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26 May 2010

Mr Chris Wilson
Executive Director
Major Projects Assessment
NSW Government Department of Planning
GPO Box 39
SYDNEY NSW 2001

Re: Weston Aluminium – Application for Development Consent Modification
Proposed Processing Trial of Spent Potlining Material

Dear Mr Wilson,

Further to our recent correspondence and meeting of 4 May 2010, Weston Aluminium Pty Limited (Weston Aluminium) has prepared the following program and environmental assessment in relation to the proposed spent potlining (SPL) processing trials within one of our rotary furnaces at our Kurri Kurri premises.

PROJECT BACKGROUND

Since 2005, Weston Aluminium representatives have undertaken extensive research, both domestically and overseas, investigating available technologies for the treatment of SPL from primary aluminium smelters. Weston Aluminium's objective is to offer a sustainable solution to domestic smelters, enabling the cost-effective treatment of SPL and, in conjunction with other treated industrial by-products, formulate the manufacture of a value-added substitute for roadbase and other building and construction products. This particular project was conceived through our central foundation and ongoing involvement with the NSW Industrial Ecology Network, represented by like-minded industry, academics and Government regulators, eager to encourage the recovery of industrial by-products as valuable resources, and thereby achieve the diversion of large material volumes from landfill.

SPL is a hazardous by-product of primary aluminium production, generated from the periodic de-lining of electrolytic cells. First Cut SPL (originating from the carbon cathode) and Second Cut SPL (refractory lining) contain varying proportions of aluminium, carbon, cyanide, fluorides, sodium and other trace contaminants, and its management and disposal represents a major issue faced by the industry on a worldwide scale. At present, the two primary smelters in NSW (Tomago Aluminium Company and Hydro Aluminium) have not yet attained an effective and sustainable solution for their SPL, and each continue to stockpile surplus SPL and/or export the waste to Europe for treatment. This is a significantly expensive process, relying on the transport of dangerous and hazardous materials over many jurisdictions and the vagaries of third party countries. This strategy is clearly not sustainable for the domestic industry.

PROJECT CONCEPT AND TRIAL PROPOSAL

Project Concept

Weston Aluminium proposes to diversify its service provision to the aluminium smelters beyond the reprocessing of aluminium drosses and other aluminium-bearing wastes, to include the treatment and processing of SPL at a local level. As discussed with the Director General, Mr Sam Haddad, during March 2010, Weston Aluminium proposes a treatment process based on the following elements:

1. Primary crushing;
2. Controlled blending with cullet and other propriety additives;
3. Fine milling;
4. Thermal treatment – cyanide destruction and liquefaction;
5. Crushing and mixing; and
6. Processing and utilisation in manufacturing process of various products including road base and blocks.

Emissions of process dust and fluoride are controlled by:

- Temperature control;
- Scrubber/baghouse complex; and
- By-product residues returned to the raw material feed in closed-loop cycle.

Laboratory-scale Trials - New Zealand, Feb – April 2010

Weston Aluminium has undertaken laboratory-scale trials in New Zealand during the period February - April 2010 to demonstrate the treatment concept and the emission control performance of the small-scale plant. This involved the processing of SPL with additives (cullet, iron oxide and scrubber lime) in a 2.7m length diesel-fired kiln at temperatures of 650 – 750^{o}C in a batch-style process, and the recovery of the liquefied glassy slag residue.

The emission control system comprised a wet lime scrubber and fabric filter baghouse constructed for the removal of fluoride and particulate emissions. This pollution control system was designed and operated to emulate that operating at our Kurri Kurri facility, and from which a full-scaled operation will be modeled.

Analyses were performed to profile the input raw materials and to characterize the treated products. These data are summarized in **Tables 1** and **2** respectively. Analytical laboratory certificates are enclosed as **Attachment 2**. These data demonstrate the complete destruction of cyanide and the immobilisation of fluoride and heavy metal contaminants.

Table 1: Analytical Characterization of Input Raw Materials (Spent Potlining and other Trial Additives)

Analytical Parameter	Total Contaminant Concentrations (mg/kg, dry wt)						Leachable Contaminant Concentrations (mg/L)			
	Hydro Aluminium		Tomago Aluminium		Cullet	Iron Oxide	Hydro Aluminium		Tomago Aluminium	
	1st Cut SPL	2nd Cut SPL	1st Cut SPL	2nd Cut SPL			1st Cut SPL	2nd Cut SPL	1st Cut SPL	2nd Cut SPL
Aluminium	56,000	46,000	50,000	56,000	750	6,700	55	160	92	59
Antimony	<0.80	<0.80	<0.80	<0.80	<0.80	<0.80	0.011	0.0060	0.011	0.0084
Arsenic	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<0.021	<0.021	<0.021	<0.021
Barium	110	110	160	320	7.1	18	0.15	0.081	0.49	0.73
Beryllium	8.4	2.2	6.5	2.9	<4.0	1.5	0.072	0.028	0.11	0.0094
Cadmium	0.22	0.63	<0.20	0.42	0.28	<0.20	<0.0011	<0.0011	<0.0011	<0.0011
Calcium	20,000	35,000	18,000	61,000	25,000	3,300	110	28	97	77
Cobalt	3.9	2.9	3.9	3.0	<0.80	5.0	0.0075	0.012	0.0051	0.010
Copper	12	13	10	14	4.0	4.4	<0.011	0.14	<0.011	0.036
Iron	12,000	9,800	9,800	12,000	7,300	320,000	59	3.7	87	17
Lead	8.8	13	19	15	5.9	8.3	<0.0021	0.0072	<0.0021	0.042
Mercury	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.0021	<0.0021	<0.0021	<0.0021
Nickel	55	15	79	19	<4.0	9.2	0.45	0.076	0.17	0.087
Phosphorus	170	240	120	240	<80	360	<0.42	<0.42	<0.42	0.56
Selenium	<40	<40	<40	<40	<40	<40	<0.021	<0.021	<0.021	<0.021
Sodium	100,000	78,000	82,000	94,000	3,000	3,600	2,000	2,300	2,100	2,600
Sulfur	<40,000	<40,000	<40,000	<40,000	<40,000	<40,000	24	14	17	16
Thallium	<0.40	<0.40	<0.40	<0.40	<0.40	<0.40	<0.0011	<0.0011	<0.0011	<0.0011
Vanadium	<200	<200	<200	<200	<200	<200	0.026	0.26	0.044	0.25
Zinc	28	45	22	45	13	28	<0.021	<0.021	<0.021	<0.021
Cyanide	43	25	37	14	-	-	6.6	13	1.2	2.8
Total Organic Carbon	14	2.5	28	1.9	-	-	-	-	-	-
Fluoride	*1	*1	*1	*1	-	-	110	160	150	110
Reactive Silica	-	-	-	-	-	-	180	90	190	38

NOTE: *1 Total fluoride determinations could not be performed by Hills Laboratory (NZ) due to the limited analytical range. Total fluoride loads within local SPL are typically reported in the order of 8 – 14% (expressed on a dry weight basis)

Table 2: Analytical Characterization of Trial Products

Analytical Parameter	Total Contaminant Concentrations (mg/kg, dry wt)		Leachable Contaminant Concentrations (mg/L)	
	Hydro Aluminium	Tomago Aluminium	Hydro Aluminium	Tomago Aluminium
Aluminium	50,800	36,900	3.0	12.6
Antimony	<5	<5	<0.1	<0.1
Arsenic	12	6	<0.1	<0.1
Barium	230	230	<0.1	<0.1
Beryllium	4	2	<0.05	<0.05
Cadmium	<1	<1	<0.05	<0.05
Calcium	80,500	46,400	23	160
Cobalt	4	3	<0.1	<0.1
Copper	15	14	<0.1	<0.1
Iron	159,000	56,400	631	129
Lead	10	7	<0.1	<0.1
Mercury	<0.1	<0.1	-	-
Nickel	26	24	<0.1	<0.1
Phosphorus	320	344	0.01	0.06
Selenium	<5	<5	<0.05	<0.05
Sodium	76,900	57,600	1680	1450
Sulfur	600	400	1	<1
Thallium	<5	<5	<0.05	<0.05
Vanadium	49	30	<0.1	<0.1
Zinc	26	18	<0.1	0.3
Cyanide	<1	<1	<0.004	<0.004
Total Organic Carbon	2.39	1.50	-	-
Fluoride	19,700	15,100	3.9	24.2
Reactive Silica	-	-	16.0	111

Emission testing was performed by K2 Environmental in conjunction with the trial processing to assess emissions of gaseous and particulate fluoride, gaseous and particulate cyanide and of total particulate matter. A summary of findings are summarized in **Table 3**. A copy of the emissions monitoring and assessment report is also enclosed (**Attachment 3**). These data demonstrate the control and removal of fluoride, particulates and cyanide by the small-scaled lime scrubber and fabric filter baghouse.

Table 3: Summary of Emission Testing Data for Trial Processing

Emission Parameter	Total Particulate Matter	Cyanide			Fluoride		
		Gaseous Cyanide	Particulate Cyanide	Total Cyanide	Gaseous Fluoride	Particulate Fluoride	Total Fluoride
Emission Concentration	<0.12	0.0068	<0.000045	0.068	0.072	0.070	0.14
Regulatory Limits	50	NL	NL	NL	NL	NL	50
NOTE: Values are expressed as mg/m^3, dry gas, 0^{o}C and 1 atmosphere Regulatory limits sourced as Group 6 criteria; *General Activities and Plant*							

Trial Proposal

Weston Aluminium now wishes to validate the process and emission control systems on a larger scale before the development of a commercial operation. It is proposed to perform these larger-scale trials at our dross processing facility in Kurri Kurri. A site locality map of our Kurri Kurri facility is provided as **Figure 1**.

Our Kurri Kurri processing facility is considered ideal for the validation trials due to the compatibility of existing unit processes and practices, as defined below:

- Rotary furnace, capable of attaining elevated temperatures required to thermally oxidise cyanide (typically >600^{o}C), and liquefy the SPL mass and other additives (including cullet, emissions scrubber lime and iron oxide materials) into a vitrified mass;
- Casting facilities for recovery of the glassy slag product; and
- Best-practice emission controls systems, including extraction hoods, wet-dry lime scrubber, baghouse complex, and a real-time, continuous fluoride monitoring system controlled by a Citect-based PLC.

The following works are proposed for the trials:

1. Risk Assessments and Safe Operating Procedures will be developed for the safe transport, handling, storage and processing of SPL. These assessments and procedures will describe specific requirements for the transport and handling of DG Class 4.3 PGIII materials, which have the potential to evolve flammable gases upon contact with water. Aluminium dross has the same DG classification, and hence Weston Aluminium currently have facilities and procedures for the correct storage, handling and processing of such materials, and for the mitigation of their contact with water;

2. Approximately 20 metric tonnes of SPL will be sourced from each of the two local smelters. It is anticipated that this will comprise approximately 10 tonnes of 1st cut and 10 tonnes of 2nd cut SPL from each smelter;

3. Trial processing of the SPL will occur at our Kurri Kurri facility during June 2010 (Note: the timing of these trials is considered ideal in advance of scheduled maintenance and re-lining of furnace refractory brick). A summary of proposed processing activities is described below:

    - The delivery of SPL materials from Tomago Aluminium Company and Hydro Aluminium will be undertaken by a licensed Dangerous Goods transport contractor (anticipated by Mountain Industries). Transport routes, material handling and documentation protocols established and implemented for current aluminium dross movements from these sites will be adopted for the transport and handling of SPL;

    - SPL feedstock materials (bulk delivery or in bulka bags) will be stored in existing, purpose-built and enclosed bays until processing. SPL received from each smelter will be stored separately for quality control purposes. Other inputs of cullet (crushed beverage and other glass), and iron oxide materials (bulk delivery or in bulka bags) will similarly be stored undercover. Emission scrubber lime inputs are currently generated onsite, and will also be stored undercover in bulka bags awaiting trial use;

    - Design formulations of SPL and other additives will be processed through an existing natural gas-fired rotary furnace in 2.5 – 3.5 tonne batches. The proportion of each feed component will be varied slightly to confirm quality assurance outcomes developed during the New Zealand trials. Batch mixes will be processed at temperatures of 650–850^{o}C to effect cyanide destruction and liquefaction of the feed mass. Temperatures achieved will be confirmed by thermocouple assessment. Batch cycle times are expected to be approximately 1-2 hours;

    - The existing wet-dry fluoride scrubber and baghouse pollution control system will be maintained and operated as per normal operation to control air emissions to within regulatory requirements. This infrastructure includes real-time, continuous fluoride and particulate monitoring devices associated with Baghouse 1. Weston Aluminium is confident that furnace operations will effect thermal destruction of cyanide (which typically occurs above 600^{o}C) and that existing pollution devices will adequately monitor and control fluoride and particulate air emissions. No

further emission pollutants are expected to occur. NATA-accredited emissions monitoring will be performed concurrently for part of the Trial program to confirm air emissions performance (see below);

- The liquefied glassy slag produced will be tapped from the furnace into existing sow molds. Once set, the product sows will be stored undercover awaiting laboratory assessment and future integration into Trial end-use products (e.g. roadbase and blocks);

- It is proposed that the processing described above will occur outside of current dross production schedules (i.e. on weekends) to minimise the impact of Trials on facility operation. Performing these trials in this manner will also permit an assessment of emissions independent of those attributable to dross processing operations;

4. NATA-certified emission testing will be performed in conjunction with Trial furnace processing works to assess compliance with existing exhaust emission performance requirements for EPL Point 1 (Stack 1). This will include an assessment of total and fine particulate, oxides of sulfur; oxides of nitrogen, chlorine, hydrogen chloride, particulate and gaseous fluoride, polycyclic aromatic hydrocarbons, volatile organic hydrocarbons, hazardous substances (heavy metals), carbon monoxide, oxygen and flow characteristics (i.e. velocity, volumetric flowrate, temperature and gas density). Potential emissions of cyanide will also be determined during this assessment;

5. NATA-certified laboratory analysis of the treated product will be undertaken to confirm cyanide destruction and contaminant immobilisation. The proposed analytical suite may include an assessment of total contaminant loads (including cyanide, fluoride, alkalis and heavy metals) and leachable contaminant loads (including cyanide, fluoride, alkalis and heavy metals) using the Toxicity Characterisation Leaching Procedure (TCLP); and

6. Blending and performance testing of the glassy slag as an integrated aggregate substitute in a roadbase sample matrix.

ENVIRONMENTAL IMPACT ASSESSMENT

In response to preliminary meetings and discussions with representatives of the NSW DoP and the NSW Department of Environment, Climate Change and Water (DECCW), we have prepared an application to modify Development Consent and an environmental impact assessment of the proposed trials. This assessment describes proposed operations, safeguards and emission control technologies designed to ensure compliance with existing regulatory standards.

Regulatory Approvals

Approval is sought from the DoP to modify our Development Consent (DA-86-04-01-MOD 3 and 10397 of 1995-Mod 1), authorizing the carrying out of necessary trial works to demonstrate treatment technologies and verify emission control performance and requirements. Our Application for the Request to Modify a Major Project is enclosed as **Attachment 1**.

Following the granting of Development Consent, Weston Aluminium will prepare an Application to the DECCW for the Variation of our Environmental Protection Licence (EPL 6423), if required.

It is noted that Weston Aluminium's application relates only to the trial processing of SPL and additives (cullet, lime and carbon-containing iron oxide materials) in one of our existing rotary furnaces. Application is not sought to vary existing environmental performance requirements established for the premises. Weston Aluminium is committed to maintaining its high standard of emissions compliance, and is confident that existing emission control technologies and practices will be sufficient to maintain this high performance standard.

Potential Key Environmental Issues and Proposed Management and Mitigation Measures

A review of potential environmental issues associated with the proposed SPL processing Trials is provided in **Table 4**. Proposed management and mitigation measures designed to address these potential issues are also tabulated.

Table 4: Potential Key Environmental Issues and Proposed Management and Mitigation Measures

Environmental Aspect	Potential Environmental Issue	Management and Mitigation Measure	Potential Environmental Impact
Air Quality	• Generation of fugitive dust emissions • Exceedance of existing regulatory compliance stack air emission limits (including particulates and fluoride)	• Laboratory-scale trials performed in New Zealand confirm that lime scrubber and fabric filter baghouse pollution control systems operate to effectively control emissions to acceptable levels. Further, trials also confirmed that the raw materials and process do not generate nuisance odour. • All trial operations will be performed within enclosed buildings. • Deliveries of raw materials will be by truck. All delivery loads will be covered by tarpaulin (similar to dross deliveries) or via tautliner. • All relevant facilities/unit operations (storage bays, furnace melting and casting) are serviced by existing pollution control systems (also see below). • Weston Aluminium will operate existing fabric filter baghouses for the control and removal of particulate matter. The existing PCME monitoring system will be operated to provide continuous, real-time assessment of particulate emissions from Stack 1. • All trial feedstock sourced will be crushed by suppliers, and hence, potential particulate-generating crushing activities will not be performed on site. • Typical fluoride loads within SPL are in the same order or lower than that of aluminium dross processed onsite. Fluoride levels within trial feedstock will be lower since the proportion of SPL within the feedstock mixture will be no greater than 50% by weight. Fluoride will be expected to occur within furnace gases at the proposed trial temperatures (650–850^{o}C). Weston Aluminium will operate existing wet-dry lime scrubber systems for the control and removal of fluoride within furnace exhaust. The existing Citect monitoring system will be operated to provide continuous, real-time assessment of gaseous fluoride emissions from Stack 1. • Furnace burners are routinely tuned on an annual basis to ensure optimal operating efficiencies. This minimises emissions of carbon monoxide, volatile organic compounds and oxides of nitrogen. • Emission testing will be performed by an independent NATA-accredited Consultant to verify emission performance.	• Emission performance is expected to be similar to that of normal site operations, and remain within existing compliance limits. The potential impact on local air emissions is therefore considered to be low.

Environmental Aspect	Potential Environmental Issue	Management and Mitigation Measure	Potential Environmental Impact
Water Quality	• Spills of raw materials to site catchment and pollution of local water ways	• All raw material truck delivery loads will be covered by tarpaulin (similar to dross deliveries) or via tautliner to prevent spillages. • No deliveries will occur during wet weather. • All trial operations will be performed within enclosed buildings to mitigate against external spills. • Should a spill occur, site personnel will recover materials in accordance with established spill response procedures. Spilt material will be returned to storage for processing (i.e. not disposed of). • The onsite Stormwater management system (drainage network, pond and wetland) captures and contains all runoff from potentially dirty areas, including hardstand and traffic ways, for subsequent onsite irrigation reuse. Only waters impinging on the catchment after this first flush is contained are directed to the adjacent Swamp Creek (north-west corner of site). The pond and wetland will similarly contain any spills, should they occur. It is expected, however, that this system will not be relied upon due to other controls proposed for the Trial.	• The potential impact on local water ways is therefore considered to be low.
Noise	• Exceedance of regulatory compliance noise limits	• Weston Aluminium has necessary approvals for plant operation 24-hours a day, 7-days per week. Specific receptor noise limits are prescribed for daytime, evening and night time periods. Weston Aluminium continues to comply with these limits. Trial operations will nevertheless be restricted to daytime periods (defined as 7am to 6pm Monday to Saturday, 8am to 6pm Sundays and public holidays). • As defined above, all operations will occur within the enclosed Plant Building, and no crushing of raw materials will occur.	• The potential impact on noise amenity is expected to be negligible.
Waste Management	• Generation of hazardous waste requiring disposal	• For raw materials delivered in polypropylene bulka bags, these bags will be disposed of following Trial completion. Up to 100 kg of bulka bag waste may be generated, of which up to 50 kg may be associated with SPL deliveries. All raw materials will be delivered in a dry state, and hence, residues of SPL within bags are likely to be negligible. These bags will be disposed of to Blacktown Waste Services' landfill in conjunction with routine site disposal protocols.	• No hazardous waste will be generated by the proposed Trial process.

Environmental Aspect	Potential Environmental Issue	Management and Mitigation Measure	Potential Environmental Impact
		• A proportion of waste scrubber lime, which is typically disposed of to landfill, will be utilised as Trial feedstock, and thereby diverted from landfill. • No other waste will be generated during the trial process.	
Hazards	• Potential contact with water and resultant generation of flammable gases • Furnace explosion and expulsion of raw/product materials	• Trial-specific Risk Assessments and Safe Operating Procedures will be prepared and documented prior to Trial commencement. • Contact of raw materials with water (and potential flammable gas generation) will be prevented by coordinating deliveries during dry weather conditions only and by conducting all trial operations within purpose-built and enclosed buildings. • The risk of furnace explosion and resultant expulsion of material is considered to be negligible. Nevertheless, furnace charging, melt, mixing and casting techniques established for dross processing will also be adopted. This includes loading the furnace with burners off, lowering furnace doors during the melt phase, and idling burners during mixing and casting.	• The potential for flammable gas generation, fires and furnace explosion is considered to be negligible.
Greenhouse Gases	• Excessive generation of greenhouse gases (GHG), including carbon dioxide, methane and oxides of nitrogen	• As described above, furnace burners are routinely tuned to optimise burner efficiencies, and minimise GHG emissions. • Emission of unburnt methane and other natural gas constituents is not likely to occur due to burner tuner and set-up, and furnace temperatures proposed for the Trial.	• Emission of GHGs is expected to be typical of normal furnace operation. The potential for excessive GHG emissions is considered to be negligible.

Other Environmental Aspects

The proposed SPL processing Trials are not expected to have any impact on transportation, biological values, visual amenity nor community effects (socio-economic, heritage and cultural values and land use).

Conclusions

We believe that Weston Aluminium has suitable facilities and emission control systems to verify, and build upon, the performance and experiences of the earlier small-scale Trials performed in New Zealand. We are confident that via the Trial activities proposed, Weston Aluminium will be able to develop an effective approach for the processing of spent potlining wastes from local primary aluminium smelters in an effective and sustainable manner.

It is considered that Weston Aluminium has the necessary facilities and procedures suitable for undertaking the SPL processing Trial works and can confidently minimize potential impact to the surrounding environment, community and site personnel.

We trust the information provided is suitable for your consideration. Should you require additional information, please do not hesitate to contact the undersigned on 4936 2166.

Yours sincerely,

Weston Aluminium Pty Ltd

Christopher McClung
Manager, Alternative Materials & Environment

Attachments: Figure 1 – Site Locality Map (Source: Figure 1 of Statement of Environmental Effects (2007), prepared by ENSR)
Attachment 1 – Application to DoP – Request to Modify a Major Project
Attachment 2 – Analytical Laboratory Certificates (Hills Laboratory and ALS Environmental)
Attachment 3 – Emissions Monitoring and Assessment Report (K2 Environmental)

Figure 1

Attachment 1

Attachment 2

Attachment 3