

AMG RESOURCES LIMITED

**SECTION 2.11
SITE CLOSURE/
DECOMMISSIONING PLAN**

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Prepared for:

AMG RESOURCES LIMITED

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2.11.5 SITE CLOSURE PLAN

The principal objective of the plan is to enable the Llanelli site of AMG Resources to be decommissioned and returned to a satisfactory state in a safe and effective manner without risk to human health or the environment.

The site closure plan for the Llanelli de-tinning works can be divided into 10 key steps: -

1. *Staged safe shut down of all production processes.*
2. *Maintenance of safe chemical storage conditions.*
3. *Prepare inventory of all hazardous materials stored on site.*
4. *Transfer of documentation to management team supervising the demolition/decommissioning procedure.*
5. *Sale and transportation of all finished products from site.*
6. *Safe emptying of all storage tanks, disconnecting and return of all gas cylinders. Flushing and decontamination of all tanks, pipe work and process equipment.*
7. *Dismantling of process equipment and sale either as process unit, component or scrap.*
8. *Survey of site structures and buildings.*
9. *Demolition of designated buildings.*
10. *Make safe any historically contaminated ground or surface water and soil.*

Where the majority of the information required for a particular section is available in an existing AMG Resources document, the contents of the document will not be duplicated in this report. If appropriate, a copy of the document may be found in the relevant Appendix and reference will be made to it in the text. If the document is too large, a copy is available for inspection at the works.

These key steps are described in detail below: -

2.11.5.1 Shut down of production processes.

A staged shut down of production processes will be undertaken, the duration of which will be controlled by the target of conversion of as much as possible of the raw materials into saleable end products. The normal production personnel will control this process. The works effluent treatment plant and

ancillary equipment will not be included in the shut down process. These facilities will be maintained in full operation until the demolition and decontamination of the site is complete.

2.11.5.2 Maintenance of safe chemical storage conditions.

The chemical storage containers will be maintained in their current operational condition to ensure that the remaining chemicals do not degrade into a form that would either be chemically more hazardous, unstable or physically more difficult to dispose of.

This will be achieved by maintaining the current support services and supplies such as electricity, gas or pressurised air until the storage vessels are safely emptied.

2.11.5.3 Prepare inventory of all hazardous materials stored on site.

Directly following the process shut down operation, an inventory will be generated by the production personnel to determine the remaining volumes of all hazardous materials stored on site.

The main sectors of the plant containing dominant hazardous materials are the production areas. The main production areas are: -

- Chemical De-tinning Plant
- Electrochemical De-tinning Plant
- Regeneration Plant
- Tin Recovery Section
- Chemical Storage Areas

The other areas of the plant containing hazardous materials are the Effluent Treatment Plant, Boiler House and Works Laboratory.

Table 2.11.1 lists all the materials on site known to be hazardous to human health and/or the environment together with their location and physical form and the maximum quantity held. The list includes generic chemicals and also process by-products. Safety data sheets for the majority of the materials listed in Table 2.11.1 may be found in Appendix 2.11.B together with information obtained from the USA Environmental Protection Agency IRIS database (where available).

2.11.5.4 Transfer of documentation to management team supervising the demolition and decommissioning procedure.

Should AMG personnel not carry out the remaining decommissioning process for whatever reason, then at this stage the decommissioning plan documentation will be passed to the team appointed for the task.

*Little chemicals
+ volumes NOT
supplied.*

2.11.5.5 Sale and transportation of all finished products from site.

If possible all saleable end products or process by-products will be sold ideally to the current customers. If this proves impossible then the materials will be stored safely until alternative customers can be found.

2.11.5.6 Safe emptying of all storage tanks, disconnecting and return of all gas cylinders. Flushing and decontamination of all tanks, pipe work and process equipment.

During the decontamination phase of the closure plan, the main underlying principle will be to use, where possible, existing materials on site to neutralise or destroy the residual hazardous substances in plant, storage vessels and pipe work e.g. acids will be used to neutralise alkalis and vice versa, reducing agents will be used to destroy oxidising agents etc.

This process will be managed and supervised by a suitably qualified chartered chemical engineer.

If the timetable for site closure is sufficiently flexible, the tin recovery operations will be shut down in a controlled manner and phased such that various operations will be maintained until the quantities of hazardous material have been reduced to a minimum.

Brief summaries of the hazards and other relevant information associated with each of the major hazardous materials on site may be found in the Decommissioning Data Sheets in Appendix 2.11.B. The locations of the hazardous materials are shown on Drawing ES1303.DC1 in Appendix 2.11.C.

In general all hazardous liquid or solid materials used or collected in the decontamination processes will be stored (to await disposal by a licensed contractor) in a bunded hardstanding area of at least 110% capacity of the material stored and the bunded area will be isolated from all controlled waters.

2.11.5.6.1 Sodium Hydroxide

Sodium hydroxide is used in the de-tinning process. It is blended with sodium nitrite to form the chemical de-tinning solution.

Various concentrations of sodium hydroxide solution are used in the works. The solutions are prepared on site from concentrated solutions (47%) supplied by road tanker. There are therefore a number of storage tanks on site containing either concentrated sodium hydroxide solution or the blended solution of sodium hydroxide and sodium nitrite of various concentrations.

The concentrated product will either be returned to the supplier or sold to a third party. A suitably licensed waste disposal contractor will dispose of the blended solutions. Some of the concentrated product will be retained on site for the treatment programs for other substances discussed in Section 5.6. After final removal of the contents from a particular tank, the empty tank and supply

pipe work will be flushed with dilute hydrochloric acid until the alkali has been neutralised followed by flushing with water. The acid will be retained, ideally in a mobile storage tank, for treating other sodium hydroxide storage tanks until exhausted.

2.11.5.6.2 Sodium Nitrite

Sodium nitrite is used in the de-tinning process. It is blended with sodium hydroxide to form the chemical de-tinning solution.

Various concentrations of sodium nitrite solution are used in the works. The solutions are prepared on site from concentrated solutions (37%) supplied by road tanker. There are therefore a number of storage tanks on site containing either concentrated sodium nitrite solution or the blended solution of sodium hydroxide and sodium nitrite of various concentrations.

The concentrated product will either be returned to the supplier or sold to a third party. A suitably licensed waste disposal contractor will dispose of the blended solutions. After final removal of the contents from a particular tank, the empty tank and supply pipe work will be flushed with water.

2.11.5.6.3 Sodium Hydroxide and Sodium Nitrite Solution (De-tinning blend)

The tin is chemically removed from the scrap tin-plate, by immersing the tin-plate in a solution containing a blend of sodium hydroxide (8%) and sodium nitrite (3.5-4%) (de-tinning blend). *49% (6 for de-tinning)*

37% → (9 for de-tinning)
The de-tinning solution, which is saturated with stannate salts is then pumped to the tin recovery section, where the tin in solution is recovered by an electrolytic process. Following the electrolytic process the depleted de-tinning solution is then strengthened by addition of fresh de-tinning blend, to keep the chemical strength within the specified working range. The blend is kept in a storage tank in the de-tinning liquor regeneration area.

A suitably licensed waste disposal contractor will dispose of the blended solutions. After removal of the contents of the tank, the empty tank and supply pipe work will be flushed with water.

2.11.5.6.4 De-tinning Liquor

The de-tinning liquor differs from the de-tinning blend in that it also contains stannate salts as a result of the de-tinning process. De-tinning liquor is stored in tanks in the tin recovery area, de-tinning lines, filter section and the regeneration unit.

These liquors will have varying levels of sodium hydroxide, sodium nitrite and stannate salts depending on their position in the de-tinning cycle. If possible the process cycle will be continued to maximise the amount of tin recovered from these solutions. Then a suitably licensed waste disposal contractor will dispose of the remaining liquors.

After final removal of the contents from a particular tank, the empty tank and supply pipe work will be flushed with water.

2.11.5.6.5 Spent Caustic

The de-tinning liquor following a number of tin recovery cycles, builds up contaminants such as sodium carbonate and aluminium which reduces its ability to recover tin to a point where it is no longer cost effective to regenerate. It is then classified as spent caustic for disposal.

The spent caustic will be disposed of by a suitably licensed waste disposal contractor, the empty tanks and supply pipe work will be flushed with water.

2.11.5.6.6 De-tinners Mud

The de-tinning liquor, during the tin recovery cycles builds up a high level of metal rich solids, some of which settle to the bottom of the tank and is removed as a sludge during tank cleaning. The remainder is recovered by filtration. The recovered solids are given the generic name de-tinners mud which is normally sold for recovery of metals.

The de-tinners mud will, if possible, be sold for recovery but if this is not possible, will be disposed of by a suitably licensed waste disposal contractor. The empty tanks and supply pipe work will be flushed with dilute hydrochloric acid until the alkali has been neutralised followed by flushing with water. The acid will be retained, ideally in a mobile storage tank, for treating other alkaline storage tanks, until exhausted.

2.11.5.6.7 Rinse Water

The de-tinning process requires the de-tinned steel to be rinsed prior to sale. This leads to the formation of a solution containing a low concentration of sodium hydroxide, sodium nitrite and stannate salts.

The rinse water will be disposed of by a suitably licensed waste disposal contractor. The empty tanks and supply pipe work will be flushed with dilute hydrochloric acid until the alkali has been neutralised followed by flushing with water. The acid will be retained, ideally in a mobile storage tank, for treating other alkaline storage tanks until exhausted.

2.11.5.6.8 Diesel

Unused diesel will either be returned to the supplier or disposed of by a suitably licensed waste disposal contractor.

The tanks and pipe work will then be flushed with an inert gas to remove any residual material and gases. The decontaminated tanks and pipe work will then either be disposed of as a working item of equipment or broken up and disposed of as scrap metal.

If the tanks or pipework are to be cut up prior to disposal, then care must be taken to re-flush the tanks with an inert gas to purge any combustible gases immediately prior to break up. Employees carrying out the cutting operation should be issued with and wear a suitable respirator. A hot work permit will be issued.

2.11.5.6.9 Lubricating Oils

Unused mineral oils will either be returned to the supplier or disposed of by a suitably licensed waste disposal contractor.

The tanks and pipe work will then be flushed with an inert gas to remove any residual material and gases. The decontaminated tanks and pipe work will then either be disposed of as a working item of equipment or broken up and disposed of as scrap metal.

If the tanks or pipe work are to be cut up prior to disposal, then care must be taken to re-flush the tanks with an inert gas to purge any combustible gases immediately prior to break up. Employees carrying out the cutting operation should be issued with and wear a suitable respirator. A hot work permit will be issued.

2.11.5.6.10 Hydraulic Oils

Unused hydraulic oils will either be returned to the supplier or disposed of by a suitably licensed waste disposal contractor.

The tanks and pipe work will then be flushed with an inert gas to remove any residual material and gases. The decontaminated tanks and pipe work will then either be disposed of as a working item of equipment or broken up and disposed of as scrap metal.

If the tanks or pipe work are to be cut up prior to disposal, then care must be taken to re-flush the tanks with an inert gas to purge any combustible gases immediately prior to break up. Employees carrying out the cutting operation should be issued with and wear a suitable respirator. A hot work permit will be issued.

2.11.5.6.11 Hydrochloric Acid

Hydrochloric acid is used to neutralise the works effluent and is purchased in 25 litre plastic carboys. Some of the hydrochloric acid will be used to neutralise alkaline residue in some of the storage tanks, the remainder will be returned to the supplier.

*Boiler!
fuel oil?
large volumes & bulk*

2.11.5.6.12 Radioactive Sources

The on-site laboratory contains a Telsec Lab-X350 X-Ray Fluorescence Analyser. Within the analytical instrument are two radioactive sources, Iron 55 and Plutonium 238. The maximum activity of the sources, when the instrument was purchased, were 740 megabecquerels and 1.85 gigabecquerels respectively.

As the instrument is a number of years old, re-sale may not be feasible. Therefore, in the event of plant decommissioning, the radioactive sources will be removed and disposed of by a suitably licensed contractor and the instrument will be sold for scrap.

2.11.5.7 Dismantling of process equipment

A tender document will be prepared which will detail the equipment to be dismantled and will include: -

- Detailed plans of the site showing the process equipment layout.
- Information on the processes carried out in each piece of equipment.
- The residual substances that could be present in each piece of process equipment.
- Safety data sheets on each potentially hazardous substance that could be present on site and its location.
- Information on the process equipment, storage vessels and pipe work that could contain residues of flammable or potential explosive gases.

The tenderers will be required to submit a detailed safe working plan with their tender document.

The process plant will then be dismantled and the equipment sold as: -

- Working process units
- Components
- Scrap

2.11.5.8 Survey of site structures and buildings

All the buildings on site will be surveyed to determine their condition, presence of remaining hazardous substances or materials either stored or included in the fabric of the buildings with particular regard to areas having asbestos containing materials.

2.11.5.9 Demolition of designated buildings.

Tender documentation will be prepared so that suitable demolition contractors can quote for the demolition of designated building. The tender document will include information from the site survey so that all tenderers will be fully aware of all remaining hazards.

The buildings, which will be designated for demolition, will be those found in the survey to be unsafe or of no future use.

Demolition is one of the most dangerous activities undertaken in the construction industry. Each tenderer will be requested to prepare and submit a safe working plan.

The principal hazards are as follows: -

- a) Falls of men, falls of materials, flying materials and debris;
- b) Collapse of the building or structure, either deliberately or unplanned;
- c) Overloading of floors or the structure with debris, resulting in floor and/or building collapse;
- d) The use of incorrect methods;
- e) Explosions in tanks or other confined spaces;
- f) The presence of live electric cables and gas mains;
- g) The presence of dusty, corrosive or poisonous materials and/or atmospheres;
- h) Projecting nails in timber, broken glass, cast iron fragments penetrating feet, hands and other parts of the body.

In addition to these hazards, the ever-present risk of asbestos inhalation must be considered, and the presence of asbestos should be taken into account in any pre-demolition survey undertaken.

2.11.5.9.1 Management of the demolition process

2.11.5.9.1.1 Pre-demolition survey

Prior to demolition taking place, a safe system of work must be established. The system will be determined by a pre-demolition survey undertaken by a competent person and, where possible, perusal of the plans of the building. The use of a Demolition Hazard CheckList is recommended. This survey should identify: -

- a) The nature and method of construction of the structure;
- b) The arrangement of buildings adjacent to that for demolition and the condition of the adjoining property;
- c) The location of underground services, e.g. water mains, electricity cables, gas pipes, drains, sewers, telephone cables;

- d) Previous use of the premises, e.g. for the storage of flammable substances;
- e) Presence of dangerous substances, e.g. asbestos lagging;
- f) The method of bonding of the main load-bearing walls;
- g) The system of shoring or other supports necessary during demolition;
- h) The presence of cantilevered structures, their form of construction and the nature of any danger;
- i) The presence of basements, cellars, vaults or other spaces;
- j) The potentially dangerous effect of removing superstructure stabilising loads from an old basement or vault retaining wall;
- k) The presence of storage tanks below or above ground and the nature of their contents;
- l) The actual sequence of operations, which should generally take place in the reverse order of construction.

Demolition work should be undertaken in accordance with the BS Code of Practice for Demolition (CP94: 1971) by registered demolition contractors listed in the appropriate Register.

2.11.5.9.1.2 Action prior to demolition

Prior to actual demolition a number of actions must be taken. Form 10 (Notice of Commencement of Building Operations or Works of Engineering Construction) must be submitted to the local offices of the HSE. Local authorities and statutory undertakers must be notified and consulted.

Services such as gas, water and electricity must be isolated. A competent supervisor with suitable experience must be appointed to take charge of the work and all persons employed on the site adequately briefed. All dangerous areas should be fenced off and appropriate warning notices displayed.

A suitably qualified chemical engineer must review the facility and certify demolition protocols as being safe.

Catching platforms should be installed not more than 6m below the working level where there is a risk to other workers.

Personal protective equipment including safety helmets with chin straps, goggles, heavy-duty gloves and safety boots with steel insoles must be provided and worn during the total period when demolition is in progress. Respiratory protection with the use of safety belts or harnesses may also be necessary.

2.11.5.9.1.3 Action during demolition

Demolition should, where possible, be carried out in the reverse order of building erection. The competent person in charge should leave no isolated freestanding wall on its own unless judged to be safe. Working platforms should be used and all refuse and debris removed from these temporary structures on a regular basis to avoid overloading, together with debris, which has accumulated behind walls.

Independently supported working platforms over any reinforced concrete slabs should be demolished. Support for members of framed structures must be provided before gutting, along with temporary props, bracing or guys to restrain remaining parts of the building. On no account must operators work from the floor being demolished, and site control must ensure that all personnel are kept at a safe distance from the scene of operations when pulling arrangements, demolition ball, pusher arm and/or explosives are being used.

The following procedures and practices should be closely followed: -

- a) Entrances, passages, stairs and ladder runs should be kept clear of all materials and debris and, where necessary, be so protected as to safeguard any person using them from falling materials;
- b) Disturbed staircases, particularly stone ones, should not be used;
- c) Accumulated debris or piled materials should not be used by operators for the performance of their work; every employee should be provided with safe footing in the form of safe planking or flooring;
- d) Access to areas where flooring has been removed, or where there are dangerous holes or openings, such as lift shafts, should be barred or protected with guard rails and toe boards;
- e) Where work cannot be done safely from the ground, or from a sound part of the building, close-boarded scaffolds, ladders or other means of support should be provided;
- f) All openings, corners, breaks and edges from or through which a person could fall a distance of more than 6ft 6ins (2m) should be securely covered or provided with guard rails and toe boards; material used to cover holes should be securely fixed in position and clearly marked; where such measures are impracticable, safety nets or sheets should be provided below openings and at the corners, etc.; where nets are impracticable safety belts should be provided and worn;
- g) Employees should not be permitted to work on, above or pass across open joisting, through which they could fall a distance of more than 6ft 6ins (2m) unless such joisting is covered by boards or other temporary covering;

- h) Timber with protruding nails should have the nails removed or knocked down or, alternatively, stacked where it would not be a source of danger or likely to further use;
- i) Glass in windows, partitions, roofs, etc. should be removed separately prior to demolition activities commencing; and
- j) Adequate and suitable lighting should be provided for all working places, approaches, dangerous openings and places where lifting or lowering is taking place.

2.11.5.10 Make safe any historically contaminated ground or surface water and soil.

Following the decommissioning/decontamination and demolition phases of the closure plan, an investigation of the ground conditions will be carried out to establish if an increase in contamination has occurred since the IPPC site report was compiled.

Where possible impermeable slabs and hardstanding will be left in place until the investigation has proven that the soils beneath them are clean.

A number of site investigations, including provision of trial pits and boreholes, have been undertaken in several phases. Soil and groundwater samples have been collected and tested in the laboratory for contamination.

The locations of the investigation points have been constrained, to a certain extent, by the presence of structures and services.

The results of investigations undertaken to date are contained in the site report.

TABLE 2.11.1 – HAZARDOUS MATERIAL LOCATIONS

Material	Physical Form	Location	Maximum Quantity on Site/Plant
Sodium Hydroxide Solution (47%)	Medium viscosity liquid	De-tinning plants and chemical storage area	18 tonnes
Sodium Nitrite Solution (37%)	Low viscosity liquid	Chemical de-tinning plant and chemical storage area	14 tonnes
Sodium Hydroxide and Sodium Nitrite Blend	Low viscosity liquid	Chemical de-tinning plant and chemical storage area	20 tonnes
Sodium Hydroxide, Sodium Nitrite and Stannate Liquor	Low viscosity liquid	Chemical e-tinning plant, tin recovery section and chemical storage area	515 tonnes
Contaminated Rinse Water	Low viscosity liquid	De-tinning plants	160000 litres
Hydraulic Oil	Low viscosity liquid	Oil storage area	5000 litres
Lubricating Oil	Medium viscosity liquid	Oil storage area	1000 litres
Hydrochloric Acid	Low viscosity liquid	Effluent plant	250 litres (10 x 25L containers)

