The Threat of Marine Plastic Pollution in Australia and Australian Waters submission from Michael Turner International Director, ENVORINEX™ 114 Victoria Street, George Town, Tasmania (www.envorinex.com)

Summary – The Australian coastline fronts numerous significant ocean currents including the East Australia current, the Antarctic Circumpolar current, the Leeuwin current as well as being impacted by the thermohaline circulation.

My coastal plastic pollution observations over many years continually underlines that not all Australian coastal marine plastic pollution has originated from Australian disposal methods.

While working in countries around the Indian and Pacific Ocean rims I have seen volumes of plastic refuse carried out to sea by floods, high tides and tsunami effects which underlines a requirement for an international amelioration program, as Australia going alone will not ameliorate the problem.

This submission is in reference to "*the measures and resourcing for mitigation of marine plastic pollution in Australia and Australian waters"* and based on the Envorinex™ expertise and experience in providing innovative and commercially sustainable waste plastic material recycling and 2nd life product manufacturing.

Due to the tyranny of distance we see that an adjunct to the Inquiry will be the need to address the siting of fixed or mobile material collection and processing centres so as to attain optimum scales of efficiency and economy in each of the six states, the Northern Territory and islands.

Additionally, as there is no commercial-off-the-shelf equipment suited to recycling marine plastic pollution a capability would need to be developed which would then potentially be internationally marketable.

Consequently, as there is no simple, quick fix answer we suggest that a nationwide marine plastic pollution shoreline / estuary mitigation and recycling program would require research, development and initialisation support, following which, the program could become commercially sustainable and able to be replicated in neighbouring and ocean rim nations.

Submission– the Primary issues in mitigating marine plastic pollution are:

1. Beached plastic marine pollution

1(a) the pollution source is not 100% Australian

In my employment I have worked in many countries and have observed volumes of disposed plastic materials lying in and about water courses and estuarine locations which are regularly flushed by floods and high tides. Landfill sites in many countries are alongside creeks and rivers into which floating plastic refuse is often blown or swept following heavy rains, to thereby begin the ocean current journey.

With a recovery team in Aceh following the 2004 Boxing Day tsunami we were told that volumes of flotsam were swept into the Indian Ocean by the receding water and 'taken away by the ocean currents.

Likewise here in Australia a variety of thoughtlessly disposed materials (including plastics) find their way from roadside locations into storm water courses and estuaries down to the coast line.

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1(b) the pollution impacts the whole Australian coastline and estuaries

Around Australia shores I have observed foreign made fishing nets, buoys, floats, thongs, bottles and clothing along with unidentifiable twine, ropes and food closures. Of course volumes vary depending on weather, tidal conditions and at times, distances from civilisation.

I do not deny that a considerable volume of Australia's marine plastic pollution is 'home-grown' and therefore it is incumbent that we re-initiate a motivation program for Australians 'to do the right thing' as a mitigation start point, rather than initiate costly deposit return programmes.

The mitigation of the existing on-shore problem is multi-fold in requiring –

(i) the formulation, initiation and promulgation of an Australian wide strategic plan tactically linked with communities to perhaps use 'work for the dole' teams to perform 'collection' operations within their vicinity;

(ii) the design of an on-shore marine plastic pollution recovery program;

(iii) the consideration of logistical demands to convey the recovered plastic pollution to (a) a centralised sorting point, (b) a centralised washing and shredding plant, (c) a centralised processing and 2nd life manufacturing plant;

(iv) the research and development of commercially sustainable 2nd life products and

(v) the design of a marketing and sales programme to create a sustainable national and export market demand for such 2nd life products.

1(c) the pollution is not just one plastic material (formulation), but a mix of plastic materials, each with a specific gravity of less than one (enabling flotation)

This is a major issue if the collected material is to be recycled into 2nd life products because no two plastic materials have the same melt flow index so therefore a heap of collected plastic materials cannot be readily recycled unless they are sorted for into 'family' materials.

As the collected materials will all need to be cleaned by shredding, washing, drying and then processing, on beach sorting will be a critical success factor so as not to demise the life of the reprocessing injection moulding or profile extrusion line equipment.

One necessary on beach action in conjunction with the sorting process will be training the collection team to ensure they shake / dust off as much sand and seaweed as possible so as to (i) lower the cleaning costs and (ii) make the collectors' bags lighter to carry to the designated collection point.

Alternatively, the recyclate material could be used as either biomass to co-generate power or as a bio-fuel feedstock, but both these avenues would lose the 2nd life commercial value and the ability to be again re-born at the end of that 2nd life designed use period.

1(d) the pollution is not all plastic

As the on-shore plastic pollution also contains a variety of glass bottle, metal containers, timber, vegetable matter, rubber and composite glass reinforced plastic materials, an at shore waste sorting process is a critical success factor especially, if the plastic materials are to be recycled, so as to reduce the collection and cartage volumes of recyclable materials and lower operational logistic costs.

2. Ocean borne plastic pollution

As there are current national and international ocean borne pollution entrapment and collection programs in various stages of research, development and trial, I have not commented on these realms.

Due to the world wide volume of commercial fishing there will always be pollution from lost and damaged equipment adrift - including netting, buoys, floats, twine and ropes which being predominately of polypropylene, have the ability to drift for years.

The off-shore, scavenge vessel interdicted materials would be brought to designated on-shore port locations and recycled by the developed processing methodology to add to the bottom line commercial sustainability of the program and would additionally support the programme generated FTEs nationwide.

Mitigation Considerations

The TV depictions of sea life killed by marine borne plastic pollution add emotional impetus to a national / international mitigation program. However, unless marine borne waste plastics can be portrayed as having real value, there will continue to be a lack of real community enthusiasm for recycling programs.

In order to induce value into the discarded plastics a perceptible end use must be established and one way to do this is to process the plastics into innovative building and landscaping products so as to enable people (especially in developing countries) to use the profiles in construction or garden / food growing projects.

Envorinex™ in 2012 researched Australia for wastestream plastic materials that could be diverted from landfill disposal and recycled into 2nd life products. This resulted in our establishment of a Melbourne uPVC waste collection, sorting and granulation program (in conjunction with the South Oakleigh Self Help Centre). This granulate is shipped to Tasmania, where we combine it with Tasmanian collected and sorted wastestream uPVC.

We then extrude this material into commercially sustainable 2nd life products such as mini, flat-packed septic tanks (for the provision of flushing sanitation to negate insect vectors in civil and natural disasters, for on farm replacement of long drops and overseas community betterment projects), plastic drawers for furniture makers, concrete log irrigation weir slip joints etc.

In 2013 we were approached by the Baxter Healthcare Group (Sydney HQ) to research and develop a recycling methodology for their clean medical waste flexible PVC IV bags, face masks and tubes from Tasmanian hospitals. In 2014 we successfully established a training program for hospital staff and in hospital recycling program protocols, which Baxter has now taken interstate. We also developed a conversion process for these wastestream materials into commercially viable insulation matting.

In 2014 we researched the viability of recycling on farm wastestream agricultural films and aquaculture farm polypipe materials and developed a protocol that has successfully overcome the identified impediments of previous failed programs with successful implementation this year.

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Having designed and initiated niche work arena plastic recycling programs Envorinex™ would look to replicate the above achieved success and motivation factors by formulating a national on-shore plastic pollution collection and recycling program with FTE benefits to local communities.

Last month we attended a conference in San Diego on Recycling Agricultural Films and found that with the work we are doing Envorinex™ is arguably slightly in advance of American programs.

At the conference we visited the San Diego Maritime Museum which had a large display of collected and collaged ocean borne plastic pollution indicating the ever increasing volume and composite mix of plastic polluting materials.

The items were salt crusted and many had marine growth (weed and crustaceans) following their immersion which underlines the critical requirement for shredding, grinding to remove the crustacean contaminates, then washing and drying prior to being reprocessed into 2nd life products for national and export markets.

The reason for this requirement is to minimise the incidence of non-plastic materials entering the reprocessing line and thereby causing damage and excessive early life wear to the barrels, screws and downline tooling.

Commercial off-the-shelf shredding, washing and drying technology does not including a crustacean removal capability, so we would need to develop an operation to do this.

The commercially available equipment is orientated to large scale, single site operations which are ideal for serving major population bases, but here in Australia we would need to develop scaled down mini-plants, to enable plant mobility and gain viability by being relocatable to numerous collection sites.

With our experience in establishing unique operational capabilities coupled with a market proven ability to research and develop new products in conjunction with CRCs and University research units, we are confident new products can be researched and developed for the recovered and scavenged marine plastic materials.

By using innovative technology and Federal Government program initiation support, the issue of Australian coastline and estuarine plastic pollution could be sustainably mitigated and provide considerable full time employment opportunities for each State and the Northern Territory, especially in coastal and island high unemployment areas.

The avenue is far from straight forward, but by developing innovative products as solutions to specific potential client nominated in-field problems, the commercial sustainability of the project will be enhanced.

Internationally, our neighbouring nations could be enticed by a program offering to provide long-life, maintenance free building materials for housing, schools, medical centres and facilities from Government sanctioned, community organised, beach and estuary combing / scavenging efforts associated with Australian developed ‘mini’ recyclate processing facilities.

As the on-shore material becomes reduced by off-shore interdiction, the work experienced shore collectors could then be re-deployed into other plastic pollution scavenge and recycle programs.

Once vessel scavenged plastic pollution materials reach shore then the sorting, shredding, washing and recycling formats are able to be sustainably performed.

The Envorinex™ international experience working with and in indigenous communities (innovative house building and sanitation programmes in the Pacific Islands, Indonesia, Philippines and Southern Africa) would assist with internationally promoting the program if Australia opted to take the program off-shore to interdict ongoing tidal and ocean current borne plastic pollution moving onto the Australian coastline.

Using a mini / mobile material cleaning and processing facility to conceptually produce kit house building materials, the recyclate material would expedite the building of low cost, maintenance free housing and offer the opportunity to perhaps initiate a programme whereby the collector receives a credit for the plastic pollution material and that credit entitlement equates to a given metre rate of recyclate profile.

Resourcing for Mitigation

The on-shore primary resourcing issues with this nationwide mitigation / recycling project are –

The cost of providing and scaling up a successful existing program to identify, recruit, train and motivate the potential collection / sorting / supervisory and administration teams;

The logistic costs associated with collecting, at site sorting and transportation;

The costs and economics of either centrally or locally processing equipment for the recyclate materials;

The employment, training and operational costs of processing equipment FTEs;

The marketing, sales and delivery costs of the 2nd life products to ensure commercial sustainability;

All require compilation and formation into a business case.

The Australian waters off-shore mitigation resourcing would require strategic and tactical considerations on receipt of current research and development results.

This side of the project could well offer an opportunity with the fishing industry as an ‘off-season’ contract employment avenue to ‘trawl’ current drifting plastic pollution (possibly with payment on a negotiated per cubic metre volume basis) and land the ‘catch’ at designated port collection points.

We suggest that the designated port plastic pollution collection / sorting points could also act as the central facility for that locality / region and thereby reduce duplication costs and offer easier access for the operational employees.

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General Comments

Envorinex™ is a Tasmanian owned and operated plastics injection moulding and extrusion company manufacturing products for the building, fencing, horticulture, apiculture, viticulture, hospitality, civil construction, marine and mining industries.

Some 90% of our manufactures leave Tasmania and of that, around 40% are exported.

We understand that we were the 1st Australian manufacturing company to offer only fully closed loop products, in that all products leaving our factory carry our 'Take Back Recycling Agreement'.

We also understand that we are the only Australian company manufacturing, collecting, recycling and actually converting plastic materials into 2nd life products.

Our range of building products hold Green Star accreditation by NetBank and we have been certified under the PVC Stewardship Program by the Australian Vinyl Council.

Envorinex is constantly researching and developing plastic recyclate products as solutions to client nominated in-field problems.

Whilst we are a small company our directors have the ability and background experience to design, initiate and grow this proposed mitigation project nationally and internationally with a real focus on achieving early commercial sustainability.

We would welcome the opportunity to expand this submission should the Committee require further input.

Attached is an article by Karen Laird Sept 2nd 2015 titled 'Seabirds cannot survive on plastics' which evidences just one of the issues of plastic pollution in the marine environment. I have highlighted her pen ultimate paragraph wherein she espouses the deposit return concept but in my first paragraph on Page 2 above, I indicate that an extended motivation program would achieve the same goal without requiring administrative inputs and controls.

End of submission.

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10 September, 2015

Seabirds cannot survive on plastic

By Karen Laird

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In the latest study on marine debris and seabirds, conducted by researchers from Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Imperial College London, nearly 60% of all seabird species were found to have plastic in their gut. As if that weren't worrying enough, they also predict that plastic ingestion will affect 99% of the world's seabird species by 2050, based on current trends. Some 90% of all seabirds alive today are estimated to have eaten plastic of some kind.

The study was led by Dr. Chris Wilcox, Senior Research Scientist at CSIRO Oceans and Atmosphere, with co-authors Dr. Denise Hardesty and Dr. Erik van Sebille, and published recently in the journal *Proceedings of the National Academy of Sciences*, aimed to assess how widespread the threat of plastic is for the world's seabirds, including albatrosses, shearwaters and penguins. The researchers analyzed the studies published since the early 1960s and discovered, unsurprisingly, that the problem is rapidly growing. In 1960, plastic was found in the stomach of less than 5% of individual seabirds, rising to 80% by 2010, including bags, bottle caps, and plastic fibres from synthetic clothes, which have washed out into the ocean from urban rivers, sewers and waste deposits.

According to the researchers, birds mistake the brightly colored items for food, or swallow them by accident, and this causes gut impaction, weight loss and sometimes even death. To predict the risk of plastic ingestion to 186 seabird species globally, they used a mixture of literature surveys, oceanographic modeling and ecological models.

"For the first time, we have a global prediction of how wide-reaching plastic impacts may be on marine species—and the results are striking," Dr. Wilcox said. "We predict, using historical observations, that 90% of individual seabirds have eaten plastic. This is a huge amount and really points to the ubiquity of plastic pollution."

Dr. Denise Hardesty from CSIRO Oceans and Atmosphere said seabirds were excellent indicators of ecosystem health. "Finding such widespread estimates of plastic in seabirds is borne out by some of the fieldwork we've carried out where I've found nearly 200 pieces of plastic in a single seabird," said Dr. Hardesty.

The researchers found that plastics will have the greatest impact on wildlife where they gather in the Southern Ocean, in a band around the southern edges of Australia, South Africa and South America. These are also the areas where the greatest diversity of species can be found. The researchers expressed concern about species such as penguins and giant albatrosses, which live in these areas.

“While the infamous garbage patches in the middle of the oceans have strikingly high densities of plastic, very few animals live here,” explained Dr. van Sebille, from the Grantham Institute at Imperial College London. “We are very concerned.”

According to Dr. Hardesty, there was still the opportunity to change the impact plastic had on seabirds. Simple waste management measures, such as such as reducing packaging, banning single-use plastic items or charging an extra fee to use them, and introducing deposits for recyclable items like drink containers could make a difference, she said.

“Efforts to reduce plastics losses into the environment in Europe resulted in measureable changes in plastic in seabird stomachs within less than a decade, which suggests that improvements in basic waste management can reduce plastic in the environment in a really short time.”

The work was carried out as part of a national marine debris project supported by CSIRO and Shell’s Social investment program as well as the marine debris working group at the National Center for Ecological Analysis and Synthesis, University of California, Santa Barbara, with support from Ocean Conservancy.