponement of work.

When work began, a dust monitor was located on site to measure the one-minute average PM₁₀ dust levels to provide real-time data. The dust monitor downloaded the data in real-time into a data logger linked to a modem which dialled out to the Environmental Superintendent’s phone should the dust level exceeded 90 µg/m³ and if the wind direction was from the west (the direction which would have the most impact on the community). This was a powerful tool that enabled action to be taken in real-time, rather than the industry-common practice of downloading data at a set time once a day, or when there is a complaint.

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Once a call was received, a responsible person was at the location where the dust was being generated within a few minutes and the situation was quickly controlled, even if it meant stopping the activity. The operators were surprised at the promptness with which the dust generation activity was identified, and it was quickly understood by everyone that the site standard of best practice dust management would not be compromised even for short durations unless there was a good enough reason (e.g. mechanical breakdown). These actions reinforced the message that was communicated during the site induction to all site personnel.

At the request of the BHPBIO ADP Manager, the Engineer's Environmental Superintendent prepared a daily environmental report that provided the analysis of the dust data together with actions that were taken or required to be taken. This report was circulated to all senior staff and personnel supervising potentially dust generating activity, as well as the site Construction Manager and the BHPBIO ADP project team. This report facilitated information promptly and enabled required actions to be taken quickly.



ENVIRONMENTAL INITIATIVES AND RECOGNITION OF EMPLOYEES

During the course of the projects more than 110 employees were recognised for showing self-initiative that led to the improvement of environmental performance towards best practice. Most of the initiatives below would not have eventuated unless the employees believed that the environment was important.

- When he noticed oil dripping on to the soil under a crane, Rangi immediately took a disposable but recyclable lunch box and taped it under the hydraulic oil tank until the mechanic was available to fix it;
- Hose placed a plastic nappy under a crane on the barge to prevent a potential oil spill;
- Angie built a cover over the storm water drain in the construction area to prevent dust entering the drain due to vehicle movement;
- Rob saved a joey after its mother was killed in a road accident and Tim kept it warm with his body heat until it could be taken to a veterinarian and then to a kangaroo sanctuary;
- Bill carried his paint container in a bucket to prevent spillage and ensured that all his team followed this procedure;
- The Project Director and senior managers worked with all personnel during emu parade rubbish collections around the sites;
- John cleaned wind-blown rubbish from the storm water pond;

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- Derryk prevented dust during the handling of soil and reject material, by implementing practices such as pre-wetting the stockpiles, reducing the height of fall between the loader bucket and the haul truck, reducing the driving speed of the vehicle, and then communicating these procedures to fellow workers in his team;
- At the induction, Brian came up with an idea for recycling of low quality wood waste into mulch using Indigenous labour. The company acted on that idea and made it a reality;
- Cameron placed a threading machine in a tray over a plastic sheet to ensure that the spray from the cooling fluid did not contaminate the soil;
- Sophie stopped work when the project environmental requirements were not being met during a tight schedule;
- Manie allocated funds to place a large silt screen in the harbour to prevent potential turbidity from seawall construction;
- Sarah (an employee's wife) reported a 2cm globule of grease in the harbour during a fishing trip. This led to the implementation of a system to prevent the release of grease into the harbour;
- Duncan developed and implemented a wet scrubbing technique that prevented the generation of dust;
- Paul set up a chemical storage facility using the wooden boxes and plastic sheets;
- One employee sponsored the local school for the purchase of recycling bags for the National Recycling Week;
- The use of waste paper for hydro-mulching of the environmental berm;
- The use of drip trays for preventing spillage of drops from the dispenser during refuelling;
- Cervan for locating a drill rig on a plastic sheet so that any hydrocarbon spillage could be contained.



Did We Succeed ?

There is no easy way to measure what the overall environmental culture of these projects is or was at any particular stage throughout their implementation. We can however measure their environmental performance through tracking the number and nature of incidents, non-compliant activities and breaches of environmental legislation. And we will witness the numerous examples of employee innovations.

It was not by good fortune that the Asset Development Projects did not breach legislation and it wasn't by luck that the few environmental incidents that did occur were all of very low level impact.

It was because of the values and beliefs of the person "on the shovel".

Initiatives of note that are related to my business dealing with him included a land-farming initiative at Council's operating landfill. It allowed a sustainable, cost-effective alternative for the treatment of some contaminated soils that will bring benefits to other companies in the future.

A wood recycling initiative using Aboriginal people (both business and community groups) was probably the best value added environmental initiative I have seen in Hedland. While it is still being fully developed, the potential is huge.

The joint venture, through Raju, participated and actively contributed to regional waste management and recycling initiatives and plans. The exercise gave him an opportunity to share his environmental knowledge and also gain an understanding of the opportunities and challenges for local government in terms of the future of sustainable waste management across the Pilbara.

*- Anthony Whitfield, Manager Environmental Health Services
Shire of Port Hedland, 18 March 2004*

"Providing a recycling service was a new initiative for Town of Port Hedland, as there were no recycling services available at that time. Considering this, the initiative was well accepted by the contractors, and with strong support from the likes of Raju (the Engineer's Environmental Superintendent) worked well"

*- Jason McLennan, Depot Supervisor Cleanaway,
Port Hedland, 27 February 2004*

"The PACE project provides a benchmark for other EMS users to follow. This is due partly to the currency of their projects, the legacy of tight control required of multiple contractors but also the resources (human, financial and technical) available."

- Bob Sherwood (February 2003, independent auditor with DNV on ISO14001 surveillance audit)