

December 13, 2021

Environmental Approvals Branch
Manitoba Conservation and Climate
1007 Century Street
Winnipeg, Manitoba R3H 0W4
Attention: **Director**

Re: Eastview Landfill - Notice of Alteration - Burning

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) is pleased to provide you with one (1) electronic copy of the Notice of Alteration Form and the accompanying NoA detailed report for amending the license at the Eastview Landfill site for the one-time use of an Air Curtain Burner (ACB) unit to dispose of one mixed wood waste pile currently at the site.

The City of Brandon has operated the Eastview Landfill since 1977, serving the resident of Brandon, several municipalities close to the site and more recently (since 2011) the RM of Cornwallis. The landfill operates under Environment Act License No. 3149 issued to the City of Brandon on August 25, 2015. With this Notice of Alteration, the City is formally requesting for an amendment to the current License that would allow the one-time use of an Air Curtain Burner unit for disposal of the large mixed wood waste pile currently onsite. KGS Group conducted a detailed review of documentation pertaining to the use of this equipment including; examples of uses of the ACB in other jurisdictions, environmental risks associated with the technology, and best practice operation procedures. Finally, in this report KGS Group describes all recommendations, including operation procedures and next steps for evaluating further usage of the ACB on the Eastview Landfill site.

Please do not hesitate to contact us if you have any questions regarding the enclosed information.

Regards,




Ma
Environmental Engineer
Tel: 204-896-1209. Email: mpoveda@kgsgroup.com

MP/jr
Enclosure

Notice of Alteration Form



File No. :	Environment Act Licence No. : 3149	
Legal name of the Licencee: The City of Brandon		
Name of the development: The Eastview Landfill		
Category and Type of development per Classes of Development Regulation: <SELECT> Class 1, Waste Disposal Ground <SELECT>		
Licencee Contact Person: Scott Haddow Mailing address of the Licencee: City: Brandon Province: Manitoba Postal Code: Phone Number: 204-729-2281 Fax: 204-729-2136 Email: s.haddow@brandon.ca		
Name of proponent contact person for purposes of the environmental assessment (e.g. consultant): Mario Poveda		
Phone: (204) 896-1209 Fax:	Mailing address: 865 Waverley St. , R3T 5P4	
Email address: mpoveda@kgsgroup.com		
Short Description of Alteration (max 90 characters): The purpose of the Alteration is to gain approval for amending the license at the Eastview Landfill site for the use of an Air Curtain Burner to dispose of one wood waste pile in the Northern section of the Landfill.		
Alteration fee attached: Yes: <input type="checkbox"/> No: <input checked="" type="checkbox"/>		
If No, please explain: City of Brandon will submit application fee		
Date: December 13, 2021	Signature: 	Printed name: Mario Poveda, P.Eng KGS Group
A complete Notice of Alteration (NoA) consists of the following components:		<p>Submit the complete NoA to: Director, Environmental Approvals Branch Manitoba Conservation and Climate 1007 Century Street Winnipeg, Manitoba R3H 0W4 EABDirector@gov.mb.ca</p> <p>For more information: Phone: (204) 945-8321 Fax: (204) 945-5229 https://www.gov.mb.ca/sd/permits_licenses_approvals/eal/licence/index.html</p>
<input checked="" type="checkbox"/> Cover letter <input checked="" type="checkbox"/> Notice of Alteration Form <input checked="" type="checkbox"/> 1 hard copy and 1 electronic copy of the NoA detailed report (see " Information Bulletin - Alteration to Developments with Environment Act Licences ") <input type="checkbox"/> \$500 Application fee, if applicable (Cheque, payable to the Minister of Finance)		
<p>Note: Per Section 14(3) of the Environment Act, Major Notices of Alteration must be filed through submission of an Environment Act Proposal Form (see "Information Bulletin – Environment Act Proposal Report Guidelines")</p>		

December 13, 2021

Environmental Approvals Branch
Manitoba Conservation and Climate
1007 Century Street
Winnipeg, Manitoba R3H 0W4

Attention: Director

Re: Eastview Landfill - Notice of Alteration Detailed Report

Kontzamanis Graumann Smith MacMillan Inc. (KGS Group) is pleased to provide you with one (1) electronic copy of the detailed report that supplements the Notice of Alteration request for amending the license at the Eastview Landfill site for the one-time use of an Air Curtain Burner (ACB) unit to dispose of one wood waste pile in the Northern section of the Landfill.

1.0 INTRODUCTION

The City of Brandon (the City) has operated a Class 1 Waste Disposal Ground (the Eastview Landfill) since 1977, serving the resident of Brandon, several municipalities close to the site and more recently (since 2011) the RM of Cornwallis. The site consists of approximately 60 hectares of land, located south of Victoria Avenue and east of 33rd Street E. The landfill operates under Environment Act License No. 3149 issued to the City of Brandon on August 25, 2015. Site infrastructure also includes a Material Recovery Facility (MRF) and residential segregated waste drop off areas.

KGS Group completed a Master Plan for the site in April 2017, along with the design and construction supervision for waste disposal Cells 15 and 16. KGs Group has also collaborated for several years in the completion of the required annual groundwater and surface water monitoring reports as well as the more recent development of the updated Closure and Post-closure report for the year 2021. Based on this latest report, the estimated closure year for the site is 2053.

With this notice of alteration, the City's intent is to request for an amendment to the current license with Manitoba Conservation and Climate (MCC) that would allow the one-time use of an ACB unit, for disposal of the large mixed wood waste pile currently onsite. To accomplish this goal, KGS Group conducted a detailed review of documentation pertaining to the use of this equipment including; examples of uses of the ACB in other jurisdictions, environmental risks associated with the technology, and best practice operation procedures.

2.0 BACKGROUND

The Eastview Landfill is currently stockpiling large quantities of mixed wood waste northwest of the active waste disposal area. There are currently three large stockpiles with volumes estimated at approximately 44,000 m³ for Pile #1, 11,000 m³ for Pile #2 and 5,000 m³ for Pile #3, as seen on Figure 1. KGS Group understands that the ACB unit would only be used for the northern pile, Pile #1.

The City will like to utilize this technology to efficiently and safely reduce the volume of the current mixed wood waste pile onsite. However, the landfill's current License prohibits burning on site. An amendment to the landfill's current license is required to allow this as a one-time event.

3.0 AIR CURTAIN BURNER TECHNOLOGY OVERVIEW

ACB units are designed to be high-efficiency incinerators by fully combusting clean wood and tree waste in a controlled environment. The wood waste is placed within an open top ACB box or trench and is ignited in a conventional manner (such as the use of liquid fuel or other ignition sources). A diesel or electric-powered motor operates a blower which creates a stream of air over the top of the burning material as it exits a blade-like manifold located at the top of the box. The stream of air recirculates and oxygenates the combusting wood debris, decreasing the generation of carbon and carbon monoxide. Residual ash is generated by the combustion of the wood waste and accumulates at the bottom of the box. Ash material is raked out or removed by machinery.

KGS Group conducted a preliminary assessment of the different types of ACBs to assist in developing a plan of use for the City. As the City is not interested in purchasing the equipment for one-time usage, only models that were available as rentals by a third-party were assessed. KGS Group understands that a S220 model unit from the supplier Northern Mat & Bridge LP. is available for rent. The S220 model is a part of the S200 series designed and produced by Air Burners Inc. and has been tested by the U.S EPA, the U.S. Forest Service and the U.S. Department of Energy to confirm emissions performance ⁽¹⁾. The S220 model is a portable skid-mounted series, that is designed for the high temperature burning of forest slash, agricultural green waste, land clearing debris, storm debris, and other waste streams.

PHOTO 1.0 S220 FIREBOX AIR CURTAIN BURNER

The S220 comes pre-assembled and ready for immediate use, and no disassembly is required for return. Power is supplied by a three-cylinder Turbo Diesel Engine, and comes with a 220L fuel tank capacity, and an approximate consumption rate of 7.6 L/hr. Wood waste is placed in the burn container, which consists of four-inch-thick refractory wall panels with thermal ceramic material and dimensions of 6m x 1.9m x 2.2m⁽¹⁾. Further specifications and general information for the ACB S220 model is attached in Appendix A.

4.0 REVIEW OF APPLICABLE REGULATIONS

Potential environmental concerns of use of the ACB technology are influenced by operating decisions (such as burn location, time of burn, and quality of burning material) ⁽²⁾. Legislation and regulation requirements on operation procedures were assessed to assist KGS Group in providing recommendations for the proper use of this technology. The MCC legislation requirements governing the Eastview Landfill License were reviewed, as well as regulations from British Columbia for the use of ACB technologies.

4.1 Manitoba Legislation

The current regulations in place for open burning of waste materials is contained within the Waste Management Facilities Regulation 37/2016 (the Regulation). The License for the Eastview Landfill does not currently permit the burning of materials at the facility. As stated in the Regulation, in addition to being permitted to burn, requirements for controlled burning of wastes include:

- The burn area must be a minimum of 50 metres from the active landfilling area and any other area used for the collection of flammable materials
- The burn area must be enclosed on three sides with a berm of at least 1.8 m height or within a metal containment vessel or cage
- The burn area must be graded to prevent the collection of surface water
- The burn activity must be supervised at all times
- The burn activity must only be performed during daylight hours
- The burn activity must only be performed when wind conditions (speed and direction) do not promote smoke and odour from affecting nearby properties or roadways
- The ashes from the burn activity must be removed regularly once extinguished and disposed of in the active landfilling area

KGS Group assesses the S220 ACB model to be an enclosed metal container, and therefore the requirement of enclosing the area with a 1.8 m high berm at this time would not be necessary. All other listed requirements are assessed to be applicable to the ACB equipment and the Eastview Landfill site.

The Regulation also states a list of current materials that are acceptable to burn, and are as follows:

- Tree branches and boughs
- Leaves and yard waste
- Loose straw
- Paper products and cardboard
- Untreated waste wood
- Wood derived packaging materials

Additionally, the Regulation indicates that it is required to create and file records of every burn activity that is performed. The information required in these records must include the following:

- Date, time, and duration of burn
- Volume of waste and types of waste burned
- Weather conditions throughout the burn (windspeed, wind direction, air temperature, precipitation, and cloud cover)
- Complaints received with respect to the burn activity (odour, smoke, noise, etc.)

4.2 British Columbia Legislation

ACB units are not currently a regulated technology in Manitoba, however regulations for ACBs exist in British Columbia under the Ministry of Environment and Climate Change Strategy. Therefore, the list of best practices associated with the use of an ACB, in the BC regulations were assessed and are summarized in the five steps below.

Step 1—Planning

In the first step, it is required to do the three following tasks;

- Reduce Vegetative Debris as much as possible.
- Check for bylaws and fire ban restrictions.
- Document information of the burn.

Step 2--Determine location and setback requirements

Location requirements can vary depending on the surrounding area and will determine the setback requirements for burning practices. The three rules listed in the regulation are the following:

- Air curtain burner cannot be operated less than 100 m from residences and businesses, and 500m from a school, hospital or community care facility.
- If ACB is located more than 1,000 m from residences and 2,000 m from a school, follow large setback instructions. If the ACB is located between 100 m and 1,000 m from residences and businesses, and between 500 m and 2,000 m from a school, follow small setback conditions.

Step 3—Prepare to burn

Before burning, vegetative debris needs to be assessed, and the following is recommended:

- Vegetative debris does not need to be seasoned before burning

Vegetative debris must not be stacked above the air outlet of the incinerator.

Step 4—Assess Conditions on Burn Day

On the day of the burn, operations must be assessed as well as site conditions including the following:

- ACB blowers must operate continuously until the vegetative debris has been reduced to ash or combustion is over.
- Opacity of smoke generated must be lower than 40% during the 30 minute start up period, and no more than 15% for more than five minutes during any other 30 minute period of the ACB operation.

There are additional requirements for operation depending on the applicable set back of the burn. For large setbacks this includes:

- If the ACB is located more than 1,000 m from residences and businesses, and 2,000 m from a school, hospital or community care facility operation can occur at all hours in the day.
- Ventilation index does not need to be checked before burning.
- For small setbacks where the air curtain is located between 100 m and 1,000 m from residences and businesses, and between 500 m and 2,000 m from a school, hospital or community care facility, the requirements are as follows: Check the ventilation index—the index must be GOOD or FAIR on every burn day.
- As long as ventilation index requirements are met, burning can happen for as many days in a row as necessary.

- Start time for each burn day is at least one hour after sunrise.
- End time for each burn day is sunset.
- Vegetative debris can only be added to the ignited ACB between allowed hours.
- If ventilation forecast is POOR for the day that it is obtained, no more vegetative debris can be ignited.

Step 5—Monitor

While burning, it is recommended to consistently monitor smoke produced, and adhere to the following:

- If smoke from the burn has potential to impact people or cause a navigation hazard do not start the burn.
- If smoke spreads during the burn and starts to cause a navigation hazard or impact people from reducing visibility, no more vegetative debris can be ignited until the conditions improve.

5.0 ESTIMATED ENVIRONMENTAL RISKS

KGS Group conducted an assessment of potential environmental risks for the use of the proposed ACB, comparing against general burning practices. Environmental concerns were evaluated by categories including: air, odour, water and soil.

5.1 Air

5.1.1 GENERAL BURNING CONCERNS

Air environmental hazards include reduced visibility, hazardous health pollutants and greenhouse gas emissions within a certain impact area.

Typical hazardous health pollutants associated with general open burning practices include; PM_{2.5}, Black carbon, polychlorinated dibenzo dioxins (PCDDs), polychlorinated dibenzo furans (PCDFs) and polyaromatic hydrocarbons, including benzo(a)pyrene⁽³⁾. Additional hazardous pollutants that can be emitted in smoke from burning practices also include; nitrogen oxides, carbon monoxide, arsenic, mercury, lead, hydrochloric acid and volatile organic compounds⁽³⁾. Studies have indicated that long term exposure to wood smoke including these pollutants has caused reduced lung function, development of asthma, heart problems and premature mortality. Short-term exposure to the various pollutants is also associated with acute bronchitis, asthma attacks, aggravation of lung diseases and increased risk to a variety of respiratory infections.⁽³⁾ Health risks including impairment of the immune system, endocrine system and the reproductive system are associated with polyaromatic hydrocarbons, dioxins and furans—however these are associated with burning of plastics and not wood products.

Burning practices involving wood waste can result in the emission of Black Carbon which is a potent greenhouse gas. Black Carbon is a soil substance that is temporarily suspended in the atmosphere before gravitating back to

the surface, and is a byproduct of the incomplete combustion of biomass material.⁽⁴⁾ In air, Black Carbon contributes to the greenhouse gas warming effect by trapping sunrays in the atmosphere.⁽⁴⁾

5.1.2 AIR CURTAIN BURNER ASSESSMENT

Air Curtain Burners are designed to reduce the emissions of particulate matter and carbon monoxide by blocking these emissions using a high velocity (1600-2000 rpm) of air flow to recirculate the contaminants in the burn box.⁽⁵⁾ A report from a case study conducted on the use of the S220 model in Jacksonville Florida indicated that ACBs can reduce CO and PM emissions by 80% in comparison to open burning practices.⁽⁵⁾

Additionally, Air Curtain Burner technology is designed to burn wood waste with nearly 100% combustion efficiency.⁽⁴⁾ Since Black Carbon is a result from incomplete combustion efficiency, ACBs are assessed to have a low risk for producing the greenhouse gas.⁽⁴⁾ However, ACB technology has been designed and evaluated to burn clean, untreated wood waste.⁽⁷⁾ Therefore, predicted environmental risks from supplier distribution have been evaluated based on burning a clean pile. The pile of wood waste at the Eastview Landfill however, is expected to be a mix of treated and untreated wood products.

A case study was conducted for the use of the S119 Firebox model from Air Burners Inc. in Symonston, Australia which involved monitoring and comparing combustion products (CO, CO₂, O₂, NO_x, SO₂ and H₂O) and particulate emissions for the burning of clean timber and logs (1), painted timbers with mixed industrial wood waste (2), clean plywood and particle board (3), and laminates including form release board (4)⁽⁶⁾. The results indicated that emissions for combustion products were similar for categories 1,2 and 4, but category 3 had slightly more CO₂ emissions and slightly less O₂ emissions. Total particulate emission was also relatively low in all scenarios. The majority of PM concentrations ranged in the 40-120um, PM 2.5 represented 2% of the particulate emissions and PM10 represented 4%⁽⁶⁾. These results indicate that there was a small difference in particulate and combustion emissions from mixed wood waste piles.

5.2 Odor

Odor can be a nuisance hazard if smoke from burning practices reaches surrounding communities.

5.2.1 GENERAL BURNING CONCERNS

General burning practices can result in large amounts of smoke that can cause haze and odor problems, specifically when there are geographical barriers and/or little wind to clear the air.⁽³⁾

5.2.2 AIR CURTAIN BURNER ASSESSMENT

Since the ACB technology is designed to control emissions of hazardous air pollutants and reduce opacity, odor has generally not been a concern of its use. However, risks of Odor from the S119 Firebox model was calculated using the Aeromod modelling process for Symonston, Australia. The results indicated that no appreciable odor was detected from any of the piles ran in the tests.⁽⁶⁾

5.3 Water

Environmental effects of water should be considered if burning is located near surrounding water bodies, if the plume has the potential to spread and contaminate these areas.

5.3.1 GENERAL BURNING CONCERNS

Negative effects on water from burning practices are typically low. However, there is a risk that pollutants in air may settle onto surrounding bodies of water and enter freshwater ecosystems.

5.3.2 AIR CURTAIN BURNER ASSESSMENT

No documentation including the assessment of potential environmental risks on water bodies using ACB technology was identified in the review. However, with the current information available, the environmental impacts on water bodies using the ACB at the Eastview Landfill site are expected to be low.

5.4 Soil

Environmental effects of soil can become a hazard if contaminants in air settles on the ground.

5.4.1 GENERAL BURNING CONCERNS

Pollutants of concern from burning practices on surrounding soil includes Black Carbon and dioxins.

5.4.2 AIR CURTAIN BURNER ASSESSMENT

No documentation including the assessment of potential environmental risks on soil using ACB technology was identified in the review. However, with the current information available, the environmental impacts on soil using the ACB at the Eastview Landfill site are expected to be low.

6.0 RECOMMENDED OPERATION PLAN

KGS Group developed a Recommended Operation Plan for the one-time use of the ACB on the Eastview Landfill, based on the environmental effects assessment, legislation review and technical specifications of the S220 model.

6.1 Proposed schedule

Based on the estimated size of the mixed wood waste pile (approximately 44,000 m³; 4,400 tonnes), it is proposed that two S220 units be rented from Northern Mat & Bridge LP. to work in parallel for a total of two months in the Spring of 2022. The S220 model has an average efficiency rate of approximately 7 tonnes of wood waste per hour. KGS Group proposes to operate the two ACB units six days per week during operation hours

(8:00am-4:00pm) at the Eastview Landfill site. Operating during these hours and months, would be in adherence to the recommendations listed in the Large Setback requirements (the most stringent) listed in the British Columbia regulations.

6.2 Proposed location

Manitoba regulations require that burning at a landfill be located at a minimum distance of 50 m from any active landfilling area. Regulations from British Columbia further indicate that the burn location must be at least 100 m from residences, and 500 m from hospitals, schools, and community care centers. KGS Group proposes to locate the ACB units northeast of the current wood waste piles near the internal access road (Figure 1.0). This location would be 50 m from all active landfilling areas and would meet the B.C. regulation location requirements, however prior to burning these requirements would need to be confirmed with the final selected location.

6.3 Proposed operation procedures

In accordance with the recommendations listed in the British Columbia regulations the following operation procedures are proposed to be implemented during the one-time burning activity:

- Assess wind conditions and the potential for smoke to cause a navigation hazard on nearby residences prior to burning—if it does, do not proceed with the burn.
- Supervise the burn activity at all times.
- Monitor smoke during the burning process—if it begins to create a navigation hazard on nearby residences do not add any more vegetative debris until conditions improve.
- Dispose of ashes regularly from the ACB. Ashes may be used as a daily cover material as a means of disposal.
- Document all required information with adherence to the Manitoba Regulation for any burning activity.

7.0 CONCLUSION

KGS Group has reviewed the use of ACB units including the proposed S220 model for a one-time event to deal with the current stockpile of mixed wood waste at the Eastview Landfill, considering potential environmental impacts, applicable regulatory requirements, and recommended operation procedures for the safe use of the technology. Considering the information available, KGS Group assesses that this technology can be used safely and efficiently as a one-time solution for the stockpile of mixed wood waste at the Eastview Landfill site, as long as the recommended operation plan and all legislation requirements are followed.

8.0 REFERENCES

1. Air Burners Inc., 2021. FireBox 200 Series
Retrieved from: <https://airburners.com/products/firebox-series/200-series-firebox/>
2. British Columbia Ministry of Environment and Healthy Living and Sport, 2010. Open Burning Smoke Control Regulation.
3. Canadian Council of Ministers of the Environment, 2016. Guidance Document for Canadian Jurisdictions on Open-Air Burning.
4. Fuhrmann, N. 2010., Woody Debris Disposal by Fire, Combustion Efficiency and Black Carbon—Why Air Curtain Burners should be used to help reduce Greenhouse Gas emissions.
5. Lee, E. & Han, H-S., 2017. Air Curtain Burners: A Tool for Disposal of Forest Residues.
6. Mike Lyons & Associates, 2016. ACT Waste Feasibility Study.
7. Air Burners Inc. 2018, Emissions Factors for Air Burners Firebox Systems Overview
8. British Columbia Ministry of Environment and Climate Change Strategy., 2021. Air Curtain Incinerators Open Burning Smoke Control Regulation Fact Sheet.
9. U.S. Environmental Protection Agency (2016). Volume-to-Weight Conversion Factors. Office of Resource Conservation and Recovery

Prepared By:



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Environmental Engineer

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Enclosure

Approved By:



Jason Mann, M.Sc., P.Geo., FGC
Environmental Department Head/
Associate Principal

STATEMENT OF LIMITATIONS AND CONDITIONS

Limitations

This report has been prepared for the City of Brandon in accordance with the agreement between KGS Group and City of Brandon (the “Agreement”). This report represents KGS Group’s professional judgment and exercising due care consistent with the preparation of similar reports. The information, data, recommendations and conclusions in this report are subject to the constraints and limitations in the Agreement and the qualifications in this report. This report must be read as a whole, and sections or parts should not be read out of context.

This report is based on information made available to KGS Group by City of Brandon. Unless stated otherwise, KGS Group has not verified the accuracy, completeness or validity of such information, makes no representation regarding its accuracy and hereby disclaims any liability in connection therewith. KGS Group shall not be responsible for conditions/issues it was not authorized or able to investigate or which were beyond the scope of its work. The information and conclusions provided in this report apply only as they existed at the time of KGS Group’s work.

Third Party Use of Report

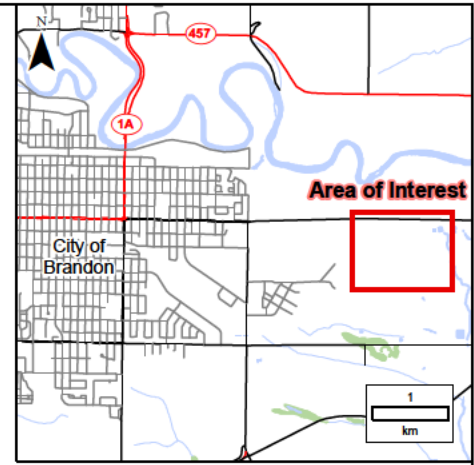
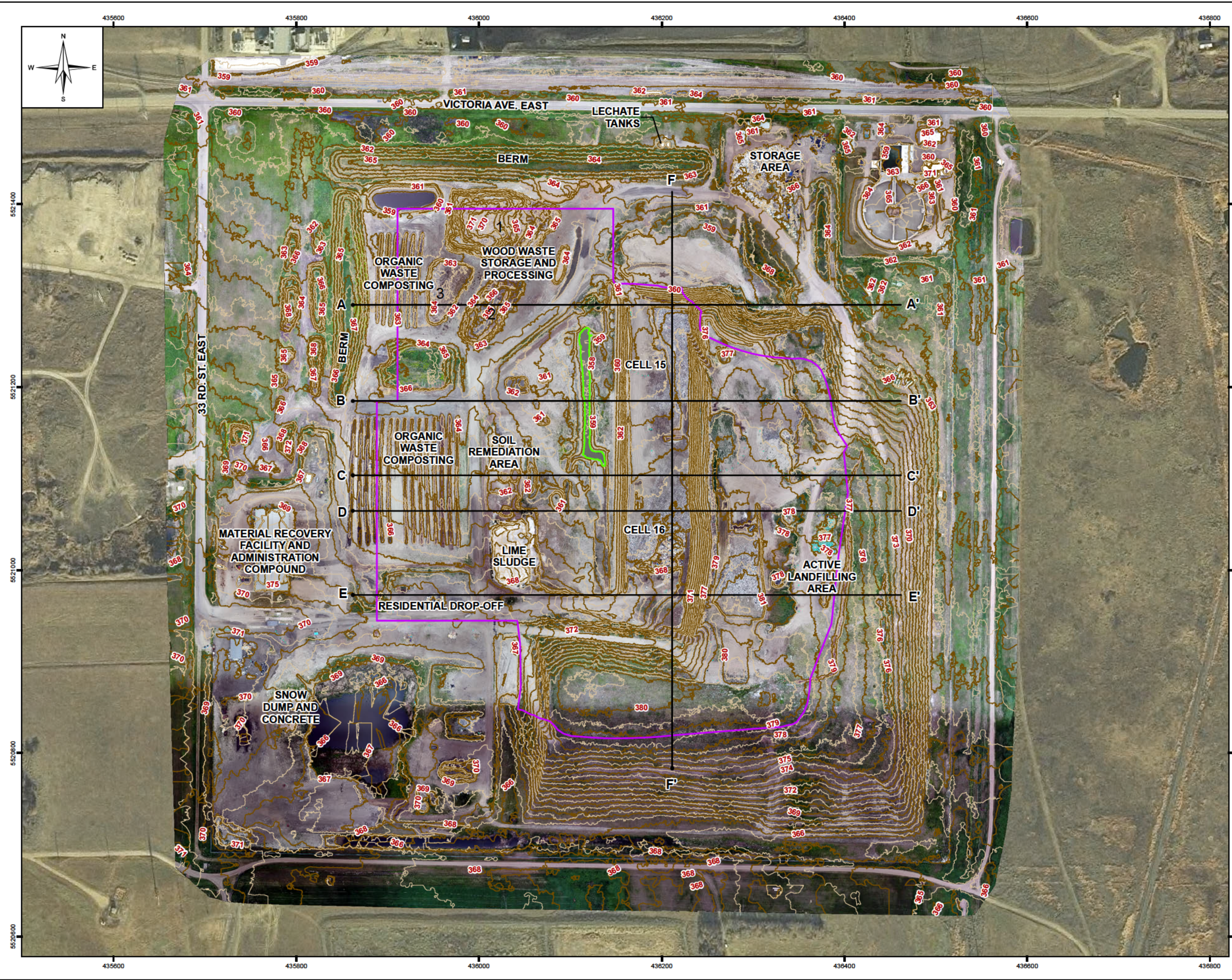
Any use a third party makes of this report or any reliance on or decisions made based on it, are the responsibility of such third parties. KGS Group accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions undertaken based on this report.

Geo-Environmental Statement of Limitations

KGS Group prepared the geo-environmental conclusions and recommendations for this report in a professional manner using the degree of skill and care exercised for similar projects under similar conditions by reputable and competent environmental consultants. The information contained in this report is based on the information that was made available to KGS Group during the investigation and upon the services described, which were performed within the time and budgetary requirements of City of Brandon. As this report is based on the available information, some of its conclusions could be different if the information upon which it is based is determined to be false, inaccurate or contradicted by additional information. KGS Group makes no representation concerning the legal significance of its findings or the value of the property investigated.

be inaccurate or incorrect.

FIGURE



- LEGEND:**
- Ditch Boundary
 - Section
 - 1 m Contour Index
 - 0.5 m Contours
 - Design Boundary

- NOTES:**
1. Survey and Drone imagery captured by KGS Group July 6, 2021.
 2. Background imagery source is ESRI/MAXAR, dated 2018.
 3. All units are metric and in metres unless otherwise specified. Transverse Mercator Projection, NAD 1983, Zone 14. Elevations are in metres above sea level (MSL).



SCALE: 1:4,000 METRIC 11"x17"

NO	DATE	DESCRIPTION	ISSUED BY	CHECK BY
0	21/10/06	ISSUED WITH FINAL REPORT	M/JN	BAT

REVISIONS / ISSUE

EASTVIEW WDG CLOSURE AND POST PLAN

CROSS SECTION SITE PLAN

OCTOBER 2021 FIGURE 1 REV: 0

APPENDIX A

Air Curtain Burner Information

FIREBOX SPECIFICATIONS



General: A self-contained, completely assembled above ground Air Curtain Burner (air curtain incinerator or FireBox) with a refractory lined burn-container for portable and permanent (stationary) applications. Designed for the high temperature burning of forest slash, agricultural green waste, land clearing debris, storm debris, and other waste streams in compliance with the requirements of US EPA 40CFR60.

Shipped from the factory completely assembled ready for immediate use and does not require disassembly for relocation. The FireBox is also used for disaster recovery and Department of Homeland Security contingencies. Electrically powered version (S220E) available for permanent (stationary) installations.

1	Power	Three-cylinder Turbo Diesel Engine approx. 49 HP, HATZ Model 3H50TIC (Does not require DEF) or equivalent engine; Emissions certified US EPA Tier 4 FINAL; Engine mounted PTO	
2	Burn Container (FireBox)	4" (102 mm) thick refractory wall panels filled with proprietary thermal ceramic material; Two full height refractory rear doors; Two ignition holes; FireBox open to the ground	
3	Safety Systems	Engine over temperature and overspeed shut down; Loss of cooling fluid shutdown; Loss of oil pressure shutdown; Lockable steel front deck security enclosure	
4	Instrument Panel	MBW electronic engine control with preset throttle settings: key switch, tachometer, hour meter, fuel gauge, oil pressure and water temperature and safety shutdown features	
5	Air Supply	Custom heavy duty fan	
6	Fuel Tank	58 Gallon (220L) minimum fuel tank capacity	
7	Transportation & Set-up	Shipped completely assembled; Ready for immediate use; Lifting pads provided for crane lifting; Unit can be dragged onsite on its skids	
8	Options	Ash clean-out rake with standard universal quick disconnect for <i>Skidsteer</i> or <i>Bobcat</i> ; Ember screen; Rough-terrain removable dolly	
9	Average Through-put	5-7 Tons per Hour (Average – See Note)	
10	Fuel Consumption	Approx. 2.0 gal/hr. (7.6L/hr.)	
11	Weight	36,650 lbs. (16,620kg)	
12	Dimensions	Overall Size L × W × H	Fire Box L × W × H
		30' 1" × 8' 6" × 8' 6" (9.2m × 2.6m × 2.6m)	19' 8" × 6' 2" × 7' 1" (6m × 1.9m × 2.2m)

Note:

Achievable through-put depends on several variables, especially the nature of the waste material, the burn chamber temperature and the loading rate.

All weights and dimensions are approximate and metric conversions are rounded. Specifications are subject to change without notice.

AIR BURNERS, INC.

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Forgotten Waste!

There is a very large problem that we as the world community are facing: the disposal of wood and vegetative waste. Waste from wildfires and massive amounts of tree mortality due to climate change, combined with few recycling options and new landfill restrictions on dumping wood waste, have created huge piles of wood and vegetative waste in every city and town. As these piles decay, they release significant amounts of methane, they cause ground water contamination through leachate and they pose the very real threat for these piles to spontaneously combust. The environmental impact today is significant and getting worse.

Where Did Our Forests Go?

The world has lost one-third of its forests, an area twice the size of the United States (owid). That is more than one trillion trees. According to the U.S. Forestry Service, in California alone, more than 160 million trees are dead, primarily due to the impacts of climate change. That is a dramatic loss for our environment.

Making It Worse!

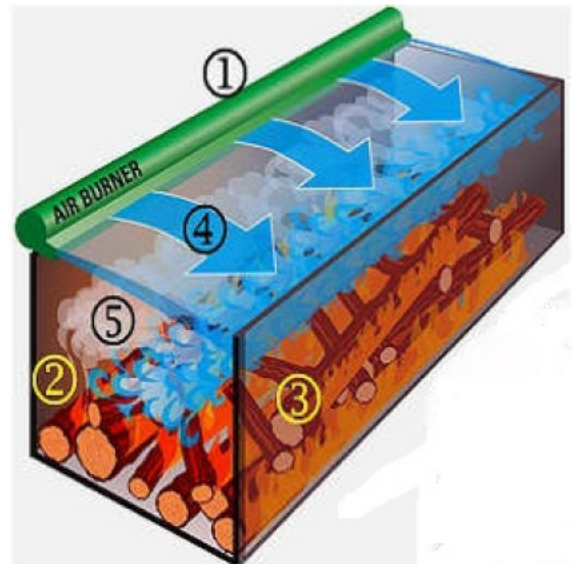
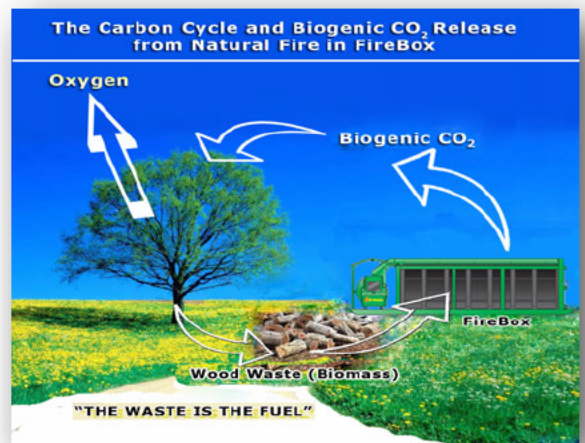
If that isn't bad enough, as we try to clean up, we typically grind all this waste into wood chips. Chipping or grinding do not provide a final disposal solution for the waste. These processes simply make a physical change to facilitate trucking. Ten tons of waste in – equals ten tons of chips out, there is no mass reduction, nor elimination. Equally concerning are the greenhouse gas emissions from the grinders powered by large diesel engines (850 hp-1000 hp), which can consume 100 gallons per hour of hydrocarbon fuel. Worse, the dust from wood chipping is carcinogenic (National Cancer Institute) and impacts everyone around the grinding operation.

The Proven Natural Solution.

The best method of eliminating wood and vegetative waste is using **Air Curtain Technology**. Air curtain machines have been around for over 25 years. The leading manufacturer, Air Burners, Inc., has worked closely with the USEPA and other national agencies to test and prove the effectiveness of the technology. This is a natural process that allows the wood waste to burn naturally, without the aide of any hydrocarbon fuels, in a controlled machine. This air curtain machine traps and eliminates the smoke particulates. Plus, the remaining biochar and carbon ash are excellent natural soil amendments.



PM—Mulch Fire in Florida caused by spontaneous combustion of wood grinding piles



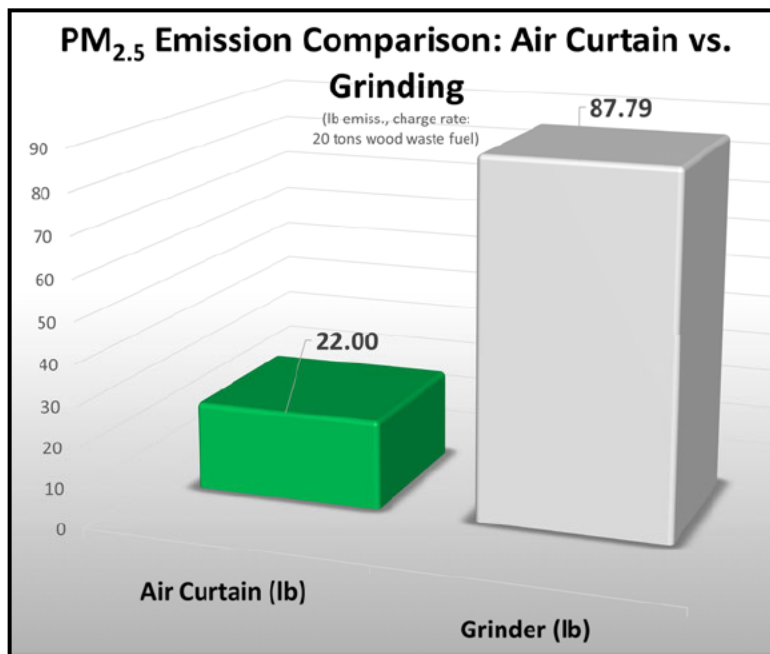
Air Burners—Principle: Air Curtain

- 1=Air Curtain Manifold
- 2=FireBox Refractory Wall
- 3=Wood Waste or Wood Fuel
- 4=Air Curtain (left to right) Traps Smoke Particulate
- 5=Smoke (PM or Black Carbon)

Compare the Emissions.

The most dangerous particulates are those at 2.5 microns in diameter and smaller. PM_{2.5} has been proven to be much lower with Air Curtain Technology than PM_{2.5} emissions from the grinding processes (refer to graph).

But what about CO₂? The CO₂ released by the air curtain machine is “biogenic” the same as released by the decaying wood chips. The carbon is released naturally from the wood waste no matter how it is handled. Grinding, composting and trucking release large amounts of anthropogenic CO₂, which is a regulated greenhouse gas (GHG). In contrast, air curtain burning only releases the good biogenic CO₂ into the atmosphere, which closes the carbon cycle. (chart on previous page)



Summary.

As a world community, we must make better choices; we must look at our processes in their entirety. Grinding wood waste might be a viable option if the chips can be utilized for a biomass power plant or recycled as ground cover. We should encourage repurposing of wood waste. But the truth is, the market for the recycled wood and vegetative waste is so small that it has almost no impact on solving the waste problem. The wood waste must be eliminated as doing the wrong thing or nothing is much more damaging to our environment, and only contributes to our worsening climate situation. One immediate and well-proven solution is Air Curtain Technology.



www.AirBurners.com

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Stop Open Burning Now



THE AGRICULTURAL AIR CURTAIN BURNER ...

- Improves the environment in the area — Protects Public Health
- Eliminates negative impact from smoke on grapes and wine
- Saves growers money — Faster, less handling, less hassle
- Metal stakes and wires mixed in with wood waste — *No Problem*
- Biochar and carbon ash stays on land — *Carbon Negative disposal job*
- Fights Climate Change by reducing Black Carbon (Smoke)



Stop Open Burning Now

Air Curtain FireBox Burners

Best Alternative to Combat Global Warming Now by Reducing Black Carbon Release from Agricultural Biomass Burning
Best Method to Eliminate Wood Waste

According to the Intergovernmental Panel on Climate Change (IPCC) of the UN and most other environmental organizations, Black Carbon (particulate matter, PM or “smoke”) along with CO₂ and methane are the largest climate change warming agents. The largest single contributor to uncontrolled Black Carbon release is open burning of biomass resulting in more than 35% of all Black Carbon in the world.

Getting rid of massive amounts of unwanted wood from forestry, agriculture, disaster recovery and land clearing operations by the use of air curtain burners by Air Burners is the most economical and most environmentally acceptable way. The bottom photo on the first page depicts a FireBox burning next to an open pile burn of biomass debris to underscore the contrast. The FireBox eliminates the wood waste faster with a minimum of smoke or particulate matter, also called Black Carbon, a serious climate changing forcing agent that contributes to the global premature melting of permafrost areas, including glaciers. Stopping Black Carbon now has a near immediate effect on reversing Global Warming, as Black Carbon resides in the atmosphere only weeks. CO₂ on the other hand has a lifetime of more than 100 years. Curbing it now is a good thing and must be done, but the benefits will be only for future generations a century away.

All CO₂ from wood combustion is Biogenic CO₂ and no additional Greenhouse Gas CO₂ is released. Residue includes Biochar and carbon ash which are land applied onsite enhancing soil conditions, making air curtain AG waste burning Carbon Negative.



S300



S200



S100



T24 BurnBoss®

Emissions from Open Pile Burning vs. Grinding & Land Applying vs. Air Curtain Burner			
Emissions in Lbs per Ton or Lbs per Acre of Vineyard Pruning Elimination			
<small>(Ref. San Joaquin Valley Unified Air Pollution Control District May 20, 2010 Revised July 21, 2010 “Cost Impacts of Alternatives to Burning”) https://www.valleyair.org/BurnPrograms/AgBurnRpts/8-VI-Costs&EconomicImpactsofAltoBurning.pdf</small>			
Vineyard Pruning Disposal (1t per acre)	NO _x	PM _{2.5}	VOC
Open Field Pile Burning (lbs/t)	5.20	7.3	5.2
Grind & Land-apply on Site (lbs/t)	6.20	0.20	0.40
Air Burners FireBox S220* (lbs/t)	1.40	0.55	0.93

Data based on 20 acre vineyard in San Joaquin Valley, CA; 1 bd (bone dry) ton per acre
 The criteria pollutants shown are the pollutants critical in California for Ground-level Ozone (“Smog”) mitigation.
 * Air Curtain Burner emissions factors (EF) applied are max. allowed emissions for Air Burners FireBoxes in SJV (Rule 2280 2019/2020).
 PM2.5/PM10 ratio per Australian/Victoria EPA FireBox Test, Act Waste Feasibility Study, 2016. Includes Excavator/Loader emissions.



Scan for Video

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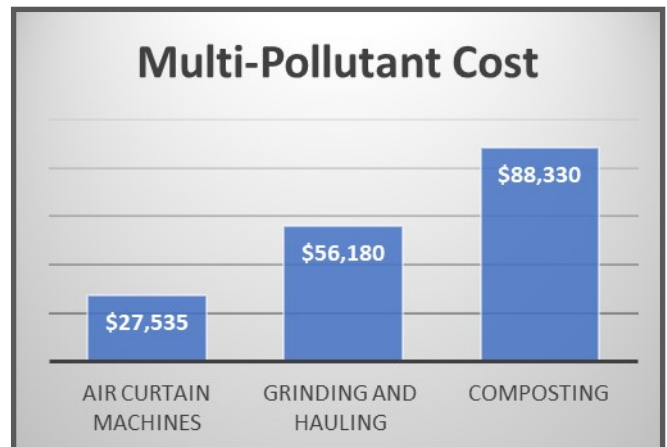
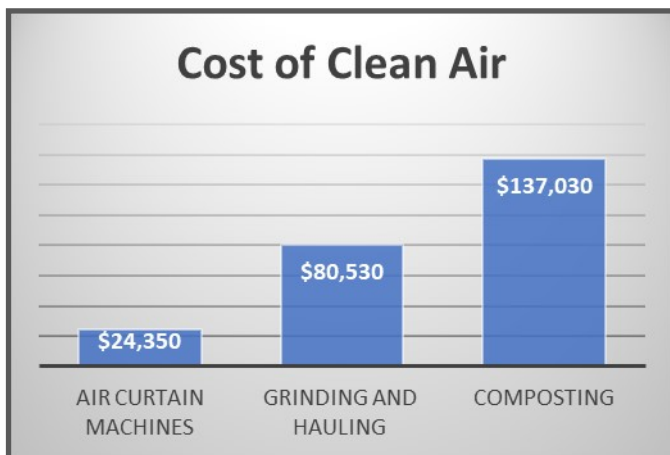


AIR CURTAIN BURNERS ARE RECOGNIZED AS THE BACT IN SAN JOAQUIN VALLEY DISTRICT FOR VEGETATIVE WASTE FROM AGRICULTURAL, FORESTRY AND LAND CLEARING

Air Burners, Inc. manufactures air curtain burners, also known as FireBoxes. They are the cleanest and least expensive way to provide an end-solution for unwanted wood waste. The FireBoxes are an air pollution control device that will allow the processing up to 13 tons an hour of wood waste with little to no smoke. For the past 25 years, Air Burners, Inc. supplied thousands of FireBoxes all over the world to help reduce costs and provide the cleanest way to reduce wood waste. This is compared to grinding and hauling, composting and, of course, open burning. Our FireBoxes have been tested by the USEPA, various air quality districts, and also by many industrial organizations all over the world. **San Joaquin Air Quality District ranks the air curtain burners as the (BACT) Best Available Control Technology to eliminate unwanted wood waste onsite.**

BACT is determined by looking at the cost, emissions and the technology that exist currently on the market. In addition to BACT the air curtain machines are the only viable option for processing vegetative waste with wires and stakes intermixed. Air Burners machines will provide an end-solution for the wood waste on site so there is no hauling involved. This will reduce emissions and overburdening of roadways from hauling the waste to landfills or other disposal sites. After the wood waste is processed in the air curtain machine ash and biochar are left over, which is a highly sought-after soil-amendment. Air Curtain machines will provide an end-solution for wood waste for **less than \$1 per ton**, compared to grinding and hauling which costs \$30+ per ton. The chips must then be disposed requiring a secondary process, causing more pollution and costs. Composting is another expensive option to reduce unwanted wood waste. With composting, it is necessary to chip the wood waste, turn over the vegetative waste rows day after day until the wood waste breaks down into a compost. Many issues are created from composting: spontaneous combustion from storage of chips and wood waste, methane from decay, leachate runoff, diesel and dust from machines constantly turning the windrows into compost. Please look at the comparisons below.

BACT Charts





Standard Air Curtain Machine



Roll-Off Type Air Curtain



Roll-Off FireBox Being Delivered



BurnBoss Working In The Vineyard



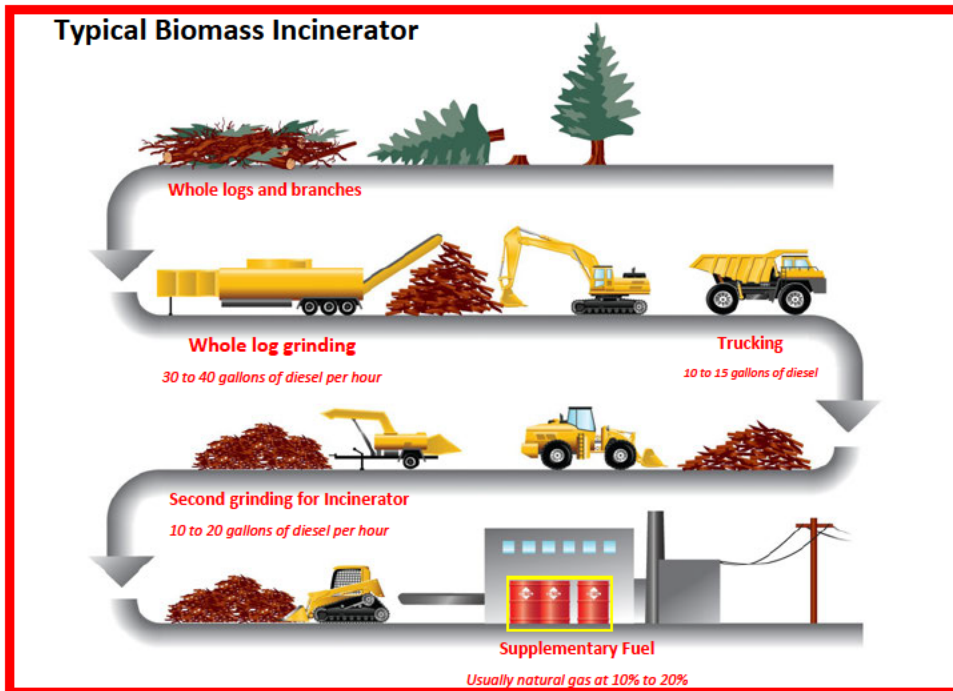
Towable FireBox, The "BurnBoss" T24

New ERA in Biomass Energy

The Old Way - Biomass plants are a viable option where available, however, they require grinding and chipping which is expensive and causes undue pollution. The chips must be transported to the biomass facility, diesel use is an added cost, damaging roads by hauling many miles (average round trip is 60 miles), plus all the time wasted in the process of making vegetative waste into chips. This results in the highest price fuel to support electrical production. **Old Way– Biomass energy sells for approximately \$0.22 per kWh (EIA)**

The New Way - Air Burners, Inc. has invested in new biomass energy technology eliminating grinding, eliminating secondary fuels, providing a portable solution for the unwanted wood waste. Air Burners, Inc. manufactures its Power Generation Units called PGFireBoxes® in the sizes of 100/ 500/ 1000-Kilowatt gross power for customers who would like to provide an end-solution for their vegetative waste and create green electricity as well. No permanent facilities are required for the PGFireBox system. The system is portable and can be relocated to an area that requires the removal of unwanted wood waste (like wildfire mitigation) and where the electric or thermal power could be utilized (like a saw mill and kiln).

New Way– Biomass energy sells for approximately \$0.03 per kWh (ABI)



The Old Way - Over 500 gallons of diesel fuel used per day to process material for incineration. Huge economic and environmental cost.



The New Way - No pre-processing is required, significantly reducing the environmental and economic cost.



Portable Biomass Energy Production
Complete system with portable cooling module



One Power Module Powering Three Air Curtain Machines and making Biochar

Air Curtain Machines have been proven time and time again to be the least expensive and cleanest way for the environment, to remove unwanted woody waste. Air Curtain Machines were recently being utilized for cleaning up Hurricane Michael in Florida, Hurricane Harvey in Texas, cleaning up the wildfires in California, and many other disasters and woody waste issues across the United States. Air Curtain Machines are the best tools for contractors, the government and farmers to help save money and assist in keeping the air we all breathe, clean.



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