Bay Area Air Quality Management District

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San Francisco, California 94109

Staff Report

BAAQMD Regulation 12, Rule 13:
Foundry and Forging Operations

BAAQMD Regulation 6, Rule 4:
Metal Recycling and Shredding Operations

Amendments to Regulation 2, Rule 1:
Permits, General Requirements

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STAFF REPORT
Regulations: Metal Melting and Recycling Operations

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I. EXECUTIVE SUMMARY

The staff of the Bay Area Air Quality Management District (District or BAAQMD) is presenting three regulatory proposals for the consideration of the District Board of Directors for adoption: proposed new Regulation 12: Miscellaneous Standards of Performance, Rule 13: Foundry and Forging Operations (Rule 12-13); proposed new Regulation 6: Particulate Matter, Rule 4: Metal Recycling and Shredding Operations (Rule 6-4); and proposed amendments to District Regulation 2; Permits, Rule 1: General Requirements (Rule 2-1).

Foundries, forges, and metal recycling and shredding operations are sources of emissions of particulate matter (PM) (including metals that are listed as toxic air contaminants) and other pollutants. Foundries can also be sources of odorous substances from casting operations. Staff has evaluated these industrial sectors and determined that generally these facilities comply with current District rules and regulations and that some facilities must also comply with federal rules that set emission limits for toxic compounds. However, some of these facilities also raise concern with respect to PM emissions, particularly when in close proximity to residential areas (with most facilities being located within or near Community Air Risk Evaluation (CARE) program designated areas).[i] The fraction of a facility's overall PM emissions due to fugitive sources can be significant. The District has also received public complaints of odors from some facilities.

During this regulatory process, staff concluded that the most effective way to reduce emissions of PM and odorous substances would be to focus on fugitive emissions that are not fully addressed by existing regulations. Staff also concluded that the best way to reduce those emissions is through the implementation of measures and procedures that are specific to the unique design and operation of each facility. This would be accomplished through the development of facility-specific plans aimed at minimizing the fugitive emissions of these pollutants. These plans, called Emissions Minimization Plans, would be developed by the facility; released for public comment; and subject to District review, recommendations, and approval; and in the future, periodically updated.

Fugitive emissions of PM from foundries (metal melting and casting), forges (heat treatment of metal), and of metal recycling including shredding operations; and fugitive emissions of odorous substances from foundry operations are most likely to impact nearby residents and businesses. Adoption of these two proposed new rules would reduce these emissions from implementation of the elements in each

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[i] Under the Community Air Risk Evaluation (CARE) program, the District has identified six impacted communities in the Bay Area based on maps of toxic air emissions and sensitive populations, including Concord, eastern San Francisco, western Alameda County, Redwood City/East Palo Alto, Richmond/San Pablo, and San Jose. These six communities are deemed CARE areas.

plan. Each facility would propose the measures and procedures it would use to reduce these emissions and the District, after considering public comments on each plan, would make recommendations to the plan that consider the unique operation and configuration of each facility, the economic and technical feasibility of the recommended measures and any potential impacts to worker health and safety. Furthermore, the proposed rules would promote continuous improvement through periodic updates of the plans and through technology sharing inherent in the District review and approval of the plans. These proposals also avoid costly duplication of existing rules and standards by focusing on those fugitive emissions that are not already regulated or controlled.

Emissions of PM (both process emissions that are largely abated and fugitive emissions) from foundries and forges are estimated to be 213 tons per year (tpy).[ii] Of these, staff estimates fugitive emissions to be 129.4 tpy. Staff estimates that reductions of fugitive emissions due to the implementation of proposed Rule 12-13 would be about 13 tpy.

PM emissions from permitted equipment at metal recycling facilities are 5.7 tpy, but fugitive PM emissions are estimated to be considerably higher, 27.5 tpy (33.2 tpy total). Staff estimates that reductions of fugitive emissions due to the implementation of proposed Rule 6-4 would be 6.5 tpy.

Staff estimates the cost to develop and complete the review and approval of an Emissions Minimization Plan would range between $750 and $3000 if developed by facility personnel. The cost of implementation of the plans would vary and would be largely dependent on the equipment, measures and/or procedures each facility opted to include in their plans. Case studies indicate that the costs of implementation can vary between a one-time capital expenditure of $5000 to as much as almost $500,000 per year, annualized. However, because plans would be developed by each facility and the District would only make recommendations after assessing their economic feasibility, plan elements would be the most economical and effective options available to each facility. A socioeconomic analysis conducted for these proposals concluded that the proposals would result in:

- No anticipated employment impacts are due to implementation of these rules;
- No foreseeable regional indirect or induced impacts;
- No significant impacts to small businesses due to the flexibility of plan requirements.

[ii] Engineering analyses of two foundries indicate that fugitive emissions of PM ranged between 60 and 85 percent of the total (abated and fugitive) PM emissions. 60% has been used to estimate fugitive emissions from the remaining foundries subject to this rule. Emissions from permitted equipment are calculated from information reported to the District annually. The metal recycling facilities subject to this rule have few permitted equipment. The fugitive emissions from metal recycling facilities have been estimated from EPA emission factors used for similar processes.

Throughout the development of these proposals, staff has engaged in an extensive public consultation process. Staff has hosted numerous meetings, participated in many stakeholder-hosted meetings, held four workshops on the two initial draft proposals in June, 2011 and July 2012, and received and considered written comments from stakeholders.

Staff recommends the adoption of both new proposed District rules: Regulation 12, Rule 13: Foundry and Forging Operations and Regulation 6, Rule 4: Metal Recycling and Shredding Operations and proposed amendments to District Regulation 2, Rule 1: General Requirements, and adoption of a California Environmental Quality Act (CEQA) Negative Declaration for these new rules and amendments.

II. BACKGROUND

A. Source Description

This rulemaking addresses foundry and forging operations and metal recycling operations. Staff has identified approximately 20 facilities in the District that are considered foundries or forges. (Some of these facilities also contain metal recycling operations.) Foundries and forges process "ferrous" metals, "non-ferrous" metals or a combination of both. Ferrous metals and alloys are iron-based metals (have iron as the largest metal component). Non-ferrous metals and alloys are non-iron based metals and alloys, e.g.: aluminum (Al), copper (Cu), magnesium (Mg), zinc (Zn), brass, and bronze.[1]

Staff has identified over 100 facilities that conduct metal recycling operations and two facilities that conduct shredding of automobiles and other materials in the Bay Area. Metal recycling facilities collect, sort and recycle scrap metal collected from peddlers and scrap yards and other satellite facilities. Scrap metal includes ferrous metals (iron and steel products) and non-ferrous (mainly aluminum, copper, brass, and other metals). The scrap metal is often shredded and the various ferrous and non-ferrous metals are segregated from each other and from non-metallic materials.

B. Life Cycle of Metals

The facilities that would be regulated under the two proposals are integral components in the life cycle of metal products. There are four major phases in the metal life cycle:

1. Secondary Metal Production
2. Product Manufacture
3. Product Use / End Use
4. Collection, Recycling, and Refinement

1 Secondary Metal Production

Secondary metal production is unlike primary metal production or smelting, where metals are produced from ore. During secondary metal production, high grade metals and alloys are produced from refined scrap metals in a furnace. Secondary metal production occurs at foundries that operate a furnace to melt metals. Because secondary metal production typically uses recycled metals, production demands less energy than primary metal production and uses material that has been diverted from landfills and the landscape. Primary base metals can be used in the production of secondary metals when producing alloys or highly specified products, such as products with aerospace or military capabilities.

2 Product Manufacture

The next phase in the life cycle of metals is the product manufacturing stage. Here products are made from the metals produced at foundries and smelters. This includes the production of intermediary products such as sheet metal and ingots that are supplied to forges and other factories, such as automakers and appliance production facilities, to produce the items that are used by consumers and the construction industry.

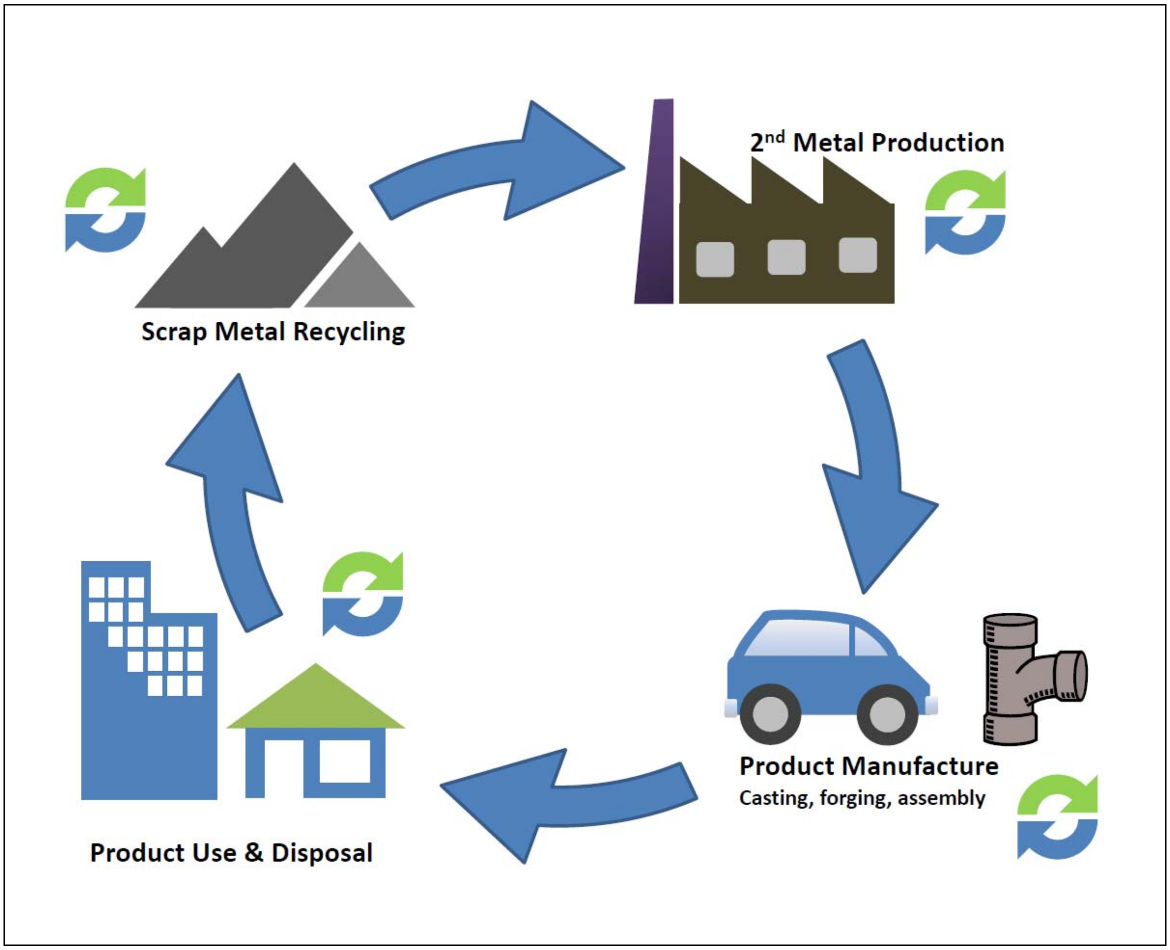
3 Product Use / End Use

Most products made of metal have a finite lifespan, after which the product reaches its “end-of-life.” The lifespan varies between products and within each type of product. Automobiles may last 10 to 20 years, while bridges and other engineering structures may last decades. The San Francisco Bay Bridge was completed in 1937. The eastern section of the Bay Bridge, which contains over one million tons of steel, was damaged during the 1989 Loma Prieta Earthquake and will soon be replaced by a new structure. The old super structure will be dismantled and scrapped.[2] Most metals contained in products in current use will be collected and recycled into new products by facilities subject to these proposed rules.

4 Collection, Recycling, and Refinement

The metals recycling industry annually diverts millions of tons of material that would otherwise be discarded in landfills. This results in both environmental and energy benefits as well as economic benefits. Because secondary metal production results in a reduction in the need for mining and smelting, less energy is used in the extraction and smelting of ore and less material is being added to landfills and littering the landscape. There is also an economic benefit. In 2010, 82 million tons of ferrous scrap and almost nine million tons of nonferrous scrap (aluminum, copper, lead, nickel, tin, zinc and others metals) were processed in the United States.[3, 4] It is estimated that approximately 700,000 automobiles and an unknown number of appliances are recycled by shredders in California each year producing approximately 1.1 million tons of recyclable scrap metal and 300,000 tons of waste.[5] Metals from end-of-life products, or "obsolete metals," include automobiles, steel structures, household appliances, railroad tracks, ships, farm equipment and other sources. Metals generated from industrial and manufacturing sources are called prompt metals. Prompt metals account for half of the ferrous scrap metal supply. 3 Figure 1 illustrates the metal life cycle.

Figure 1
The Life Cycle of Metals



C. Equipment Descriptions

1. Foundries and Furnaces

Foundries are metal melting operations that cast molten metals into a wide array of products, such as pipes, connectors, valves, engine parts, pump housings, ski lift and cable car castings. Foundries melt metal in furnaces using coke, electricity, or natural gas. Once the molten metal has the right properties, it is poured or “tapped” and transferred to molds in which the metal casting is formed into the shape of the final product. Foundries may operate one or more type(s) of furnaces, which include cupola, electric arc, reverberatory, sweat, and crucible.

Cupola Furnace

The cupola furnace is one of the oldest methods of making cast iron and is the most common furnace operating at iron and steel foundries for secondary steel production (steel made from scrap or ingots – not iron ore) in the District. A cupola is a cylindrical, water-cooled furnace that is lined with refractory brick made from heat resistant material such as aluminum oxide, magnesium oxide, silicon, or silicon carbide and is similar in appearance to a squat smoke stack. In the metal melting process, operators deposit layers of scrap iron or steel, coke and lime (used as flux) into the cupola near the top; this combination of materials is called the “charge.” Air, often preheated, is blown in to the bottom of the furnace through tuyeres (nozzles though which air blasts are routed into the furnace to provide oxygen) to improve the combustion and heating of the furnace.

Electric Arc Furnace

The electric arc furnace (EAF) is also used in secondary steel production. This furnace relies on electricity to heat and melt metal rather than a fuel such as coke or natural gas. The furnace is lined with refractory material and is usually water-cooled. The vessel is covered with a retractable roof through which typically three cylindrical, graphite electrodes descend into the furnace. When powered with a very strong electrical current, an electric arc forms between the charged metal and the electrode; the electrical arc that forms heats the metal to its melting point. Once the metal is molten and of the proper metallurgical properties, the electrodes are raised. The furnace is built on a tilting platform so that the liquid steel can be easily tapped. One facility in the Bay Area operates three EAFs.

Reverberatory Furnaces

The reverberatory furnace differs from a cupola furnace in that in a reverberatory furnace, the metal is isolated from contact with the fuel. Reverberatory furnaces rely on radiant and convective heating to melt the metal. These furnaces are not considered as energy-efficient as the cupola or electric arc furnaces. Reverberatory furnaces have historically been used for melting bronze, brass, and pig iron (an intermediate product of smelting iron ore with a high carbon content). In the Bay Area, these furnaces are used primarily for melting secondary aluminum, often from scrap.[6, 7]

The basic design of an aluminum reverberatory furnace is a simple steel box lined with refractory bricks with a flue at one end and a vertically-lifting door at the other. The temperature in the furnace allows the aluminum to melt while leaving solid other metals that have a higher melting point, such as iron. The floor of the furnace slopes slightly to separate the molten aluminum from the solid metals.[6]

Sweat Furnace

Sweat furnaces provides an effective and cost-effective means to separate non-ferrous metals, such as aluminum, from iron and/or steel. These units are also commonly known as dry hearth furnaces. Sweat furnaces heat, typically using natural gas, commingled recyclable metals to a temperature that causes the non-ferrous metals, such as aluminum, to melt and run off (i.e., "sweat") leaving behind steel and other materials that have a higher melting point .[8] The floor of the furnace is slightly inclined to allow the melted metal to flow and be directed to either a holding furnace or into molds.

Crucible Furnace

Crucible furnaces are one of the oldest and simplest types of melting unit used in the foundry. The furnaces use a refractory crucible which contains the metal charge. Crucibles and their covers are made of high temperature-resistant materials, usually porcelain, alumina or an inert metal. The charge is heated via conduction of heat through the walls of the crucible. The heating fuel is typically coke, oil, gas or electricity. Crucible melting is commonly used where small batches of low melting point alloy are required. The capital outlay of these furnaces makes them attractive to small non-ferrous foundries.

Crucible furnaces are typically classified according to the method of removing the metal from the crucible:

- Tilting furnace, in which the molten metal is transferred to the mold or ladle by mechanically tilting the crucible and furnace body.

- Lift-out furnace, in which the crucible and molten metal are removed from the furnace body for direct pouring into the mold.

- Bale-out furnace, in which the metal is ladled from the crucible to the mold.[9]

2. Forges and Ovens

Forges are metal processing operations where the metal is worked in the solid state. There are several types of forging: hot, warm, and cold. In hot forging, the metal is heated in a furnace above its recrystallization temperature – often to glowing, but not to a molten state. Forging makes metal more malleable, which makes it more amenable to shaping, stamping, or forming. Warm forging occurs between 30 and 100 percent of the metal's recrystallization temperature (on an absolute scale) while cold forging occurs below 30 percent of the recrystallization temperature, usually at ambient temperatures. Historically, these types of metalworking were performed by a blacksmith. Currently, industrial forging is done either with presses or hammers powered by compressed air, electricity, hydraulics or steam. The furnaces used in the forging process are heated with natural gas or electricity.[10]

Associated with forging of metal is the quenching process, in which the hot metal is rapidly cooled in a liquid (such as water or oil) or air cooled. Quenching retards crystallization and preserves various qualities in the metal that would be lost during a slow cooling process.[10]

D. Operations Associated with Foundries

In addition to the equipment that heats and melts metals, several other operations are associated with foundries to produce the end products. These operations include temporary mold and core making, metal casting, cooling, shakeout and sand reclamation. These operations contribute to the emissions of particulate matter and odors. Once metal is heated to become molten in a furnace, it is cast, the process of pouring molten metal into molds to create products such as pipes, engines, tools, pumps, toys, and a myriad of other products. Metal casting requires the making of molds into which the molten metal is poured. These molds must withstand the extreme heat from the molten metal and maintain their shape without collapsing until the metal has cooled and solidified. Once solid and properly cooled, the part can be extracted from the mold. In sand casting, separation of the cooled cast part from the spent mold and core assembly is called shakeout. After the part is separated, the spent sand / binder mixture is sent through a sand reclamation process.

1. Temporary Mold and Core Making and Metal Casting

Temporary molds are made from mixtures of refractory (heat resistant) sand and some type of binder. (There are also molds for permanent casting: centrifugal casting (for casting of pipes), die casting, and ingot and sow casting.)

Sand Mold and Core Making

Sand casting is one of the earliest techniques used in metal casting due to the simplicity and availability of materials used. In sand mold making, disposable mold and core assemblies are produced with a mixture of sand and an organic or inorganic binder. A mold forms the shape that the cast part is to take and cores are used to form internal spaces within the mold. A binder is mixed with sand so the mold and core shapes do not disintegrate when they come into contact with the molten metal. Organic binders, when vaporized by molten metal, can be the source of odor complaints about foundries. There are several general techniques used to produce molds and cores for sand casting: bake molding, no-bake and cold box molding, green sand molding, warm box molding, and hot box molding.

Bake Molding: With bake sand molding, a shell mold of the pattern is made by covering a heated metal pattern with a mixture of sand and a thermoset plastic binder, usually phenolic urethane. This action results in a thin layer of a sand and plastic mixture adhering to the pattern and some off-gassing of organic compounds also occurs. This skin of sand and plastic is removed from the pattern to form the "shell mold." The two halves of the shell mold are secured together in a flask – a container with only sides (no top or bottom) that forms a frame around the mold – and either a casting sand or green sand is poured around the outside of the shell to support it. Once the shell is secured, molten metal is poured in the shell to form the cast part. Contact with the hot molten metal results in vapor off-gassing. When the metal solidifies, the shell is broken and the molding materials recycled. This process can produce complex castings with good surface finish and excellent dimensional tolerance. A good surface finish and good size tolerance reduce the need for machining the part after casting. Shell molding offers better surface finish, better dimensional tolerances, and higher throughput due to reduced cycle times. The materials that can be used with this process include iron, and aluminum and copper alloys.[11]

No-Bake and Cold Box Molding: In the no bake and cold box techniques, sand is compacted around a master pattern – which is in the shape of the item to be cast – to form a mold cavity, which is sort of a negative of the master pattern and item to be cast. In order to obtain the desired properties for the binder, various solvents and additives are typically used with the reactive components of the binders to enhance the properties needed. This type of mold gets its name from not being baked in an oven like other sand mold types. Like bake casting, molds often form a two-part mold having a top and bottom that can be separated so that the master pattern can be removed.[1, 12, 13]

In the no-bake process, a liquid curing catalyst is mixed with the sand and binder before shaping the mixture in a pattern. This mixture is shaped by compacting it into a pattern and allowing it to cure until it is self-supporting.[12]

Cold box casting uses organic and inorganic binders that strengthen the mold by chemically adhering to the sand. In the cold-box process, a gaseous catalyst is permeated through a shaped mixture of the sand and binder. The gaseous catalyst cures the binder to form a hardened mold. The type of catalyst or co-reactant gas/vapor that is used depends upon the specific chemistry of the binder employed: epoxy-acrylic cold-box uses only sulfur dioxide. Urethane cold-box uses only tertiary amines; alkaline resole cold-box uses methyl formate or carbon dioxide; and sodium silicate cold-box uses carbon dioxide. This type of mold is not baked in an oven like other sand mold types. Because these types of mold making processes use no phenolic binders and are not heated, there is a much lower chance of emissions of odorous substances.[1,12,14]

Green Sand Molding: The most common method for metal casting uses green sand molding, which is considered no-bake casting. Green sand is a mixture of refractory (heat resistant) sand, starch and/or seacoal (pulverized coal), and water. It is call "green" because of the moisture content of the mixture and not due to any coloration. The addition of the hot molten metal causes the starch or coal to partially combust which results in the off-gassing of organic vapors.[11,15,16]

Warm Box Molding: Warm box molding is a recently developed system that produces cores using a furfuryl alcohol-based binder that cures using a latent (heat activated) catalyst. The catalysts are acidic solutions of various salts. The resin, catalyst and release agent are mixed with the sand to form a sand mix with a long shelf life. When used, the mix is blown into a pattern heated to between 300 to 450 °F. The latent heat of the pattern rapidly accelerates the cures of the resin in the sand mix to form an insoluble, infusible solid. The mold remains in the box long enough to develop adequate strength to be handled and is then ejected. Curing continues as the mold cools.[17]

Hot Box Molding: Hot box molding is a heat-cured process that produces cores using sand, either a phenolic resin or furfuryl alcohol based binder, and a latent catalyst. Typically hot box mold and core assemblies require higher curing temperatures than a warm-box process. The sand with the binder is blown (using air pressure) into a heated core box that is at a temperature between 445 and 550°F.[1]

2. Cooling

Once a metal part has been cast, it must be allowed to cool before it can be removed from the mold. The duration of cooling is dependent on the size and shape of the cast part. Parts with a large surface area will cool faster than parts with a smaller surface area. During cooling, emissions of volatile organic compounds (VOC) including odorous substances and particulate matter may occur.

3. Shakeout

Once the cast metal part cools sufficiently it has to be removed from a sand mold. The process of removing the cast part is called "shakeout." With an efficient shakeout, the mold is broken up, the castings and sand are separated, and mold lumps are reduced in size by shaking the cast part. To accomplish this, most modern foundries use a vibratory or rotary shakeout system.[18]

Vibratory Shakeout System

Vibratory decks are commonly used to perform the shakeout operation. The vibrating deck consists of a heavy-duty steel frame and a perforated grid on the frame's top face. The frame is isolated by springs from the vibrating grid. The action of the vibrating deck imparts high frequency vibrations to the mold to break down compacted sand. The continuing vibration usually is enough to remove the remaining adhering sand from the casting. [18]

Rotary Drum Shakeout System

A rotary shakeout consists of two concentric drums. The outer unit is supported on rollers and may be gear- or chain-driven, typically at three to eight revolutions per minute. The inner drum is perforated to allow sand to flow into the space between the two drums. This allows the sand and castings to be delivered to fixed points for separation.[18]

4. Thermal Sand Reclamation

Many foundries that cast metal parts with sand molds and cores recycle or reclaim the sand for reuse. A well-operated sand reclamation system can achieve reclamation rates of well over 90 percent. The spent sand is heated to over 1350^{o}F in a fluid calcining bed to burn off the organic binding agent, before being cooled and pneumatically scrubbed to remove remaining clay, binder and metal fines. The exhaust from the reclaimer is usually routed to control devices, typically an afterburner and a baghouse. Reclamation greatly reduces waste and there is usually little to no loss of quality in the reclaimed sand. The reclaimed sand can be mixed with a binder and used for subsequent core or mold making.[19]

5. Permanent Mold Casting

There are three primary types of metal casting that use permanent molds: die casting, centrifugal casting, and gravity casting. Unlike sand casting, in which the mold is destroyed with each casting, permanent mold casts are used for multiple castings of the same product.[20]

Die Casting

Die casting is used to produce small to medium-sized castings at high production rates. Metal molds are coated with a mold release coating and preheated before molten metal is injected into it. Premeasured amounts of molten metal are forced from a shot chamber into the permanent mold or die under extreme pressure (1,450 to 30,500 pounds per square inch). This allows for high production rates.[21, 22]

Castings of varying weights and sizes can be produced. Nearly all die castings are produced from nonferrous alloys (aluminum, zinc and copper alloys), with limited amounts of cast iron and steel castings produced in special applications. The die casting process is suitable for a wide variety of applications for which high volume production is needed. Die casting provides excellent mechanical properties, surface finish, precise dimensional tolerances and can produce thin-section castings.[22]

Centrifugal Casting

In centrifugal casting, a permanent mold is rotated about its axis at high speeds (300 to 3000 revolutions per minute) as the molten metal is poured. The molten metal is centrifugally thrown towards the inner mold wall, where it solidifies while cooling. Typical materials that can be cast with this process are iron, steel, stainless steels, and alloys of aluminum, copper and nickel. Typical parts made by this process are pipes, boilers, pressure vessels, flywheels, cylinder liners and other parts that are symmetric around an axis.[23]

Ingot, Pigs and Sow Casting

Many foundry operations produce metals and alloys for raw materials in other metal melting operations. In these operations, the metal is usually made into ingots, pigs, or sows, which are masses of metal shaped for convenient transport and storage, such as in rectangular bars or blocks. The three terms, ingot, pig and sow, are often used interchangeably and the difference between them depends greatly on the context and the speaker. Ingots are typically the smallest of the three often weighing up to 20 pounds; pigs are usually larger than ingots and smaller than sows; and sows can weigh well over a ton. Ingots, pigs and sows are produced using the mold chill method. In mold chill, a permanent mold is cooled using a water spray or an internal cooling system. Once molten metal is poured into the mold it cools and contracts, which causes it to pull away from the surface of the mold. The molds are usually arranged in a continuous loop conveyor system that continuously fills the molds with molten metal and sprays them with water to cool after the ingots are ejected.

E. Metal Recycling and Shredding Operations

There are various scrap handlers and metal recycling operations in the Bay Area that range from a few tons throughput per year to thousands of tons of crushed or shredded metal per year, often with satellite feeder facilities. Sources of scrap metal are as varied as metallic products themselves; however, the majority of scrap metal comes from automobiles, demolitions (buildings, construction sites, even the Bay and Carquinez Straits Bridges), manufacturing, wiring, and miscellany (cans, appliances and other consumer products). The majority of metals recycled are steel and other ferrous metal alloys, aluminum, and copper and copper alloys, such as brass and bronze, although precious metals are also recycled.

1. Receiving Scrap

Recycling businesses buy scrap metal from companies, public agencies and individuals. Upon arrival at the facility, the operator weighs the metal and sometimes scans it for radioactive materials. The load of scrap metal is inspected to minimize the presence of unacceptable substances such as wood, paper, dirt, rocks, glass and free liquids. Loads of scrap with more than residual amounts of these materials are not accepted. Other substances that may contaminate scrap metal include other metals, insulation, plastics, paints, and oils. Staff at these facilities is trained to recognize types of metals and alloys on sight. When there is doubt, the metal can be analyzed with hand-held spectrometers that provide accurate composition.

2. Depollution Process and Crushing

According to the California Metals Discards Act, vehicles and appliances must be depolluted before it can be further processed as scrap. Depollution involves the safe removal of “materials that require special handling” which include such materials as unspent sodium azide canisters; encapsulated polychlorinated biphenyls (PCBs) and metal encased capacitors; chlorofluorocarbon (CFC), hydrochlorofluorocarbon (HCFC) and other refrigerants from air-conditioning and refrigeration units; oil; mercury switches and temperature control devices; and other materials regulated as hazardous wastes. Facilities that conduct depollution activities must be certified by the California Department of Toxic Substances Control (DTSC). [24]

Once scrapped vehicles and appliances are properly depolluted, they are often crushed onsite in a large crusher to reduce their volume to make transportation easier. Crushers are basically large-scale compactors and can be of two types: "pancake," where scrap material (vehicle or appliance) is flattened by a descending hydraulically powered plate, or a baling type press, in which the scrap material is compressed from several directions into a large cube. Car crushers can be stationary or mobile.

3. Sizing and Sorting

Once the scrap has been inspected and depolluted it is sized and sorted. The sizing of the scrap is dependent on the facility, but metals are segregated by metal type, ferrous metal and alloys and non-ferrous metals and alloys. Ferrous metals can be separated from non-ferrous metals using magnets.

4. Auto and Metal Shredding

Only two recycling facilities in the Bay Area operate auto shredders. Once an end-of-life vehicle or appliance has gone through a depollution process, it is sent to a shredding and sorting operation which can be recycled in foundry processes. An auto shredder is a combination of a hammer mill – a machine that cuts and crushes cars, appliances, and other scrap metal – and screens to size the shredded materials into fist-sized scraps of metal. Water injection is used during the operation to minimize dust emissions and also to help reduce the potential for fires because the metals heat significantly due to friction and stress and the presence of residual organics. The shredding of automobiles results in a mixture of ferrous metal and non-ferrous metal, and shredder wastes. Once shredded, the ferrous metal is segregated magnetically from the mixture of non-ferrous metals and shredder waste also known as shredder residue or "fluff." This mixture can be further separated using air streams and screens to separate the lighter fluff from the heavier material containing metal.[25]

Scrap that has been properly sized and sorted is often sold and sent to foundries in the vicinity or shipped out of the Bay Area. At one Bay Area facility, aluminum scrap is charged to furnaces onsite to produce reclaimed metal that may be used as feed stock in other metal-melting processes.

5. Shredder Residue ("Fluff")

Shredder residue and scrap metal contaminated with shredder residue are of concern because shredder residue is a source of PM and can be contaminated with toxic metals (lead, mercury, arsenic) and other toxic compounds such as sodium azide and PCBs.[24, 25] Shredder residue or "fluff" is a by-product of scrap metal recycling and is generated at large-scale metal recycling facilities that operate shredders and hammermills.. Shredder residue can also be found at large-scale regional collection sites of scrap metals. Shredder residue is the material that remains after scrapped items, such as automobiles and appliances, are shredded.. There are two Bay Area facilities that operate shedders and one that receives shredder residue. These facilities all collect scrap metals from others scrap yards as far away as Nevada and Arizona. Shredder residue compositions varies; but it is generally a mixture of plastic, vinyl, leather, cloth, sponge, foam, glass and other metallic material. In addition, trace amounts of lead, copper, cadmium, chromium, zinc, and mercury may be present, along with organic compounds, such as oil, antifreeze, transmission and brake fluids, and polychlorinated biphenyls (PCBs).[5, 25] Further, the scrap metal used as charge in the furnaces at many of the Bay Area's steel foundries most often contains some amount of shredder residue contamination.

F. Regulatory History

Metal melting and processing facilities in the Bay Area are subject to many air pollution control regulations, which largely depend on the types of metals processed and the pollutants emitted. Included in these regulations are District rules, a State airborne toxic control measure (ATCM), and at least five national emissions standards for hazardous air pollutants (NESHAP) promulgated by US Environmental Protection Agency (EPA).

1. District Regulations

The District currently regulates metal melting and processing facilities under the following rules:

- Regulation 1: General Provisions & Definitions;
- Regulation 2, Rule 1: General Requirements;
- Regulation 2, Rule 2: New Source Review;
- Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants;
- Regulation 2, Rule 6: Major Facility Review;
- Regulation 6, Rule 1: Particulate Matter General Requirements;
- Regulation 7: Odorous Substances; and
- Regulation 11, Rule 15: Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting.

Regulation 1: General Provisions and Definitions

The provisions and definitions in this regulation are applicable to all District Regulations and are in addition to the provisions and definitions in individual rules and regulations. Regulation 1 includes sections on nuisance, exclusions, breakdown procedures, definitions, right-of-access, sampling, and records maintenance.

Regulation 2, Rule 1: General Requirements

Regulation 2, Rule 1 includes criteria for issuance or denial of permits, exemptions, and appeals. Under the general requirements, any facility that operates equipment that causes or reduces air pollutants must have a permit to operate that provides details on how the equipment is to be operated and/or the levels to which the emissions are to be mitigated.

Regulation 2, Rule 2: New Source Review

Regulation 2, Rule 2 (Rule 2-2) applies to new or modified sources. Rule 2-2 contains requirements for Best Available Control Technology (BACT) and emission offsets. Rule 2-2 also implements federal New Source Review and Prevention of Significant Deterioration requirements. Any metal melting and processing facility that installs a new source or modifies an existing source of air pollutants that emits ten pounds per day of any criteria pollutant must obtain permits under this rule and install District-approved BACT.

Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants

Regulation 2, Rule 5 requires preconstruction permit review for new and modified sources of toxic air contaminants; contains project health risk limits; and imposes requirements for Toxics Best Available Control Technology (TBACT). Any metal melting and processing facility that installs a new source or modifies an existing source of toxic air pollutants must install District-approved TBACT.

Regulation 2, Rule 6: Major Facility Review

Regulation 2, Rule 6 establishes procedures for large facilities to obtain federal Title V permits.[iii] This rule applies to any metal melting and processing facility that is major source or operates under a Synthetic Minor Operating Permit. A major source emits 100 tons per year of any regulated pollutant or 10 tons per year of any hazardous (toxic) pollutant or 25 tons per year of all toxic pollutants. A Synthetic Minor Operating Permit limits production to keep facilities from emitting pollutants at levels that would trigger Title V permit requirements.

Regulation 6, Rule 1: Particulate Matter General Requirements

Regulation 6, Rule 1 limits the quantity of particulate matter in the atmosphere by controlling emission rates, concentration, visible emissions and opacity.

Regulation 7: Odorous Substances.

Regulation 7 establishes general limitations on odorous substances based on complaints and specific emission limitations on certain odorous compounds. Compounds with specific emissions limits regulated under Regulation 7 include dimethylsulfide, ammonia, mercaptans, phenols, and trimethylamine.

Regulation 11, Rule 15: Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting

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[iii] Title V operating permits are federally-enforceable permits issued by the District as required by the 1990 federal Clean Air Act amendments, and in accordance with District Regulation 2, Rule 6: Major Facility Review. Title V permits are required for "major facilities" that have the potential to emit regulated air pollutants or hazardous air pollutants above specific thresholds. Title V permits list every federally-enforceable air pollution requirement applicable at a major facility, including BAAQMD rules that have been incorporated into the state implementation plan (SIP) and include either a certification of compliance with these requirements or a schedule to comply. Title V permits must be renewed every five years, and renewals, as well as original permits, are subject to public notice requirements and EPA review.

Airborne Toxic Control Measures (ATCMs) are adopted by the California Air Resources Board (ARB) and are applicable throughout California. The Non-Ferrous Metal Melting ATCM applies to facilities that melt non-ferrous metals such as aluminum, copper, zinc, lead, cadmium, arsenic and their alloys.[iv] The ATCM limits emissions of PM and dust. The ATCM contains emission standards, equipment and operating requirements and specifications. All emission points equipped with an emission collection system must meet the specifications of the "Industrial Ventilation, Manual of Recommended Practices," 20th Edition, 1988. The District adopted the ATCM by reference as Regulation 11, Rule 15 on April 6, 1994.

Under this rule, any particulate matter control device must achieve a control effectiveness of at least 99 percent along with specific operating conditions. Further, the ATCM prohibits visible emissions that exceed an opacity limit of ten percent for three minutes or longer in any hour.

2. California Air Toxic "Hot Spots" Program

The District also implements the California Air Toxic "Hot Spots" Program (AB2588). This program identifies facilities that emit toxic air contaminants, prioritizes them, assesses the health risk, notifies local populations, and requires risk reduction.

3. Federal MACT Standards Affecting Foundries

Federal Maximum Achievable Control Technology (MACT) Standards are set by the EPA to control emissions of hazardous air pollutants (HAP). Hazardous air pollutants are 187 compounds that have been determined by the US EPA to be toxic. The following five MACT Standards affect 22 Bay Area facilities that hold District permits. These five regulations are:

- The National Emission Standard for Hazardous Air Pollutants (NESHAP) for Iron and Steel Foundries: 40 CFR Part 63, Subpart EEEEE (E5);
- NESHAP for Secondary Aluminum Production: 40 CFR Part 63, Subpart RRR (R3);
- NESHAP for Electric Arc Furnace Steelmaking Facilities: 40 CFR Part 63, Subpart YYYYY (Y5);
- NESHAP for Iron and Steel Foundries: 40 CFR Part 63, Subpart ZZZZZ (Z5); and
- NESHAP for Aluminum, Copper, and Other Nonferrous Foundries: 40 CFR Part 63, Subpart ZZZZZZ (Z6).

[iv] Although the ATCM regulates facilities that melt lead, cadmium, or arsenic, there are no such facilities in the Bay Area.

NESHAP for Iron and Steel Foundries, 40 CFR Part 63, Subpart EEEEE

The NESHAP for Iron and Steel Foundries (40 CFR Part 63, Subpart EEEEE (E5)) was originally promulgated in April 2004 and was amended in May 2005 and again in February 2008. It affects iron and steel foundries (NAICS Code numbers 331511, 331512, 331513) that are major sources of hazardous air pollutant (HAP) emissions. A major source is a facility with the potential to emit a total of ten tons per year of a single HAP or 25 tons per year of a combination of HAPs. E5 addresses emissions from metal melting furnaces, including EAF, electric induction furnaces, and cupola furnaces; scrap preheaters; pouring areas and stations; automated conveyor and pallet cooling lines; automated shakeout lines that use a sand mold system; and mold and core-making lines. This MACT standard also covers visible emissions from foundry sources and buildings. Two metal melting and processing facilities in the District are subject to this NESHAP, AB&I and US Pipe. Tables 1 and 2 present summaries of the main emission limits and standards contained in this NESHAP for both existing and new sources.[26]

Table 1
EEEEE Existing Iron and Steel Foundries

Source	Requirements / Standards
Electric arc furnace, Electric induction furnace Scrap preheater	0.005 grains of PM per dry standard cubic foot (gr/dscf), or 0.0004 gr/dscf of total metal HAP
Cupola furnace	0.006 gr/dscf of PM, or 0.10 pound of PM per ton (lb/ton) of metal charged, or 0.0005 gr/dscf of total metal HAP, or 0.008 lb of total metal HAP per ton of metal charged, <u>AND</u> 20 ppmv of volatile organic HAPs (VOHAP)
Pouring area /station	0.010 gr/dscf of PM, or 0.0008 gr/dscf of total metal HAP
Scrap preheater (in lieu of works practice standards – See below)	20 ppmv of VOHAP
Visible emissions	20 percent (6-minute average), except for one 6-minute average per hour that does not exceed 27 percent opacity

Table 2
EEEEE New Iron and Steel Foundries

Source	Requirements / Standards
Cupola furnace	0.002 gr/dscf of PM, or 0.0002 gr/dscf of total metal HAP, <u>AND</u> 20 ppmv of VOHAP
Electric arc furnace	0.002 gr/dscf of PM, or 0.0002 gr/dscf of total metal HAP
Electric induction furnace Scrap preheater	0.001 gr/dscf of PM, or 0.00008 gr/dscf of total metal HAP
Pouring area station	0.002 gr/dscf of PM, or 0.0002 gr/dscf of total metal HAP
Scrap preheater (in lieu of works practice standards – See below)	20 ppmv of VOHAP
Visible emissions	20 percent opacity (6-minute average), except for one 6-minute average per hour that does not exceed 27 percent opacity

<u>Work Practice Standards of E5:</u>

Metallic Scrap Management Program:

1. <u>Restricted metallic scrap</u>: E5 requires affected facilities to prepare and operate according to a written acceptance and use policy for the metal ingots, pig iron, slitter, or other materials that do not include recycle scrap metal from automotive body scrap, engine blocks, and oil filters, oily turnings, lead components, chlorinated plastics, or free liquids.
2. <u>General iron and steel scrap</u>: E5 also requires facilities to prepare and operate according to a written acceptance and use policy for iron and steel scrap metal that has been depleted (to the extent practicable) of organics and toxic metals in the charge materials used by the foundry.

Mercury Requirements:

1. <u>Site-specific plan for mercury switches</u>: E5 requires affected facilities to:
   i. Include a requirement in the scrap acceptance policy for removal of mercury switches from vehicle bodies used to make the scrap;
   ii. Prepare and operate according to a plan demonstrating how the facility will implement the scrap specification for removal of mercury switches.

NESHAP for Secondary Aluminum Production: 40 CFR Part 63, Subpart RRR (R3)

The NESHAP for Secondary Aluminum Production (40 CFR Part 63, Subpart RRR (R3)) was promulgated in March 2000 and was amended in December

2002 and again in December 2005. This MACT standard affects new and existing sources at secondary aluminum production facilities with the following NAICS Code numbers: 331312, 331314, 331315, 331316, 331319, 331521, and 331524. R3 regulates emissions of PM, total hydrocarbons (THC), and hydrochloric acid (HCl) from the following sources: aluminum scrap shredders, thermal chip dryers, scrap dryers, delacquering or decoating kilns, group 2 (i.e., processing clean charge only and no reactive fluxing) furnaces, sweat furnaces, dross-only furnaces, and rotary dross coolers. R3 also limits emissions of dioxin and furans (D/F) from thermal chip dryers, scrap dryers, delacquering /decorating kilns, and sweat furnaces; and from secondary aluminum processing units from area source[v] facilities. At least nine metal melting and processing facilities in the District are subject to this NESHAP, including CASS and a number of smaller facilities; ECS Refining, California Casting, Metech Recycling, Roto Metals, Tomra Pacific, J & B Enterprises, Kearney Pattern Works and Foundry, and Castco.

Table 3 presents summaries of the main emission limits and standards contained in R3. [27]

Table 3
RRR Secondary Aluminum Foundries

Source	Requirements / Standards
Sweat furnace	$3.5x10^{-10}$ gr of D/F toxic equivalents (TEQ) per dscf @ 11 percent O_2 (no opacity standard)
Dross-only furnace	0.30 lb of PM per ton of feed/charge 10% opacity from any PM add-on control device
Scrap dryer/delacquering kiln/decoating kiln (major source)	0.06 lb of THC, as propane, per ton of feed/charge 0.08 lb PM per ton of feed/charge 3.5×10^{-6} gr of D/F TEQ per ton of feed/charge 0.80 lb HCl per ton of feed/charge 10% opacity from any PM add-on control device
Scrap dryer/delacquering kiln/decoating kiln (Alt. limits if equipped with afterburner)	0.20 lb of THC, as propane, per ton of feed/charge 0.30 lb per ton of feed/charge 7.0×10^{-5}gr of D/F TEQ per ton of feed/charge 1.50 lb HCl per ton of feed/charge 10% opacity from any PM add-on control device
Aluminum scrap shredder	0.010 gr/dscf of PM 10% opacity from any PM add-on control device
Thermal chip dryer	0.80 lb of THC, as propane, per ton of feed/charge 3.5×10^{-5} gr of D/F TEQ per ton of feed/charge (no opacity standard)

[v] Area sources are defined by EPA as sources that emit less than 10 tons of a single hazardous air pollutant (HAP) or less than 25 tons of a combination of HAPs annually.

NESHAP for Electric Arc Furnace Steelmaking Facilities: 40 CFR Part 63, Subpart YYYYY

The NESHAP for Electric Arc Furnace Steelmaking Facilities: 40 CFR Part 63, Subpart YYYYY (Y5) was promulgated on December 28, 2007, and addresses emissions from area source steelmaking facilities using electric arc furnaces (EAF). PM emissions from charging, melting, and tapping operations must be collected and controlled. The Y5 requirements are additional to those of other NESHAPs that affect ferrous metal melting operations. This MACT standard has requirements for large and small facilities. Under this rule, a large facility is defined as having a production rate of at least 150,000 tons per year of stainless or specialty steel. A small facility produces less than 150,000 tons of steel annually. At least five metal melting and processing facilities in the District are subject to this NESHAP, including Pacific Steel Castings, Western Forge and Flange Company, Steve Zappetini & Son Inc, Stoltz Metals Inc, and Almaden Welding.

Table 4 presents summaries of the main emission limits and standards contained in Y5. [28]

Table 4
YYYYY Electric Arc Furnaces

Pollutant	Limits
PM	0.0052 gr/dscf (if less than 150,000 tons/yr: 0.8 lb/ton of steel or 0.0052 gr/dscf)
Visible emissions (VE)	6 percent opacity

NESHAP for Iron and Steel Foundries: 40 CFR Part 63, Subpart ZZZZZ

The NESHAP for Iron and Steel Foundries: 40 CFR Part 63, Subpart ZZZZZ (Z5) was promulgated January 2, 2008, and affects all area source iron and steel foundries. This MACT standard has requirements for large and small facilities that are non-major sources. There are different criteria defining large and small facilities, depending on whether the facility is new or existing. A large, existing facility is defined as one with a production rate of at least 20,000 tons per year of stainless or specialty steel. A small, existing facility produces less than 20,000 tons of steel annually. For new facilities, a large facility produces at least 10,000 tons annually and a small facility, less than 10,000 tons. This regulation affects at least three metal melting and processing facilities in the District, including PSC, PCC Structurals, and Ridge Foundry.

Table 5 presents summaries of the main emission limits and standards contained in Z5. [29]

Table 5
ZZZZZ Iron and Steel Foundries

Source	Limits
Furnace (Existing)	0.8 lb PM per ton or 0.06 lb of total metal HAP per ton of metal charged
Furnace (New)	0.1 lb PM per ton or 0.008 lb of total metal HAP per ton of metal charged
Visible emissions (VE)	20% opacity except for one 6-min avg/hour at 30%

NESHAP for Area Source Aluminum, Copper, and Other Nonferrous Foundries: 40 CFR Part 63, Subpart ZZZZZZ

The NESHAP for Area Source Aluminum, Copper, and Other Nonferrous Foundries: 40 CFR Part 63, Subpart ZZZZZZ (Z6) was promulgated on June 25, 2009 and addresses emissions of HAPs from area source aluminum, copper and other nonferrous foundries (NAICS Codes: 331524, 331525, and 331528). Under this MACT standard, an affected area source:

1. Emits less than 10 tons per year of a single HAP or less than 25 tons of any combination of HAPs;
2. Has an annual metal melt production of 600 tons or more; and
3. Uses material that contains, as appropriate:
    - Aluminum foundry HAP: any material containing beryllium, cadmium, lead, or nickel in amounts greater than or equal to 0.1 percent by weight or manganese greater than or equal to 1.0 percent by weight;
    - Copper foundry HAP: any material containing lead or nickel in amounts greater than or equal to 0.1 percent by weight or containing manganese greater than or equal to 1.0 percent by weight; or
    - Other nonferrous foundry HAP: any material containing chromium, lead, or nickel in amounts greater than or equal to 0.1 percent by weight.

At least two metal melting and processing facilities in the District are subject to this NESHAP: Kearney Pattern Works and Foundry, Inc. and Castco.

Table 6 presents summaries of the main emission limits and standards contained in Z6. [30]

Table 6
Non-ferrous Metal Foundries

Source	PM Limits
Existing large foundry	95% control efficiency or 0.015 gr/dscf
New large foundry	99% control efficiency or 0.010 gr/dscf

4. Federal Air Quality Regulations Affecting Metal Recyclers

Solvent Cleaning (degreasers), 40 CFR Part 63 Subpart T, The National Emission Standards for Hazardous Air Pollutants regulates Halogenated Solvent Cleaning. This applies to any halogenated solvent cleaning machine which uses solvent containing methylene chloride, perchloroethylene, trichloroethylene, 1,1,1-trichloroethane, carbon tetrachloride, or chloroform, or any combination of these halogenated HAP solvents, in a total concentration greater than five percent by weight, as a cleaning or drying agent. Cleaning machines with a capacity of less than two gallons are exempt from the NESHAP. Auto recyclers sometimes use solvent degreasers to clean metal prior to resale.

Refrigerant Reclamation, 40 CFR Part 82 Subpart F addresses refrigerant recycling. This regulation requires that refrigerants be reclaimed before dismantling vehicles, refrigerants only be sold to certified dealers, and recovered refrigerants be properly labeled. This regulation does allow the use of the refrigerant in other cars owned by the dismantler. This regulation is based on Title VI of the 1990 Clean Air Act, Section 608.

5. Other Environmental Regulations Affecting Metal Recyclers

Metal recycling facilities are governed by several environmental regulations. These regulations include: the federal Resource Conservation and Recovery Act (RCRA) and the Metallic Discards Act (MDA), both enforced by DTSC via Certified Unified Program Agencies (CUPAs); and the National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements, enforced by the regional water quality control board, San Francisco Bay Area Region.

Federal Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA) 42 U.S.C. §6901 et seq. gives the EPA the authority to control hazardous waste from the "cradle-to-grave." This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. RCRA also set forth a framework for the management of non-hazardous solid wastes. The 1986 amendments to RCRA enabled EPA to address environmental problems that could result from underground tanks storing petroleum and other hazardous substances.

Metallic Discards Act

The Metallic Discards Act (MDA) is a California law that requires metal to be diverted from landfills for resource recovery and regulates any hazardous material released or removed from "metal discards" prior to crushing for transport or transferring to a baler or shredder for recycling.[24] Typical metallic discards include refrigerators, stoves, clothes washers and dryers, and air conditioners. The MDA has two main parts: (1) restrictions on disposal of metallic discards, and (2) requirement to remove materials that require special handling, which include items such as unspent sodium azide air bag canisters, encapsulated PCBs, refrigerants, used oil, and mercury switches. The MDA prohibits solid waste facilities such as landfills from accepting major appliances, vehicles, or other metallic discards, and prohibits their disposal on land or in mixed municipal solid waste. These restrictions do not apply to small amounts of metal that are economically infeasible to be separated from the waste stream.[31]

National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements

The National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements control water pollution by regulating point sources that discharge pollutants into surface waters of the United States. These regulations provide numeric effluent pollutant limits, numeric action levels, and technology and water quality-based effluent limitations for storm water and non-storm water discharges. Facilities required to obtain an NPDES permit include facilities that are listed under Standard Industrial Classification (SIC) Code 5093 (scrap and waste materials) and engaged in the following types of activities: (1) automotive wrecking for scrap-wholesale (this category does not include facilities engaged in automobile dismantling for the primary purpose of selling second hard parts, such as Pick-n-Pull); (2) iron and steel scrap- wholesale; (3) junk and scrap metal – wholesale; (4) metal waste and scrap- wholesale; and (5) non-ferrous metals scrap wholesale. Other types of facilities listed under SIC Code 5093 and engaged in wastes recycling, such as glass, paper, or plastic recyclers, are not covered under these requirements.

G. Emissions from Foundries, Forges, and Metal Recycling and Shredding Facilities

District staff has identified numerous metal melting and processing facilities in the Bay Area. There are at least 17 facilities that engage in metal melting and processing activities, such as metal melting and casting (foundries) and heat treatment of metals (forges). Additionally, there are more than 100 facilities that engage in scrap metal recycling, two of which are large-scale facilities that operate auto shredders and one large facility that handles shredder residue. All of these operations emit particulate matter, including metals; volatile organic compounds (VOC) (which include odorous compounds such as phenols); and/or toxics compounds.

The casting of molten metals is the primary source of PM and odorous substances, such as phenolic compounds, at foundries. These emissions occur when the hot molten metals contact the molds and cores formulated with binders that contain phenols, urethane, furans or other organic compounds. Metal forges emit PM and may emit odors from heat and pressure applied to lubricating oils on the metals. Table 7 lists the most common stages of production at foundries and forges and the types of emissions associated with those stages.

Table 7
Metal Production and Recycling Stages, Description and Emissions

Process*	Description	Emissions
Shredding	Grinding and sizing of scrap metal from cars and appliances into fist-sized chunks or metal using a hammermill and screens.	PM, visible emissions (VE)
Metal Management	Compilation, collection, storage and sorting of metals for metal management and the handling of byproduct and wastes.	PM, VE
Charging	Preheating the furnace and adding metal, flux, fuel and other compounds to furnace	PM
Furnace / Oven Operations: Metal Melting	Heating until the metal mixture is molten and reaches the proper temperature and metallurgic properties.	PM, VOC, carbon monoxide, oxides of nitrogen, toxics
Tapping	Molten metal is poured from furnace into a ladle for transfer to the casting area.	PM
Casting / Pouring	The tapped metal is transferred to the casting area and poured into the molds to form castings.	PM, VOC
Cooling	The cast metal is allowed to cool to close to ambient temperatures. While cooling, the metal cast shrinks often pulling away from the mold.	PM, VOC
Shakeout	Removing the casting from the mold – which can often involve destruction of mold.	PM, VOC
Grinding / Finishing	Once the casting is removed from the mold, it may have to be finished by grinding excesses of metal.	PM
Mold / Core Making	Making the mold / core from sand and binders and other substances such as clay, starch, charcoal.	PM, VOC, toxics

* The listed metal melting processes – metal management through grinding / finishing – are sequential steps in the production of cast metal parts. Mold / core making, however, is an essential parallel process that is not specifically a sequential step in the production of cast metal parts.

Operations at metal recycling facilities result in the emissions of PM from metal collection, sorting and shredding operations. Shredder residue and scrap metal contaminated with shredder residue are of concern because shredder residue is a source of PM and can be contaminated with toxic metals (lead, mercury, arsenic) and other toxic compounds such as sodium azide and PCBs.[24, 25] Shredder residue, if not handled properly, can become airborne, transported, and deposited off site.[32, 33, 34, 35]

H. Current Emissions Reduction Techniques

The methods used to reduce the emission of pollutants from any source or operation fall into three main categories: 1) emissions abatement from point sources, such as an exhaust stack from a furnace or engine, through the use of control equipment such as carbon adsorption systems or fabric filters; 2) fugitive emission reduction through enhanced capture techniques; and 3) pollution prevention practices, such as reformulations and the reuse or recycling of by-products of production.

As discussed earlier, foundries, forges, and recycling facilities operate under a regulatory umbrella that ensures point sources of PM and VOC emissions, such as furnaces, ovens, core- and mold-making apparatus, sand reclamation, and shredders / hammermills are abated with the appropriate control equipment – baghouses, cyclones, afterburners, and carbon adsorption. Because these point sources of air pollutants are subject to such a high degree of control – at minimum, 95 percent – the fraction of the overall remaining emissions (emissions after control) attributable to fugitives becomes significant. In two detailed analyses, the fraction of the overall emissions attributable to fugitive emissions at two foundries was found to range between 60 and 85 percent.[36, 37]

In addition, various other processes and emissions sources, such as tapping, pouring and casting, cooling, shakeout, metal management, sorting, separation, open spaces, and trackout while having some limits placed on their emissions, are not adequately controlled and are the primary sources of fugitive emissions. Although all these emissions sources are subject to at best, 20 percent opacity standards via federal or District regulation, these opacity standards are not adequate to ensure the minimization of these fugitive emissions.

All of the potentially affected facilities engage in some sort of pollution prevention practices that ultimately reduce the emissions of PM, toxic compounds, or odors. These practices include the reformulations of binders used in mold and cores making, minimization of contaminants, such as lead weights, mercury switches, PCB, and sodium azide canisters in either the metal charged to furnaces or scrap to be recycled. These practices have greatly reduce the amounts of contaminants in the metal process and recycling streams and, therefore, in the emissions from these facilities.

Staff has concluded that additional measures are needed to properly address fugitive emissions of both PM and odorous substances from foundries, forges and, metal recycling operations. Focusing on these emissions would address the sources that are not fully covered under the current regulatory environment.

IV. PROPOSED RULES

The District is proposing two new rules that would address fugitive emissions of PM and odorous substances from foundry, forging, and metal recycling and shredding facilities in the Bay Area: Regulation 12, Rule 13: Foundry and Forging Operations (Rule 12-13) and Regulation 6, Rule 4: Metal Recycling and Shredding Operations (Rule 6-4). Both of these proposed rules would rely on the implementation of management procedures through the development of Emissions Minimization Plans (EMP) to minimize fugitive emissions. Staff has analyzed the District and federal rules that these facilities are subject to and the stringent emission limitations that affect the most significant of their emission sources. Due to the controls on these sources, staff believes that the best opportunity to reduce emissions from and complaints about these facilities is to address fugitive emissions of particulate matter and odorous substances. Fugitive emissions, emitted near ground level, are also the most likely to affect nearby populations. The reliance on the development of an EMP allows each facility to tailor its approach to reducing or minimizing emissions to the unique conditions and configuration of its affected operations. Development of an EMP also encourages innovation and challenges the industry to look for more efficient, cost-effective methods of emissions control, minimization and prevention. Further, requiring the development of and compliance with an EMP also allows an exchange of information through the public's review and comments, District's recommendations on the procedures contained in the received EMPs, and through discussions with affected industry directly or via industry associations.

Proposed Rule 12-13 would address fugitive emissions from several general processes of foundries and forges and their associated operations, including:

- Mold and core making;
- Furnace / oven (including tapping);
- Heat treatment of metals;
- Casting and cooling;
- Shakeout;
- Finishing;
- Sand reclamation;
- Dross and slag management; and
- Metal management.

Proposed Rule 6-4 would focus on reducing fugitive emissions from metal recycling facilities that compile, shred, and sort scrap metal for resale, including the following operations:

- Metal management,
- Shredding operations, including minimization of automotive shredder residue (ASR) or “fluff.”

A. Proposed New Rule 12-13: Foundry and Forging Operations

Proposed Rule 12-13: Foundry and Forging Operations would affect metal melting and processing operations that occur at foundries and forges. The proposed rule primarily relies upon the development and implementation of an EMP at each affected facility that would include equipment, practices and procedures to minimize fugitive emissions of PM and odorous substances. The EMP would ensure that affected facilities employ the best means available to address fugitive emissions that are not adequately addressed by current regulations applicable to these facilities.

1. Applicability

Proposed Rule 12-13 would affect the facilities that either melt metals (foundries) or heat treat metals (forges). The rule would apply to facilities with foundry furnaces and forging ovens that require a District permit. Foundries or forges with an annual metal throughput (metal charged to a furnace or heated in an oven) of 2,500 tons or more would be subject to all of the requirements of the rule; those facilities with a throughput between one and 2,500 tons would only be required to keep records on their annual metal throughput. This applicability would address those facilities with the greatest potential for emissions of PM and odorous substances. Table 8 lists permitted foundries and forges, their 2010 reported annual metal throughput and the locations of the facilities relative to impacted Community Air Risk Evaluation (CARE) areas.

Table 8
Foundries and Forges 2010 Annual Metal Throughput and Proximity to a CARE Area[a]

Facility Name	City	CARE Area	Annual Metal Throughput (tons/yr)
USS-POSCO Industries	Pittsburg	no	1,028,974
United States Pipe & Foundry	Union City	no	56,700
A B & I Foundry	Oakland	yes	39,500
Pacific Steel Casting	Berkeley	yes	28,460
CASS	Oakland	yes	14,700
Metech Recycling	Gilroy	no	788
PCC Structurals	San Leandro	yes	668
Berkeley Forge & Tool	Berkeley	yes	305
Ridge Foundry	San Leandro	yes	252
Xstrata Copper	San Jose	no	182
Memry Corporation	Menlo Park	no	69
Aalba Dent	Fairfield	no	63
ECS Refining	Santa Clara	yes	28
California Casting	Richmond	yes	3
J & B Enterprises	Santa Clara	yes	1
Castco	San Leandro	yes	n/a[b]

a. This information presented in this table comes from facility-reported permit data.
b. The annual metal throughput was not reported for this facility.

2. Emission Limits

Proposed Rule 12-13 would contain no emissions limits. Emissions limits and work practice standards are already contained in Regulation 11: Hazardous Pollutants, Rule 15: Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting and the five applicable NESHAPs that affect metal melting operations, District Regulation 6 and the permit conditions assigned to each piece of equipment:

1. Subpart RRR—National Emission Standards for Hazardous Air Pollutants for Secondary Aluminum Production.
2. Subpart EEEEE—National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries.
3. Subpart YYYYY—National Emission Standards for Hazardous Air Pollutants for Area Sources: Electric Arc Furnace Steelmaking Facilities
4. Subpart ZZZZZ—National Emission Standards for Hazardous Air Pollutants for Iron and Steel Foundries Area Sources.
5. Subpart ZZZZZZ—National Emission Standards for Hazardous Air Pollutants: Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries.

Staff believes that the emissions limits contained in these various regulations and permits effectively address process emissions of PM at this time.

The District will seek delegation from the US EPA for the federal NESHAP regulations, so that the District would be the primary enforcing agency for these regulations. This would mean that once delegation is granted, the District would enforce the federal NESHAPs for all affected facilities, including those not subject to the requirements of proposed Rule 12-13. The facilities would submit plans, reports, monitoring and source test information to the District rather than to EPA.

3. Development and Implementation of the Emissions Minimization Plan

Proposed Rule 12-13 would require affected facilities to develop and submit to the District for approval an Emissions Minimization Plan (EMP) that would detail the practices that have been or will be implemented to minimize fugitive emissions from the following operations and materials:

1. Mold and core making;
2. Metal melting and tapping;
3. Heat treatment of metals;
4. Casting and cooling;
5. Shakeout;
6. Finishing;
7. Sand reclamation;
8. Dross and slag management; and
9. Metal management, including, scrap metal acceptance and handling (to minimize contaminants such as lead, mercury, PCBs, and plastics).

The purpose of the EMP would be to establish individualized programs for a facility to implement to minimize fugitive PM and odor emissions. Over time, facilities would be able to improve their practices and equipment to reduce fugitive emissions and the impacts on the surrounding communities. Proposed Rule 12-13 would require that affected facilities submit an EMP to the District within one year of the adoption of the rule or within six months of becoming subject to the rule.

4. Evaluation of the EMP

The receipt of the EMP is the first step in an overall dialogue between the District, affected facilities and the public. Within 30 days of receiving a draft EMP, the District would determine if the EMP is complete, i.e., whether it includes all required elements of the EMP. If the EMP is not complete, the District would notify the facility that the EMP is not complete and the basis of this determination. Upon receipt of notification of an incomplete EMP, the facility has 30 days to correct any deficiencies and resubmit the draft EMP. If the District determines that the deficiencies are not corrected, the District would disapprove the EMP. If the EMP is complete, the District would evaluate all plan elements and would make it available for 30 days for public comment with any confidential information, such as metal throughput, redacted. The District may extend the public comment period up to a total of 90 days and may also hold a public meeting if it is requested. Within 30 days of the close of the public comment period, the District would consider the proposed plan and any comments submitted by the public and may make recommendations – based on technical and economic feasibility and taking into consideration worker health and safety practices – for further revisions to the EMP by the facility to reduce or prevent fugitive emissions.

5. Revision and Approval of the Final EMP

After receiving any District recommendations, the facility would have 30 days to resubmit a revised final EMP reflecting the recommended changes or (in the absence of incorporating the recommendations) an EMP accompanied by written reasons explaining why any specific recommendation was not incorporated into the EMP. Within 30 days of the receipt of the final EMP, the District would review the EMP and determine whether or not it meets the requirements of the Rule. If the District determines that the EMP provides adequate emissions minimization procedures for all affected operations, the District would approve the EMP. If the District determines that all elements were not included, or that the measures were insufficient to adequately minimize emissions, the District would notify the facility of its decision and the basis. The facility would have 30 days to correct the deficiencies in the EMP and resubmit it for approval. If the facility fails to correct the deficiencies, the District would disapprove the EMP, and the facility would be in violation of the Rule 30 days following the disapproval.

6. Reporting Requirements

Intended Emission Reduction Projects

In addition to submission of their EMPs, affected facilities would be required to report to the District equipment, processes or procedures they plan to install or implement within the next five years to reduce or prevent fugitive emissions along with a schedule of implementation. This report would be independent of the EMP and considered a forecast of efforts intended by the facility and may be subject to change by the facility. The planned future actions would not be enforceable; but would encourage facilities to think long term about capital and operational improvements to reduce fugitives.

Reporting Requirements for Emissions Capture/Collection Systems Required Under the NESHAPs or Non-Ferrous Metal Melting ATCM

Facilities subject to the Non-Ferrous Metal Melting ATCM or one of the four federal NESHAPs that require the installation of an emissions capture/collection system capable of meeting "accepted engineering standards, such as those published by the American Conference of Governmental Industrial Hygienists" would be required to report to the District which of the NESHAP and ATCM provisions are applicable and the manner in which these requirements are met. The specific sections are:

- 40 CFR Part 63, Subpart RRR: NESHAP for Secondary Aluminum Production, Section 63.1506(c)(1) through (c)(3) Capture/collection systems design, installation, and operation;
- 40 CFR Part 63, Subpart EEEEE: NESHAP for Major Source Iron and Steel Foundries, Section 63.7690(b)(1);
- 40 CFR Part 63, Subpart YYYYY: NESHAP for Area Sources: Electric Arc Furnace Steelmaking Facilities, Section 63.10686;
- 40 CFR Part 63, Subpart ZZZZZ: NESHAP for Iron and Steel Foundries Area Sources, Section 63.10895(b);
- District Regulation 11: Hazardous Pollutants, Rule 15: Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting, Sections 11-15 (b)(1) and (b)(3).

Reporting Requirements for Operation and Maintenance Plans

The proposed rule also requires facilities subject to one of the five federal NESHAP that require the development of operation and maintenance (O&M) plans to submit a copy of those approved O&M plans to the District within six months of the adoption of the Rule. The specific sections are:

- 40 CFR Part 63, Subpart RRR: NESHAP for Secondary Aluminum Production, Section 63.1510(b);
- 40 CFR Part 63, Subpart EEEEE: NESHAP for Major Source Iron and Steel Foundries, Section 63.7710(b);
- 40 CFR Part 63, Subpart YYYYY: NESHAP for Area Sources: Electric Arc Furnace Steelmaking Facilities, Section 63.10685(a) and (b);
- 40 CFR Part 63, Subpart ZZZZZ: NESHAP for Iron and Steel Foundries Area Sources, Section 63.10896;
- 40 CFR Part 63, Subpart ZZZZZZ: NESHAP: Area Source Standards for Aluminum, Copper, and Other Nonferrous Foundries, Section 63.11550(a)(3).

Review of Alternative Binder Formulations

Affected facilities that use mold and core binders made with odorous substances, defined in the rule as phenol and phenolic compounds, would be required to investigate the availability and efficacy of alternative binders that produce fewer emissions of odorous substances than currently used at that facility. The facility would have to complete and report the results of this investigation to the District no later than two years after the adoption of the Rule and biennially thereafter.

7. Recordkeeping

The proposal would require all foundries and forges with an annual metal throughput of one ton or more to maintain records on the monthly throughput of ferrous and non-ferrous metal processed. This includes metal melted, heated, or scrapped; the monthly throughputs of the type(s) of binder systems and sand used; and for those facilities that qualify for the clean aluminum exemption, the aluminum purity certification.

8. Pure Metal or Alloy Exemption

Facilities that only melt metals or alloys other than lead, solder, or zinc scrap that certifiably contain less than 0.004 percent cadmium and less than 0.002 percent arsenic would be exempt from the EMP development and all other requirements, except certain reporting requirements of the proposal. However, to retain this exemption, the facilities must maintain records certifying the purity of the metals or alloys melted. This exemption duplicates an exemption in the Non-Ferrous Metal Melting ATCM and District Rule 11-15.

B. Proposed New Rule 6-4: Metal Recycling and Shredding Operations

Proposed Rule 6-4: Metal Recycling and Shredding Operations would also rely upon the development and implementation an EMP that would include practices and procedures to minimize fugitive emissions of PM. However, proposed Rule 6-4 differs from proposed Rule 12-13 in that it applies specifically to scrap metal recycling and shredding operations and focuses on those operations and materials specific to this industry. Proposed Rule 6-4 does not contain a requirement to minimize odors because odors are not typically associated with normal operations at these types of facilities. Staff has reviewed complaints received about metal recycling facilities. The complaints typically stem from the use of a cutting torch on unusually large pieces of metal, or are associated with accidental fires; these are the types of events that the District's complaint process is designed to address.

1. Applicability

Proposed Rule 6-4 would apply to scrap metal recycling facilities that receive at least 1,000 tons of scrap metal per year. Metal recycling facilities with an annual metal throughput of 50,000 tons or more would be subject to the general requirements of the rule. This applicability level is based on the size of facilities (based on throughput) that produce, receive, or process scrap metal containing shredder residue. Feeder facilities that supply the larger scrap recycling facilities, such as Pick-n-Pull, which receive, de-pollute, dismantle, crush, and/or bail automobiles, generally do not exceed 50,000 tons per year and do not handle shredder residue.[38] Those recycling facilities with an annual metal throughput between 1,000 and 50,000 tons would only be required to keep records of their annual metal throughput. Based on this applicability, the general requirements of proposed Rule 6-4 would currently apply to only three Bay Area metal recycling operations: Schnitzer Steel at the Port of Oakland and Sims Metals at the Port of

Redwood City and at the Port of Richmond. Two of these facilities operate large-scale shredders that size and sort scrap metal and the other is a large-scale metal recycling operation that receives scrap metal containing shredder residue from facilities outside the Bay Area. Table 9 provides the affected metal recycling facilities, along with their locations, metal throughput and proximities to CARE Areas.

Table 9
Metal Recycling & Shredding Facilities 2010 Annual Throughput and Proximity to a CARE Area*

Facility Name	City	CARE Area	Annual Metal Throughput (tons)
Schnitzer Steel	Oakland	yes	529,000
Sims Metal Management	Redwood City	yes	374,000
Sims Metal Management	Richmond	yes	360,000

* This information presented in this table comes from facility-reported permit data on annual throughput and estimated emissions.

Staff has investigated small-scale metal recycling operations that do not shred or collect shredded scrap and has determined that these facilities are not likely to be sources of shredder residue. These facilities may operate metal shears, crushers and/or bailers; however, because these operations do not produce shredder residue, if routine depollution practices are employed, the potential for contamination is minimal. The depollution practices are addressed under the DTSC and the Regional Water Control Board regulations, which are enforced by the Certified Unified Program Agencies (CUPA).

2. Emission Limits

Like proposed Rule 12-13, proposed Rule 6-4 does not contain emission limits. There are no federal NESHAPs that apply specifically to this industry; there are two NESHAPs that may apply depending on the type of operations present at these facilities. These NESHAPs are the Subpart T—National Emission Standards for Halogenated Solvent Cleaning and the Subpart B—Servicing of Motor Vehicle Air Conditioners for refrigerants which are currently addressed in District Regulation 8, Rule 16: Solvent Cleaning Operations and Regulation 12, Rule 7: Motor Vehicle Air Conditioner Refrigerant, respectively. These rules would only apply to these facilities if they operate solvent cleaning apparatus using one of the six regulated chemicals or remove refrigerant from automobiles and refrigerators.

However, the shredding operations are currently subject to District Regulation 6, Rule 1: Particulate Matter, General Requirements, which imposes a 20 percent opacity standard on all sources of particulate. In addition, the shredder / hammermills at these facilities have a limit of 0.01 grains per dry standard cubic foot that address process PM emissions imposed by their Permits to Operate, significantly more stringent than the 0.15 gr/dscf limitation in Rule 6-1.

3. Development and Implementation of Emissions Minimization Plans

Like proposed Rule 12-13, Section 6-4-401 of proposed Rule 6-4 would require affected facilities to develop and implement an EMP that would detail the practices and equipment that have been or will be implemented to minimize fugitive emissions from the following operations, areas, and materials:

1. Roadways and other trafficked areas;
2. Scrap metal, including:
    a. Handling and storage operations,
    b. Crushing operations,
    c. Sorting operations,
    d. Shredding / hammermill operations;
3. Receipt of scrap metal from providers;
4. Depollution operations.

4. Evaluation of the EMP

The receipt of the EMP is the first step in an overall dialogue between the District, affected facilities, and the public. Within 30 days of receiving a draft EMP, the District would determine if the EMP is complete, i.e., whether it includes all required elements of the EMP. If the EMP is not complete, the District would notify the facility that the EMP is not complete and the basis of this determination. Upon receipt of notification of an incomplete EMP, the facility would have 30 days to correct any deficiencies and resubmit the draft EMP. If the District determines that the deficiencies were not corrected, the District would disapprove the EMP. If the EMP is complete, the District would evaluate all plan elements and would make it available for 30 days for public comment with any confidential information, such as metal throughput, redacted. The District may extend the public comment period up to a total of 90 days and would consider holding a public meeting if it is requested. Within 30 days of the close of the public comment period, the District would consider the proposed plan and any comments submitted by the public and may make recommendations – based on technical and economic feasibility and taking into consideration worker health and safety practices – for further revisions to the EMP by the facility to reduce or prevent fugitive emissions.

5. Revision and Approval of the Final EMP

After receiving any District recommendations, the facility would have 30 days to resubmit a revised final EMP reflecting the recommended changes or (in the absence of incorporating the recommendations) an EMP accompanied by written reasons explaining why any specific recommendation was not incorporated into the EMP. Within 30 days of the receipt of the final EMP, the District would review the EMP and determine whether or not it meets the requirements of the Rule. If the District determines that the EMP provides adequate emissions minimization procedures for all affected operations, the District would approve the EMP. If the District determines that all elements were not included, or that the measures were insufficient to adequately minimize emissions, the District would notify the facility of its decision and the basis. The facility would have 30 days to correct the deficiencies in the EMP and resubmit it for approval. If the facility fails to correct the deficiencies, the District would disapprove the EMP, and the facility would be in violation of the Rule 30 days following the disapproval.

6. Reporting: Intended Emission Reduction Projects

Along with the EMP, affected facilities would be required to report to the District any equipment, processes or procedures that would be installed or implemented within the next five years to reduce or prevent fugitive emissions along with a schedule of implementation. This report would be independent of the EMP and considered a forecast of efforts intended by the facility and may be subject to change.

7. Exemptions: Regulation 12, Rule 13: Emissions Minimization Plans:

Metal recycling facilities that would have to comply with the EMP requirements of Proposed Rule 12-13: Foundry and Forging Operations would not have to develop a separate EMP for the Metal Recycling and Shredding rule provided the requirements for an EMP under Rule 12-13, Section 401 and Rule 6-4, Section 401 are incorporated in the same EMP.

8. Limited Exemption: Low Throughput Recycling Facilities:

Metal recycling facilities with an annual metal throughput between 1,000 and 50,000 tons would not be required to develop and implement a District-approved EMP. These facilities, however, would be required to maintain records on their metal throughput and provide the basis for the throughput determination.

C. Amendments to Regulation 2: Permits, Rule 1: General Requirements - Permit Exemption for Mold Making Equipment

Staff also proposes to eliminate the permit exemption for heated shell core and shell mold manufacturing machines in District Regulation 2, Rule 1: General Requirements (Rule 2-1). Currently, shell core and shell mold manufacturing machines are exempt from permits under Rule 2-1, Section 122.3. Because some of these machines, specifically those using heat to produce the shell cores and molds, are sources of emissions of PM and odorous substances and would be regulated under proposed Rule 12-13, their exemption from permit requirements should be removed. The proposed amendments to Rule 2-1 would read as follows:

2-1-122 Exemption, Casting and Molding Equipment: The following equipment is exempt from the requirements of Sections 2-1-301 and 302, provided that the source does not require permitting pursuant to Section 2-1-319.

122.1 Molds used for the casting of metals.
122.2 Foundry sand mold and core forming equipment, including shell core and shell-mold manufacturing machines, to which no heat is applied, except processes utilizing organic binders yielding in excess of 0.25% free phenol by weight of sand.
~~**122.3** Shell core and shell-mold manufacturing machines~~.
122.~~4~~3 Equipment used for extrusion, compression molding and injection molding of plastics. The use of mold release products or lubricants is not exempt unless the VOC content of these materials is less than or equal to 1 percent, by weight, or unless the total facility-wide uncontrolled VOC emissions from the use of these materials are less than 150 lb/yr.
122.~~5~~4 Die casting machines.

When a source becomes subject to permit requirements by a change in District rules, the operator of that source has 90 days to submit a permit application.

D. Overview of Affected Facilities

Based on the applicability of each of the proposed rules, the following eight facilities would have to develop, have approved, and implement Emissions Minimization Plans: AB&I Foundry, United States Pipe & Foundry, Custom Alloy & Scrap Sales, Inc., Pacific Steel Casting Company, USS-POSCO Industries, Schnitzer Steel Products Company, Sims Metal Management, Redwood City, and Sims Metal Management, Richmond. These eight facilities represent the foundries and forges with the largest metal throughput and the largest metal recyclers that either operate shredders or receive or process scrap metal that contains shredder residue.

1. AB&I Foundry, Oakland

AB&I Foundry is a secondary steel foundry that was established in 1906 as the American Brass and Iron Foundry and is located on eight acres in south-east Oakland near the Coliseum complex, which is in a District-designated CARE Area. The facility operates a water-cooled cupola furnace and makes pipes, pipe fittings, and couplings; and custom castings from recycled steel scrap metal. The exhaust from the furnace is controlled using a combination of an afterburner (for VOCs) and a baghouse (for particulates). The facility also operates mold and core making, sand reclamation machines, and a hot asphalt dip tank for waterproofing pipes. The facility employs approximately 200 people. AB&I is regulated under several District rules, one federal air toxic regulation and by other environmental agencies.

2. United States Pipe & Foundry Company, LLC., Union City

United States Pipe & Foundry (US Pipe) is a secondary steel foundry that is part of a company with over a 100-year history. US Pipe began operating on 70 acres in Union City in 1951. The facility operates a water-cooled cupola furnace and produces ductile iron pipes and fittings. The exhaust from the furnace is controlled using a combination of an afterburner and a baghouse. The facility also operates mold and core making and sand reclamation machines, and a hot asphalt dip tank for water proofing pipes. The facility employs approximately 180 people. US Pipe is regulated under several District rules, one federal air toxic regulation and by other environmental agencies.

3. Custom Alloy & Scrap Sales, Inc., Oakland

Custom Alloy & Scrap Sales (CASS) is a combined secondary aluminum production and scrap metal recycling facility that was founded in 1970 and has several satellite plants located in Antioch, Los Angeles, and Dayton, Nevada. CASS is located in west Oakland on seven acres of property within a District-designated CARE Area.[39] The facility operates three aluminum furnaces: two reverberatory furnaces and a sweat furnace that produce aluminum ingots. The exhaust from these furnaces is controlled using an afterburner and baghouse combination. The facility also recycles scrap metal supplied by peddlers and aluminum dross – a by-product of the aluminum production. CASS employs 20 people and is regulated under several District rules, one federal air toxic regulation and by other environmental agencies.

4. Pacific Steel Casting Company, Berkeley

Pacific Steel Casting (PSC) is a secondary steel foundry that operates in a mixed industrial area in West Berkeley. There are three electric arc furnaces that produce steel castings made from recycled steel scrap metal used in oil and gas production, mining, construction, trucking, alternative energy and the military. The exhaust from the furnaces is controlled using a combination of baghouses and carbon adsorption units. The facility also operates mold and core making and sand reclamation machines. PSC employs approximately 215 people and occupies a total of five acres located in one of the District-designated CARE Areas. PSC is regulated under several District rules, two federal air toxic regulations and by other environmental agencies.

5. USS-POSCO Industries, Pittsburg

USS-POSCO is a steel finishing plant owned and operated by USS-POSCO Industries (UPI), a joint venture company established by US Steel Corporation and POSCO of the Republic of Korea. UPI is located on 1072 acres in Pittsburg and manufactures cold rolled, galvanized and tin mill products from hot rolled steel.[40] There are 90 sources at USS-POSCO permitted by the District. UPI also produces scrap metal that is managed and recycled. UPI employs nearly 1,000 people and its processes are regulated by the District and other environmental agencies.

6. Schnitzer Steel Products Company, Oakland

Schnitzer Steel Products (Schnitzer) is a metal recycling and shredding facility located on 35 acres in Oakland at the Port and is located in one of the District-designated CARE Areas. Schnitzer collects, depollutes (appliances only), shreds, and segregates scrap metal. (Automobiles are depolluted prior to arrival.) Collected scrap metal is shredded in a hammermill, the exhaust from which is controlled using water injection, cyclones, and a scrubber, filter, and demister combination. Schnitzer employs 75 people and is regulated by the District and other environmental agencies.

7. Sims Metal Management, Redwood City

Sims Metal Management (Sims) is metal recycling and shredding facility located in Redwood City at the Port and is located in one of the District-designated CARE Areas. Sims, Redwood City collects, depollutes appliances (similar to Schnitzer, automobiles are depolluted prior to arriving at the facility), shreds, and segregates scrap metal. Collected scrap metal is shredded in a hammermill, the exhaust from which is controlled using water injection and dynamic cyclones and scrubber combination. Sims Redwood City employs 22 people and is regulated by the District and other environmental agencies.

8. Sims Metal Management, Richmond

Sims Metal Management (Sims) is metal recycling facility located on an 18-acre parcel in Richmond at the seaport and is located in one of the District-designated CARE Areas. Sims Richmond collects, crushes, depollutes, and segregates scrap metal. Collected scrap metal (mostly automobiles and appliances, but including auto shredder residue) is collected from a variety of sources, including other metal recycling facilities in the western United States. The Sims Richmond facility employs 37 people and is regulated by the District and other environmental agencies.

V. EMISSIONS AND EMISSIONS REDUCTIONS

This proposal would address fugitive emissions of particulate matter and odorous substances. The implementation of various federal, State, and District regulations has addressed emissions of pollutants from most point and some fugitive sources located at foundries and forges and metal recycling facilities. (Point sources include exhaust from identified equipment, such as furnaces, ovens, shredders, and core and mold making equipment.) However, the degree of control of fugitive sources varies. Because point sources are well controlled, fugitive emissions from the metal melting and processing operations comprise a significant portion of the overall emissions from these facilities. Because there are few point sources at metal recycling facilities, and they are well controlled, the fugitive emissions from these facilities are the vast majority of the total. Most fugitive emissions are released at ground level and have the potential to impact nearby residents. Modeling indicates that these ground level fugitive emissions may have a disproportionately greater impact on nearby receptors than stack emissions. It also follows that reductions in fugitive ground-level emissions would have a beneficial effect on associated risk relative to an equivalent reduction in stack emissions of the same pollutant. Because stack emissions are currently subject to a high degree of control, these rules are specifically aimed at reducing fugitive emissions that may not be sufficiently addressed.

A. Particulate Matter

Particulate matter (PM) is a mixture of suspended particles and liquid droplets. PM includes elements, such as carbon and metals; compounds, such as nitrates, organics and sulfates; and complex mixtures such as diesel exhaust and wood smoke. PM is a leading health concern. A large body of evidence suggests that exposure to PM, particularly fine PM, can cause a wide range of health effects, including aggravation of asthma and bronchitis, an increase in visits to the hospital with respiratory and cardio-vascular symptoms, and a contribution to heart attacks and deaths. The Bay Area is not in attainment of the California standards for either PM of 10 microns or less aerodynamic diameter (PM10) or PM of 2.5 microns or less aerodynamic diameter (PM2.5); or of the national 24-hour PM2.5 ambient air quality standard.

Most of the facilities proposed to be regulated are located in or near BAAQMD Community Air Risk Evaluation (CARE) communities. Reducing PM2.5 emissions in these communities will help improve health and air quality in these communities most affected by air pollution. Additionally, PM emissions from foundries, forges, and metal recycling operations may contain toxic metals, which would also be reduced by targeting fugitive emissions of PM.

Process emissions of PM at foundries and forges are subject to stringent controls. Source test results show that PM emissions range from 0.0005 to 0.078 grains per dry standard cubic feet from furnaces and other point sources. This level of control of point sources is due to permit conditions based on current District, State, and federal regulations. Table 10 shows estimates of process and fugitive emissions for foundries and forges.

A District engineering analysis of PM emissions at Pacific Steel Casting indicated that fugitive emissions comprise about 65 percent of the facility's total emissions (fugitive and abated PM emissions).[41] A similar analysis of PM emissions at ABI conducted by Keramida Environmental, an engineering consulting firm, showed fugitive emissions to be 85 percent of the total emissions (fugitive and abated).[42] These percentages were used to estimate the fugitive emissions from these two facilities. For US Pipe, a conservative estimate of 60 percent fugitive emissions was used.

CASS has very low amounts of process emissions that are well abated. This is because CASS is unique among the five facilities subject to the proposal because it only melts aluminum, which has a much lower melting point than iron, in furnaces heated by natural gas. Also, CASS uses permanent molds for the molten aluminum rather than sand molds, the manufacture and use of which generates particulate emissions. The fugitive emissions estimate for CASS is derived from its metal scrap recycling, which includes aluminum and non-aluminum scrap.

USS POSCO generates PM from its various processes; but these processes generate little fugitive PM. USS POSCO does generate scrap, estimated to be approximately ten percent of its metal throughput, and this scrap is conveyed and stored on site for recycling off site. Fugitive emissions were estimated from the storage and transfer of this material. Table 10 provides the annual metal throughputs, process, fugitive, and total PM emissions for the five facilities that would be affected by proposed Rule 12-13.

Table 10
Foundries and Forges Estimated Annual Process, Fugitive and Total PM Emissions

Facility Name	Annual Metal Throughput (tons)	Annual Process Emissions (tons)	Annual Fugitive Emissions (tons)	Total Annual PM Emissions (tons)
USS-POSCO Industries	1,028,974	15.8	0.15	16.0
United States Pipe & Foundry	56,700	7.3	12.2	19.5
A B & I Foundry	39,500	0.8	4.3	5.0
Pacific Steel Casting	28,460	59.7	110.9	170.6
CASS	14,700	0.01	1.9	1.88
	TOTALS	**83.5**	**129.4**	**213.0**

Staff used an engineering analysis of fugitive PM emissions from a recent CEQA analysis conducted for a new facility in West Sacramento, California to estimate fugitive emissions from Bay Area scrap metal recycling facilities.[43] For each facility, existing control mechanisms were considered based on a comparison to the new facility, weighted by the relative throughput of metal scrap. Table 11 shows estimates of process and fugitive emissions for metal recycling facilities.

Table 11
Metal Recycling Facility Estimated Annual Process, Fugitive and Total PM Emissions

Facility Name	Annual Metal Throughput (tons)	Annual Process Emissions (tons)	Annual Fugitive Emissions (tons)	Total Annual PM Emissions (tons)
Schnitzer Steel	529,000	00.13	11.5	11.6
Sims, Redwood City	374,000	5.6	7.0	12.6
Sims, Richmond	360,000	n/a	9.0	9.0
	TOTALS	**5.7**	**27.5**	**33.2**

The requirement to develop an EMP is aimed at minimizing PM emissions. The proposal allows each facility to identify its practices for reducing fugitive emissions according to the needs and capabilities of their operations. Accordingly, an estimation of emission reductions due to the adoption of this proposal would be difficult to determine precisely. However, over time, the District may be able to make qualitative comparisons of the effectiveness of the practices that promote better capture or the minimization of fugitive emissions from those sources for which emissions factors are available. Understanding the various practices implemented at each facility will assist the District to better understand the benefits of such practices applied to similar operations and under different conditions.

The fugitive emissions for foundries and forges total 129.4 tons per year. EPA, in developing national rules for various industries, estimates that these kinds of plans (often referred to as Operations and Maintenance plans) reduce emissions by up to 20 percent. Staff estimates, because many potential measures have already been put into place, that implementation of proposed Regulation 12, Rule 13 could reduce emissions by at least 10%, or 13 tons per year.

Staff estimates the potential emission reductions from the implementation of proposed Regulation 6, Rule 4 from the three affected metal recyclers to be 20 percent or 6.5 tons per year. This is based on comparing the Bay Area metal recyclers with the highly controlled project planned for West Sacramento.

B. Odorous Substances

The typical complaints the District receives about foundries and forges concern odors, and most of the odors complaints come from the use of phenols and phenolic compounds in binders that are volatilized in the casting process. Phenol is discernible at a concentration of 0.011 parts per million (11 parts per billion).[44] So, fugitive emissions of these compounds have a high potential to generate complaints. The proposal would minimize the emissions of odorous substances by requiring the facilities to evaluate various methods currently employed to address fugitive emissions and evaluate additional and alternative means to further reduce these emissions. Further, where applicable, facilities must periodically research alternatives to binders formulated with phenols or other odorous substances. Although, currently, not all casting jobs can be performed using low phenolic binder, manufacturers are constantly developing and testing new formulations that may allow foundries to replace binders formulated with phenol. Such replacements could greatly reduce, if not eliminate, the emissions of phenolic compounds that contribute to odorous emissions.

C. Evaluation of Emission Reductions

Staff will evaluate emissions reductions by a number of means. Because EMPs will be individual to each facility and address fugitive emissions rather than easily-measured process emissions, evaluation will depend on observation, interaction with the community and monitoring techniques. EMPs, when approved, are in place for a five year period. After three years from the first approval, staff will work with affected facilities and solicit input on progress from the communities. Staff monitors complaints received about these facilities and has seen a reduction in complaints from the addition of new equipment and the interaction with facilities during this rule development process. Staff has conducted two air monitoring studies associated with these facilities, one in West Berkeley and one in Oakland. The information required in an EMP and the evaluation process will lead to a greater understanding of how to reduce emissions from these facilities and the vast amount of experience gained by the District inspection staff and permit engineers in analyzing these facilities will be of primary importance in tracking progress. Finally, District staff will continue to focus on emissions in CARE areas and will consider a variety of means to monitor and assess emissions from foundry, forges and metal recycling facilities.

VI. ECONOMIC IMPACTS

A. Introduction

This section discusses the estimated costs associated with the proposed rules. The California Health & Safety Code states, in part, that districts shall endeavor to achieve and maintain state ambient air quality standards for ozone, carbon monoxide, sulfur dioxide, and nitrogen dioxide by the earliest practicable date. In developing regulations to achieve this objective, districts shall consider the cost effectiveness of their air quality programs, rules, regulations, and enforcement practices in addition to other relevant factors, and shall strive to achieve the most efficient methods of air pollution control. However, priority shall be placed upon expeditious progress toward the goal of healthful air.

A number of unique factors come into play in the analysis of the cost of these proposed rules. Most facilities have already implemented many emissions minimization measures that have greatly reduced the impacts of fugitive emissions of both PM and odorous substances to the nearby communities. Therefore, many of the costs of minimization have already been incurred by the affected facilities. Also, because each facility is unique in its operations, configurations, throughput, products, location and proximity to nearby receptors, it would be beyond the scope of this report to fully analyze each facility to determine the extent to which additional emissions minimization measure are needed and the economic impacts of each of those measures. The operator of each facility will be required to evaluate its own operations and conditions to identify the best means to reduce fugitive emissions from their facility.

The proposed rules require metal processing and recycling facilities to develop the minimization measures they will implement to reduce fugitive emissions. It is expected that each facility, given the flexibility provided by the structure of the rules, will develop an emissions minimization plan that includes effective and economical minimization measures for each operation that is required to be addressed; thus ensuring continuous improvement at the least cost. The rules recognize that each facility, all of which are long-standing Bay Area operations, have already implemented a variety of measures to reduce fugitive emissions, and these efforts are to be reflected in the plans. The public review process will allow other facilities to consider and implement similar measures. The exact estimates of the costs of compliance presented below do not represent an expectation of costs facilities would incur, but they present a range of potential measures that could be considered and the costs of each.

B. Development of an Emissions Minimization Plan

The cost of developing an EMP is dependent on the number of processes and operations that an affected facility must address. For each of the applicable subject areas, a facility must conduct an evaluation to determine whether the practices and equipment currently in place are adequate to ensure emissions minimization. Staff estimates that an evaluation of each affected operation would require two to four man-hours. This estimation includes:

- Identifying which operations would be subject to procedure development requirements;
- Determining the emissions minimization practices currently employed;
- Analyzing those practices to determine their efficacy in minimizing emissions; and
- Identifying and incorporating best practices for those subjects for which the current practice is inadequate.

The number of affected operations range between five and ten for each potentially affected facility. Using a value of $75 per hour for the cost (wages and benefits) of an environmental engineer,[45] the cost of developing an EMP would range between $750 and $3000 if done by facility personnel.

C. EMP Implementation

The exact cost of implementation of an EMP would be dependent on the unique operations, configurations, and measures used to address fugitive emissions of PM and odorous substances at each affected facility. However, at a minimum, the cost of implementing an EMP would depend on several parameters:

- Whether a candidate measure is currently being practiced and, if so, is it adequate to reduce emissions;
- The equipment needed to implement a new measure;
- Permitting cost (if necessary);
- The time required to properly train personnel in the new measure; and
- Any ongoing materials (such as energy, filters, or activated carbon) or additional labor needed to implement a new practice.

Following are case studies illustrating the potential cost of emission minimization options that may be employed to reduce fugitive emissions of PM or odorous substances.

Case Study 1: Minimization of Air Drafts for Metal Finishing Operations

One potential emissions minimization option to reduce fugitive emissions of both PM and odors is the construction of an enclosure to minimize air drafts. Staff has assumed that an enclosure 20 feet long, 10 feet wide and 10 feet tall would be the minimum needed to address metal finishing operations. It is also assumed that at least two walls of the enclosure would already exist.[vi] Therefore, the enclosure would require two panels (ten by ten feet; ten by 20 feet) with a ceiling (10 x 20 feet). An enclosure of this size would cost about $25,000 based on an approximate cost of $50 per square foot of installed material.[46] Site-specific evaluations at each facility would be required to improve cost estimates associated with this proposal. This cost could be reduced if finishing operations were relocated to an area already protected from uncontrolled drafts.

Case Study 2: Upgrading PM_{10} Emissions Capture and Control Systems at a Foundry

One option to address fugitive emissions would be to upgrade the capacity of an existing emissions control system to handle both process and fugitive emissions. This effort would require increasing the capacity of the emission abatement device to control stack / exhaust emissions, and also the expected fugitive emissions from the process. One Bay Area foundry reported that the cost to transport and install a baghouse that was once operated at another foundry in the southeastern United States totaled $3.5 million. (The cost of this baghouse when it was originally purchased and installed was reported to be approximately

[vi] These are the approximate dimensions and conditions of the cooling areas for several of the metal melting facilities visited by District staff.

$7 million.) The baghouse, which has a capacity of 68,000 dry standard cubic feet per minute (dscfm), replaced two existing baghouses with a combined capacity of 44,000 dscfm. The facility-estimated cost to dismantle the existing baghouses is $250,000. Based on US EPA cost estimates, the total annual direct and indirect operating expenses (labor, maintenance, replacement bags and parts, and utilities, etc.) would be approximately $915,000.

The capital cost of an emissions collection system is estimated to be approximately $355,000. Theoretically, the additional capacity of this baghouse (22,000 dscfm) could be used to minimize fugitive emissions from tapping, pouring and casting operations. If the capital and indirect operating costs of the baghouse were apportioned based on capacity (22,000 dscfm to 68,000 dscfm or 0.32), the apportioned costs of the utilization of the additional capacity would be $1.1 million (capital costs) and $267,000 (annual operating costs). Annualizing the apportioned capital costs of the additional baghouse capacity and the emissions collection system over ten years at an annual interest rate of five percent[vii] and combining the resultant value ($193,000) with the apportioned annual operating costs of $267,000 results in an overall annualized cost of $459,000.

Case Study 3: Shakers to Reduce Trackout onto Public Roadways

One metal recycling facility has installed a series of shakers to reduce trackout of mud, which may contain metal contaminants and fluff, in recycling facilities onto public streets and highways where it can be re-entrained. The shakers are three feet by 15 feet in size and are arrayed in series with two dedicated to the right side of the tires and two dedicated to the left. The cost of installation totaled $5,000.[47]

Case Study 4: Reducing Fugitive PM_{10} Emissions from Transfer Operations at a Metal Recycling Facility

The transfer of refined scrap metal from stockpiles to a ship via a conveyor system can result in visible and PM_{10} emissions, which can be especially high during a windy period. The primary sources of emissions are at the drop points and the conveyor during high winds. One method used to address these emissions is the installation of a combination of dust control options for the conveyor system, including a wind tunnel, cocooning the conveyor, belly pans with a water recycle mechanism, side walls screens that allow air to pass through but filter dust, and a super chute with an apron to shield material falling into the ship. The unit, capital, and total annualized costs for the equipment to mitigate these fugitive emissions from a conveyor system are listed in Table 11.

[vii] A five percent interest rate applied over a ten-year period results in a capital recovery factor of 0.1295.

Table 11
Capital and Operational Costs for Conveyor System Dust Control

Mitigation Option	Unit Costs[48]	Capital Costs[viii]	Annualized Capital and Annual Operational Costs
Wind Tunnel (200 feet)	$270 / foot	$67,500	$8,741
Conveyor Cocoon (100 feet)	$500 / foot	$62,500	$8,094
Belly Pans w/ Water Recycle (100 feet)	$229 / foot	$28,625	$3,707
Side Wall Screens (100 feet)	$8 / foot	$1,000	$129
Super Chute with Apron (2 chutes at 5 & 20-foot drops)	$1,500 / foot	$46,875	$6,070
Material Cost (Water at 50 gpm @ 16 hr/wk)	$3.30 /100 ft^3 [49]	n/a	$11,011
Maintenance & Repair	n/a	n/a	$2,000
Labor (wage & benefit) @ 64 hrs/yr	$30 / hr		1,920
		TOTAL	**$41,672**

<u>Case Study 5: Dust Control for Open Spaces and Stockpiles Using Industrial Misters</u>

Open areas and stockpiles are potential sources of PM emissions at both metal production and recycling facilities. Water, one of the best dust control options, cannot be used at foundries to mitigate dust emissions from charged scrap metal. However, water is used extensively at metal recycling facilities to control dust and PM emissions.

One extremely effective method to control dust from open spaces and stockpiles is the use of industrial water misters, specifically devices with brand names, such as "Buffalo Turbines®" or "Dust Boss®." These devices atomize water under high pressure into aerosol droplets and spray the resulting mist over large areas to agglomerate airborne dust particles.[50] The specification sheet of these devices (a Dust Boss® DB-100) states that it could address an area up to 280,000 square feet (when using the 359° programming), 6.4 acres (ac).[ix] The following additional equipment and materials are needed to operate one Dust Boss® DB-100: 150 kiloWatt (kW) generator, minimum 28.2 gallon per minute (gpm) water pump, 100 feet of industrial water hose, 50,000 gallons per day of water. Table 12 presents the costs associated with purchase and installation of these industrial misters.

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viii These values represent unit costs, plus tax, shipping and installation (an additional 25 percent of the unit costs).

ix Considering prevailing diurnal wind patterns along the edges of the San Francisco Bay, staff used a conservative value of 140,000 or 180 degrees of effectiveness.

Table 12
Capital Costs for Industrial Misters

Equipment / Material	Cost per Unit	Total Cost per Unit[x]
Dust Boss® DB-60 w/ 359° programming	$29,900[51]	$35,880
359 degree programming	$3,800[51]	$4,560
Generator: 150 kW	$17,900[52]	$21,480
Water Pump: 30 gpm	$300[53]	$360
Water Hose: 100 feet	$725[54]	$870
	TOTAL	**$63,150**

The capital costs to provide dust control for 3.2 acres would total about $63,000. Amortizing this value over ten years at annual five percent interest rate results in an annualized cost of $8,118 per 3.2 acres or about $2,600 per acre. The capital cost to mitigate a five-acre area would require at least two DB-100s at an approximately annualized capital cost of $16,236.

Operating cost for the misters include the cost of fuel for generators, the cost of labor for operating and maintaining the units, and may include the cost of water if purchased and not recycled. For the purposes of this analysis, it is assumed that the misters would operate 24 hours a day, seven days per week for at least 75 percent of the year; the remaining 25 percent of the year natural precipitation would maintain moist surfaces during operations and windy conditions. It is estimated that a 150 kW diesel generator would require at least 9.3 gallons of diesel per hour. Cost estimates assume that for at least nine months each year, a facility would rely on precipitation and collected storm and recycled water (three months for precipitation only, six months for collected water; and for the remaining three months, the facility would purchase water from a local utility. East Bay Municipal Utility District charges $3.30 per 100 cubic feet of potable water and $2.94 per 100 ft^3 for non-potable water. A Dust Boss® DB-100 requires 50,000 gallons per day. To address the five-acre area, the two DB-100s would need to be supplied with 100,000 gallon of water per day for at least six months, half of which would potentially need to be purchased. This translates into 13,368 ft^3 per day, which for three months would total 1.2 million ft^3. This volume of water at the potable rate of $3.30 per 100 ft^3 equals $40,250. Table 13 presents the annual operating costs for high-powered misters.

[x] These values represent unit prices, tax, shipping and installation.

Table 13
Annual Operating Costs for High-Powered Misters

Equipment / Material	Cost per Unit	Annual Operating Costs
Diesel Fuel for 150 kW Generator (9.3 gph)	$4.00 per gallon	$491,000
Water (50,000 gallons / day)	$3.30 per 100 ft^3 [49]	$40,250
Labor at 80 hours per year mister	$30 per man-hour	$4,800
Misc. (repair and maintenance parts, insurance)	n/a	$3,000
	TOTAL	**$539,050**

The total annual cost of mitigating dust and particulate emissions from five acres of scrap metal is the sum of the annualized capital cost ($16,236) and annual operational cost ($539,050), or about $540,000.

Case Study 6: Installation of Screened Fences as Wind Barriers

Screen fencing is an effective means to passively reduce fugitive dust emissions from open unpaved areas. A modest reduction of wind speed from these barriers can result in major reduction of fugitive dust emissions. The material and installation costs per foot for screened fences 22 and 35 feet high are $350 and $370 respectively.[55] To enclose a square ten-acre parcel with a 22-foot high screened fence would cost $940,000; a 35-foot high fence would be twice that amount at $1.8 million.[xi] The annualized cost of the installation of these fences would be $120,000 and $240,000, respectively.[xii]

Case Study 7: Switching to Lower VOC Binder Formulation

One of the most effective means to reduce the emissions of odorous substances is to reduce or eliminate the use of odorous substances in the formulations of binders used in mold and core making operations. A reduction such as this would translate into reductions in the emissions of odorous substances in both the mold and core making operations, as well as the casting, cooling, and shakeout processes. One Bay Area facility was able to switch from a Pepset® two-part binder system to a Techniset® two-part binder system. The cost, VOC concentration, potential emissions and emission reduction comparison for the two systems are presented in Table 14.

xi The disproportionate difference between the costs of a 22-foot fence and a 35-foot fence is due to the additional strengthening required to support the extra height, weight, and torque due to winds to which the taller fence would be subject.

xii A five-percent annual interest rate applied over a ten-year period results in a cost-recovery factor of 0.1295.

Table 14
Comparison of Costs and VOC concentrations and Potential Emissions for Two Binder Systems

	Pepset®	Techniset®
Cost[56]	$2.76/lb	$2.75/lb
Average VOC Concentration[56]	219 ppm	78 ppm
Potential VOC Emissions*	26.1 tpy	9.3 tpy
Potential VOC Emissions Reductions*		**16.8 tpy**

* These emission values are hypothetical and based on an air flow rate of 50,000 cfm and operating four hours per day, five days per week, for 52 weeks per year.

There is no essential cost difference between the two binder systems. Tests using a photoionization detector indicated that the Techniset system achieved a 64 percent reduction in VOC emissions over the Pepset system with no reduction in performance. This facility was able to switch to a lower VOC-emitting binder with no reduction in performance and no increase in operation cost with a reduction in VOC (including odorous substances) emissions.

The case studies indicate that there exists a broad range of emissions minimization options available and that those options come with a broad range of costs. While these case studies were presented to illustrate these variations (nature and costs), it should not be assumed that the District would require any of these options be included in any EMP. These options were presented for illustrative purposes only.

D. Review of Alternative Binder Formulations

There are only three facilities that would be affected by Section 12-13-409 of the proposed foundry and forging operations rule, the requirement to evaluate and report on alternative binder formulations: AB&I, PSC, and US Pipe. Each of these facilities has mold- and core-making operations that use foundry sands formulated with phenolic compounds. To comply with this requirement, affected facilities would need to:

- Identify the operations where odorous substances are used or can be emitted, such as mold- and core-making, casting, cooling, shakeout and sand reclamation operations;
- Consult with binder formulators to determine if there are any low- or non-phenolic binders available that may reduce the emissions of odorous substances relative to the current formulations in use at the facility;
- Evaluate the available binder formulations to determine if any are suitable for the facility's affected operations. This may include:
    - o Working with the binder manufacturers to determine if there are like facilities that use alternative binder formulations;
    - o Reviewing casting properties, weight, shape, size, whether the casting is bulky or intricate;

- Comparing binder properties under various conditions, such as tensile strength under ambient and "hot" conditions;
- Seeking approval of alternative processes from clients;
- Developing pilot programs that would help evaluate the efficacy of various alternative binders formulations;
- Determining how affected operations would have to change to accommodate alternative binders, such sand reclamation rates and spent sand disposal requirements.

Usually, the facility does not incur a direct cost for these evaluations; the binder manufacturer would normally underwrite the cost of the evaluation, which would be recovered in the cost of the binder. However, the foundry's personnel time / resources would be needed to oversee and participate in the evaluation. These evaluations can range from a little as three to five weeks for a simple change to as much as 16 months for large-scale foundry operations with various and changing products.[57]

This type of effort may be undertaken by individual facilities of done collectively through industry association or binder manufactures.

E. Cost Effectiveness

Estimating the cost effectiveness (costs of implementation in dollars per ton of pollutant reduced) of these two proposals is not a straightforward exercise. Because these two proposals rely on the development and implementation of EMPs, the emission reductions and costs due to the implementation of the facility-selected minimization measures cannot be ascertained at this point and is dependent upon the measures selected by the operators of the affected facilities and the recommendations of the District. However, the cost of the expected emissions reductions due to the implementation of each case study, above, has been estimated.

1. Cost Effectiveness of Case Study 1: Minimization of Air Drafts for Metal Finishing Operations

This measure would help to reduce the impacts of fugitive emissions of PM to a nearby community. The PM emissions from a metal finishing operation with an annual metal throughput of 20,000 tons are estimated to be approximately 0.15 tons. Annualizing the $25,000 cost of an enclosure over ten years at a five percent interest rate results in an annual cost of $3237. The resulting cost-effectiveness is $21,600 per ton of PM.

2. Cost Effectiveness of Case Study 2: Upgrading PM_{10} Emissions Capture and Control Systems at a Foundry

Case Study 2 showed that the annualized cost of an emissions collection system and extra carrying capacity of a baghouse were apportioned based on capacity (22,000 dscfm divided by 68,000 dscfm or 0.32) to be $459,000. The additional carrying capacity of this baghouse (22,000 dscfm) theoretically could be used to minimize fugitive emissions from tapping, pouring and casting operations. The estimated uncontrolled PM_{10} emissions from pouring and cooling 20,000 tons of steel is estimated to be 7.5 tons per year (based on a pouring emission factor of 0.5 pounds of PM10 per ton of steel poured (lbs/ton) and a mold cooling emission factor of 0.25 lbs/ton).[58] If a capture efficiency of 85 percent and a control efficiency of 99 percent were achieved, an emissions reduction of 6.3 tons of PM_{10} per year would result. The resulting cost-effectiveness based in an emissions reduction of 6.3 tons of PM_{10} would be about $72,800 per ton of PM_{10} reduced.

3. Cost Effectiveness of Case Study 3: Shakers to Reduce Carryout onto Public Roadways

Based on an annual scrap metal throughput of 400,000 tons and a quarter mile roadway, staff estimated the potential amount of carryout to be approximately three tons of PM that could be re-entrained into the air. The use of a tire shaker could reduce this amount up to 75 percent or up to three tons per year, resulting in a cost effectiveness of $215 per ton reduced based on a capital cost of $5,000.

4. Cost Effectiveness of Case Study 4: Reducing Fugitive PM_{10} Emissions from Transfer Operations at a Metal Recycling Facility

If implementation of this minimization measure could reduce fugitive emissions from transfer operations resulted in an overall emission reduction of 10 percent for a facility, the cost effectiveness for this would be approximately $69,500 per ton of PM reduced. This assumes about six tons of PM emissions are available to be reduced.

5. Cost Effectiveness of Case Study 5: Dust Control for Open Spaces and Stockpiles Using Industrial Misters

If implementation of this minimization measure could reduce fugitive emissions from transfer operations resulted in an overall emission reduction of 10 percent for a facility, the cost effectiveness for this would be approximately $105,250 per ton of PM reduced. This assumes a total of six tons of PM emissions are available to be reduced from a total of nine tons.

6. Cost Effectiveness of Case Study 6: Installation of Screened Fences as Wind Barriers

If implementation of this measure contributes at least 10 and 20 percent respectively for fences that are 22 and 35 feet high of the overall emissions reductions available, the cost effectiveness of these minimization options would range be approximately $200,000 per ton.

7. Cost Effectiveness of Case Study 7: Switching to Lower VOC Binder Formulation

Case Study 7 illustrated that the cost of switching from a phenol-based binder system to one with a lesser phenol content was essentially zero. (It must be noted that this is a unique circumstance and cannot be expected to applicable to all mold and core making operations.) Under this scenario, the VOC emissions reductions were estimated to be 16.8 tons per year. Of this VOC reduction, a substantial fraction could be attributable to odorous phenolic compounds. The resulting cost effectiveness for this case study is zero.

Table 15 summarizes the cost effectiveness for the above case studies.

Table 15
Cost Effectiveness for Selected Case Studies

Case Study	**Annualized Costs**	**Estimated Emission Reduction** (tpy)	**Cost Effectiveness** ($/ton)
1	$3,250	0.15	$21,600
2	$459,000	6.3	$72,800
3	$650	3	$215
4	$41,672	0.6	$69,500
5	$539,050	0.6	$105,250
6	$120,000 to $240,000	0.6-1.2	$200,000
7	$0	16.8	$0

F. Socioeconomic Analysis

Section 40728.5 of the California Health and Safety Code requires an air district to assess the socioeconomic impacts of the adoption, amendment or repeal of a rule if the rule is one that “will significantly affect air quality or emissions limitations.” BAE Urban Economics of Emeryville, California has prepared a socioeconomic analysis of the proposed rule and it is attached to this report as Appendix B.

In order to estimate the economic impacts on the affected industries of enacting Rule 12-13 and Rule 6-4, the socioeconomic analysis compares the annualized compliance costs for these industries with their ten-year average profit ratio. The analysis uses data from the District, Dun & Bradstreet, InfoUSA, company annual reports and SEC filings, and the Internal Revenue Service (IRS). The analysis indicates that:

- While some of the case study solutions appear to have compliance costs that are greater than 10 percent of annual profits, the structure of these rules is driven by the EMP, which would be developed by each business and as such, would exclude solutions that are not considered financially feasible by the business itself. As a result, no employment impacts are anticipated due to implementation of these rules.

- While some of the proposed solutions would appear to result in significant direct impacts, the approach to this rule is to allow the affected businesses to suggest and utilize solutions that would be financially feasible, i.e., they would not be required to implement solutions that might result in closure and significant direct impacts. As a result, the rule adoption would not result in any foreseeable indirect or induced impacts either.

The socioeconomic analysis conducted for these proposals concluded that the proposals would result in:

- No anticipated employment impacts are due to implementation of these rules;
- No foreseeable regional indirect or induced impacts;
- No significant impacts to small businesses due to the flexibility of plan requirements.

G. Incremental Cost Analysis

Section 40920.6 of the California Health and Safety Code requires an air district to perform an incremental cost analysis for any proposed Best Available Retrofit Control Technology rule or feasible measure. The air district must: (1) identify one or more control options achieving the emission reduction objectives for the proposed rule, (2) determine the cost effectiveness for each option, and (3) calculate the incremental cost effectiveness for each option. To determine incremental costs, the air district must "calculate the difference in the dollar costs divided by the difference in the emission reduction potentials between each progressively more stringent potential control option as compared to the next less expensive control option."

1. Incremental Cost Effectiveness for the Proposed Rule 12-13

To estimate the incremental cost effectiveness of compliance with a more stringent option, staff used Case Study 2 to compare each of the two regulatory proposals with the 2011 draft proposal that contained specific capture and control limits for PM and VOC emissions. Under the 2011 draft proposal, affected foundries, forges, and metal recyclers operating shredder would be required to achieve an 85 percent capture efficiency and control emissions of PM to at least 0.002 grams per dry standard cubic foot (at least 99 percent control) and reduce organic compounds (VOC) emissions by 95 percent or to 5 parts per million. To achieve these levels of capture and control would require the installation of enclosures, hoods, and/or partitions with air movement equipment to create negative pressure and highly effective PM and VOC controls. Table 16 lists the equipment needed and cost associated with each piece of equipment for a medium size-foundry with a metal throughput of 20,000 tons per year.

Table 16
Control Equipment, Capital and Annualized Costs for Case Study 2

Equipment / Control Device	Capital Costs	Annualized Costs
Emissions Capture System	$354,719	$45,936
Baghouse (50,000 dscfm)	$948,406	$122,819
Carbon Adsorption Unit	$2,296,462	$297,392
TOTAL	**$3,599,587**	**$466,147***

* Note that the total annualized cost presented do not include annual operating costs.

The emissions reductions based on the differences between the current emissions limits for both PM and VOCs and the 2011 draft proposal are listed in Table 17.

Table 17
Emissions and Incremental Emission Reductions for PM and VOCs for Case Study 2

Pollutant	Emission Reduction Due to 2011 Draft Proposal (tpy)	Emission Reduction Due to the NESHAP or Permit Conditions (tpy)	Incremental Emission Reduction (tpy)
PM	6.3	6.1	0.2
VOC	1.4	1.2	0.2
TOTALS	**7.7**	**7.3**	**0.4**

The incremental cost effectiveness is the ratio of the annualized costs and emissions reductions which is $466,147 divided by 0.4 tpy, which results in a value of $1.17 million per ton of pollutant reduced. If an existing capture system could be used, the incremental cost effective would be $1.05 million per ton of pollutant reduced. If an existing baghouse could achieve the standard using state-of-the-art bags, the incremental cost effectiveness would be $858,000 per ton of pollutant reduced.

2. Incremental Cost Effectiveness for Proposed Rule 6-4

PM emissions for metal recycling and shredding operations range between 0.13 and 5.6 tpy. The shredding / hammermill operation must meet a PM emission limit of 0.01 gr/dscf. The 2011 draft proposal required the installation of an enclosure and an abatement device that meets an emissions limit of 0.002 gr/dscf. Implementation of these requirements should result in a PM emission reduction of at 80 percent or 4.48 tons (based on the higher PM emission value of 5.6 tpy). Table 18 provides the costs to enclose the shredding / hammermill and the cost of a PM abatement device that would meet the 0.002 gr/dscf limit.

Table 18
Control Equipment, Capital and Annualized Costs for Case Study 2

Equipment / Control Device	Capital Costs	Annualized Costs
Shredder Enclosure	$1.70 million[59]	$220,150
Baghouse (50,000 dscfm)	$948,406	$122,819
TOTAL	**$2.65 million**	**$342,969***

* Note that the total annualized cost presented do not include annual operating costs.

The incremental cost effectiveness is the ratio of the annualized costs and emissions reductions which is $343,000 divided by 4.48 tpy, which results in a value of $76,560 per ton of PM reduced. The high incremental costs illustrated in this section are the reason that emissions limits consistent with the 2011 draft proposal are not included in the final proposal.

VII. ENVIRONMENTAL IMPACTS

Pursuant to the California Environmental Quality Act, the District has had an initial study for the proposed rules prepared by Environmental Audit, Inc. of Placentia, California. The initial study concludes that there are no potential significant adverse environmental impacts associated with the proposed rules. A negative declaration is expected to be proposed for approval by the District Board of Directors pending public review and comment. A copy of the negative declaration and initial study is attached to this report as Appendix C and has been made available for public comment.

VIII. REGULATORY ANALYSIS

Section 40727.2 of the Health and Safety Code requires an air district, in adopting, amending, or repealing an air district regulation, to identify existing federal and District air pollution control requirements for the equipment or source type affected by the proposed change in air district rules. The air district must then note any differences between these existing requirements and the requirements imposed by the proposed change.

The proposed two new rules are drafted to ensure that their requirements do not conflict with federal regulations and are consistent with district rules that apply to the affected facilities. Federal regulation and District rules form the regulatory foundation upon which the proposals build. The five federal NESHAPs that potentially affect the foundries regulate process emissions of PM by establishing emissions limits, process conditions, and work practices standards for both ferrous and non-ferrous foundries. The Solvent Cleaning NESHAP affects solvent cleaning operations that occur at metal recycling facilities. The Airborne Toxic Control Measure for Emissions of Toxic Metals from Non-Ferrous Metal Melting (District Rule 11-15) also sets emissions limits, process conditions, and work practices standards. Table 19 summarizes the emissions standard contained in these regulations.

Table 19
Federal and State Regulations and Their Affected Processes

Rule / Regulation	Process
NESHAP for Iron and Steel Foundries: 40 CFR Part 63, Subpart EEEEE	Electric arc furnace
	Electric induction furnace
	Scrap preheater
	Cupola furnace
	Pouring area /station
NESHAP for Secondary Aluminum Production: 40 CFR Part 63, Subpart RRR	Sweat furnace
	Dross-only furnace
	Scrap dryer/delacquering kiln/decoating kiln
	Aluminum scrap shredder
NESHAP for Electric Arc Furnace Steelmaking Facilities: 40 CFR Part 63, Subpart YYYYY	Electric Arc Furnace
	Electric Induction Oven
NESHAP for Iron and Steel Foundries: 40 CFR Part 63, Subpart ZZZZZ	Furnace
NESHAP for Aluminum, Copper, and Other Nonferrous Foundries: 40 CFR Part 63, Subpart ZZZZZZ	Furnace
Solvent Cleaning NESHAP: 40 CFR Part 63 Subpart T	Halogenated solvent cleaning operations
ATCM for Emissions of Toxic Metals from Non-Ferrous Metal Melting	Emission points and collection systems

These regulations address the process emissions while the proposals would further address fugitive emissions from the affected sources and other operations at the affected facilities. While these regulations also contain requirements that affect fugitive emissions, the District has determined that those requirements do not adequately address fugitive emissions. Because affected facilities would be required to list and implement all the measures currently employed to reduce fugitive emissions, including those measures born of federal, state, District regulation, the proposals are not duplicative of these regulations.

IX. DISTRICT STAFF IMPACTS

District staff resources would be impacted by the requirement for each affected facility to develop and submit to the District an Emissions Minimization Plan. District staff would review the EMP for accuracy and completeness, release the EMP for public comment, and review it for approval by the APCO. The elements of the approved EMP would be incorporated into the facility's operating permit and monitored for compliance. Further, to assist the facilities in preparing an EMP, District staff would develop compliance guidance documents to help streamline the EMP development, review and approval process. The facilities would also periodically update their EMPs which would result in District reviews in the future.

As the EMPs are implemented, the causes of odorous impacts should decrease. This should result in a decrease in the number and frequency of community odor complaints. This would, as a consequence, reduce District staff resources in investigating odor complaints.

X. RULE DEVELOPMENT / PUBLIC CONSULTATION PROCESS

Throughout the development of these proposals, staff has engaged in an extensive public consultation process. Staff has hosted numerous meetings, participated in numerous stakeholder-hosted meetings, held four workshops on the two initial draft proposals in June, 2011 and July 2012, and has received and considered a considerable amount of feedback from stakeholders.

The process involved:

- Workshops;
- Multiple meetings with stakeholders, including:
  - Facility owners / operators and industry association representatives,
  - Community groups,
  - Public officials and their staff members,
- Attendance at multiple community meetings;
- Correspondence and telephone conferences with the following governmental agencies:
  - US EPA,
  - DTSC,
  - SCAQMD,
  - Yolo –Solano Air Pollution Control District
  - ARB,
  - United States Department of the Interior, Fish and Wildlife Service

  - Maricopa County Air Quality Department, Arizona,
  - Regional Water Quality Control Boards, and
  - Bay Area Certified United Program Agencies;
- Facility visits (number of visits):
  - PSC – Berkeley (3),
  - CASS – Oakland (3),
  - AB&I – Oakland (2) ,
  - US Pipe – Union City (3),
  - A&B Die Casting – Rodeo (1),
  - PCC Structurals – San Leandro (2),
  - Berkeley Forge – Berkeley (1),
  - USS / POSCO – Pittsburg (2),
  - Schnitzer Steel – Oakland (2),
  - Schnitzer Steel – San Jose (1),
  - Pick-N-Pull – San Jose (1),
  - Sims Metals – Richmond (2),
  - Sims Metals – Redwood City (2),
  - Waste Management, Davis Street Transfer Station – San Leandro (1),
- Conference calls;
  - Binder manufacturers,
  - Industry association representatives.

District staff hosted two sets of workshops for two draft proposals. The first draft of Rule 12-13: Metal Melting and Processing Operations and a workshop report were published on June 23, 2011 and two workshops (one in Oakland on July 27 and another in Redwood City on July 28, 2011) were held to present, discuss, and receive comments on the June draft regulation. Both workshops were well attended and numerous comments were received. Major comments included:

- The draft proposal is a one-size-fits-all approach to regulate a disparate industry;
- The draft rule should be bifurcated – one rule for foundries and forges and another for recycling and shredding operations;
- Emissions limits are too stringent and not appropriate for the metal melting industry;
- Monitoring for odors should occur more frequently;
- Exemptions should be based on emissions in consideration of cumulative impacts, especially in CARE areas, not on metal throughput.

In response to the comments received on the initial draft of the proposal and based on additional research and analyses, staff made major revisions, including bifurcating the proposal to better distinguish between metal production and metal recycling industries, and the removal of emissions standards. A second workshop package, including the two draft rules and a second workshop report, was published June 2012 and a second series of workshops were hosted in July 2012. Comments on the 2012 proposal included the following:

- The draft rules should include quantifiable fugitive emission reduction goals that are necessary to improve public health by a specified deadline;
- “Technical and economic feasibility” should be clearly defined in the rules;
- The clean metal exemption should be expanded to include other metals (e.g.: zinc, brass and bronze) to be consistent with other regulations that consider clean metals;
- Allow for the extension of the public comment period and the potential for a public meeting;
- Reinstate and strengthen specific emissions limits, and add emission standards for toxics including metals, sulfur compounds, VOCs, dust, smoke, and any additional non-odorous toxics known to be emitted (not just particulate matter and odors).

Staff reviewed and considered comments made regarding the July 2012 draft proposals and made some changes that are reflected in the final proposals. The final proposals reflect some of the comments received, for example:

- The 30-day public comment period may be extended upon request and District consideration for a public meeting was explicitly included in the language of the Rule; and
- The exemption for clean metals was expanded to include other metals in addition to aluminum.

XI. CONCLUSION

Pursuant to Section 40727 of the California Health and Safety Code, the proposed rules must meet findings of necessity, authority, clarity, consistency, non-duplication, and reference before the Board of Directors may adopt, amend, or repeal a rule. The proposed rules are:

- Necessary to protect public health by ensuring reduction in PM, including toxic metals, and by reducing the impacts of odorous to nearby residents to meet the commitment of Control Measure SSM-1 of the Bay Area 2010 Clean Air Plan;

- Authorized by California Health and Safety Code Sections 40000, 40001, 40702, and 40725 through 40728;

- Clear, in that the rules specifically delineate the affected industry, compliance options, and administrative requirements for industry subject to this rule, so that its meaning can be easily understood by the persons directly affected by it;

- Consistent with other California air district rules, and not in conflict with state or federal law;

- Non-duplicative of other statutes, rules, or regulations; and,

- Implementing, interpreting and making specific and the provisions of the California Health and Safety sections 40000 and 40702.

A socioeconomic analysis prepared by Bay Area Economics has found that the proposed rules should not have a significant economic impact or cause regional job loss. A California Environmental Quality Act (CEQA) analysis prepared by Environmental Audit, Inc., concludes that the proposed rules would not result in adverse environmental impacts. District staff has reviewed and accepted this analysis as well. The CEQA document will be available for public comments prior to the public hearing.

The proposed rules have met all legal noticing requirements, have been discussed with the regulated community and other interested parties, and reflect the input and comments of many affected and interested stakeholders. District staff recommends adoption of proposed new Rule 12, Regulation 13: Foundry and Forging Operations; proposed new Rule 6, Rule 4: Metal Recycling and Shredding Operations; proposed amendments to District Regulation 2, Rule 1: General Requirements; and adoption of the CEQA Negative Declaration.

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