Australian Revised National Plan Policy and Process for the Recognition, Application and Monitoring of Oil Spill Control Agents, Including Dispersants

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Abstract

Australia has revised its approach on chemical oil spill control agents (OSCAs) based on local and international experience. Revisions to Australia's spill risk profile, response planning and governance arrangements are complemented by a revised approach to OSCA use, including dispersants. This comprises four key elements: acceptance via a register; operational logistics; use approval; and monitoring.

Registry listing ensures formal acceptance of an OSCA's acceptability for planning and use. Acceptance requires testing for efficacy under specific Australian conditions (tropical and temperate) with multiple oil types (crude and fuels), and for toxicology on up to 10 local species. Existing products held in National Plan stockpiles are grandfathered into the Registry until stocks are exhausted - new stock, even of previously accepted formulations, must gain new registry listing before use.

National Plan OSCA logistics include strategic stockpile locations, volumes and application technologies; the latter including a national 24/7 fixed wing aerial dispersant delivery contract jointly supported by government and industry.

Use approval relies on strategic environmental risk assessment (ERA) for pre-approval within a recognised contingency plan and tactical ERA (net environmental benefit assessment - NEBA) to inform the decisions during a response.

Requirements for response-phase monitoring (especially of dispersant use) hasn't changed, but technologies available have, and post-incident effects or impacts monitoring, by resource management agencies, is promoted. All National Plan monitoring guidance is under review during 2013. AMSA has partnered with the internationally-recognised Australian science agency CSIRO to deliver response-phase monitoring, following their demonstrated success during the *Deepwater Horizon* response.

1. Introduction

From time to time, suppliers of oil spill response products (sometimes for new or innovative technologies) ask about what requirements exist for 'approval' or use in Australia. Unlike some overseas countries, Australia has no specific regulatory powers to 'license' or 'approve' such products. The oil spill control agents (OSCA) policy is administrative and has evolved over time within the overall Australian approach to spill response planning, described below. The objective is to ensure appropriate, effective, safe and environmentally beneficial response technologies become part of the Australian responder's toolbox.

Like many countries with comprehensive marine oil spill contingency measures Australia has recently revised its spill response policy, planning and operational arrangements in light of recent local and international experience and events. Australia is now rapidly moving to implement its new (2012) integrated and comprehensive system known as the *Australian National Plan for Maritime Environmental Emergencies* (*National Plan*) (AMSA 2013b). This replaces the previous 10 year old *National Plan to Combat Pollution of the Sea by Oil and Other Hazardous and Noxious Substances* and the *National Maritime Emergency Response Arrangements* (the latter dealing with maritime intervention and salvage). The revision of the Oil Spill Control Agents (OSCAs) policy has responded to the same policy drivers.

Whilst the *Deepwater Horizon* incident in the Gulf of Mexico incident has deservedly driven spill response research, planning and review worldwide, Australia's *Montara* well blow-out incident (DET, 2011) in the Timor Sea in late 2009 provided a similar local impetus and resulted in formal government direction for change. Other locally-significant recent incidents, including the 2009 *Pacific Adventurer* incident (AMSA, 2010a) near Brisbane and the 2010 *Shen Neng1* on the Great Barrier Reef (AMSA, 2010b), provided substantial operational experience. The 2011 *Assessment of the Risk of Pollution from Marine Oil Spills in Australian Ports and Waters* (DNV, 2011) supported recent experience and placed it in an international context.

These reviews consistently noted the need for improved use of decision-making rigour within spill response, and the need for a more comprehensive and scientific approach to planning, preparation and response. The public controversy generated by the use dispersants in both *Montara* and *Deepwater Horizon* incidents also highlighted the need for clearer information regarding the appropriate use of dispersant (and by association, other chemical tools) during a response (DET, 2011; AMSA, 2012).

The Australian National Plan agencies are now working towards implementing a more comprehensive approach to OSCA management. This will include science-based acceptability (efficacy and toxicology), practicality (location, volumes, and application technologies), decision-making for use, and monitoring (effectiveness and effects). This is a journey Australia's National Plan partners willingly to ensure that OSCAs continue to be viable, pragmatic and effective response tools for local use.

2. The Australian OPRC Context

Since 1973, the Australian National Plan arrangements have formed a cooperative, administrative framework to bring together the combined resources of the Commonwealth, State and Northern Territory governments, in partnership with the oil, shipping and exploration industries, to address risks of marine and maritime oil and chemical spills. Multi-lateral agreements between the various partners prescribe responsibilities for contingency planning, technical support, access to equipment, and management and administrative arrangements.

The geographical area covered by the Australian National Plan is large, covering more than 10million km² and nearly 60,000 km of coastline (GA, 2013). This encompasses the Australian Territorial Seas, including off-shore islands and territories (incl. the Australian Antarctic Territory), the Exclusive Economic Zone, and the high seas where an oil spill has the potential to impact on Australian interests. See Figure 1. Australian National Plan Response Resources Locations. Australia also has bilateral and multilateral mutual aid arrangements with neighbouring states, including New Zealand, Indonesia, Papua New Guinea, Korea, and South Pacific Regional Environment Programme partner nations. Within the Territorial Sea, the first three nautical miles is State and Northern Territory Coastal Waters, with the Commonwealth having jurisdiction over the rest.

The Australian Maritime Safety Authority (AMSA) is the designated National Authority under OPRC (the *International Convention on Oil Pollution Preparedness, Response and Cooperation 1990* and its *Protocol on Preparedness, Response and Cooperation to Pollution Incidents by Hazardous and Noxious Substances*) for Australia. AMSA is the Commonwealths Government's response agency. It also administers the overall National Plan governance structure, provides and coordinates technical advice and training, and manages materials and equipment stockpiles (including dispersants). So, AMSA is involved in both setting and complying with relevant OSCA policy and process.

Out of the *Montara* Inquiry (DET, op. cit.) have come major changes in the regulation of the Australian offshore oil and gas industry with the advent of the National Offshore Petroleum Safety and Environmental Management Authority (NOPSEMA) in January 2012.

The changes have had wide-ranging implications, but the offshore oil and gas sector seems committed to maintaining their strong connections within the revised National Plan arrangements and policies (AMSA, 2013a).

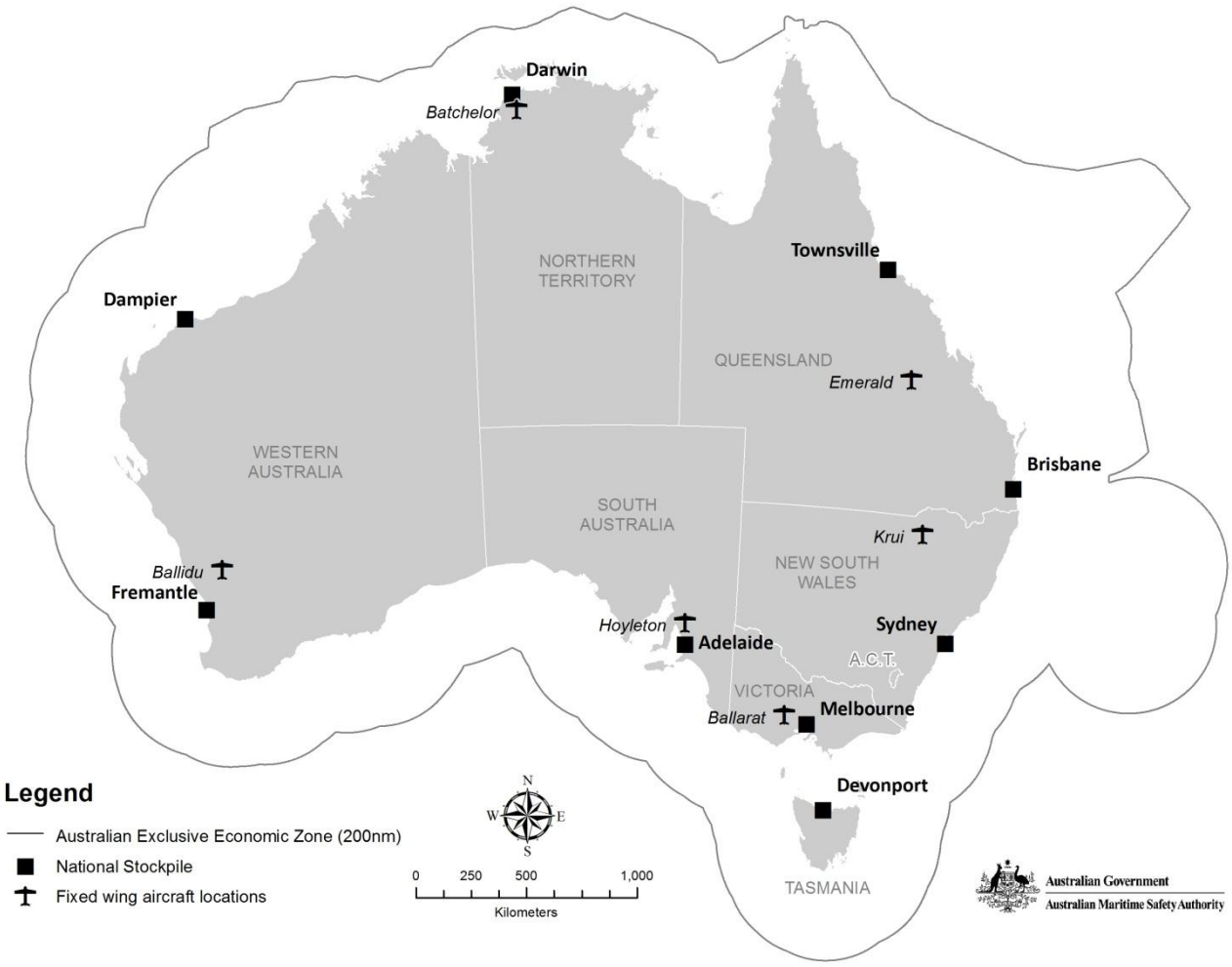

Figure 1. Australian National Plan Response Resources Locations

3. Regulatory Exemptions for Rapid Spill Response

As noted above, the National Plan (and associated jurisdictional and industry plans) and arrangements form an administrative framework, supported by industry, sector, health and safety, or environmental legislation. Australia's federated system of jurisdictional and legal arrangements is complex, but as application is normally limited to a specific geographical area there is rarely jurisdictional overlap. Each jurisdiction applies its own legislative requirements governing oil spill response, as needed.

It is well recognised that spill response actions benefit from rapid, unimpeded and robust intervention, based on pre-agreed response plans, in order to maximise the chances of containing pollution and minimising the threat to the environment. Australia has implemented legislative exemptions from compliance action where a response is mounted, using an OSCA, by the relevant National Plan combat agency and in accordance with the applicable contingency plan at the national, State/NT, regional, port, or terminal and platform level. These include national MARPOL (*The International Convention for the Prevention of*

Pollution from Ships) provisions to exempt relevant overboard discharges from authorised response vessels during a National Plan response. This could include the deliberate application of an OSCA, such as a dispersant. A similar provision exists under national Commonwealth environmental legislation (the Environment Protection and Biodiversity Conservation Act 1999) where the Environment Minister has granted an exemption for actions undertaken in accordance with the National Plan, including use of registered OSCAs.

4. Oil Spill Control Agent Policy and Procedure

Current National Plan OSCA arrangements have four key and linked components:

- **Registry listing** – through acceptance testing
- **Logistics arrangements** – stockpile management and aerial application capabilities
- **Use approval** for listed products
- **Monitoring** – primarily response-phase (Type I) monitoring for effectiveness

5. Acceptance – Prior to 2011

Even prior to the advent of the first Australian National Plan in 1973, Australia has been aware of the advantages and disadvantages of the use of chemical spill response agents, especially dispersants. The *Oceanic Grandeur* incident in Torres Strait (AMSA, 2013c) in 1970 resulted in chemical dispersants being applied from small local vessels, as other response options were constrained by tidal conditions and the remote location. Lessons learned from this and subsequent incidents led to National Plan guidance on both dispersant testing prior to purchase for stockpiles (AMSA, 1998) and for acceptance of new chemical response products (AMSA, 1999) into the Australian arrangements.

Dispersant acceptability testing in Australia goes back to the early 1980s, prior to the establishment of AMSA in 1990, and focussed primarily on efficacy and toxicity (P. Nelson, AMSA, 2103, pers. comm.) A single efficacy test was based on the Mackay (MNS) Test protocol (Mackay et al., 1978), using an artificially weathered Light Arabian Crude as the reference oil, and requiring a 75% efficiency result at an application ratio of 20:1, i.e. twenty parts oil to one part dispersant. As dispersant testing was by then a worldwide practice, the Australian process of a single test on a single reference oil was not unusual. Toxicity tests involved a standard 96hr static test against two temperate Australian species from a list of five, and two specified Australian tropical species, with the required threshold being an LC_{50} of 10ppm or greater. Biodegradability requirements were tested against an Australian Standard (AS1792-1976).

The dispersant test protocol remained the same until early 2011. All National Plan stockpile dispersants were required to meet these requirements based on pre-purchase tender declarations by suppliers or manufacturers.

The first reference to a National Plan response chemical acceptability policy arose out of the 1996 National Plan Scientific Support Coordinator (SSC) workshop (SSC, 1996). Concern was raised that despite many of the ‘new’ chemical response products being touted as having significant potential for improving the overall effectiveness of oil spill clean-up, insufficient rigorous information on their chemical process, effectiveness, practicality, disposal and potential environmental side-effects was available (ibid.).

The new product types included:

- herding agents
- solidifiers
- shoreline pre-treatment agents
- oxidation agents
- emulsion treating agents
- shoreline cleaning agents
- elasticity modifiers
- bioremediation agents

Recognising that ‘spill incidents and emergency situations are not appropriate situations for the testing of new products and oil spill treatment chemicals’ and that

Australia's risk profile was different to other countries, the SSCs recommended the development of a three-step acceptability process for new products.

The Acceptability Protocol for new products built upon the acceptability testing of dispersants, and the one other similar system in operation at the time, the US-EPA National Contingency Plan Product Schedule. Potential suppliers were asked to show their US Listing, supply product data, including safety data sheets, and all laboratory test results for effectiveness and toxicity. Additional toxicity testing on local species, under local environmental could be asked for, and additional effectiveness tests on local oils or products. Prior to any incident controller approval for full scale field application, products may require pilot evaluation in field effectiveness tests and a simple monitoring plan to assess adverse environmental effects. This protocol was accepted for National Plan use in 1997.

The Protocol remained unchanged and unused until 2011, with few, if any suppliers seeking Australian acceptance, as this was a period of low demand by Australia, with few significant spills (T. Gilbert, APASA, pers. comm.).

6. The 2011 National Plan OSCA Protocols and Registry

Testing and acceptance protocols for OSCAs (including dispersants) were revised and published in the 2011 National Plan *Protocol for the Register of Oil Spill Control Agents* (referred to as the Register) (AMSA, 2011). In undertaking this revision, however, it was noted that still the majority of coastal states require no local testing of dispersants or other OSCAs, prior to their deployment. Those that do, tend to accept US or various European protocol results and acceptances.

The major gaps or inconsistencies identified in the review of existing National Plan protocols included:

1. **Definition** - defining the types of OSCA likely to be supplied in Australia and including dispersants.
2. **Standardisation** - of requirements and protocols for testing (including efficacy) and acceptance of results from similar overseas schemes.
3. **Reference oil types** - reviewing the appropriateness of the crude reference oil and including other locally common risk oils.
4. **Toxicity** - extending the range of local species tested for toxicity.

In essence, the new testing and acceptance regime specified in the Registry attempts to provide a comprehensive and standardised approach to acceptance in Australia, giving suppliers more certainty, decision-makers and users more relevant information, and stakeholders more comfort that effective and safe products are available for use.

The gaps were addressed by nine integrated elements:

1. **Standard List of OSCA Types** - of nine OSCA types and 16 sub-types that are relevant for Australia:
    - Dispersants (3 sub-types) – hydrocarbon-based, water-dilutable concentrates and concentrates
    - Surface Cleaners
    - Bioremediation Agents (2) – nutrient only and biological agent
    - Loose Sorbents (3) – natural organic, natural mineral and synthetic material
    - Degreasers (3) – natural solvents, enzyme-based and solvent-based
    - Solidifying or Gelling Agents
    - Emulsion Breakers
    - Herding Agents
    - Wicking Agents
2. **Standard Test Regime** - the test regime for each OSCA type is set, determining whether efficacy, toxicity or biodegradation tests would be required or not for each type, and defining which recognised test protocol would be most appropriate

for a given OSCA. All the OSCAs, except three, were allocated internationally recognised efficacy tests. It was recognised that the effectiveness of some methods (e.g. washing) may have little to do with the efficacy of the product and more to do with the method of application (e.g. mechanical force or water pressure). However, the advantage of this approach is that some efficacy testing completed overseas can be used to meet Australian requirements.

3. **Mackay Efficacy Test** - the Mackay test was retained after comparing four main alternative protocols. Given the apparent lack of international consensus on testing methodology, no viable alternative was identified. The assessment considered the Mackay test attempted to mimic natural mixing conditions and so provides a reasonable indication of efficacy rather than a relative score for product, condition or oil comparisons. A 70% effectiveness pass rate was set to ensure product quality is maintained.
4. **New Standard Reference Oil** - Arabian light crude was changed to Kuwait light crude. The Arabian crude is blended at source to highly variable specification, making it less useful as a standard reference oil. Whereas the Kuwait oil is a well-documented, stable, international standard reference oil, with many years of Warren Springs Laboratory (WSL, 2007) science behind it. This allows Australia to accept UK efficacy test results. Australia now has a sufficient stock of the Kuwait reference oil for the foreseeable future.
5. **Adding Fuel Oil Tests** - Extending the testing to fuel oils (IFO 180 and 380) reflects the wider range of oil types in Australian waters and the threats associated with them. These fuel oils comprise the bulk of non-distillate marine fuels, and their composition varies widely depending on supplier. Choosing the WSL Flask test for the fuel oils lowered testing costs, and allowed indicative results to inform decision-making. These tests are not pass/fail.
6. **Toxicity Testing** - All relevant OSCA types, based on their chemical composition, mode of action and place of application, now undertake both pass/fail and indicative tests. Based on accepted Australian requirements (ANZECC, 2000) and a review of published international practice, the tests were expanded to cover a wider range of Australian phyla, including planktonic species, recognising their particular sensitivity to water contamination. The final selection of species reflects the use of Australian analogues of overseas species in local laboratories.
7. **GESAMP Toxicity Standard** - The LC_{50} pass/fail performance requirement of at least 10mg/litre (10ppm) is based on GESAMP (2002) standard for aquatic toxicity, of 'slightly toxic' of greater than 10ppm. This is also retained, but with a recommendation that non-lethal tests be substituted once these are formally available. Results for some species are mandatory pass/fail, and other results provide information for expert assessment of the suitability of OSCA application in particular environments.
8. **Shoreline Risk** - A rocky shoreline test was also added, given the potential for some OSCAs to be used on and around shorelines. This was based directly on the UK approach (Kirby et al., 1996). Discretion was retained to apply a modified version of the seawater test for bioremediation products designed to be applied on soft shorelines.
9. **Biodegradability** - this testing is also required where an OSCA (or its products) may be inherently persistent and harmful.

The new testing requirements for efficacy, toxicity and biodegradability complemented the unchanged requirements for product quality, longevity, composition, labelling, and packaging. Together, they provide increased certainty that the OSCA products

listed on the Australian National Plan OSCA Register are fit for purpose and acceptable from a human safety (operator and public) and environmental effects (acute, chronic and latent) perspective (AMSA, 2011).

7. Logistics - Stockpile and Field Application Arrangements

Oil spill dispersants remain one of the most effective response strategies for combating large oil spills. As such, AMSA continues to maintain significant quantities of dispersants and spray equipment within its stockpiles (see Figure 1. above). Prior to 2011, the only OSCAs available in Australia were dispersants, held in the various National Plan stockpiles spread around the country in two different types of stockpiles – those in high risk areas able to be easy accessed and those in areas where logistics were available to move them quickly to a spill location. The volumes and types of dispersants have changed over the years, as risk and technology has changed, but not markedly so over the past decade. This approach was adopted very early under National Plan arrangements and through many reviews has remained relatively constant, including under the latest review of the National Plan (AMSA, 2012). Stockpile locations, contents, volumes held and access arrangements are included in various National Plan documents and annexes.

One of the more significant changes was the establishment of a permanent fixed wing aerial dispersant capability, as a result of the 1993 High Level Working Party Review of the National Plan (AMSA, 1993). This recommended a shift from a solely close in-shore helicopter-based aerial delivery system, to include a capacity to operate further offshore. In 1996 AMSA, with industry support, entered in the first of a series of contracts known as the Fixed Wing Aerial Dispersant Capability. This is based on the concept of utilising large agricultural fixed wing aircraft to apply oil spill dispersants. It has grown to become a key component of Australia's capacity to respond to oil spills in the marine environment.

The current contract is a 24/7, 365 day arrangement taking advantage of a fleet of larger Air Tractor and Thrush aircraft normally used throughout Australia for agricultural spraying and fire fighting. These turbine-powered single-engine aircraft can carry up to 3600 litres of dispersant, up to 350km offshore. As they are designed and equipped with sophisticated navigation and data logging capability, they can fly safely as low as 2-5metres above the water to deliver the dispersant with pinpoint accuracy and effectiveness. For safety reasons and to assist with delivery accuracy, a trained aerial observer in a separate aircraft provides on-site directions towards the heaviest concentrations of oil, advises when to start and stop spraying, and monitors effectiveness.

Once activated the aircraft fly to a suitable airfield to which strategically located dispersant will already be dispatched by AMSA, awaiting loading and deployment. The contract now includes air base management, dispersant loading, and all logistical requirements for keeping the aircraft operating safely and effectively for as long as is needed.

8. Approval to Use an OSCA in a Response

The *Montara* response was AMSA's third significant response since 1983, its first oil platform response, and by far, its largest dispersant spraying operation. Prior to the *Montara* response, the National Plan did not have suitable, clearly-documented decision-making process for the use of dispersants during such an incident. Very quickly, a suitable process was developed 'on-the-fly', by drawing on AMSA staff knowledge of other agency approval processes, to ensure decisions made at the time were well-documented. In review, this was noted as "not best practice" (AMSA, 2010), and a more suitable arrangement was required.

Notwithstanding that an OSCA is listed on the National Plan Register, its use in an incident must be approved by the relevant Incident Controller and/or Statutory Authority, such as the State/NT or Commonwealth government having jurisdiction over the sea, estuary or coastal land. Although the use of the OSCA is to benefit both the spill clean-up and for the

affected environment, the approving authority must be convinced through solid evidence and good decision-making processes, that its use is necessary. Evidence may come from the results of monitoring, testing or expert advice. It is important that the reasons for providing approval are regularly re-assessed and further documented, throughout the response.

A formal, documented process provides the approving authority with evidence that good decision-making processes have been followed, including:

- Need and effectiveness
- Expert opinion and testing
- Alternatives considered
- Environmental effects of the oil and the oil/OSCA mix – net environmental benefit assessment
- Safety issues for the public or operators.

Since 2010, a specific procedure, drawing on and consistent with international best practice, has been developed to provide AMSA with a clear, well-documented decision-making process for OSCA use. This called the *Protocol for Obtaining Approval for the Application of Oil Spill Control Agents to Oil at Sea or on Shorelines* (AMSA, 2013). The new *Protocol* is built around four key elements to ensure rapid uptake. The first two are simple decision-trees for assisting with the approval process for at-sea or on-shoreline use, as some of the considerations for each OSCA and each use are different. The third key element is a simple decision-tree on conducting a rapid net environmental benefit assessment. This has been developed from a review of a myriad of similar processes, and adapted for this particular use. Tying all these together is an active PDF-format form, identifying all the required processes, information and decision points. As an AMSA Guideline, this protocol will be scrutinised and critiqued by National Plan stakeholders, before they decide to adopt, adapt or reject it for their circumstances and plans.

9. Monitoring OSCA Use

As noted above, Australia's OSCA policy process is a journey. Revising and implementing the monitoring component is the final leg of this journey. Response-phase monitoring (often referred to as operational or Type I monitoring) is universally recognised as essential in spill response. In 2003, in collaboration with Maritime New Zealand, Australia developed a very simple and robust handbook (AMSA and MNZ, 2003) that provided guidelines for undertaking monitoring for actual or potential marine spill responses. Although it focuses on oil spill monitoring, the information is also generally applicable for monitoring marine chemical spills. The National Plan has also traditionally focussed on response-phase monitoring, leaving jurisdictional resource management agencies to address post-spill effects or impacts (often referred to as scientific or Type II) monitoring.

Post-*Montara*, the regulatory requirements on Australian offshore oil and gas sector have been substantially tightened, especially for monitoring and impact assessment, driven by the joint Commonwealth regulators, NOPSEMA and the Department of Sustainability, Environment, Water, Populations and Communities (SEWPaC). With support from industry, the scientific community and National Plan stakeholders NOPSEMA has produced an Information Paper on Operational and Scientific Monitoring (NOPSEMA, 2012) to assist its sector meet the new requirements. Industry has also responded by producing monitoring plans informed and underpinned by significant scientific advice and guidance. A number of companies in the offshore sector have invested heavily in developing both general knowledge of scientific monitoring for their industry and lease location, and in specific operational and scientific monitoring plans to cover the extent of potential spills. They have also invested in processes to implement these, through commercial contracts with service providers.

We expect these companies will eventually provide access to their substantial body of knowledge and work in monitoring - both response and post-spill – as a contribution from the

industry to the National Plan. As the environment is agnostic to the source of any oil (or chemical) spilled that impacts it (maritime or petroleum sector), the work of the offshore industry provides an invaluable opportunity to develop a more comprehensive approach to monitoring for all National Plan stakeholders. Leveraging the valuable work completed for and by the offshore industry may progress the development of post-spill monitoring guidance to complement the response-phase work already proposed.

Modern responders and stakeholders have much higher expectations of rapid, robust, reliable information to inform response actions and post-spill effects. Expectations of situational awareness during a spill response have also increased. The basic questions haven't altered: for any spill, it is still important to know:

- What, how much and where is the spill?
- Trajectory and weathering?
- Weather and other environmental conditions, now and predicted?
- What response techniques and technologies will work?
- Did the response work and how effective was it?
- When should the response actions cease?

Current (and imminent) monitoring technologies can now deliver these with increasing resolution, accuracy and timeliness, and so success can be better assessed and achieved. More sophisticated monitoring requires more careful and expert management to ensure effective use of resources (response or monitoring).

The next stage is to conduct a full review of the National Plan Oil Spill Monitoring Handbook. In particular, it is necessary to consider those monitoring needs and processes either not contemplated when the Handbook was completed or which time and technology have offered better solutions to. This will be concluded by December 2013.

Recent developments worldwide, and in Australia, will also influence the review. AMSA's MOU with the premier Australian scientific agency, CSIRO, for response-phase scientific support means they will be available to provide both back-office advice across all aspects of spills and response. Specifically, this will include field monitoring of spills and dispersant application, and their movement and effectiveness. This will complement and validate the spill trajectory and behaviour modelling services we also contract from AsiaPacificASA through their OILMAP^{TM} and related services. There has also been a surge in monitoring processes and technologies from international incidents and research that AMSA expects to tap into through all National Plan stakeholders, in particular the National Plan Environment and Science Coordinators (ESC) network, industry contacts and academia, and worldwide.

10. Conclusion

In summary, Australia is rapidly moving towards establishing a comprehensive policy and operational approach to employing oil spill control agents effectively and safely in spill response. The means for recognition and acceptance is through the Register, and so to date four products have been listed with a further six under application, and many more in the enquiry phase. We have a 'tested-in-battle' operational capability to deliver OSCAs (especially dispersants) all around Australia's coast and well beyond, through the strategic stockpiles and fixed-wing contract. The decision-making tools are now in place to ensure Register-listed products are considered for operational deployment. And last, but certainly not least, we are addressing our monitoring science, technology and capability to ensure response-phase monitoring is up-to-date and post-spill effects phase monitoring is similarly available, taking advantage of the impetus and investment of the offshore sector, and developments worldwide.

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