Material Safety Data Sheet (MSDS)

Section 1 – Chemical Product and Company Identification

Product/Chemical Name: Fly Ash
Chemical Names/Synonyms: Coal Fly Ash
Manufacturer: RRI Energy
   Avon Lake Power Plant
   33570 Lake Road
   Avon Lake, Ohio 44012
General Information: 440-930-6459
Off-Hour Emergency Phone Number: 440-930-6459

Section 2 - Composition/Information on Ingredients

<table>
<thead>
<tr>
<th>Ingredient Name</th>
<th>CAS Number</th>
<th>Percentage by vol.</th>
<th>OSHA PEL ¹</th>
<th>ACGIH TLV ²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fly Ash</td>
<td>68131-74-8</td>
<td>100</td>
<td>15 mg/m³ (as total dust, PNOR)²</td>
<td>10 mg/m³ (as inhalable fraction, PNOS)⁴⁵</td>
</tr>
<tr>
<td>Silica (crystalline quartz)**</td>
<td>14808-60-7</td>
<td>Varies</td>
<td>10 mg/m³ (as respirable fraction)</td>
<td>0.025 mg/m³</td>
</tr>
<tr>
<td>Iron Oxide (dust)</td>
<td>1309-37-1</td>
<td>Varies</td>
<td>15 mg/m³ (as total dust, PNOR)</td>
<td>10 mg/m³ (as inhalable fraction, PNOS)</td>
</tr>
<tr>
<td>Barium</td>
<td>7440-39-3</td>
<td>0-1</td>
<td>0.5 mg/m³</td>
<td>0.5 mg/m³</td>
</tr>
</tbody>
</table>

Notes:
- * Percentage by vol. is a representative percent by volume for each ingredient in the total product.
- ** Total silicon dioxide reported as SiO₂. Silicon dioxide may be present in silicate, amorphous and crystalline (as quartz) forms. The regulatory listings above, PEL and TLV are for crystalline silica (as quartz). For silica, amorphous, including natural diatomaceous earth (112926-00-8) the OSHA PEL-TWA is 80 mg/m³ / %SiO₂.

Section 3 – Hazards Identification

Emergency Overview

CAUTION!

Fly Ash is a byproduct of the combustion of coal and is used for soil stabilization, an ingredient for cement, concrete and products made from concrete, filler in asphalt, and products used in construction.

May cause skin, eye and respiratory tract irritation. Avoid prolonged or repeated contact. Cancer Hazard. Observe good hygiene and safety practices when handling. If appropriate, respiratory protection and other personal protective equipment should be used. Potentially hazardous airborne particulate may be generated when disturbed and should be performed in well-ventilated areas.

Potential Health Effects

Primary Entry Routes: Excessive total particulate exposure may cause irritation to the eyes, skin and respiratory tract. Operations which generate high dust concentrations may result in the following effects if exposures exceed recommended limits as listed in Section 2

Target Organs: Respiratory system, skin, eyes

Acute Effects:
- Inhalation: Excessive exposures may cause irritation to nose, throat, lungs, and respiratory tract.
- Eye: Contact with eyes may cause moderate to severe irritation.
Section 3 – Hazards Identification (continued)

Acute Effects (continued):

- **Skin**: May cause mild to moderate irritation with prolonged or repeated contact. Irritation comes from both the abrasiveness and alkalinity of the fly ash. Chemical irritation may come from water becoming more alkaline from chemicals in the fly ash. In very rare instances the chemical irritation may lead to blistering.
- **Ingestion**: No known health effects.

Chronic Effects:

- **Inhalation**: Excessive and repeated exposures may cause benign lung changes associated with exposure to nuisances dust. Prolonged inhalation of silica dust may result in disabling pulmonary disorders, cough, dyspnea, and scarring of lung tissue (silicosis).
- **Eye**: Contact with eyes may cause moderate to severe irritation.
- **Skin**: May cause mild to moderate irritation with prolonged or repeated contact.
- **Ingestion**: No known health effects.

Chronic effects by component:

- **SILICA (Crystalline quartz)**: Inhalation of quartz is classified by IARC as a Group 1 Carcinogen, Carcinogenic to Humans. Chronic exposure can cause silicosis, a form of lung scarring that can cause shortness of breath, reduced lung function, and in severe cases, death.
- **IRON OXIDE**: Chronic inhalation of excessive concentrations of iron oxide fumes or dusts may result in the development of a benign pneumoconiosis, called siderosis, which is observable as an X-ray change. No physical impairment of lung function has been associated with siderosis. Inhalation of excessive concentrations of ferric oxide may enhance the risk of lung cancer development in workers exposed to pulmonary carcinogens. Iron oxide is listed as a Group 3 (not classifiable) carcinogen by IARC.
- **BARIUM**: The three stages of poisoning from soluble barium compounds are acute gastroenteritis, loss of reflexes with the onset of muscular paralysis, and progressive muscular paralysis. When ingested, barium compounds exert profound effects on all muscles, especially the heart. In addition, exposure to metallic barium may result in severe burns, through explosion and fire.

Carcinogenicity: IARC, NTP, and OSHA do not list Fly Ash as a carcinogen. However, IARC identifies crystalline silica as a Group 1, Carcinogenic to Humans. NTP identifies crystalline silica of respirable size as Known to be a Human Carcinogen.

Medical Conditions Aggravated by Long-Term Exposure: May adversely affect individuals with existing medical conditions such as chronic blood disorders (i.e. anemia), eye, skin, and respiratory disorders (i.e., asthma, chronic bronchitis, emphysema, etc.).

SARA Potential Hazard Categories: Immediate Acute Health Hazard; Delayed Chronic Health Hazard

Section 4 - First Aid Measures

**Inhalation**: Remove to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, give artificial respiration. Seek immediate medical attention.

**Eye Contact**: Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids open during this flushing with water. Seek immediate medical attention. Contact physician regardless of route of exposure.

**Skin Contact**: Remove contaminated clothing. Flush and wash affected areas with soap or mild detergent and water. Do not reuse clothing until laundered. If irritation persists, seek medical attention.

**Ingestion**: Do not induce vomiting. If conscious, have person drink plenty of water. Seek medical attention or contact poison control center immediately.

**Medical Conditions Aggravated by Long-Term Exposure**: Individuals with chronic respiratory disorders (i.e., asthma, chronic bronchitis, emphysema, etc.) may be adversely affected by any airborne particulate matter exposure.

**Notes to Physician**: Respiratory disease may be aggravated by exposure to dust. Treatment of overexposure should be directed at the control of symptoms and the clinical condition.

Section 5 – Fire and Explosion Hazard Information

- **Flash Point**: Not Determined
- **Flash Point Method**: Not Applicable
- **Burning Rate**: Not Determined
- **Flammability Classification**: Non-Combustible
- **Extinguishing Media**: Use extinguishing media appropriate for surrounding fire.
- **Unusual Fire or Explosion Hazards**: None Known.
- **Hazardous Combustion Products**: Above 1450º C decomposes to calcium oxide and sulfur dioxide.
- **Fire-Fighting Instructions**: Do not release runoff from fire control methods to sewers or waterways.
- **Fire-Fighting Equipment**: Wear a self-contained breathing apparatus (SCBA) with a full face-piece operated in pressure-demand or positive-pressure mode and full protective clothing.
Section 6 - Accidental Release Measures

Spill/Leak Procedures: Wear appropriate personal protective equipment as specified in Section 8. Contain and recover material when possible. Do not release into sewers or waterways. Contain material and follow normal clean-up procedures. Collect material in appropriate, labeled containers for recovery or disposal. Keep unnecessary people away. Isolate hazard area and deny entry. Stay upwind.

Regulatory Requirements: Follow applicable Federal, state, and local regulations.

Disposal: Follow applicable Federal, state, and local regulations.

Water Release: Keep out of water supplies and sewers.

Section 7 - Handling and Storage

Handling Precautions: Avoid inhalation or contact. Ventilate area of spill. Use vacuum or wet mop to clean up dust. Minimize dust generation or accumulation where ignition sources may occur.

Storage Requirements: Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from incompatible substances, heat or ignition sources.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use controls as appropriate to minimize exposure to dust and incompatible materials and heat during handling operations.

Ventilation: Provide general or local exhaust ventilation systems to minimize airborne concentrations. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen.

Protective Clothing/Equipment: Persons handling this product should wear appropriate wear resistant gloves/clothing and safety glasses with side shields, goggles or face shield to prevent skin and eye contact are required. Contact lenses should not be worn where industrial exposures to this material are likely. Wash skin that has been exposed with soap and water or waterless hand cleaner.

Section 9 - Physical and Chemical Properties

Physical State: Solid Powdery Material

Appearance and Odor: Light Brown/No Odor

Odor Threshold: No Data Supplied (ND)

Vapor Pressure: Not Applicable (NA)

Vapor Density (air = 1): NA

Molecular Formula: Varies

Molecular Weight: Varies

Density: No Information Found (NIF)

Specific Gravity (H₂O = 1): 1.06 – 1.14

pH (as shipped): NA

Water Solubility: NA

Other Solubilities: NA

Boiling Point: NA

Viscosity: NA

Refractive Index: NIF

Surface Tension: NIF

% Volatile: 1 - 3

Evaporation Rate (Butyl Acetate = 1): NA

Freezing Point: NIF

Melting Point: NIF

Section 10 - Stability and Reactivity

Stability: Fly Ash is stable under normal storage and handling conditions. Fly Ash may react with water, resulting in a slight release of heat, depending on the amount of lime (calcium oxide) present.

Polymerization: Hazard polymerization will not occur.

Chemical Incompatibilities: Fly ash is incompatible with acids, diazomethane, phosphorus, aluminum metal and strong oxidizing agents

Conditions to Avoid: Storage with incompatible materials.

Hazardous Decomposition Products: Decomposes to calcium oxide and sulfur dioxide above 1450º C. Slight exothermic reaction when water is mixed with fly ash.

Section 11 - Toxicological Information

The following information is available:

Acute Inhalation Effects: Acute toxicity of Fly Ash components may result primarily from irritation to nose, throat, lungs, and respiratory tract.

Acute Oral Effects: No Information Found

Other: No LC50 or LD50 has been established for Fly Ash, however, the following toxicity data has been determined for the components: Silica, Amorphous CAS 7631-86-9: LD50: 3,160 mg/kg (oral rat); Silica, crystalline quartz: NIF; Iron Oxide: NIF; Barium LD50: NIF
Section 11 - Toxicological Information

Skin Effects:
Skin contact may cause mild to moderate irritation with prolonged or repeated contact.

Chronic Effects: Refer to Section 3

Carcinogenicity: IARC lists Crystalline Silica as a Group 1 carcinogen. NTP lists Crystalline Silica of respirable size as known to be a human carcinogen.

Mutagenicity: No Information Found

Teratogenicity: No Information Found

Notes:
NIOSH, Registry of Toxic Effects of Chemical Substances (RTECS); (GF8285000) for additional toxicity data on fly ash; (VV7330000) for crystalline silica, quartz; (NO7400000) for iron oxide; and (CQ8370000) for barium

Section 12 - Ecological Information

Ecotoxicity: No Information Found (NIF). However, individual components of the product have been found to be toxic to the environment and may migrate into soil and groundwater and be ingested by wildlife.

Environmental Fate: NIF - This material is not expected to significantly bioaccumulate.

Environmental Degradation: NIF - This material is not expected to biodegrade significantly.

Soil Absorption/Mobility: NIF - However, individual components of the product have been found to be absorbed by plants from soil.

Aquatic Toxicity: NIF

Section 13 - Disposal Considerations

Disposal: Follow applicable Federal, state, and local regulations for disposal of solid waste accumulated during handling operations of the product.

Disposal Regulatory Requirements: Follow applicable Federal, state and local regulations.

Container Cleaning and Disposal: Follow applicable Federal, state and local regulations.

Section 14 - Transport Information

US Department of Transportation (DOT) Data (49 CFR 172.101):
Fly Ash is currently Not Listed as a hazardous substance under 49 CFR 172.101 DOT regulations

All Federal, state, and local laws and regulations that apply to the transport of this type of material must be adhered to.

Shipping Name: Not Applicable (NA)
Packaging Authorizations (173.***): a) Exceptions: NA
b) Non-bulk: NA
c) Bulk: NA

Hazard Class: NA

ID No.: NA

Vessel Stowage Location:
a) Vessel Stowage: NA
b) Other: NA

DOT/IMO Label: NA

Special Provisions (172.102): NA

The International Maritime Dangerous Goods (IMDG) and the Regulations Concerning the International Carriage of Dangerous Goods by Rail (RID) classification, packaging and shipping requirements follow the US DOT Hazardous Materials Regulation.

Section 15 - Regulatory Information

Regulatory Information: The following listing of regulations relating to an RRI Energy, Inc product may not be complete and should not be solely relied upon for all regulatory compliance responsibilities.

This product and/or its constituents are subject to the following regulations:

OSHA Regulations: OSHA has not established a substance-specific standard for occupational exposure to Fly Ash. However, exposures are regulated under OSHA, Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-2 & Z-3): The product as a whole is not listed. However, individual components of the product are listed: Crystalline silica, iron oxide, and barium (Refer to Section 2 for exposure limits)

EPA Regulations: Fly Ash is not listed as a whole. However, individual components of the product are listed for SARA 313, Refer to Section 313 Supplier Notification information below:

CAA: The product, Fly Ash as a whole, and individual components of the product are not listed.

CERCLA: The product, Fly Ash as a whole, and individual components of the product are not listed.

CWA: The product, Fly Ash as a whole, and individual components of the product are not listed.

RCRA: The product, Fly Ash as a whole, and individual components of the product are not listed.

SARA 311/312: Immediate Acute Health Hazard; Delayed Chronic Health Hazard

SARA 313: The product, Fly Ash as a whole is not listed. Barium is subject to SARA 313 reporting requirements. Please also note that if you prepackage or otherwise redistribute this product to industrial customers, SARA 313 requires that a notice be sent to those customers

TSCA: Product and components are listed.

SDWA: The product, Fly Ash as a whole is not listed. Barium is regulated under this act.
Section 15 - Regulatory Information (continued)

Regulation Key:

CAA Clean Air Act (42 USC Sec. 7412; 40 CFR Part 61 [As of: 8/18/06])
CERCLA Comprehensive Environmental Response, Compensation and Liability Act (42 USC secs. 9601(14), 9603(a); 40 CFR Sec. 302.4, Table 302.4, Table 302.4 and App. A)
CWA Clean Water Act (33 USC Secs. 1311; 1314(b), (c), (e), (g); 136(b), (c); 137(b), (c) [as of 8/2/06])
RCRA Resource Conservation Recovery Act (42 USC Sec. 6921; 40 CFR Part 261 App VIII)
SARA Superfund Amendments and Reauthorization Title III Section 302 Extremely Hazardous Substances (42 USC secs. 11023, 13106; 40 CFR Sec. 372.65) and Section 313 Toxic Chemicals (42 USC secs. 11023, 13106; 40 CFR Sec. 372.65 [as of 6/30/05])
TSCA Toxic Substance Control Act (15 U.S.C. ss/s 2601 et seq. [1976])
SDWA Safe Drinking Water Act (42 U.S.C. ss/s 300f et seq. [1974])

This information should be included in all MSDSs that are copied and distributed for this material.

State Regulations: The product, Fly Ash as a whole is not listed in any state regulations. However, individual components of the product are listed in various state regulations:

Pennsylvania: The product, Fly Ash as a whole is not listed. However, individual components of the product are listed.
- Hazardous Substances: Iron Oxide and Quartz
- Environmental Hazards: Barium
- Special Hazard Substances: None Listed

California Prop. 65: The product, Fly Ash as a whole is not listed. However, individual components of the product are listed. Silica-crystalline

New Jersey: The product, Fly Ash as a whole is not listed. However, individual components of the product are listed:
- Hazardous Substances: Barium, Iron Oxide, and Silica Quartz
- Special Hazard Substances: Silica Quartz

Massachusetts: The product, Fly Ash as a whole is not listed. However, Individual components of the product are listed. Barium, Silica (Crystalline, Quartz), and Iron Oxide

Other Regulations: The product, Fly Ash as a whole may not be listed in other regulations. However, individual components of the product may be listed, check appropriate regulations for further regulatory compliance.

WHMIS Classification (Canadian): This product is not classified, however the following ingredients are classified: Quartz: D2A, Barium: B6, D2B

WHMIS - Workplace Hazardous Materials Information System

Section 16 - Other Information

Prepared By: RRI, Energy
Revision History: Original

Hazardous Material Identification System (HMIS) Classification

<table>
<thead>
<tr>
<th>Health Hazard</th>
<th>Fire Hazard</th>
<th>Physical hazards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

HEALTH = 1, * Denotes possible chronic hazard if airborne dusts or fumes are generated irritation or minor reversible injury possible.
FIRE = 0, Materials that will not burn
PHYSICAL HAZARDS = 0, Materials that are normally stable, even under fire conditions, and will not react with water, polymerize, decompose, condense, or self-react. Non-explosives

ABBREVIATIONS/ACRONYMS:

ACGIH American Conference of Governmental Industrial Hygienists
BEIs Biological Exposure Indices
CAS Chemical Abstracts Service
CERCLA Comprehensive Environmental Response, Compensation, and Liability Act
CFR Code of Federal Regulations
CNS Central Nervous System
GI, GIT Gastro-Intestinal, Gastro-Intestinal Tract
HMIS Hazardous Materials Identification System
IARC International Agency for Research on Cancer
LC50 Median Lethal Concentration
LD50 Median Lethal Dose
LDLo Lowest Dose to have killed animals or humans

National Fire Protection Association (NFPA)

HEALTH = 1, Exposure could cause irritation but only minor residual injury even if no treatment is given.
FIRE = 0, Materials that will not burn
INSTABILITY = 0, Normally stable, even under fire exposure conditions, and are not reactive with water.

NIF No Information Found
NIOSH National Institute for Occupational Safety and Health
NTP National Toxicology Program
ORC Organization Resources Counselors
OSHA Occupational Safety and Health Administration
PEL Permissible Exposure Limit
PNOR Particulate Not Otherwise Regulated
PNOC Particulate Not Otherwise Classified
PPE Personal Protective Equipment
ppm parts per million
RCRA Resource Conservation and Recovery Act
RTECS Registry of Toxic Effects of Chemical Substances
### ABBREVIATIONS/ACRONYMS (continued):

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>LEL</td>
<td>Lower Explosive Limit</td>
</tr>
<tr>
<td>µg/m³</td>
<td>microgram per cubic meter of air</td>
</tr>
<tr>
<td>ng/m³</td>
<td>milligram per cubic meter of air</td>
</tr>
<tr>
<td>mppcf</td>
<td>million particles per cubic foot</td>
</tr>
<tr>
<td>MSDS</td>
<td>Material Safety Data Sheet</td>
</tr>
<tr>
<td>MSHA</td>
<td>Mine Safety and Health Administration</td>
</tr>
<tr>
<td>NFPA</td>
<td>National Fire Protection Association</td>
</tr>
<tr>
<td>SARA</td>
<td>Superfund Amendment and Reauthorization Act</td>
</tr>
<tr>
<td>SCBA</td>
<td>Self-contained Breathing Apparatus</td>
</tr>
<tr>
<td>STEL</td>
<td>Short-term Exposure Limit</td>
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<tr>
<td>TLV</td>
<td>Threshold Limit Value</td>
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<tr>
<td>TWA</td>
<td>Time-weighted Average</td>
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<tr>
<td>UEL</td>
<td>Upper Explosive Limit</td>
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